

References

- Gad Abraham, Yixuan Qiu, and Michael Inouye. FlashPCA2: principal component analysis of Biobank-scale genotype datasets. *Bioinformatics*, 33(17):2776–2778, September 2017. ISSN 1367-4803, 1460-2059. doi: 10.1093/bioinformatics/btx299. URL <https://academic.oup.com/bioinformatics/article/33/17/2776/3798630>.
- Christopher I. Amos, Joe Dennis, Zhaoming Wang, Jinyoung Byun, Fredrick R. Schumacher, Simon A. Gayther, Graham Casey, David J. Hunter, Thomas A. Sellers, Stephen B. Gruber, Alison M. Dunning, Kyriaki Michailidou, Laura Fachal, Kimberly Doheny, Amanda B. Spurdle, Yafang Li, Xiangjun Xiao, Jane Romm, Elizabeth Pugh, Gerhard A. Coetzee, Dennis J. Hazelett, Stig E. Bojesen, Charlisse Caga-Anan, Christopher A. Haiman, Ahsan Kamal, Craig Luccarini, Daniel Tessier, Daniel Vincent, François Bacot, David J. Van Den Berg, Stefanie Nelson, Stephen Demetriades, David E. Goldgar, Fergus J. Couch, Judith L. Forman, Graham G. Giles, David V. Conti, Heike Bickeböller, Angela Risch, Melanie Waldenberger, Irene Brüske-Hohlfeld, Belynda D. Hicks, Hua Ling, Lesley McGuffog, Andrew Lee, Karoline Kuchenbaecker, Penny Soucy, Judith Manz, Julie M. Cunningham, Katja Butterbach, Zsofia Kote-Jarai, Peter Kraft, Liesel FitzGerald, Sara Lindström, Marcia Adams, James D. McKay, Catherine M. Phelan, Sara Benlloch, Linda E. Kelemen, Paul Brennan, Marjorie Riggan, Tracy A. O’Mara, Hongbing Shen, Yongyong Shi, Deborah J. Thompson, Marc T. Goodman, Sune F. Nielsen, Andrew Berchuck, Sylvie Laboissiere, Stephanie L. Schmit, Tameka Shelford, Christopher K. Edlund, Jack A. Taylor, John K. Field, Sue K. Park, Kenneth Offit, Mads Thomassen, Rita Schmutzler, Laura Ottini, Rayjean J. Hung, Jonathan Marchini, Ali Amin Al Olama, Ulrike Peters, Rosalind A. Eeles, Michael F. Seldin, Elizabeth Gillanders, Daniela Seminara, Antonis C. Antoniou, Paul D.P. Pharoah, Georgia Chenevix-Trench, Stephen J. Chanock, Jacques Simard, and Douglas F. Easton. The OncoArray Consortium: A Network for Understanding the Genetic Architecture of Common Cancers. *Cancer Epidemiology Biomarkers & Prevention*, 26(1):126–135, January 2017. ISSN 1055-9965, 1538-7755. doi: 10.1158/1055-9965.EPI-16-0106. URL <http://cebp.aacrjournals.org/lookup/doi/10.1158/1055-9965.EPI-16-0106>.
- Carl A Anderson, Fredrik H Pettersson, Geraldine M Clarke, Lon R Cardon, Andrew P Morris, and Krina T Zondervan. Data quality control in genetic case-control association studies. *Nature Protocols*, 5(9):1564–1573, September 2010. ISSN 1754-2189, 1750-2799. doi: 10.1038/nprot.2010.116. URL <http://www.nature.com/doifinder/10.1038/nprot.2010.116>.
- Christof Angermueller, Tanel Pärnamaa, Leopold Parts, and Oliver Stegle. Deep learning for computational biology. *Molecular Systems Biology*, 12(7):878, July 2016. ISSN

- 1744-4292, 1744-4292, 1744-4292. doi: 10.15252/msb.20156651. URL <http://msb.embopress.org/lookup/doi/10.15252/msb.20156651>.
- William J. Astle, Heather Elding, Tao Jiang, Dave Allen, Dace Ruklisa, Alice L. Mann, Daniel Mead, Heleen Bouman, Fernando Riveros-Mckay, Myrto A. Kostadima, John J. Lambourne, Suthesh Sivapalaratnam, Kate Downes, Kousik Kundu, Lorenzo Bomba, Kim Berentsen, John R. Bradley, Louise C. Daugherty, Olivier Delaneau, Kathleen Freson, Stephen F. Garner, Luigi Grassi, Jose Guerrero, Matthias Haimel, Eva M. Janssen-Megens, Anita Kaan, Mihir Kamat, Bowon Kim, Amit Mandoli, Jonathan Marchini, Joost H.A. Martens, Stuart Meacham, Karyn Megy, Jared O'Connell, Romina Petersen, Nilofar Sharifi, Simon M. Sheard, James R. Staley, Salih Tuna, Martijn van der Ent, Klaudia Walter, Shuang-Yin Wang, Eleanor Wheeler, Steven P. Wilder, Valentina Iotchkova, Carmel Moore, Jennifer Sambrook, Hendrik G. Stunnenberg, Emanuele Di Angelantonio, Stephen Kaptoge, Taco W. Kuijpers, Enrique Carrillo-de Santa-Pau, David Juan, Daniel Rico, Alfonso Valencia, Lu Chen, Bing Ge, Louella Vasquez, Tony Kwan, Diego Garrido-Martín, Stephen Watt, Ying Yang, Roderic Guigo, Stephan Beck, Dirk S. Paul, Tomi Pastinen, David Bujold, Guillaume Bourque, Mattia Frontini, John Danesh, David J. Roberts, Willem H. Ouwehand, Adam S. Butterworth, and Nicole Soranzo. The Allelic Landscape of Human Blood Cell Trait Variation and Links to Common Complex Disease. *Cell*, 167(5):1415–1429.e19, November 2016. ISSN 00928674. doi: 10.1016/j.cell.2016.10.042. URL <https://linkinghub.elsevier.com/retrieve/pii/S0092867416314635>.
- David P. Baker, Paul J. Eslinger, Martin Benavides, Ellen Peters, Nathan F. Dieckmann, and Juan Leon. The cognitive impact of the education revolution: A possible cause of the Flynn Effect on population IQ. *Intelligence*, 49:144–158, March 2015. ISSN 01602896. doi: 10.1016/j.intell.2015.01.003. URL <https://linkinghub.elsevier.com/retrieve/pii/S0160289615000082>.
- Sara Balduzzi, Gerta Rücker, and Guido Schwarzer. How to perform a meta-analysis with R: a practical tutorial. *Evidence Based Mental Health*, 22(4):153–160, November 2019. ISSN 1362-0347, 1468-960X. doi: 10.1136/ebmental-2019-300117. URL <http://ebmh.bmj.com/lookup/doi/10.1136/ebmental-2019-300117>.
- Jeffrey C Barrett, James C Lee, Charles W Lees, Natalie J Prescott, Carl A Anderson, Anne Phillips, Emma Wesley, Kirstie Parnell, Hu Zhang, Hazel Drummond, Elaine R Nimmo, Dunecan Massey, Kasia Blaszczyk, Timothy Elliott, Lynn Cotterill, Helen Dallal, Alan J Lobo, Craig Mowat, Jeremy D Sanderson, Derek P Jewell, William G Newman, Cathryn Edwards, Tariq Ahmad, John C Mansfield, Jack Satsangi, Miles Parkes, Christopher G Mathew, Peter Donnelly, Leena Peltonen, Jenefer M Blackwell, Elvira Bramon, Matthew A Brown, Juan P Casas, Aiden Corvin, Nicholas Craddock, Panos Deloukas, Audrey Duncanson, Janusz Jankowski, Hugh S Markus, Christopher G Mathew, Mark I McCarthy, Colin N A Palmer, Robert Plomin, Anna Rautanen, Stephen J Sawcer, Nilesh Samani, Richard C Trembath, Ananth C Viswanathan, Nicholas Wood, Chris C A Spencer, Jeffrey C Barrett, Céline Bellenguez, Daniel Davison, Colin Freeman, Amy Strange, Peter Donnelly, Cordelia Langford, Sarah E Hunt, Sarah Edkins, Rhian Gwilliam, Hannah Blackburn, Suzannah J Bumpstead, Serge Dronov, Matthew Gillman, Emma Gray, Naomi Hammond, Alagurevathi Jayakumar, Owen T McCann, Jennifer Liddle, Marc L Perez, Simon C Potter, Radhi Ravindrarajah, Michelle Ricketts, Matthew Waller, Paul Weston, Sara Widaa, Pamela Whittaker, Panos Deloukas,

- Leena Peltonen, Christopher G Mathew, Jenefer M Blackwell, Matthew A Brown, Aiden Corvin, Mark I McCarthy, Chris C A Spencer, Antony P Attwood, Jonathan Stephens, Jennifer Sambrook, Willem H Ouwehand, Wendy L McArdle, Susan M Ring, and David P Strachan. Genome-wide association study of ulcerative colitis identifies three new susceptibility loci, including the HNF4A region. *Nature Genetics*, 41(12): 1330–1334, December 2009. ISSN 1061-4036, 1546-1718. doi: 10.1038/ng.483. URL <http://www.nature.com/doifinder/10.1038/ng.483>.
- W. Bateson. *The Progress of Genetics Since the Rediscovery of Mendel's Papers*. Progressus rei botanicae. G. Fischer, 1906. URL <https://books.google.co.uk/books?id=nz8ZAAAAYAAJ>.
- Olivia Belbin, Kevin Morgan, Chris Medway, Donald Warden, Mario Cortina-Borja, Cornelia M. van Duijn, Hieab H.H. Adams, Ana Frank-Garcia, Keeley Brookes, Pascual Sánchez-Juan, Victoria Alvarez, Reinhard Heun, Heike Kölsch, Eliecer Coto, Patrick G. Kehoe, Eloy Rodriguez-Rodriguez, Maria J Bullido, M. Arfan Ikram, A. David Smith, and Donald J. Lehmann. The Epistasis Project: A Multi-Cohort Study of the Effects of BDNF, DBH, and SORT1 Epistasis on Alzheimer's Disease Risk. *Journal of Alzheimer's Disease*, 68(4):1535–1547, April 2019. ISSN 13872877, 18758908. doi: 10.3233/JAD-181116. URL <https://www.medra.org/servlet/aliasResolver?alias=iospres&doi=10.3233/JAD-181116>.
- Pau Bellot, Gustavo de Los Campos, and Miguel Pérez-Enciso. Can deep learning improve genomic prediction of complex human traits? *Genetics*, 210(3):809–819, 2018.
- Yoshua Bengio, Yann LeCun, et al. Scaling learning algorithms towards ai. 2007.
- James Bergstra, Daniel Yamins, and David Cox. Making a science of model search: Hyperparameter optimization in hundreds of dimensions for vision architectures. In *International conference on machine learning*, pages 115–123, 2013.
- Richard J. Biedrzycki, Ashley E. Sier, Dongjing Liu, Erika N. Dreikorn, and Daniel E. Weeks. Spinning convincing stories for both true and false association signals. *Genetic Epidemiology*, 43(4):356–364, June 2019. ISSN 0741-0395, 1098-2272. doi: 10.1002/gepi.22189. URL <https://onlinelibrary.wiley.com/doi/abs/10.1002/gepi.22189>.
- Mariusz Bojarski, Davide Del Testa, Daniel Dworakowski, Bernhard Firner, Beat Flepp, Praseen Goyal, Lawrence D Jackel, Mathew Monfort, Urs Muller, Jiakai Zhang, et al. End to end learning for self-driving cars. *arXiv preprint arXiv:1604.07316*, 2016.
- Evan A. Boyle, Yang I. Li, and Jonathan K. Pritchard. An Expanded View of Complex Traits: From Polygenic to Omnigenic. *Cell*, 169(7):1177–1186, June 2017. ISSN 00928674. doi: 10.1016/j.cell.2017.05.038. URL <https://linkinghub.elsevier.com/retrieve/pii/S0092867417306293>.
- Nadav Brandes, Nathan Linal, and Michal Linal. PWAS: Proteome-Wide Association Study. preprint, Bioinformatics, October 2019a. URL <http://biorxiv.org/lookup/doi/10.1101/812289>.

- Nadav Brandes, Nathan Linial, and Michal Linial. Quantifying gene selection in cancer through protein functional alteration bias. *Nucleic Acids Research*, 47(13):6642–6655, July 2019b. ISSN 0305-1048, 1362-4962. doi: 10.1093/nar/gkz546. URL <https://academic.oup.com/nar/article/47/13/6642/5523008>.
- Andrew Brock, Theodore Lim, James M Ritchie, and Nick Weston. Neural photo editing with introspective adversarial networks. *arXiv preprint arXiv:1609.07093*, 2016.
- Sharon R. Browning and Brian L. Browning. Haplotype phasing: existing methods and new developments. *Nature Reviews Genetics*, 12(10):703–714, October 2011. ISSN 1471-0056, 1471-0064. doi: 10.1038/nrg3054. URL <http://www.nature.com/articles/nrg3054>.
- Brendan K Bulik-Sullivan, Po-Ru Loh, Hilary K Finucane, Stephan Ripke, Jian Yang, Nick Patterson, Mark J Daly, Alkes L Price, and Benjamin M Neale. Ld score regression distinguishes confounding from polygenicity in genome-wide association studies. *Nature genetics*, 47(3):291–295, 2015.
- Annalisa Buniello, Jacqueline A L MacArthur, Maria Cerezo, Laura W Harris, James Hayhurst, Cinzia Malangone, Aoife McMahon, Joannella Morales, Edward Mountjoy, Elliot Sollis, Daniel Suveges, Olga Vrousitou, Patricia L Whetzel, Ridwan Amode, Jose A Guillen, Harpreet S Riat, Stephen J Trevanion, Peggy Hall, Heather Junkins, Paul Flicek, Tony Burdett, Lucia A Hindorf, Fiona Cunningham, and Helen Parkinson. The NHGRI-EBI GWAS Catalog of published genome-wide association studies, targeted arrays and summary statistics 2019. *Nucleic Acids Research*, 47(D1):D1005–D1012, January 2019. ISSN 0305-1048, 1362-4962. doi: 10.1093/nar/gky1120. URL <https://academic.oup.com/nar/article/47/D1/D1005/5184712>.
- Oliver S. Burren, Hui Guo, and Chris Wallace. VSEAMS: a pipeline for variant set enrichment analysis using summary GWAS data identifies IKZF3, BATF and ESRRA as key transcription factors in type 1 diabetes. *Bioinformatics*, 30(23):3342–3348, December 2014. ISSN 1460-2059, 1367-4803. doi: 10.1093/bioinformatics/btu571. URL <https://academic.oup.com/bioinformatics/article-lookup/doi/10.1093/bioinformatics/btu571>.
- Oliver S Burren, Guillermo Reales, Limy Wong, John Bowes, James C Lee, Anne Barton, Paul A Lyons, Kenneth GC Smith, Wendy Thomson, Paul DW Kirk, and Chris Wallace. Informed dimension reduction of clinically-related genome-wide association summary data characterises cross-trait axes of genetic risk. preprint, *Genetics*, January 2020. URL <http://biorxiv.org/lookup/doi/10.1101/2020.01.14.905869>.
- Clare Bycroft, Colin Freeman, Desislava Petkova, Gavin Band, Lloyd T Elliott, Kevin Sharp, Allan Motyer, Damjan Vukcevic, Olivier Delaneau, Jared O’Connell, Adrian Cortes, Samantha Welsh, Gil McVean, Stephen Leslie, Peter Donnelly, and Jonathan Marchini. Genome-wide genetic data on ~500,000 UK Biobank participants. July 2017. doi: 10.1101/166298. URL <http://biorxiv.org/lookup/doi/10.1101/166298>.
- Ashley J.R. Carter, Joachim Hermisson, and Thomas F. Hansen. The role of epistatic gene interactions in the response to selection and the evolution of evolvability. *Theoretical Population Biology*, 68(3):179–196, November 2005. ISSN 00405809. doi: 10.1016/j.tpb.2005.05.002. URL <https://linkinghub.elsevier.com/retrieve/pii/S0040580905000638>.

- Stephane E. Castel, Alejandra Cervera, Pejman Mohammadi, François Aguet, Ferran Reverter, Aaron Wolman, Roderic Guigo, Ivan Iossifov, Ana Vasileva, and Tuuli Lappalainen. Modified penetrance of coding variants by cis-regulatory variation contributes to disease risk. *Nature Genetics*, 50(9):1327–1334, September 2018. ISSN 1061-4036, 1546-1718. doi: 10.1038/s41588-018-0192-y. URL <http://www.nature.com/articles/s41588-018-0192-y>.
- Casimiro Castillejo-López, Angélica M Delgado-Vega, Jerome Wojcik, Sergey V Kozyrev, Elangovan Thavathiru, Ying-Yu Wu, Elena Sánchez, David Pöllumann, Juan R López-Egido, Serena Fineschi, Nicolás Domínguez, Rufeí Lu, Judith A James, Joan T Merrill, Jennifer A Kelly, Kenneth M Kaufman, Kathy L Moser, Gary Gilkeson, Johan Frostegård, Bernardo A Pons-Estel, Sandra D’Alfonso, Torsten Witte, José Luis Callejas, John B Harley, Patrick M Gaffney, Javier Martin, Joel M Guthridge, and Marta E Alarcón-Riquelme. Genetic and physical interaction of the B-cell systemic lupus erythematosus-associated genes *BANK1* and *BLK*. *Annals of the Rheumatic Diseases*, 71(1):136–142, January 2012. ISSN 0003-4967, 1468-2060. doi: 10.1136/annrheumdis-2011-200085. URL <http://ard.bmj.com/lookup/doi/10.1136/annrheumdis-2011-200085>.
- Lu Chen, Bing Ge, Francesco Paolo Casale, Louella Vasquez, Tony Kwan, Diego Garrido-Martín, Stephen Watt, Ying Yan, Kousik Kundu, Simone Ecker, Avik Datta, David Richardson, Frances Burden, Daniel Mead, Alice L. Mann, Jose Maria Fernandez, Sophia Rowston, Steven P. Wilder, Samantha Farrow, Xiaojian Shao, John J. Lambourne, Adriana Redensek, Cornelis A. Albers, Vyacheslav Amstislavskiy, Sofie Ashford, Kim Berentsen, Lorenzo Bomba, Guillaume Bourque, David Bujold, Stephan Busche, Maxime Caron, Shu-Huang Chen, Warren Cheung, Oliver Delaneau, Emmanuel T. Dermitzakis, Heather Elding, Irina Colgiu, Frederik O. Bagger, Paul Flicek, Ehsan Habibi, Valentina Iotchkova, Eva Janssen-Megens, Bowon Kim, Hans Lehrach, Ernesto Lowy, Amit Mandoli, Filomena Matarese, Matthew T. Maurano, John A. Morris, Vera Pancaldi, Farzin Pourfarzad, Karola Rehnstrom, Augusto Rendon, Thomas Risch, Nilofar Sharifi, Marie-Michelle Simon, Marc Sultan, Alfonso Valencia, Klaudia Walter, Shuang-Yin Wang, Mattia Frontini, Stylianos E. Antonarakis, Laura Clarke, Marie-Laure Yaspo, Stephan Beck, Roderic Guigo, Daniel Rico, Joost H.A. Martens, Willem H. Ouwehand, Taco W. Kuijpers, Dirk S. Paul, Hendrik G. Stunnenberg, Oliver Stegle, Kate Downes, Tomi Pastinen, and Nicole Soranzo. Genetic Drivers of Epigenetic and Transcriptional Variation in Human Immune Cells. *Cell*, 167(5):1398–1414.e24, November 2016. ISSN 00928674. doi: 10.1016/j.cell.2016.10.026. URL <https://linkinghub.elsevier.com/retrieve/pii/S0092867416314465>.
- Travers Ching, Daniel S Himmelstein, Brett K Beaulieu-Jones, Alexandr A Kalinin, Brian T Do, Gregory P Way, Enrico Ferrero, Paul-Michael Agapow, Michael Zietz, Michael M Hoffman, et al. Opportunities and obstacles for deep learning in biology and medicine. *Journal of The Royal Society Interface*, 15(141):20170387, 2018.
- Pietro Chiurazzi and Filomena Pirozzi. Advances in understanding—genetic basis of intellectual disability. *F1000Research*, 5, 2016.
- Shing Wan Choi, Timothy Shin Heng Mak, and Paul O’Reilly. A guide to performing Polygenic Risk Score analyses. *bioRxiv*, September 2018. doi: 10.1101/416545. URL <http://biorxiv.org/lookup/doi/10.1101/416545>.

- David G. Clayton. Prediction and Interaction in Complex Disease Genetics: Experience in Type 1 Diabetes. *PLoS Genetics*, 5(7):e1000540, July 2009. ISSN 1553-7404. doi: 10.1371/journal.pgen.1000540. URL <http://dx.plos.org/10.1371/journal.pgen.1000540>.
- Isabelle Cleynen, Gabrielle Boucher, Luke Jostins, L Philip Schumm, Sebastian Zeissig, Tariq Ahmad, Vibeke Andersen, Jane M Andrews, Vito Annesse, Stephan Brand, Steven R Brant, Judy H Cho, Mark J Daly, Marla Dubinsky, Richard H Duerr, Lynnette R Ferguson, Andre Franke, Richard B Geary, Philippe Goyette, Hakon Hakonarson, Jonas Halfvarson, Johannes R Hov, Hailang Huang, Nicholas A Kennedy, Limas Kupcinskis, Ian C Lawrance, James C Lee, Jack Satsangi, Stephan Schreiber, Emilie Théâtre, Andrea E van der Meulen-de Jong, Rinse K Weersma, David C Wilson, Miles Parkes, Severine Vermeire, John D Rioux, John Mansfield, Mark S Silverberg, Graham Radford-Smith, Dermot P B McGovern, Jeffrey C Barrett, and Charlie W Lees. Inherited determinants of Crohn's disease and ulcerative colitis phenotypes: a genetic association study. *The Lancet*, 387(10014):156–167, January 2016. ISSN 01406736. doi: 10.1016/S0140-6736(15)00465-1. URL <https://linkinghub.elsevier.com/retrieve/pii/S0140673615004651>.
- COPDGene Investigators, ECLIPSE Investigators, LifeLines Investigators, SPIROMICS Research Group, International COPD Genetics Network Investigators, UK BiLEVE Investigators, International COPD Genetics Consortium, Brian D Hobbs, Kim de Jong, Maxime Lamontagne, Yohan Bossé, Nick Shrine, María Soler Artigas, Louise V Wain, Ian P Hall, Victoria E Jackson, Annah B Wyss, Stephanie J London, Kari E North, Nora Franceschini, David P Strachan, Terri H Beaty, John E Hokanson, James D Crapo, Peter J Castaldi, Robert P Chase, Traci M Bartz, Susan R Heckbert, Bruce M Psaty, Sina A Gharib, Pieter Zanen, Jan W Lammers, Matthijs Oudkerk, H J Groen, Nicholas Locantore, Ruth Tal-Singer, Stephen I Rennard, Jørgen Vestbo, Wim Timens, Peter D Paré, Jeanne C Latourelle, Josée Dupuis, George T O'Connor, Jemma B Wilk, Woo Jin Kim, Mi Kyeong Lee, Yeon-Mok Oh, Judith M Vonk, Harry J de Koning, Shuguang Leng, Steven A Belinsky, Yohannes Tesfaigzi, Ani Manichaikul, Xin-Qun Wang, Stephen S Rich, R Graham Barr, David Sparrow, Augusto A Litonjua, Per Bakke, Amund Gulsvik, Lies Lahousse, Guy G Brusselle, Bruno H Stricker, André G Uitterlinden, Elizabeth J Ampleford, Eugene R Bleecker, Prescott G Woodruff, Deborah A Meyers, Dandi Qiao, David A Lomas, Jae-Joon Yim, Deog Kyeom Kim, Iwona Hawrylkiewicz, Pawel Sliwinski, Megan Hardin, Tasha E Fingerlin, David A Schwartz, Dirkje S Postma, William MacNee, Martin D Tobin, Edwin K Silverman, H Marika Boezen, and Michael H Cho. Genetic loci associated with chronic obstructive pulmonary disease overlap with loci for lung function and pulmonary fibrosis. *Nature Genetics*, 49(3):426–432, March 2017. ISSN 1061-4036, 1546-1718. doi: 10.1038/ng.3752. URL <http://www.nature.com/articles/ng.3752>.
- H. J. Cordell. Epistasis: what it means, what it doesn't mean, and statistical methods to detect it in humans. *Human Molecular Genetics*, 11(20):2463–2468, October 2002. ISSN 14602083. doi: 10.1093/hmg/11.20.2463. URL <https://academic.oup.com/hmg/article-lookup/doi/10.1093/hmg/11.20.2463>.
- Heather J Cordell. Detecting gene–gene interactions that underlie human diseases. *Nature Reviews Genetics*, 10(6):392–404, June 2009. ISSN 1471-0056, 1471-0064. doi: 10.1038/nrg2579. URL <http://www.nature.com/articles/nrg2579>.

- Jerry A. Coyne, Nicholas H. Barton, and Michael Turelli. PERSPECTIVE: A CRITIQUE OF SEWALL WRIGHT'S SHIFTING BALANCE THEORY OF EVOLUTION. *Evolution*, 51(3):643–671, June 1997. ISSN 00143820. doi: 10.1111/j.1558-5646.1997.tb03650.x. URL <http://doi.wiley.com/10.1111/j.1558-5646.1997.tb03650.x>.
- José Crossa, Gustavo de Los Campos, Paulino Pérez, Daniel Gianola, Juan Burgueño, José Luis Araus, Dan Makumbi, Ravi P. Singh, Susanne Dreisigacker, Jianbing Yan, Vivi Arief, Marianne Banziger, and Hans-Joachim Braun. Prediction of genetic values of quantitative traits in plant breeding using pedigree and molecular markers. *Genetics*, 186(2):713–724, October 2010. ISSN 1943-2631. doi: 10.1534/genetics.110.118521.
- José Crossa, Yoseph Beyene, Semagn Kassa, Paulino Pérez, John M. Hickey, Charles Chen, Gustavo de los Campos, Juan Burgueño, Vanessa S. Windhausen, Ed Buckler, Jean-Luc Jannink, Marco A. Lopez Cruz, and Raman Babu. Genomic Prediction in Maize Breeding Populations with Genotyping-by-Sequencing. *G3 & Genomes/Genetics*, 3(11):1903–1926, November 2013. ISSN 2160-1836. doi: 10.1534/g3.113.008227. URL <http://g3journal.org/lookup/doi/10.1534/g3.113.008227>.
- James F Crow. On epistasis: why it is unimportant in polygenic directional selection. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 365(1544):1241–1244, 2010.
- George Cybenko. Approximation by superpositions of a sigmoidal function. *Mathematics of control, signals and systems*, 2(4):303–314, 1989.
- Jie Dang, Jiangxia Li, Qian Xin, Shan Shan, Xianli Bian, Qianqian Yuan, Na Liu, Xiaochun Ma, Yan Li, and Qiji Liu. Gene-gene interaction of ATG5, ATG7, BLK and BANK1 in systemic lupus erythematosus. *International Journal of Rheumatic Diseases*, 19(12):1284–1293, December 2016. ISSN 17561841. doi: 10.1111/1756-185X.12768. URL <http://doi.wiley.com/10.1111/1756-185X.12768>.
- Katrina M de Lange, Loukas Moutsianas, James C Lee, Christopher A Lamb, Yang Luo, Nicholas A Kennedy, Luke Jostins, Daniel L Rice, Javier Gutierrez-Achury, Sun-Gou Ji, Graham Heap, Elaine R Nimmo, Cathryn Edwards, Paul Henderson, Craig Mowat, Jeremy Sanderson, Jack Satsangi, Alison Simmons, David C Wilson, Mark Tremelling, Ailsa Hart, Christopher G Mathew, William G Newman, Miles Parkes, Charlie W Lees, Holm Uhlig, Chris Hawkey, Natalie J Prescott, Tariq Ahmad, John C Mansfield, Carl A Anderson, and Jeffrey C Barrett. Genome-wide association study implicates immune activation of multiple integrin genes in inflammatory bowel disease. *Nature Genetics*, 49(2):256–261, February 2017. ISSN 1061-4036, 1546-1718. doi: 10.1038/ng.3760. URL <http://www.nature.com/articles/ng.3760>.
- Ronald de Vlaming and Patrick J. F. Groenen. The Current and Future Use of Ridge Regression for Prediction in Quantitative Genetics. *BioMed Research International*, 2015:1–18, 2015. ISSN 2314-6133, 2314-6141. doi: 10.1155/2015/143712. URL <http://www.hindawi.com/journals/bmri/2015/143712/>.
- Olivier Delaneau, Cedric Coulonges, and Jean-Francois Zagury. Shape-IT: new rapid and accurate algorithm for haplotype inference. *BMC Bioinformatics*, 9(1):540, 2008. ISSN 1471-2105. doi: 10.1186/1471-2105-9-540. URL <http://bmcbioinformatics.biomedcentral.com/articles/10.1186/1471-2105-9-540>.

- Olivier Delaneau, Jonathan Marchini, and Jean-François Zagury. A linear complexity phasing method for thousands of genomes. *Nature Methods*, 9(2):179–181, February 2012. ISSN 1548-7091, 1548-7105. doi: 10.1038/nmeth.1785. URL <http://www.nature.com/articles/nmeth.1785>.
- Frank Dudbridge and Arief Gusnanto. Estimation of significance thresholds for genomewide association scans. *Genetic Epidemiology*, 32(3):227–234, April 2008. ISSN 07410395, 10982272. doi: 10.1002/gepi.20297. URL <http://doi.wiley.com/10.1002/gepi.20297>.
- Ian Dunham, Ewan Birney, Bryan R Lajoie, Amartya Sanyal, Xianjun Dong, Melissa Greven, Xinying Lin, Jie Wang, Troy W Whitfield, Jiali Zhuang, et al. An integrated encyclopedia of dna elements in the human genome. 2012.
- Claudia Durand and Gudrun A Rappold. Height matters—from monogenic disorders to normal variation. *Nature Reviews Endocrinology*, 9(3):171–177, 2013.
- Cathy E. Elks, Marcel den Hoed, Jing Hua Zhao, Stephen J. Sharp, Nicholas J. Wareham, Ruth J. F. Loos, and Ken K. Ong. Variability in the Heritability of Body Mass Index: A Systematic Review and Meta-Regression. *Frontiers in Endocrinology*, 3, 2012. ISSN 1664-2392. doi: 10.3389/fendo.2012.00029. URL <http://journal.frontiersin.org/article/10.3389/fendo.2012.00029/abstract>.
- Jeffrey B. Endelman. Ridge Regression and Other Kernels for Genomic Selection with R Package rrBLUP. *The Plant Genome Journal*, 4(3):250, 2011. ISSN 1940-3372. doi: 10.3835/plantgenome2011.08.0024. URL <https://www.crops.org/publications/tpg/abstracts/4/3/250>.
- Luke M Evans, Rasool Tahmasbi, Scott I Vrieze, Gonçalo R Abecasis, Sayantan Das, Steven Gazal, Douglas W Bjelland, Teresa R De Candia, Michael E Goddard, Benjamin M Neale, et al. Comparison of methods that use whole genome data to estimate the heritability and genetic architecture of complex traits. *Nature genetics*, 50(5):737–745, 2018.
- R E Everts, J Rothuizen, and B A Oost. Identification of a premature stop codon in the melanocyte-stimulating hormone receptor gene (MC1R) in Labrador and Golden retrievers with yellow coat colour. *Animal Genetics*, 31(3):194–199, June 2000. ISSN 0268-9146, 1365-2052. doi: 10.1046/j.1365-2052.2000.00639.x. URL <https://onlinelibrary.wiley.com/doi/abs/10.1046/j.1365-2052.2000.00639.x>.
- Kyle Kai-How Farh, Alexander Marson, Jiang Zhu, Markus Klei, William J. Housley, Samantha Beik, Noam Shores, Holly Whitton, Russell J. H. Ryan, Alexander A. Shishkin, Meital Hatan, Marlene J. Carrasco-Alfonso, Dita Mayer, C. John Luckey, Nikolaos A. Patsopoulos, Philip L. De Jager, Vijay K. Kuchroo, Charles B. Epstein, Mark J. Daly, David A. Hafler, and Bradley E. Bernstein. Genetic and epigenetic fine mapping of causal autoimmune disease variants. *Nature*, 518(7539):337–343, February 2015. ISSN 0028-0836, 1476-4687. doi: 10.1038/nature13835. URL <http://www.nature.com/articles/nature13835>.
- Katherine A Fawcett and Inês Barroso. The genetics of obesity: FTO leads the way. *Trends in genetics : TIG*, 26(6):266–274, June 2010. ISSN 0168-9525. doi: 10.1016/j.tig.

- 2010.02.006. URL <https://pubmed.ncbi.nlm.nih.gov/20381893>. Edition: 2010/04/08
Publisher: Elsevier Trends Journals.
- Chloe Fawns-Ritchie and Ian J. Deary. Reliability and validity of the UK Biobank cognitive tests. *PLOS ONE*, 15(4):e0231627, April 2020. ISSN 1932-6203. doi: 10.1371/journal.pone.0231627. URL <https://dx.plos.org/10.1371/journal.pone.0231627>.
- FinnGen. FinnGen documentation of r3 release, 2020. URL <https://finngen.gitbook.io/documentation/>.
- Alexandra E. Fish, John A. Capra, and William S. Bush. Are Interactions between cis-Regulatory Variants Evidence for Biological Epistasis or Statistical Artifacts? *The American Journal of Human Genetics*, 99(4):817–830, October 2016. ISSN 00029297. doi: 10.1016/j.ajhg.2016.07.022. URL <https://linkinghub.elsevier.com/retrieve/pii/S0002929716303238>.
- RA Fisher. The correlation between relatives on the supposition of mendelian inheritance. *Transactions of the Royal Society of Edinburgh*, 52:399–433, 1918.
- Ronald Aylmer Fisher. *The genetical theory of natural selection*. The Clarendon Press, 1930.
- Anna Fry, Thomas J Littlejohns, Cathie Sudlow, Nicola Doherty, Ligia Adamska, Tim Sprosen, Rory Collins, and Naomi E Allen. Comparison of Sociodemographic and Health-Related Characteristics of UK Biobank Participants With Those of the General Population. *American Journal of Epidemiology*, 186(9):1026–1034, November 2017. ISSN 0002-9262, 1476-6256. doi: 10.1093/aje/kwx246. URL <https://academic.oup.com/aje/article/186/9/1026/3883629>.
- Geoff Fudenberg, David R. Kelley, and Katherine S. Pollard. Predicting 3D genome folding from DNA sequence. preprint, Genomics, October 2019. URL <http://biorxiv.org/lookup/doi/10.1101/800060>.
- Kunihiko Fukushima and Sei Miyake. Neocognitron: A new algorithm for pattern recognition tolerant of deformations and shifts in position. *Pattern Recognition*, 15(6):455–469, January 1982. ISSN 00313203. doi: 10.1016/0031-3203(82)90024-3. URL <https://linkinghub.elsevier.com/retrieve/pii/0031320382900243>.
- Terrence S. Furey, Praveen Sethupathy, and Shehzad Z. Sheikh. Redefining the IBDs using genome-scale molecular phenotyping. *Nature Reviews Gastroenterology & Hepatology*, 16(5):296–311, May 2019. ISSN 1759-5045, 1759-5053. doi: 10.1038/s41575-019-0118-x. URL <http://www.nature.com/articles/s41575-019-0118-x>.
- Yarin Gal and Zoubin Ghahramani. Bayesian convolutional neural networks with bernoulli approximate variational inference. *arXiv preprint arXiv:1506.02158*, 2015.
- Yarin Gal and Zoubin Ghahramani. Dropout as a bayesian approximation: Representing model uncertainty in deep learning. In *international conference on machine learning*, pages 1050–1059, 2016.

- Michael D. Gallagher and Alice S. Chen-Plotkin. The Post-GWAS Era: From Association to Function. *The American Journal of Human Genetics*, 102(5):717–730, May 2018. ISSN 00029297. doi: 10.1016/j.ajhg.2018.04.002. URL <https://linkinghub.elsevier.com/retrieve/pii/S0002929718301344>.
- GEL. 5 million genomes project, 2020. URL https://www.weka.io/wp-content/uploads/2020/01/GEL-CaseStudy_W03CS202001.pdf.
- Xavier Glorot, Antoine Bordes, and Yoshua Bengio. Deep sparse rectifier neural networks. In *Proceedings of the fourteenth international conference on artificial intelligence and statistics*, pages 315–323, 2011.
- GTEEx Consortium, Eric R Gamazon, Heather E Wheeler, Kanaan P Shah, Sahar V Mozaffari, Keston Aquino-Michaels, Robert J Carroll, Anne E Eyler, Joshua C Denny, Dan L Nicolae, Nancy J Cox, and Hae Kyung Im. A gene-based association method for mapping traits using reference transcriptome data. *Nature Genetics*, 47(9):1091–1098, September 2015. ISSN 1061-4036, 1546-1718. doi: 10.1038/ng.3367. URL <http://www.nature.com/articles/ng.3367>.
- Alexander Gusev, Arthur Ko, Huwenbo Shi, Gaurav Bhatia, Wonil Chung, Brenda W J H Penninx, Rick Jansen, Eco J C de Geus, Dorret I Boomsma, Fred A Wright, Patrick F Sullivan, Elina Nikkola, Marcus Alvarez, Mete Civelek, Aldons J Lusis, Terho Lehtimäki, Emma Raitoharju, Mika Kähönen, Ilkka Seppälä, Olli T Raitakari, Johanna Kuusisto, Markku Laakso, Alkes L Price, Päivi Pajukanta, and Bogdan Pasaniuc. Integrative approaches for large-scale transcriptome-wide association studies. *Nature Genetics*, 48(3):245–252, March 2016. ISSN 1061-4036, 1546-1718. doi: 10.1038/ng.3506. URL <http://www.nature.com/articles/ng.3506>.
- Jean Louis Guénet, Fernando Benavides, Jean-Jacques Panthier, and Xavier Montagutelli. *Genetics of the Mouse*. Springer Berlin Heidelberg, Berlin, Heidelberg, 2015. ISBN 978-3-662-44286-9 978-3-662-44287-6. doi: 10.1007/978-3-662-44287-6. URL <http://link.springer.com/10.1007/978-3-662-44287-6>.
- Emmanuelle Génin, Baptiste Coustet, Yannick Allanore, Ikue Ito, Maria Teruel, Arnaud Constantin, Thierry Schaefferbeke, Adeline Ruysen-Witrand, Shigeto Tohma, Alain Cantagrel, Olivier Vittecoq, Thomas Barnette, Xavier Le Loët, Patrice Fardellone, Hiroshi Furukawa, Olivier Meyer, Benjamin Fernández-Gutiérrez, Alejandro Balsa, Miguel A. González-Gay, Gilles Chiocchia, Naoyuki Tsuchiya, Javier Martin, and Philippe Dieudé. Epistatic Interaction between BANK1 and BLK in Rheumatoid Arthritis: Results from a Large Trans-Ethnic Meta-Analysis. *PLoS ONE*, 8(4):e61044, April 2013. ISSN 1932-6203. doi: 10.1371/journal.pone.0061044. URL <https://dx.plos.org/10.1371/journal.pone.0061044>.
- Thomas F. Hansen. WHY EPISTASIS IS IMPORTANT FOR SELECTION AND ADAPTATION: PERSPECTIVE. *Evolution*, 67(12):3501–3511, December 2013. ISSN 00143820. doi: 10.1111/evo.12214. URL <http://doi.wiley.com/10.1111/evo.12214>.
- Frank E Harrell Jr. *rms: Regression Modeling Strategies*, 2019. URL <https://CRAN.R-project.org/package=rms>. R package version 5.1-4.

- Kaiming He, Xiangyu Zhang, Shaoqing Ren, and Jian Sun. Delving deep into rectifiers: Surpassing human-level performance on imagenet classification. In *Proceedings of the IEEE international conference on computer vision*, pages 1026–1034, 2015.
- Kaiming He, Xiangyu Zhang, Shaoqing Ren, and Jian Sun. Deep residual learning for image recognition. In *Proceedings of the IEEE conference on computer vision and pattern recognition*, pages 770–778, 2016.
- Gibran Hemani, Konstantin Shakhbazov, Harm-Jan Westra, Tonu Esko, Anjali K. Henders, Allan F. McRae, Jian Yang, Greg Gibson, Nicholas G. Martin, Andres Metspalu, Lude Franke, Grant W. Montgomery, Peter M. Visscher, and Joseph E. Powell. Detection and replication of epistasis influencing transcription in humans. *Nature*, 508(7495): 249–253, February 2014. ISSN 0028-0836, 1476-4687. doi: 10.1038/nature13005. URL <http://www.nature.com/doifinder/10.1038/nature13005>.
- C. R. Henderson. Estimation of genetic parameters. *Biometrics - vol. 6*, pages 186–187, 1950. event-place: Washington, USA.
- Natalia Hernandez-Pacheco, Maria Pino-Yanes, and Carlos Flores. Genomic Predictors of Asthma Phenotypes and Treatment Response. *Frontiers in Pediatrics*, 7:6, February 2019. ISSN 2296-2360. doi: 10.3389/fped.2019.00006. URL <https://www.frontiersin.org/article/10.3389/fped.2019.00006/full>.
- Joel Hestness, Sharan Narang, Newsha Ardalani, Gregory Diamos, Heewoo Jun, Hassan Kianinejad, Md Mostofa Ali Patwary, Yang Yang, and Yanqi Zhou. Deep Learning Scaling is Predictable, Empirically. *arXiv:1712.00409 [cs, stat]*, December 2017. URL <http://arxiv.org/abs/1712.00409>. arXiv: 1712.00409.
- W. David Hill, Ruben C. Arslan, Charley Xia, Michelle Luciano, Carmen Amador, Pau Navarro, Caroline Hayward, Reka Nagy, David J. Porteous, Andrew M. McIntosh, Ian J. Deary, Chris S. Haley, and Lars Penke. Genomic analysis of family data reveals additional genetic effects on intelligence and personality. *Molecular Psychiatry*, 23(12):2347–2362, December 2018. ISSN 1359-4184, 1476-5578. doi: 10.1038/s41380-017-0005-1. URL <http://www.nature.com/articles/s41380-017-0005-1>.
- L. A. Hindorff, P. Sethupathy, H. A. Junkins, E. M. Ramos, J. P. Mehta, F. S. Collins, and T. A. Manolio. Potential etiologic and functional implications of genome-wide association loci for human diseases and traits. *Proceedings of the National Academy of Sciences*, 106(23): 9362–9367, June 2009. ISSN 0027-8424, 1091-6490. doi: 10.1073/pnas.0903103106. URL <http://www.pnas.org/cgi/doi/10.1073/pnas.0903103106>.
- Geoffrey E Hinton. Distributed representations. 1984.
- Valentin Hivert, Julia Sidorenko, Florian Rohart, Michael E Goddard, Jian Yang, Naomi R Wray, Loic Yengo, and Peter M Visscher. Estimation of non-additive genetic variance in human complex traits from a large sample of unrelated individuals. preprint, Genetics, November 2020. URL <http://biorxiv.org/lookup/doi/10.1101/2020.11.09.375501>.
- Adela Hruby and Frank B. Hu. The Epidemiology of Obesity: A Big Picture. *PharmacoEconomics*, 33(7):673–689, July 2015. ISSN 1170-7690, 1179-2027. doi: 10.1007/s40273-014-0243-x. URL <http://link.springer.com/10.1007/s40273-014-0243-x>.

- Hailiang Huang, Ming Fang, Luke Jostins, Maša Umićević Mirkov, Gabrielle Boucher, Carl A. Anderson, Vibeke Andersen, Isabelle Cleynen, Adrian Cortes, François Crins, Mauro D'Amato, Valérie Deffontaine, Julia Dmitrieva, Elisa Docampo, Mahmoud Elansary, Kyle Kai-How Farh, Andre Franke, Ann-Stephan Gori, Philippe Goyette, Jonas Halfvarson, Talin Haritunians, Jo Knight, Ian C. Lawrance, Charlie W. Lees, Edouard Louis, Rob Mariman, Theo Meuwissen, Myriam Mni, Yukihide Momozawa, Miles Parkes, Sarah L. Spain, Emilie Théâtre, Gosia Trynka, Jack Satsangi, Suzanne van Sommeren, Severine Vermeire, Ramnik J. Xavier, Rinse K. Weersma, Richard H. Duerr, Christopher G. Mathew, John D. Rioux, Dermot P. B. McGovern, Judy H. Cho, Michel Georges, Mark J. Daly, and International Inflammatory Bowel Disease Genetics Consortium Barrett, Jeffrey C. Fine-mapping inflammatory bowel disease loci to single-variant resolution. *Nature*, 547(7662):173–178, July 2017. ISSN 0028-0836, 1476-4687. doi: 10.1038/nature22969. URL <http://www.nature.com/articles/nature22969>.
- Wen Huang and Trudy F. C. Mackay. The Genetic Architecture of Quantitative Traits Cannot Be Inferred from Variance Component Analysis. *PLOS Genetics*, 12(11): e1006421, November 2016. ISSN 1553-7404. doi: 10.1371/journal.pgen.1006421. URL <http://dx.plos.org/10.1371/journal.pgen.1006421>.
- D. H. Hubel and T. N. Wiesel. Receptive fields, binocular interaction and functional architecture in the cat's visual cortex. *The Journal of Physiology*, 160(1):106–154, January 1962. ISSN 00223751. doi: 10.1113/jphysiol.1962.sp006837. URL <http://doi.wiley.com/10.1113/jphysiol.1962.sp006837>.
- International Inflammatory Bowel Disease Genetics Consortium, Philippe Goyette, Gabrielle Boucher, Dermot Mallon, Eva Ellinghaus, Luke Jostins, Hailiang Huang, Stephan Ripke, Elena S Gusareva, Vito Annese, Stephen L Hauser, Jorge R Oksenberg, Ingo Thomsen, Stephen Leslie, Mark J Daly, Kristel Van Steen, Richard H Duerr, Jeffrey C Barrett, Dermot P B McGovern, L Philip Schumm, James A Traherne, Mary N Carrington, Vasilis Kosmoliaptsis, Tom H Karlsen, Andre Franke, and John D Rioux. High-density mapping of the MHC identifies a shared role for HLA-DRB1*01:03 in inflammatory bowel diseases and heterozygous advantage in ulcerative colitis. *Nature Genetics*, 47(2): 172–179, February 2015. ISSN 1061-4036, 1546-1718. doi: 10.1038/ng.3176. URL <http://www.nature.com/articles/ng.3176>.
- International Multiple Sclerosis Genetics Consortium, International IBD Genetics Consortium, Jimmy Z Liu, Suzanne van Sommeren, Hailiang Huang, Siew C Ng, Rudi Alberts, Atsushi Takahashi, Stephan Ripke, James C Lee, Luke Jostins, Tejas Shah, Shifteh Abedian, Jae Hee Cheon, Judy Cho, Naser E Daryani, Lude Franke, Yuta Fuyuno, Ailsa Hart, Ramesh C Juyal, Garima Juyal, Won Ho Kim, Andrew P Morris, Hossein Poustchi, William G Newman, Vandana Midha, Timothy R Orchard, Homayon Vahedi, Ajit Sood, Joseph J Y Sung, Reza Malekzadeh, Harm-Jan Westra, Keiko Yamazaki, Suk-Kyun Yang, Jeffrey C Barrett, Andre Franke, Behrooz Z Alizadeh, Miles Parkes, Thelma B K, Mark J Daly, Michiaki Kubo, Carl A Anderson, and Rinse K Weersma. Association analyses identify 38 susceptibility loci for inflammatory bowel disease and highlight shared genetic risk across populations. *Nature Genetics*, 47(9): 979–986, September 2015. ISSN 1061-4036, 1546-1718. doi: 10.1038/ng.3359. URL <http://www.nature.com/articles/ng.3359>.

- Sergey Ioffe and Christian Szegedy. Batch Normalization: Accelerating Deep Network Training by Reducing Internal Covariate Shift. *arXiv:1502.03167 [cs]*, February 2015. URL <http://arxiv.org/abs/1502.03167>. arXiv: 1502.03167.
- A. G. Ivakhnenko. Polynomial Theory of Complex Systems. *IEEE Transactions on Systems, Man, and Cybernetics*, SMC-1(4):364–378, October 1971. ISSN 0018-9472, 2168-2909. doi: 10.1109/TSMC.1971.4308320. URL <http://ieeexplore.ieee.org/document/4308320/>.
- Arija G. Jansen, Sabine E. Mous, Tonya White, Danielle Posthuma, and Tinca J. C. Polderman. What Twin Studies Tell Us About the Heritability of Brain Development, Morphology, and Function: A Review. *Neuropsychology Review*, 25(1):27–46, March 2015. ISSN 1040-7308, 1573-6660. doi: 10.1007/s11065-015-9278-9. URL <http://link.springer.com/10.1007/s11065-015-9278-9>.
- Yong Jiang and Jochen C. Reif. Modeling Epistasis in Genomic Selection. *Genetics*, 201(2):759–768, October 2015. ISSN 0016-6731, 1943-2631. doi: 10.1534/genetics.115.177907. URL <http://www.genetics.org/lookup/doi/10.1534/genetics.115.177907>.
- Åsa Johansson, Mathias Rask-Andersen, Torgny Karlsson, and Weronica E Ek. Genome-wide association analysis of 350 000 Caucasians from the UK Biobank identifies novel loci for asthma, hay fever and eczema. *Human Molecular Genetics*, 28(23):4022–4041, December 2019. ISSN 0964-6906, 1460-2083. doi: 10.1093/hmg/ddz175. URL <https://academic.oup.com/hmg/article/28/23/4022/5540983>.
- Hyun Min Kang, Noah A. Zaitlen, Claire M. Wade, Andrew Kirby, David Heckerman, Mark J. Daly, and Eleazar Eskin. Efficient Control of Population Structure in Model Organism Association Mapping. *Genetics*, 178(3):1709–1723, March 2008. ISSN 0016-6731, 1943-2631. doi: 10.1534/genetics.107.080101. URL <http://www.genetics.org/lookup/doi/10.1534/genetics.107.080101>.
- David R. Kelley, Yakir A. Reshef, Maxwell Bileschi, David Belanger, Cory Y. McLean, and Jasper Snoek. Sequential regulatory activity prediction across chromosomes with convolutional neural networks. *Genome Research*, 28(5):739–750, May 2018. ISSN 1088-9051, 1549-5469. doi: 10.1101/gr.227819.117. URL <http://genome.cshlp.org/lookup/doi/10.1101/gr.227819.117>.
- Amit V. Khera, Mark Chaffin, Krishna G. Aragam, Mary E. Haas, Carolina Roselli, Seung Hoan Choi, Pradeep Natarajan, Eric S. Lander, Steven A. Lubitz, Patrick T. Ellinor, and Sekar Kathiresan. Genome-wide polygenic scores for common diseases identify individuals with risk equivalent to monogenic mutations. *Nature Genetics*, 50(9):1219–1224, September 2018. ISSN 1061-4036, 1546-1718. doi: 10.1038/s41588-018-0183-z. URL <http://www.nature.com/articles/s41588-018-0183-z>.
- Hwasoon Kim, Alexander Grueneberg, Ana I. Vazquez, Stephen Hsu, and Gustavo de los Campos. Will Big Data Close the Missing Heritability Gap? *Genetics*, 207(3):1135–1145, November 2017. ISSN 0016-6731, 1943-2631. doi: 10.1534/genetics.117.300271. URL <http://www.genetics.org/lookup/doi/10.1534/genetics.117.300271>.

- Diederik P. Kingma and Jimmy Ba. Adam: A Method for Stochastic Optimization. *arXiv:1412.6980 [cs]*, December 2014. URL <http://arxiv.org/abs/1412.6980>. arXiv: 1412.6980.
- Günter Klambauer, Thomas Unterthiner, Andreas Mayr, and Sepp Hochreiter. Self-normalizing neural networks. In *Advances in neural information processing systems*, pages 971–980, 2017.
- R. J. Klein. Complement Factor H Polymorphism in Age-Related Macular Degeneration. *Science*, 308(5720):385–389, April 2005. ISSN 0036-8075, 1095-9203. doi: 10.1126/science.1109557. URL <https://www.sciencemag.org/lookup/doi/10.1126/science.1109557>.
- Evan Koch, Mickey Ristroph, and Mark Kirkpatrick. Long Range Linkage Disequilibrium across the Human Genome. *PLoS ONE*, 8(12):e80754, December 2013. ISSN 1932-6203. doi: 10.1371/journal.pone.0080754. URL <https://dx.plos.org/10.1371/journal.pone.0080754>.
- Augustine Kong, Michael L. Frigge, Gudmar Thorleifsson, Hreinn Stefansson, Alexander I. Young, Florian Zink, Gudrun A. Jonsdottir, Aysu Okbay, Patrick Sulem, Gisli Masson, Daniel F. Gudbjartsson, Agnar Helgason, Gyda Bjornsdottir, Unnur Thorsteinsdottir, and Kari Stefansson. Selection against variants in the genome associated with educational attainment. *Proceedings of the National Academy of Sciences*, 114(5):E727–E732, January 2017. ISSN 0027-8424, 1091-6490. doi: 10.1073/pnas.1612113114. URL <http://www.pnas.org/lookup/doi/10.1073/pnas.1612113114>.
- Augustine Kong, Gudmar Thorleifsson, Michael L. Frigge, Bjarni J. Vilhjalmsson, Alexander I. Young, Thorgeir E. Thorgeirsson, Stefania Benonisdottir, Asmundur Oddsson, Bjarni V. Halldorsson, Gisli Masson, Daniel F. Gudbjartsson, Agnar Helgason, Gyda Bjornsdottir, Unnur Thorsteinsdottir, and Kari Stefansson. The nature of nurture: Effects of parental genotypes. *Science*, 359(6374):424–428, January 2018. ISSN 0036-8075, 1095-9203. doi: 10.1126/science.aan6877. URL <https://www.sciencemag.org/lookup/doi/10.1126/science.aan6877>.
- Elena Kuzmin, Benjamin VanderSluis, Wen Wang, Guihong Tan, Raamesh Deshpande, Yiqun Chen, Matej Usaj, Attila Balint, Mojca Mattiazzi Usaj, Jolanda van Leeuwen, Elizabeth N. Koch, Carles Pons, Andrius J. Dagilis, Michael Prysizlak, Jason Zi Yang Wang, Julia Hanchard, Margot Riggi, Kaicong Xu, Hamed Heydari, Bryan-Joseph San Luis, Ermira Shuteriqi, Hongwei Zhu, Nydia Van Dyk, Sara Sharifpoor, Michael Costanzo, Robbie Loewith, Amy Caudy, Daniel Bolnick, Grant W. Brown, Brenda J. Andrews, Charles Boone, and Chad L. Myers. Systematic analysis of complex genetic interactions. *Science*, 360(6386):eaao1729, April 2018. ISSN 0036-8075, 1095-9203. doi: 10.1126/science.aao1729. URL <http://www.sciencemag.org/lookup/doi/10.1126/science.aao1729>.
- Yann LeCun, Yoshua Bengio, and Geoffrey Hinton. Deep learning. *Nature*, 521:436, May 2015. URL <http://dx.doi.org/10.1038/nature14539>.
- Yann A LeCun, Léon Bottou, Genevieve B Orr, and Klaus-Robert Müller. Efficient backprop. In *Neural networks: Tricks of the trade*, pages 9–48. Springer, 2012.

James J. Lee, Robbee Wedow, Aysu Okbay, Edward Kong, Omeed Maghziyan, Meghan Zacher, Tuan Anh Nguyen-Viet, Peter Bowers, Julia Sidorenko, Richard Karlsson Linnér, Mark Alan Fontana, Tushar Kundu, Chanwook Lee, Hui Li, Ruoxi Li, Rebecca Royer, Pascal N. Timshel, Raymond K. Walters, Emily A. Willoughby, Loïc Yengo, Michelle Agee, Babak Alipanahi, Adam Auton, Robert K. Bell, Katarzyna Bryc, Sarah L. Elson, Pierre Fontanillas, David A. Hinds, Jennifer C. McCreight., Karen E. Huber, Nadia K. Litterman, Matthew H. McIntyre, Joanna L. Mountain, Elizabeth S. Noblin, Carrie A. M. Northover, Steven J. Pitts, J. Fah Sathirapongsasuti, Olga V. Sazonova, Janie F. Shelton, Suyash Shringarpure, Chao Tian, Vladimir Vacic, Catherine H. Wilson, Aysu Okbay, Jonathan P. Beauchamp, Mark Alan Fontana, James J. Lee, Tune H. Pers, Cornelius A. Rietveld, Patrick Turley, Guo-Bo Chen, Valur Emilsson, S. Fleur W. Meddens, Sven Oskarsson, Joseph K. Pickrell, Kevin Thom, Pascal Timshel, Ronald de Vlaming, Abdel Abdellaoui, Tarunveer S. Ahluwalia, Jonas Bacelis, Clemens Baumbach, Gyda Bjornsdottir, Johannes H. Brandsma, Maria Pina Concas, Jaime Derringer, Nicholas A. Furlotte, Tessel E. Galesloot, Giorgia Grotto, Richa Gupta, Leanne M. Hall, Sarah E. Harris, Edith Hofer, Momoko Horikoshi, Jennifer E. Huffman, Kadri Kaasik, Ioanna P. Kalafati, Robert Karlsson, Augustine Kong, Jari Lahti, Sven J. van der Lee, Christiaan de Leeuw, Penelope A. Lind, Karl-Oskar Lindgren, Tian Liu, Massimo Mangino, Jonathan Marten, Evelin Mihailov, Michael B. Miller, Peter J. van der Most, Christopher Oldmeadow, Antony Payton, Natalia Pervjakova, Wouter J. Peyrot, Yong Qian, Olli Raitakari, Rico Rueedi, Erika Salvi, Børge Schmidt, Katharina E. Schraut, Jianxin Shi, Albert V. Smith, Raymond A. Poot, Beate St Pourcain, Alexander Teumer, Gudmar Thorleifsson, Niek Verweij, Dragana Vuckovic, Juergen Wellmann, Harm-Jan Westra, Jingyun Yang, Wei Zhao, Zhihong Zhu, Behrooz Z. Alizadeh, Najaf Amin, Andrew Bakshi, Sebastian E. Baumeister, Ginevra Biino, Klaus Bønnelykke, Patricia A. Boyle, Harry Campbell, Francesco P. Cappuccio, Gail Davies, Jan-Emmanuel De Neve, Panos Deloukas, Ilja Demuth, Jun Ding, Peter Eibich, Lewin Eisele, Nina Eklund, David M. Evans, Jessica D. Faul, Mary F. Feitosa, Andreas J. Forstner, Iliaria Gandin, Bjarni Gunnarsson, Bjarni V. Halldórsson, Tamara B. Harris, Andrew C. Heath, Lynne J. Hocking, Elizabeth G. Holliday, Georg Homuth, Michael A. Horan, Jouke-Jan Hottenga, Philip L. de Jager, Peter K. Joshi, Astanand Jugessur, Marika A. Kaakinen, Mika Kähönen, Stavroula Kanoni, Liisa Keltigangas-Järvinen, Lambertus A. L. M. Kiemeny, Ivana Kolcic, Seppo Koskinen, Aldi T. Kraja, Martin Kroh, Zoltan Kutalik, Antti Latvala, Lenore J. Launer, Maël P. Lebreton, Douglas F. Levinson, Paul Lichtenstein, Peter Lichtner, David C. M. Liewald, LifeLines Cohort Study Loukola, Anu, Pamela A. Madden, Reedik Mägi, Tomi Mäki-Opas, Riccardo E. Marioni, Pedro Marques-Vidal, Gerardus A. Meddens, George McMahon, Christa Meisinger, Thomas Meitinger, Yusplitri Milaneschi, Lili Milani, Grant W. Montgomery, Ronny Myhre, Christopher P. Nelson, Dale R. Nyholt, William E. R. Ollier, Aarno Palotie, Lavinia Paternoster, Nancy L. Pedersen, Katja E. Petrovic, David J. Porteous, Katri Räikkönen, Susan M. Ring, Antonietta Robino, Olga Rostapshova, Igor Rudan, Aldo Rustichini, Veikko Salomaa, Alan R. Sanders, Antti-Pekka Sarin, Helena Schmidt, Rodney J. Scott, Blair H. Smith, Jennifer A. Smith, Jan A. Staessen, Elisabeth Steinhagen-Thiessen, Konstantin Strauch, Antonio Terracciano, Martin D. Tobin, Sheila Ulivi, Simona Vaccargiu, Lydia Quaye, Frank J. A. van Rooij, Cristina Venturini, Anna A. E. Vinkhuyzen, Uwe Völker, Henry Völzke, Judith M. Vonk, Diego Vozzi, Johannes Waage, Erin B. Ware, Gonneke Willemsen, John R. Attia, David A. Bennett, Klaus Berger, Lars Bertram, Hans Bisgaard, Dorret I. Boomsma, Ingrid B. Borecki, Ute Bültmann, Christopher F.

- Chabris, Francesco Cucca, Daniele Cusi, Ian J. Deary, George V. Dedoussis, Cornelia M. van Duijn, Johan G. Eriksson, Barbara Franke, Lude Franke, Paolo Gasparini, Pablo V. Gejman, Christian Gieger, Hans-Jürgen Grabe, Jacob Gratten, Patrick J. F. Groenen, Vilmondur Gudnason, Pim van der Harst, Caroline Hayward, David A. Hinds, Wolfgang Hoffmann, Elina Hyppönen, William G. Iacono, Bo Jacobsson, Marjo-Riitta Järvelin, Karl-Heinz Jöckel, Jaakko Kaprio, Sharon L. R. Kardia, Terho Lehtimäki, Steven F. Lehrer, Patrik K. E. Magnusson, Nicholas G. Martin, Matt McGue, Andres Metspalu, Neil Pendleton, Brenda W. J. H. Penninx, Markus Perola, Nicola Pirastu, Mario Pirastu, Ozren Polasek, Danielle Posthuma, Christine Power, Michael A. Province, Nilesh J. Samani, David Schlessinger, Reinhold Schmidt, Thorkild I. A. Sørensen, Tim D. Spector, Kari Stefansson, Unnur Thorsteinsdóttir, A. Roy Thurik, Nicholas J. Timpson, Henning Tiemeier, Joyce Y. Tung, André G. Uitterlinden, Veronique Vitart, Peter Vollenweider, David R. Weir, James F. Wilson, Alan F. Wright, Dalton C. Conley, Robert F. Krueger, George Davey Smith, Albert Hofman, David I. Laibson, Sarah E. Medland, Michelle N. Meyer, Jian Yang, Magnus Johannesson, Peter M. Visscher, Tõnu Esko, Philipp D. Koellinger, David Cesarini, 23andMe Research Team, COGENT (Cognitive Genomics Consortium), and Social Science Genetic Association Consortium. Gene discovery and polygenic prediction from a genome-wide association study of educational attainment in 1.1 million individuals. *Nature Genetics*, 50(8): 1112–1121, August 2018. ISSN 1546-1718. doi: 10.1038/s41588-018-0147-3. URL <https://doi.org/10.1038/s41588-018-0147-3>.
- Phil H. Lee, Verner Anttila, Hyejung Won, Yen-Chen A. Feng, Jacob Rosenthal, Zhaozhong Zhu, Elliot M. Tucker-Drob, Michel G. Nivard, Andrew D. Grotzinger, Danielle Posthuma, Meg M.-J. Wang, Dongmei Yu, Eli A. Stahl, Raymond K. Walters, Richard J.L. Anney, Laramie E. Duncan, Tian Ge, Rolf Adolfsson, Tobias Banaschewski, Sintia Belangero, Edwin H. Cook, Giovanni Coppola, Eske M. Derks, Pieter J. Hoekstra, Jaakko Kaprio, Anna Keski-Rahkonen, George Kirov, Henry R. Kranzler, Jurjen J. Luykx, Luis A. Rohde, Clement C. Zai, Esben Agerbo, M.J. Arranz, Philip Asherson, Marie Bækvad-Hansen, Gísli Baldursson, Mark Bellgrove, Richard A. Belliveau, Jan Buitelaar, Christie L. Burton, Jonas Bybjerg-Grauholm, Miquel Casas, Felecia Cerrato, Kimberly Chambert, Claire Churchhouse, Bru Cormand, Jennifer Crosbie, Søren Dalsgaard, Ditte Demontis, Alysa E. Doyle, Ashley Dumont, Josephine Elia, Jakob Grove, Olafur O. Gudmundsson, Jan Haavik, Hakon Hakonarson, Christine S. Hansen, Catharina A. Hartman, Zariah Hawi, Amaia Hervás, David M. Hougaard, Daniel P. Howrigan, Hailiang Huang, Jonna Kuntsi, Kate Langley, Klaus-Peter Lesch, Patrick W.L. Leung, Sandra K. Loo, Joanna Martin, Alicia R. Martin, James J. McGough, Sarah E. Medland, Jennifer L. Moran, Ole Mors, Preben B. Mortensen, Robert D. Oades, Duncan S. Palmer, Carsten B. Pedersen, Marianne G. Pedersen, Trinu Peters, Timothy Poterba, Jesper B. Poulsen, Josep Antoni Ramos-Quiroga, Andreas Reif, Marta Ribasés, Aribert Rothenberger, Paula Rovira, Cristina Sánchez-Mora, F. Kyle Satterstrom, Russell Schachar, Maria Soler Artigas, Stacy Steinberg, Hreinn Stefansson, Patrick Turley, G. Bragi Walters, Thomas Werge, Tetyana Zayats, Dan E. Arking, Francesco Bettella, Joseph D. Buxbaum, Jane H. Christensen, Ryan L. Collins, Hilary Coon, Silvia De Rubeis, Richard Delorme, Dorothy E. Grice, Thomas F. Hansen, Peter A. Holmans, Sigrun Hope, Christina M. Hultman, Lambertus Klei, Christine Ladd-Acosta, Pall Magnusson, Terje Nærland, Mette Nyegaard, Dalila Pinto, Per Qvist, Karola Rehnström, Abraham Reichenberg, Jennifer Reichert, Kathryn Roeder, Guy A. Rouleau, Evald Saemundsen, Stephan J. Sanders, Sven Sandin, Beate St Pourcain, Kari Stefansson, James S. Sutcliffe,

Michael E. Talkowski, Lauren A. Weiss, A. Jeremy Willsey, Ingrid Agartz, Huda Akil, Diego Albani, Martin Alda, Thomas D. Als, Adebayo Anjorin, Lena Backlund, Nicholas Bass, Michael Bauer, Bernhard T. Baune, Frank Bellivier, Sarah E. Bergen, Wade H. Berrettini, Joanna M. Biernacka, Douglas H.R. Blackwood, Erlend Bøen, Monika Budde, William Bunney, Margit Burmeister, William Byerley, Enda M. Byrne, Sven Cichon, Toni-Kim Clarke, Jonathan R.I. Coleman, Nicholas Craddock, David Curtis, Piotr M. Czerski, Anders M. Dale, Nina Dalkner, Udo Dannlowski, Franziska Degenhardt, Arianna Di Florio, Torbjørn Elvsåshagen, Bruno Etain, Sascha B. Fischer, Andreas J. Forstner, Liz Forty, Josef Frank, Mark Frye, Janice M. Fullerton, Katrin Gade, Héléna A. Gaspar, Elliot S. Gershon, Michael Gill, Fernando S. Goes, Scott D. Gordon, Katherine Gordon-Smith, Melissa J. Green, Tiffany A. Greenwood, Maria Grigoriou-Serbanescu, José Guzman-Parra, Joanna Hauser, Martin Hautzinger, Urs Heilbronner, Stefan Herms, Per Hoffmann, Dominic Holland, Stéphane Jamain, Ian Jones, Lisa A. Jones, Radhika Kandaswamy, John R. Kelsoe, James L. Kennedy, Oedegaard Ketil Joachim, Sarah Kittel-Schneider, Manolis Kogevinas, Anna C. Koller, Catharina Lavebratt, Cathryn M. Lewis, Qingqin S. Li, Jolanta Lissowska, Loes M.O. Loohuis, Susanne Lucae, Anna Maaser, Ulrik F. Malt, Nicholas G. Martin, Lina Martinsson, Susan L. McElroy, Francis J. McMahon, Andrew McQuillin, Ingrid Melle, Andres Metspalu, Vincent Millischer, Philip B. Mitchell, Grant W. Montgomery, Gunnar Morken, Derek W. Morris, Bertram Müller-Myhsok, Niamh Mullins, Richard M. Myers, Caroline M. Nievergelt, Merete Nordentoft, Annelie Nordin Adolfsson, Markus M. Nöthen, Roel A. Ophoff, Michael J. Owen, Sara A. Paciga, Carlos N. Pato, Michele T. Pato, Roy H. Perlis, Amy Perry, James B. Potash, Céline S. Reinbold, Marcella Rietschel, Margarita Rivera, Mary Roberson, Martin Schalling, Peter R. Schofield, Thomas G. Schulze, Laura J. Scott, Alessandro Serretti, Engilbert Sigurdsson, Olav B. Smeland, Eystein Stordal, Fabian Streit, Jana Strohmaier, Thorgeir E. Thorgeirsson, Jens Treutlein, Gustavo Turecki, Arne E. Vaaler, Eduard Vieta, John B. Vincent, Yunpeng Wang, Stephanie H. Witt, Peter Zandi, Roger A.H. Adan, Lars Alfredsson, Tetsuya Ando, Harald Aschauer, Jessica H. Baker, Vladimir Bencko, Andrew W. Bergen, Andreas Birgegård, Vesna Boraska Perica, Harry Brandt, Roland Burghardt, Laura Carlberg, Matteo Cassina, Maurizio Clementi, Philippe Courtet, Steven Crawford, Scott Crow, James J. Crowley, Unna N. Danner, Oliver S.P. Davis, Daniela Degortes, Janiece E. DeSocio, Danielle M. Dick, Christian Dina, Elisa Docampo, Karin Egberts, Stefan Ehrlich, Thomas Espeseth, Fernando Fernández-Aranda, Manfred M. Fichter, Lenka Foretova, Monica Forzan, Giovanni Gambaro, Ina Giegling, Fragiskos Gonidakis, Philip Gorwood, Monica Gratacos Mayora, Yiran Guo, Katherine A. Halmi, Konstantinos Hatzikotoulas, Johannes Hebebrand, Sietske G. Helder, Beate Herpertz-Dahlmann, Wolfgang Herzog, Anke Hinney, Hartmut Imgart, Susana Jiménez-Murcia, Craig Johnson, Jennifer Jordan, Antonio Julià, Deborah Kaminská, Leila Karhunen, Andreas Karwautz, Martien J.H. Kas, Walter H. Kaye, Martin A. Kennedy, Youl-Ri Kim, Lars Klareskog, Kelly L. Klump, Gun Peggy S. Knudsen, Mikael Landén, Stephanie Le Hellard, Robert D. Levitan, Dong Li, Paul Lichtenstein, Mario Maj, Sara Marsal, Sara McDevitt, James Mitchell, Palmiero Monteleone, Alessio Maria Monteleone, Melissa A. Munn-Chernoff, Benedetta Nacmias, Marie Navratilova, Julie K. O'Toole, Leonid Padyukov, Jacques Pantel, Hana Papezova, Raquel Rabionet, Anu Raevuori, Nicolas Ramoz, Ted Reichborn-Kjennerud, Valdo Ricca, Marion Roberts, Dan Rujescu, Filip Rybakowski, André Scherag, Ulrike Schmidt, Jochen Seitz, Lenka Slachtova, Margarita C.T. Slof-Op't Landt, Agnieszka Slopian, Sandro Sorbi, Lorraine Southam, Michael Strober, Alfonso Tortorella, Federica Tozzi,

Janet Treasure, Konstantinos Tziouvas, Annemarie A. van Elburg, Tracey D. Wade, Gudrun Wagner, Esther Walton, Hunna J. Watson, H-Erich Wichmann, D. Blake Woodside, Eleftheria Zeggini, Stephanie Zerwas, Stephan Zipfel, Mark J. Adams, Till F.M. Andlauer, Klaus Berger, Elisabeth B. Binder, Dorret I. Boomsma, Enrique Castelao, Lucía Colodro-Conde, Nese Direk, Anna R. Docherty, Enrico Domenici, Katharina Domschke, Erin C. Dunn, Jerome C. Foo, E.J.C. de Geus, Hans J. Grabe, Steven P. Hamilton, Carsten Horn, Jouke-Jan Hottenga, David Howard, Marcus Ising, Stefan Kloiber, Douglas F. Levinson, Glyn Lewis, Patrik K.E. Magnusson, Hamdi Mbarek, Christel M. Middeldorp, Sara Mostafavi, Dale R. Nyholt, Brenda WJH. Penninx, Roseann E. Peterson, Giorgio Pistis, David J. Porteous, Martin Preisig, Jorge A. Quiroz, Catherine Schaefer, Eva C. Schulte, Jianxin Shi, Daniel J. Smith, Pippa A. Thomson, Henning Tiemeier, Rudolf Uher, Sandra van der Auwera, Myrna M. Weissman, Madeline Alexander, Martin Begemann, Elvira Bramon, Nancy G. Buccola, Murray J. Cairns, Dominique Champion, Vaughan J. Carr, C. Robert Cloninger, David Cohen, David A. Collier, Aiden Corvin, Lynn E. DeLisi, Gary Donohoe, Frank Dudbridge, Jubao Duan, Robert Freedman, Pablo V. Gejman, Vera Golimbet, Stephanie Godard, Hannelore Ehrenreich, Annette M. Hartmann, Frans A. Henskens, Masashi Ikeda, Nakao Iwata, Assen V. Jablensky, Inge Joa, Erik G. Jönsson, Brian J. Kelly, Jo Knight, Bettina Konte, Claudine Laurent-Levinson, Jimmy Lee, Todd Lencz, Bernard Lerer, Carmel M. Loughland, Anil K. Malhotra, Jacques Mallet, Colm McDonald, Marina Mitjans, Bryan J. Mowry, Kieran C. Murphy, Robin M. Murray, F. Anthony O'Neill, Sang-Yun Oh, Aarno Palotie, Christos Pantelis, Ann E. Pulver, Tracey L. Petryshen, Digby J. Quedsted, Brien Riley, Alan R. Sanders, Ulrich Schall, Sibylle G. Schwab, Rodney J. Scott, Pak C. Sham, Jeremy M. Silverman, Kang Sim, Agnes A. Steixner, Paul A. Tooney, Jim van Os, Marquis P. Vawter, Dermot Walsh, Mark Weiser, Dieter B. Wildenauer, Nigel M. Williams, Brandon K. Wormley, Fuquan Zhang, Christos Androustos, Paul D. Arnold, Cathy L. Barr, Csaba Barta, Katharina Bey, O. Joseph Bienvenu, Donald W. Black, Lawrence W. Brown, Cathy Budman, Danielle Cath, Keun-Ah Cheon, Valentina Ciullo, Barbara J. Coffey, Daniele Cusi, Lea K. Davis, Damiaan Denys, Christel Depienne, Andrea Dietrich, Valsamma Eapen, Peter Falkai, Thomas V. Fernandez, Blanca Garcia-Delgar, Daniel A. Geller, Donald L. Gilbert, Marco A. Grados, Erica Greenberg, Edna Grünblatt, Julie Hagstrøm, Gregory L. Hanna, Andreas Hartmann, Tammy Hedderly, Gary A. Heiman, Isobel Heyman, Hyun Ju Hong, Alden Huang, Chaim Huyser, Laura Ibanez-Gomez, Ekaterina A. Khramtsova, Young Key Kim, Young-Shin Kim, Robert A. King, Yun-Joo Koh, Anastasios Konstantinidis, Sodahm Kook, Samuel Kuperman, Bennett L. Leventhal, Christine Lochner, Andrea G. Ludolph, Marcos Madruga-Garrido, Irene Malaty, Athanasios Maras, James T. McCracken, Inge A. Meijer, Pablo Mir, Astrid Morer, Kirsten R. Müller-Vahl, Alexander Münchau, Tara L. Murphy, Allan Naarden, Peter Nagy, Gerald Nestadt, Paul S. Nestadt, Humberto Nicolini, Erika L. Nurmi, Michael S. Okun, Peristera Paschou, Fabrizio Piras, Federica Piras, Christopher Pittenger, Kerstin J. Plessen, Margaret A. Richter, Renata Rizzo, Mary Robertson, Veit Roessner, Stephan Ruhrmann, Jack F. Samuels, Paul Sandor, Monika Schlögelhofer, Eun-Young Shin, Harvey Singer, Dong-Ho Song, Jungeun Song, Gianfranco Spalletta, Dan J. Stein, S Evelyn Stewart, Eric A. Storch, Barbara Stranger, Manfred Stuhmann, Zsanett Tarnok, Jay A. Tischfield, Jennifer Tübing, Frank Visscher, Nienke Vulink, Michael Wagner, Susanne Walitza, Sina Wanderer, Martin Woods, Yulia Worbe, Gwyneth Zai, Samuel H. Zinner, Patrick F. Sullivan, Barbara Franke, Mark J. Daly, Cynthia M. Bulik, Cathryn M. Lewis, Andrew M. McIntosh, Michael C. O'Donovan,

- Amanda Zheutlin, Ole A. Andreassen, Anders D. Børglum, Gerome Breen, Howard J. Edenberg, Ayman H. Fanous, Stephen V. Faraone, Joel Gelernter, Carol A. Mathews, Manuel Mattheisen, Karen S. Mitchell, Michael C. Neale, John I. Nurnberger, Stephan Ripke, Susan L. Santangelo, Jeremiah M. Scharf, Murray B. Stein, Laura M. Thornton, James T.R. Walters, Naomi R. Wray, Daniel H. Geschwind, Benjamin M. Neale, Kenneth S. Kendler, and Jordan W. Smoller. Genomic Relationships, Novel Loci, and Pleiotropic Mechanisms across Eight Psychiatric Disorders. *Cell*, 179(7):1469–1482.e11, December 2019. ISSN 00928674. doi: 10.1016/j.cell.2019.11.020. URL <https://linkinghub.elsevier.com/retrieve/pii/S0092867419312760>.
- Sang Hong Lee, Naomi R. Wray, Michael E. Goddard, and Peter M. Visscher. Estimating Missing Heritability for Disease from Genome-wide Association Studies. *The American Journal of Human Genetics*, 88(3):294–305, March 2011. ISSN 00029297. doi: 10.1016/j.ajhg.2011.02.002. URL <https://linkinghub.elsevier.com/retrieve/pii/S0002929711000206>.
- R. C. Lewontin. The Interaction of Selection and Linkage. I. General Considerations; Heterotic Models. *Genetics*, 49(1):49–67, January 1964. ISSN 0016-6731.
- Na Li and Matthew Stephens. Modeling linkage disequilibrium and identifying recombination hotspots using single-nucleotide polymorphism data. *Genetics*, 165(4):2213–2233, December 2003. ISSN 0016-6731.
- Dan-Yu Lin and Patrick F. Sullivan. Meta-Analysis of Genome-wide Association Studies with Overlapping Subjects. *The American Journal of Human Genetics*, 85(6):862–872, December 2009. ISSN 00029297. doi: 10.1016/j.ajhg.2009.11.001. URL <https://linkinghub.elsevier.com/retrieve/pii/S0002929709005151>.
- Peng Lin, Sarah M. Hartz, Zhehao Zhang, Scott F. Saccone, Jia Wang, Jay A. Tischfield, Howard J. Edenberg, John R. Kramer, Alison M. Goate, Laura J. Bierut, John P. Rice, and for the COGA Collaborators COGENE Collaborators, GENEVA. A New Statistic to Evaluate Imputation Reliability. *PLoS ONE*, 5(3):e9697, March 2010. ISSN 1932-6203. doi: 10.1371/journal.pone.0009697. URL <https://dx.plos.org/10.1371/journal.pone.0009697>.
- Christoph Lippert, Jennifer Listgarten, Robert I. Davidson, Jeff Baxter, Hoifung Poon, Carl M. Kadie, and David Heckerman. An Exhaustive Epistatic SNP Association Analysis on Expanded Wellcome Trust Data. *Scientific Reports*, 3(1):1099, December 2013. ISSN 2045-2322. doi: 10.1038/srep01099. URL <http://www.nature.com/articles/srep01099>.
- Po-Ru Loh, Gleb Kichaev, Steven Gazal, Armin P. Schoech, and Alkes L. Price. Mixed-model association for biobank-scale datasets. *Nature Genetics*, 50(7):906–908, July 2018. ISSN 1061-4036, 1546-1718. doi: 10.1038/s41588-018-0144-6. URL <http://www.nature.com/articles/s41588-018-0144-6>.
- Yang Luo, Katrina M de Lange, Luke Jostins, Loukas Moutsianas, Joshua Randall, Nicholas A Kennedy, Christopher A Lamb, Shane McCarthy, Tariq Ahmad, Cathryn Edwards, Eva Goncalves Serra, Ailsa Hart, Chris Hawkey, John C Mansfield, Craig Mowat, William G Newman, Sam Nichols, Martin Pollard, Jack Satsangi, Alison Simmons, Mark Tremelling, Holm Uhlig, David C Wilson, James C Lee, Natalie J

- Prescott, Charlie W Lees, Christopher G Mathew, Miles Parkes, Jeffrey C Barrett, and Carl A Anderson. Exploring the genetic architecture of inflammatory bowel disease by whole-genome sequencing identifies association at ADCY7. *Nature Genetics*, 49(2): 186–192, February 2017. ISSN 1061-4036, 1546-1718. doi: 10.1038/ng.3761. URL <http://www.nature.com/articles/ng.3761>.
- Wenlong Ma, Zhixu Qiu, Jie Song, Qian Cheng, and Chuang Ma. DeepGS: Predicting phenotypes from genotypes using Deep Learning. *bioRxiv*, December 2017. doi: 10.1101/241414. URL <http://biorxiv.org/lookup/doi/10.1101/241414>.
- Trudy F. C. Mackay. Epistasis and quantitative traits: using model organisms to study gene–gene interactions. *Nature Reviews Genetics*, 15(1):22–33, January 2014. ISSN 1471-0056, 1471-0064. doi: 10.1038/nrg3627. URL <http://www.nature.com/articles/nrg3627>.
- Trudy FC Mackay and Jason H Moore. Why epistasis is important for tackling complex human disease genetics. *Genome Medicine*, 6(6):125, 2014. ISSN 1756-994X. doi: 10.1186/gm561. URL <http://genomemedicine.biomedcentral.com/articles/10.1186/gm561>.
- Timothy Shin Heng Mak, Robert Milan Porsch, Shing Wan Choi, Xueya Zhou, and Pak Chung Sham. Polygenic scores via penalized regression on summary statistics: MAK et al. *Genetic Epidemiology*, 41(6):469–480, September 2017. ISSN 07410395. doi: 10.1002/gepi.22050. URL <http://doi.wiley.com/10.1002/gepi.22050>.
- Asko Mäki-Tanila and William G Hill. Influence of gene interaction on complex trait variation with multilocus models. *Genetics*, 198(1):355–367, 2014.
- Jonathan Marchini and Bryan Howie. Genotype imputation for genome-wide association studies. *Nature Reviews Genetics*, 11(7):499–511, July 2010. ISSN 1471-0056, 1471-0064. doi: 10.1038/nrg2796. URL <http://www.nature.com/articles/nrg2796>.
- Jonathan Marchini, Peter Donnelly, and Lon R Cardon. Genome-wide strategies for detecting multiple loci that influence complex diseases. *Nature Genetics*, 37(4):413–417, April 2005. ISSN 1061-4036, 1546-1718. doi: 10.1038/ng1537. URL <http://www.nature.com/articles/ng1537>.
- Jonathan Marchini, David Cutler, Nick Patterson, Matthew Stephens, Eleazar Eskin, Eran Halperin, Shin Lin, Zhaohui S. Qin, Heather M. Munro, Gonçalo R. Abecasis, and Peter Donnelly. A Comparison of Phasing Algorithms for Trios and Unrelated Individuals. *The American Journal of Human Genetics*, 78(3):437–450, March 2006. ISSN 00029297. doi: 10.1086/500808. URL <https://linkinghub.elsevier.com/retrieve/pii/S0002929707623830>.
- Gabor T. Marth, Ian Korf, Mark D. Yandell, Raymond T. Yeh, Zhijie Gu, Hamideh Zakeri, Nathan O. Stitzel, LaDeana Hillier, Pui-Yan Kwok, and Warren R. Gish. A general approach to single-nucleotide polymorphism discovery. *Nature Genetics*, 23(4):452–456, December 1999. ISSN 1061-4036, 1546-1718. doi: 10.1038/70570. URL http://www.nature.com/articles/ng1299_452.

- Alicia R. Martin, Masahiro Kanai, Yoichiro Kamatani, Yukinori Okada, Benjamin M. Neale, and Mark J. Daly. Clinical use of current polygenic risk scores may exacerbate health disparities. *Nature Genetics*, 51(4):584–591, April 2019. ISSN 1061-4036, 1546-1718. doi: 10.1038/s41588-019-0379-x. URL <http://www.nature.com/articles/s41588-019-0379-x>.
- Nasim Mavaddat, Kyriaki Michailidou, Joe Dennis, Michael Lush, Laura Fachal, Andrew Lee, Jonathan P. Tyrer, Ting-Huei Chen, Qin Wang, Manjeet K. Bolla, Xin Yang, Muriel A. Adank, Thomas Ahearn, Kristiina Aittomäki, Jamie Allen, Irene L. Andrulis, Hoda Anton-Culver, Natalia N. Antonenkova, Volker Arndt, Kristan J. Aronson, Paul L. Auer, Päivi Auvinen, Myrto Barrdahl, Laura E. Beane Freeman, Matthias W. Beckmann, Sabine Behrens, Javier Benitez, Marina Bermisheva, Leslie Bernstein, Carl Blomqvist, Natalia V. Bogdanova, Stig E. Bojesen, Bernardo Bonanni, Anne-Lise Børresen-Dale, Hiltrud Brauch, Michael Bremer, Hermann Brenner, Adam Brentnall, Ian W. Brock, Angela Brooks-Wilson, Sara Y. Brucker, Thomas Brüning, Barbara Burwinkel, Daniele Campa, Brian D. Carter, Jose E. Castelao, Stephen J. Chanock, Rowan Chlebowski, Hans Christiansen, Christine L. Clarke, J. Margriet Collée, Emilie Cordina-Duverger, Sten Cornelissen, Fergus J. Couch, Angela Cox, Simon S. Cross, Kamila Czene, Mary B. Daly, Peter Devilee, Thilo Dörk, Isabel dos Santos-Silva, Martine Dumont, Lorraine Durcan, Miriam Dwek, Diana M. Eccles, Arif B. Ekici, A. Heather Eliassen, Carolina Ellberg, Christoph Engel, Mikael Eriksson, D. Gareth Evans, Peter A. Fasching, Jonine Figueroa, Olivia Fletcher, Henrik Flyger, Asta Försti, Lin Fritschi, Marika Gabrielson, Manuela Gago-Dominguez, Susan M. Gapstur, José A. García-Sáenz, Mia M. Gaudet, Vassilios Georgoulas, Graham G. Giles, Irina R. Gilyazova, Gord Glendon, Mark S. Goldberg, David E. Goldgar, Anna González-Neira, Grethe I. Grenaker Alnæs, Mervi Grip, Jacek Gronwald, Anne Grundy, Pascal Guénel, Lothar Haeberle, Eric Hahnen, Christopher A. Haiman, Niclas Håkansson, Ute Hamann, Susan E. Hankinson, Elaine F. Harkness, Steven N. Hart, Wei He, Alexander Hein, Jane Heyworth, Peter Hillemanns, Antoinette Hollestelle, Maartje J. Hooning, Robert N. Hoover, John L. Hopper, Anthony Howell, Guanmengqian Huang, Keith Humphreys, David J. Hunter, Milena Jakimovska, Anna Jakubowska, Wolfgang Janni, Esther M. John, Nichola Johnson, Michael E. Jones, Arja Jukkola-Vuorinen, Audrey Jung, Rudolf Kaaks, Katarzyna Kaczmarek, Vesa Kataja, Renske Keeman, Michael J. Kerin, Elza Khusnutdinova, Johanna I. Kiiski, Julia A. Knight, Yon-Dschun Ko, Veli-Matti Kosma, Stella Koutros, Vessela N. Kristensen, Ute Krüger, Tabea Köhl, Diether Lambrechts, Loic Le Marchand, Eunjung Lee, Flavio Lejbkovicz, Jenna Lilyquist, Annika Lindblom, Sara Lindström, Jolanta Lissowska, Wing-Yee Lo, Sibylle Loibl, Jirong Long, Jan Lubiński, Michael P. Lux, Robert J. MacInnis, Tom Maishman, Enes Makalic, Ivana Maleva Kostovska, Arto Mannermaa, Siranoush Manoukian, Sara Margolin, John W.M. Martens, Maria Elena Martinez, Dimitrios Mavroudis, Catriona McLean, Alfons Meindl, Usha Menon, Pooja Middha, Nicola Miller, Fernando Moreno, Anna Marie Mulligan, Claire Mulot, Victor M. Muñoz-Garzon, Susan L. Neuhausen, Heli Nevanlinna, Patrick Neven, William G. Newman, Sune F. Nielsen, Børge G. Nordestgaard, Aaron Norman, Kenneth Offit, Janet E. Olson, Håkan Olsson, Nick Orr, V. Shane Pankratz, Tjoung-Won Park-Simon, Jose I.A. Perez, Clara Pérez-Barrios, Paolo Peterlongo, Julian Peto, Mila Pinchev, Dijana Plaseska-Karanfilska, Eric C. Polley, Ross Prentice, Nadege Presneau, Darya Prokofyeva, Kristen Purrington, Katri Pylkäs, Brigitte Rack, Paolo Radice, Rohini Rau-Murthy, Gad Rennert, Hedy S. Rennert, Valerie Rhenius, Mark Robson, Atocha Romero, Kathryn J. Ruddy, Matthias Ruebner, Emmanouil Saloustros, Dale P. Sandler, Elinor J. Sawyer, Daniel F. Schmidt, Rita K. Schmutzler, Andreas Schneeweiss, Minouk J. Schoemaker,

- Fredrick Schumacher, Peter Schürmann, Lukas Schwentner, Christopher Scott, Rodney J. Scott, Caroline Seynaeve, Mitul Shah, Mark E. Sherman, Martha J. Shrubsole, Xiao-Ou Shu, Susan Slager, Ann Smeets, Christof Sohn, Penny Soucy, Melissa C. Southey, John J. Spinelli, Christa Stegmaier, Jennifer Stone, Anthony J. Swerdlow, Rulla M. Tamimi, William J. Tapper, Jack A. Taylor, Mary Beth Terry, Kathrin Thöne, Rob A.E.M. Tollenaar, Ian Tomlinson, Thérèse Truong, Maria Tzardi, Hans-Ulrich Ulmer, Michael Untch, Celine M. Vachon, Elke M. van Veen, Joseph Vijai, Clarice R. Weinberg, Camilla Wendt, Alice S. Whittemore, Hans Wildiers, Walter Willett, Robert Winqvist, Alicja Wolk, Xiaohong R. Yang, Drakoulis Yannoukakos, Yan Zhang, Wei Zheng, Argyrios Ziogas, Alison M. Dunning, Deborah J. Thompson, Georgia Chenevix-Trench, Jenny Chang-Claude, Marjanka K. Schmidt, Per Hall, Roger L. Milne, Paul D.P. Pharoah, Antonis C. Antoniou, Nilanjan Chatterjee, Peter Kraft, Montserrat García-Closas, Jacques Simard, and Douglas F. Easton. Polygenic Risk Scores for Prediction of Breast Cancer and Breast Cancer Subtypes. *The American Journal of Human Genetics*, 104(1):21–34, January 2019. ISSN 00029297. doi: 10.1016/j.ajhg.2018.11.002. URL <https://linkinghub.elsevier.com/retrieve/pii/S0002929718304051>.
- Warren S. McCulloch and Walter Pitts. A logical calculus of the ideas immanent in nervous activity. *The Bulletin of Mathematical Biophysics*, 5(4):115–133, December 1943. ISSN 0007-4985, 1522-9602. doi: 10.1007/BF02478259. URL <http://link.springer.com/10.1007/BF02478259>.
- T. H. Meuwissen, B. J. Hayes, and M. E. Goddard. Prediction of total genetic value using genome-wide dense marker maps. *Genetics*, 157(4):1819–1829, April 2001. ISSN 0016-6731.
- Melinda C Mills and Charles Rahal. A scientometric review of genome-wide association studies. *Communications biology*, 2(1):1–11, 2019.
- Yukihide Momozawa, Julia Dmitrieva, Emilie Théâtre, Valérie Deffontaine, Souad Rahmouni, Benoît Charlotiaux, François Crins, Elisa Docampo, Mahmoud Elansary, Ann-Stephan Gori, Christelle Lecut, Rob Mariman, Myriam Mni, Cécile Oury, Ilya Altukhov, Dmitry Alexeev, Yuri Aulchenko, Leila Amininejad, Gerd Bouma, Frank Hoentjen, Mark Löwenberg, Bas Oldenburg, Marieke J. Pierik, Andrea E. vander Meulen-de Jong, C. Janneke van der Woude, Marijn C. Visschedijk, Mark Lathrop, Jean-Pierre Hugot, Rinse K. Weersma, Martine De Vos, Denis Franchimont, Severine Vermeire, Michiaki Kubo, Edouard Louis, and The International IBD Genetics Consortium Georges, Michel. IBD risk loci are enriched in multigenic regulatory modules encompassing putative causative genes. *Nature Communications*, 9(1): 2427, December 2018. ISSN 2041-1723. doi: 10.1038/s41467-018-04365-8. URL <http://www.nature.com/articles/s41467-018-04365-8>.
- Casimiro A Curbelo Montañez, Paul Fergus, Carl Chalmers, and Jade Hind. Analysis of extremely obese individuals using deep learning stacked autoencoders and genome-wide genetic data. In *International Meeting on Computational Intelligence Methods for Bioinformatics and Biostatistics*, pages 262–276. Springer, 2018.
- Jason H. Moore and Scott M. Williams. Traversing the conceptual divide between biological and statistical epistasis: systems biology and a more modern synthesis. *BioEssays*, 27

- (6):637–646, June 2005. ISSN 0265-9247, 1521-1878. doi: 10.1002/bies.20236. URL <http://doi.wiley.com/10.1002/bies.20236>.
- Alexander Mordvintsev, Christopher Olah, and Mike Tyka. Deepdream—a code example for visualizing neural networks. *Google Research*, 2(5), 2015.
- Gota Morota and Daniel Gianola. Kernel-based whole-genome prediction of complex traits: a review. *Frontiers in Genetics*, 5, October 2014. ISSN 1664-8021. doi: 10.3389/fgene.2014.00363. URL <http://journal.frontiersin.org/article/10.3389/fgene.2014.00363/abstract>.
- Gerhard Moser, Bruce Tier, Ron E Crump, Mehar S Khatkar, and Herman W Raadsma. A comparison of five methods to predict genomic breeding values of dairy bulls from genome-wide SNP markers. *Genetics Selection Evolution*, 41(1), December 2009. ISSN 1297-9686. doi: 10.1186/1297-9686-41-56. URL <https://gsejournal.biomedcentral.com/articles/10.1186/1297-9686-41-56>.
- Hakhamanesh Mostafavi, Arbel Harpak, Ipsita Agarwal, Dalton Conley, Jonathan K Pritchard, and Molly Przeworski. Variable prediction accuracy of polygenic scores within an ancestry group. *eLife*, 9:e48376, January 2020. ISSN 2050-084X. doi: 10.7554/eLife.48376. URL <https://elifesciences.org/articles/48376>.
- Alison A Motsinger-Reif, Scott M Dudek, Lance W Hahn, and Marylyn D Ritchie. Comparison of approaches for machine-learning optimization of neural networks for detecting gene-gene interactions in genetic epidemiology. *Genetic Epidemiology: The Official Publication of the International Genetic Epidemiology Society*, 32(4):325–340, 2008.
- Siew C Ng, Hai Yun Shi, Nima Hamidi, Fox E Underwood, Whitney Tang, Eric I Benchimol, Remo Panaccione, Subrata Ghosh, Justin C Y Wu, Francis K L Chan, Joseph J Y Sung, and Gilaad G Kaplan. Worldwide incidence and prevalence of inflammatory bowel disease in the 21st century: a systematic review of population-based studies. *The Lancet*, 390(10114):2769–2778, December 2017. ISSN 01406736. doi: 10.1016/S0140-6736(17)32448-0. URL <https://linkinghub.elsevier.com/retrieve/pii/S0140673617324480>.
- Magnus Nordborg and Simon Tavaré. Linkage disequilibrium: what history has to tell us. *Trends in Genetics*, 18(2):83–90, February 2002. ISSN 01689525. doi: 10.1016/S0168-9525(02)02557-X. URL <https://linkinghub.elsevier.com/retrieve/pii/S016895250202557X>.
- Ian Osband. Risk versus uncertainty in deep learning: Bayes, bootstrap and the dangers of dropout. 2016.
- Kouichi Ozaki, Yozo Ohnishi, Aritoshi Iida, Akihiko Sekine, Ryo Yamada, Tatsuhiko Tsunoda, Hiroshi Sato, Hideyuki Sato, Masatsugu Hori, Yusuke Nakamura, and Toshihiro Tanaka. Functional SNPs in the lymphotoxin-a gene that are associated with susceptibility to myocardial infarction. *Nature Genetics*, 32(4):650–654, December 2002. ISSN 1061-4036, 1546-1718. doi: 10.1038/ng1047. URL <http://www.nature.com/articles/ng1047>.

- Adam Paszke, Sam Gross, Soumith Chintala, Gregory Chanan, Edward Yang, Zachary DeVito, Zeming Lin, Alban Desmaison, Luca Antiga, and Adam Lerer. Automatic differentiation in pytorch. 2017.
- Anna Peeters, Emma Gearon, Kathryn Backholer, and Bendix Carstensen. Trends in the skewness of the body mass index distribution among urban Australian adults, 1980 to 2007. *Annals of Epidemiology*, 25(1):26–33, January 2015. ISSN 10472797. doi: 10.1016/j.annepidem.2014.10.008. URL <https://linkinghub.elsevier.com/retrieve/pii/S1047279714004505>.
- Roseann E. Peterson, Karoline Kuchenbaecker, Raymond K. Walters, Chia-Yen Chen, Alice B. Popejoy, Sathish Periyasamy, Max Lam, Conrad Iyegbe, Rona J. Strawbridge, Leslie Brick, Caitlin E. Carey, Alicia R. Martin, Jacquelyn L. Meyers, Jinni Su, Junfang Chen, Alexis C. Edwards, Allan Kalungi, Nastassja Koen, Lerato Majara, Emanuel Schwarz, Jordan W. Smoller, Eli A. Stahl, Patrick F. Sullivan, Evangelos Vassos, Bryan Mowry, Miguel L. Prieto, Alfredo Cuellar-Barboza, Tim B. Bigdeli, Howard J. Edenberg, Hailiang Huang, and Laramie E. Duncan. Genome-wide Association Studies in Ancestrally Diverse Populations: Opportunities, Methods, Pitfalls, and Recommendations. *Cell*, 179(3):589–603, October 2019. ISSN 00928674. doi: 10.1016/j.cell.2019.08.051. URL <https://linkinghub.elsevier.com/retrieve/pii/S0092867419310025>.
- Patrick C. Phillips. Epistasis — the essential role of gene interactions in the structure and evolution of genetic systems. *Nature Reviews Genetics*, 9(11):855–867, November 2008. ISSN 1471-0056, 1471-0064. doi: 10.1038/nrg2452. URL <http://www.nature.com/articles/nrg2452>.
- R Plomin and I J Deary. Genetics and intelligence differences: five special findings. *Molecular Psychiatry*, 20(1):98–108, February 2015. ISSN 1359-4184, 1476-5578. doi: 10.1038/mp.2014.105. URL <http://www.nature.com/articles/mp2014105>.
- Robert Plomin and Sophie von Stumm. The new genetics of intelligence. *Nature Reviews Genetics*, 19(3):148, 2018.
- Tinca J C Polderman, Beben Benyamin, Christiaan A de Leeuw, Patrick F Sullivan, Arjen van Bochoven, Peter M Visscher, and Danielle Posthuma. Meta-analysis of the heritability of human traits based on fifty years of twin studies. *Nature Genetics*, 47(7):702–709, July 2015. ISSN 1061-4036, 1546-1718. doi: 10.1038/ng.3285. URL <http://www.nature.com/articles/ng.3285>.
- Christian Ponte-Fernández, Jorge González-Domínguez, and María J Martín. Fast search of third-order epistatic interactions on CPU and GPU clusters. *The International Journal of High Performance Computing Applications*, 34(1):20–29, January 2020. ISSN 1094-3420, 1741-2846. doi: 10.1177/1094342019852128. URL <http://journals.sagepub.com/doi/10.1177/1094342019852128>.
- Torsten Pook, Jan Freudenthal, Arthur Korte, and Henner Simianer. Using local convolutional neural networks for genomic prediction. preprint, *Genetics*, May 2020. URL <http://biorxiv.org/lookup/doi/10.1101/2020.05.12.090118>.
- Alice B Popejoy and Stephanie M Fullerton. Genomics is failing on diversity. *Nature News*, 538(7624):161, 2016.

- Lutz Prechelt. Early stopping-but when? In *Neural Networks: Tricks of the trade*, pages 55–69. Springer, 1998.
- Florian Privé, Julyan Arbel, and Bjarni J. Vilhjálmsón. LDpred2: better, faster, stronger. preprint, Genetics, April 2020. URL <http://biorxiv.org/lookup/doi/10.1101/2020.04.28.066720>.
- Sara L. Pulit, Sera A. J. de With, and Paul I. W. de Bakker. Resetting the bar: Statistical significance in whole-genome sequencing-based association studies of global populations: Pulit et al. *Genetic Epidemiology*, 41(2):145–151, February 2017. ISSN 07410395. doi: 10.1002/gepi.22032. URL <http://doi.wiley.com/10.1002/gepi.22032>.
- Chris M. Rands, Stephen Meader, Chris P. Ponting, and Gerton Lunter. 8.2% of the Human Genome Is Constrained: Variation in Rates of Turnover across Functional Element Classes in the Human Lineage. *PLoS Genetics*, 10(7):e1004525, July 2014. ISSN 1553-7404. doi: 10.1371/journal.pgen.1004525. URL <https://dx.plos.org/10.1371/journal.pgen.1004525>.
- James C Raven. Mental tests used in genetic studies: The performance of related individuals on tests mainly educative and mainly reproductive. *Unpublished master's thesis, University of London*, 1936.
- JC Raven et al. Raven manual: Section 4, advanced progressive matrices, 1988 edition, 1988.
- Herve Rhinn, Ryousuke Fujita, Liang Qiang, Rong Cheng, Joseph H. Lee, and Asa Abeliovich. Integrative genomics identifies APOE e4 effectors in Alzheimer's disease. *Nature*, 500(7460):45–50, August 2013. ISSN 0028-0836, 1476-4687. doi: 10.1038/nature12415. URL <http://www.nature.com/articles/nature12415>.
- Herve Rhinn, Ryousuke Fujita, Liang Qiang, Rong Chen, Joseph H. Lee, and Asa Abeliovich. Retraction Note: Integrative genomics identifies APOE e4 effectors in Alzheimer's disease. *Nature*, 523(7562):626–626, July 2015. ISSN 0028-0836, 1476-4687. doi: 10.1038/nature14591. URL <http://www.nature.com/articles/nature14591>.
- Samuli Ripatti, Emmi Tikkanen, Marju Orho-Melander, Aki S Havulinna, Kaisa Silander, Amitabh Sharma, Candace Guiducci, Markus Perola, Antti Jula, Juha Sinisalo, Marja-Liisa Lokki, Markku S Nieminen, Olle Melander, Veikko Salomaa, Leena Peltonen, and Sekar Kathiresan. A multilocus genetic risk score for coronary heart disease: case-control and prospective cohort analyses. *The Lancet*, 376(9750):1393–1400, October 2010. ISSN 01406736. doi: 10.1016/S0140-6736(10)61267-6. URL <https://linkinghub.elsevier.com/retrieve/pii/S0140673610612676>.
- Jared C. Roach, Gustavo Glusman, Robert Hubley, Stephen Z. Montsaroff, Alisha K. Holloway, Denise E. Mauldin, Deepak Srivastava, Vidu Garg, Katherine S. Pollard, David J. Galas, Leroy Hood, and Arian F.A. Smit. Chromosomal Haplotypes by Genetic Phasing of Human Families. *The American Journal of Human Genetics*, 89(3): 382–397, September 2011. ISSN 00029297. doi: 10.1016/j.ajhg.2011.07.023. URL <https://linkinghub.elsevier.com/retrieve/pii/S0002929711003181>.

- Herbert Robbins and Sutton Monro. A stochastic approximation method. *The annals of mathematical statistics*, pages 400–407, 1951.
- Pau Rodríguez, Jordi Gonzalez, Guillem Cucurull, Josep M Gonfaus, and Xavier Roca. Regularizing cnns with locally constrained decorrelations. *arXiv preprint arXiv:1611.01967*, 2016.
- F. Rosenblatt. The perceptron: A probabilistic model for information storage and organization in the brain. *Psychological Review*, 65(6):386–408, 1958. ISSN 1939-1471, 0033-295X. doi: 10.1037/h0042519. URL <http://doi.apa.org/getdoi.cfm?doi=10.1037/h0042519>.
- Jaya M. Satagopan and Robert C. Elston. Evaluation of removable statistical interaction for binary traits. *Statistics in Medicine*, 32(7):1164–1190, March 2013. ISSN 02776715. doi: 10.1002/sim.5628. URL <http://doi.wiley.com/10.1002/sim.5628>.
- Jeanne E. Savage, Philip R. Jansen, Sven Stringer, Kyoko Watanabe, Julien Bryois, Christiaan A. de Leeuw, Mats Nagel, Swapnil Awasthi, Peter B. Barr, Jonathan R. I. Coleman, Katrina L. Grasby, Anke R. Hammerschlag, Jakob A. Kaminski, Robert Karlsson, Eva Krapohl, Max Lam, Marianne Nygaard, Chandra A. Reynolds, Joey W. Trampush, Hannah Young, Delilah Zabaneh, Sara Hägg, Narelle K. Hansell, Ida K. Karlsson, Sten Linnarsson, Grant W. Montgomery, Ana B. Muñoz-Manchado, Erin B. Quinlan, Gunter Schumann, Nathan G. Skene, Bradley T. Webb, Tonya White, Dan E. Arking, Dimitrios Avramopoulos, Robert M. Bilder, Panos Bitsios, Katherine E. Burdick, Tyrone D. Cannon, Ornit Chiba-Falek, Andrea Christoforou, Elizabeth T. Cirulli, Eliza Congdon, Aiden Corvin, Gail Davies, Ian J. Deary, Pamela DeRosse, Dwight Dickinson, Srdjan Djurovic, Gary Donohoe, Emily Drabant Conley, Johan G. Eriksson, Thomas Espeseth, Nelson A. Freimer, Stella Giakoumaki, Ina Giegling, Michael Gill, David C. Glahn, Ahmad R. Hariri, Alex Hatzimanolis, Matthew C. Keller, Emma Knowles, Deborah Koltai, Bettina Konte, Jari Lahti, Stephanie Le Hellard, Todd Lencz, David C. Liewald, Edythe London, Astri J. Lundervold, Anil K. Malhotra, Ingrid Melle, Derek Morris, Anna C. Need, William Ollier, Aarno Palotie, Antony Payton, Neil Pendleton, Russell A. Poldrack, Katri Räikkönen, Ivar Reinvang, Panos Roussos, Dan Rujescu, Fred W. Sabb, Matthew A. Scult, Olav B. Smeland, Nikolaos Smyrnis, John M. Starr, Vidar M. Steen, Nikos C. Stefanis, Richard E. Straub, Kjetil Sundet, Henning Tiemeier, Aristotle N. Voineskos, Daniel R. Weinberger, Elisabeth Widen, Jin Yu, Goncalo Abecasis, Ole A. Andreassen, Gerome Breen, Lene Christiansen, Birgit Debrabant, Danielle M. Dick, Andreas Heinz, Jens Hjerling-Leffler, M. Arfan Ikram, Kenneth S. Kendler, Nicholas G. Martin, Sarah E. Medland, Nancy L. Pedersen, Robert Plomin, Tinca J. C. Polderman, Stephan Ripke, Sophie van der Sluis, Patrick F. Sullivan, Scott I. Vrieze, Margaret J. Wright, and Danielle Posthuma. Genome-wide association meta-analysis in 269,867 individuals identifies new genetic and functional links to intelligence. *Nature Genetics*, 50(7):912–919, July 2018. ISSN 1061-4036, 1546-1718. doi: 10.1038/s41588-018-0152-6. URL <http://www.nature.com/articles/s41588-018-0152-6>.
- Jürgen Schmidhuber. Deep learning in neural networks: An overview. *Neural Networks*, 61:85–117, January 2015. ISSN 08936080. doi: 10.1016/j.neunet.2014.09.003. URL <https://linkinghub.elsevier.com/retrieve/pii/S0893608014002135>.
- Martin Schumacher, Reinhard Roßner, and Werner Vach. Neural networks and logistic regression: Part I. *Computational Statistics & Data Analysis*, 21(6):661–682, June 1996.

- ISSN 01679473. doi: 10.1016/0167-9473(95)00032-1. URL <https://linkinghub.elsevier.com/retrieve/pii/0167947395000321>.
- Shailja C. Shah, Hamed Khalili, Corinne Gower-Rousseau, Ola Olen, Eric I. Benchimol, Elsebeth Lynge, Kári R. Nielsen, Paul Brassard, Maria Vutcovici, Alain Bitton, Charles N. Bernstein, Desmond Leddin, Hala Tamim, Tryggvi Stefansson, Edward V. Loftus, Bjørn Moum, Whitney Tang, Siew C. Ng, Richard Gearry, Brankica Sincic, Sally Bell, Bruce E. Sands, Peter L. Lakatos, Zsuzsanna Végh, Claudia Ott, Gilaad G. Kaplan, Johan Burisch, and Jean-Frederic Colombel. Sex-Based Differences in Incidence of Inflammatory Bowel Diseases—Pooled Analysis of Population-Based Studies From Western Countries. *Gastroenterology*, 155(4):1079–1089.e3, October 2018. ISSN 00165085. doi: 10.1053/j.gastro.2018.06.043. URL <https://linkinghub.elsevier.com/retrieve/pii/S0016508518346857>.
- P.C. Sham and S. Purcell. Equivalence between Haseman-Elston and Variance-Components Linkage Analyses for Sib Pairs. *The American Journal of Human Genetics*, 68(6):1527–1532, June 2001. ISSN 00029297. doi: 10.1086/320593. URL <https://linkinghub.elsevier.com/retrieve/pii/S0002929707610659>.
- Jianxin Shi, Douglas F. Levinson, Jubao Duan, Alan R. Sanders, Yonglan Zheng, Itsik Pe'er, Frank Dudbridge, Peter A. Holmans, Alice S. Whittemore, Bryan J. Mowry, Ann Olincy, Farooq Amin, C. Robert Cloninger, Jeremy M. Silverman, Nancy G. Buccola, William F. Byerley, Donald W. Black, Raymond R. Crowe, Jorge R. Oksenberg, Daniel B. Mirel, Kenneth S. Kendler, Robert Freedman, and Pablo V. Gejman. Common variants on chromosome 6p22.1 are associated with schizophrenia. *Nature*, 460(7256):753–757, August 2009. ISSN 0028-0836, 1476-4687. doi: 10.1038/nature08192. URL <http://www.nature.com/articles/nature08192>.
- David Silver, Aja Huang, Chris J Maddison, Arthur Guez, Laurent Sifre, George Van Den Driessche, Julian Schrittwieser, Ioannis Antonoglou, Veda Panneershelvam, Marc Lanctot, et al. Mastering the game of go with deep neural networks and tree search. *nature*, 529(7587):484–489, 2016.
- Karen Simonyan, Andrea Vedaldi, and Andrew Zisserman. Deep Inside Convolutional Networks: Visualising Image Classification Models and Saliency Maps. *arXiv:1312.6034 [cs]*, December 2013. URL <http://arxiv.org/abs/1312.6034>. arXiv: 1312.6034.
- Montgomery Slatkin. Linkage disequilibrium — understanding the evolutionary past and mapping the medical future. *Nature Reviews Genetics*, 9(6):477–485, June 2008. ISSN 1471-0056, 1471-0064. doi: 10.1038/nrg2361. URL <http://www.nature.com/articles/nrg2361>.
- Daniel Smilkov, Nikhil Thorat, Been Kim, Fernanda Viégas, and Martin Wattenberg. Smoothgrad: removing noise by adding noise. *arXiv preprint arXiv:1706.03825*, 2017.
- Daria Sorokina, Rich Caruana, Mirek Riedewald, and Daniel Fink. Detecting statistical interactions with additive groves of trees. In *Proceedings of the 25th international conference on Machine learning*, pages 1000–1007, 2008.
- Sarah L. Spain and Jeffrey C. Barrett. Strategies for fine-mapping complex traits. *Human Molecular Genetics*, 24(R1):R111–R119, October 2015. ISSN 0964-6906, 1460-2083.

- doi: 10.1093/hmg/ddv260. URL <https://academic.oup.com/hmg/article-lookup/doi/10.1093/hmg/ddv260>.
- Doug Speed and David J. Balding. MultiBLUP: improved SNP-based prediction for complex traits. *Genome Research*, 24(9):1550–1557, September 2014. ISSN 1088-9051, 1549-5469. doi: 10.1101/gr.169375.113. URL <http://genome.cshlp.org/lookup/doi/10.1101/gr.169375.113>.
- Doug Speed, Gibran Hemani, Michael R. Johnson, and David J. Balding. Improved Heritability Estimation from Genome-wide SNPs. *The American Journal of Human Genetics*, 91(6):1011–1021, December 2012. ISSN 00029297. doi: 10.1016/j.ajhg.2012.10.010. URL <http://linkinghub.elsevier.com/retrieve/pii/S0002929712005332>.
- Jost Tobias Springenberg, Alexey Dosovitskiy, Thomas Brox, and Martin Riedmiller. Striving for simplicity: The all convolutional net. *arXiv preprint arXiv:1412.6806*, 2014.
- Nitish Srivastava, Geoffrey Hinton, Alex Krizhevsky, Ilya Sutskever, and Ruslan Salakhutdinov. Dropout: a simple way to prevent neural networks from overfitting. *The journal of machine learning research*, 15(1):1929–1958, 2014.
- M. Stephens, N. J. Smith, and P. Donnelly. A new statistical method for haplotype reconstruction from population data. *American Journal of Human Genetics*, 68(4):978–989, April 2001. ISSN 0002-9297. doi: 10.1086/319501.
- Gert Stulp, Louise Barrett, Felix C. Tropf, and Melinda Mills. Does natural selection favour taller stature among the tallest people on earth? *Proceedings of the Royal Society B: Biological Sciences*, 282(1806):20150211, May 2015. ISSN 0962-8452, 1471-2954. doi: 10.1098/rspb.2015.0211. URL <https://royalsocietypublishing.org/doi/10.1098/rspb.2015.0211>.
- Guosheng Su, Ole F. Christensen, Tage Ostensen, Mark Henryon, and Mogens S. Lund. Estimating Additive and Non-Additive Genetic Variances and Predicting Genetic Merits Using Genome-Wide Dense Single Nucleotide Polymorphism Markers. *PLoS ONE*, 7(9):e45293, September 2012. ISSN 1932-6203. doi: 10.1371/journal.pone.0045293. URL <http://dx.plos.org/10.1371/journal.pone.0045293>.
- Cathie Sudlow, John Gallacher, Naomi Allen, Valerie Beral, Paul Burton, John Danesh, Paul Downey, Paul Elliott, Jane Green, Martin Landray, Bette Liu, Paul Matthews, Giok Ong, Jill Pell, Alan Silman, Alan Young, Tim Sprosen, Tim Peakman, and Rory Collins. UK Biobank: An Open Access Resource for Identifying the Causes of a Wide Range of Complex Diseases of Middle and Old Age. *PLOS Medicine*, 12(3): e1001779, March 2015. ISSN 1549-1676. doi: 10.1371/journal.pmed.1001779. URL <http://dx.plos.org/10.1371/journal.pmed.1001779>.
- Vivian Tam, Nikunj Patel, Michelle Turcotte, Yohan Bossé, Guillaume Paré, and David Meyre. Benefits and limitations of genome-wide association studies. *Nature Reviews Genetics*, 20(8):467–484, August 2019. ISSN 1471-0056, 1471-0064. doi: 10.1038/s41576-019-0127-1. URL <http://www.nature.com/articles/s41576-019-0127-1>.

- The All of Us Research Program Investigators. The “All of Us” Research Program. *New England Journal of Medicine*, 381(7):668–676, August 2019. ISSN 0028-4793, 1533-4406. doi: 10.1056/NEJMSr1809937. URL <http://www.nejm.org/doi/10.1056/NEJMSr1809937>.
- The Australo-Anglo-American Spondyloarthritis Consortium (TASC), the Wellcome Trust Case Control Consortium 2 (WTCCC2), Spondyloarthritis Research Consortium of Canada (SPARCC), David M Evans, Chris C A Spencer, Jennifer J Pointon, Zhan Su, David Harvey, Grazyna Kochan, Udo Oppermann, Alexander Diltthey, Matti Piriinen, Millicent A Stone, Louise Appleton, Loukas Moutsianas, Stephen Leslie, Tom Wordsworth, Tony J Kenna, Tugce Karaderi, Gethin P Thomas, Michael M Ward, Michael H Weisman, Claire Farrar, Linda A Bradbury, Patrick Danoy, Robert D Inman, Walter Maksymowych, Dafna Gladman, Proton Rahman, Ann Morgan, Helena Marzo-Ortega, Paul Bowness, Karl Gaffney, J S Hill Gaston, Malcolm Smith, Jacome Bruges-Armas, Ana-Rita Couto, Rosa Sorrentino, Fabiana Paladini, Manuel A Ferreira, Huji Xu, Yu Liu, Lei Jiang, Carlos Lopez-Larrea, Roberto Díaz-Peña, Antonio López-Vázquez, Tetyana Zayats, Gavin Band, Céline Bellenguez, Hannah Blackburn, Jenefer M Blackwell, Elvira Bramon, Suzannah J Bumpstead, Juan P Casas, Aiden Corvin, Nicholas Craddock, Panos Deloukas, Serge Dronov, Audrey Duncanson, Sarah Edkins, Colin Freeman, Matthew Gillman, Emma Gray, Rhian Gwilliam, Naomi Hammond, Sarah E Hunt, Janusz Jankowski, Alagurevathi Jayakumar, Cordelia Langford, Jennifer Liddle, Hugh S Markus, Christopher G Mathew, Owen T McCann, Mark I McCarthy, Colin N A Palmer, Leena Peltonen, Robert Plomin, Simon C Potter, Anna Rautanen, Radhi Ravindrarajah, Michelle Ricketts, Nilesh Samani, Stephen J Sawcer, Amy Strange, Richard C Trembath, Ananth C Viswanathan, Matthew Waller, Paul Weston, Pamela Whittaker, Sara Widaa, Nicholas W Wood, Gilean McVean, John D Reville, B Paul Wordsworth, Matthew A Brown, and Peter Donnelly. Interaction between ERAP1 and HLA-B27 in ankylosing spondylitis implicates peptide handling in the mechanism for HLA-B27 in disease susceptibility. *Nature Genetics*, 43(8): 761–767, August 2011. ISSN 1061-4036, 1546-1718. doi: 10.1038/ng.873. URL <http://www.nature.com/articles/ng.873>.
- The International IBD Genetics Consortium (IIBDGC), Luke Jostins, Stephan Ripke, Rinse K. Weersma, Richard H. Duerr, Dermot P. McGovern, Ken Y. Hui, James C. Lee, L. Philip Schumm, Yashoda Sharma, Carl A. Anderson, Jonah Essers, Mitja Mitrovic, Kaida Ning, Isabelle Cleynen, Emilie Theate, Sarah L. Spain, Soumya Raychaudhuri, Philippe Goyette, Zhi Wei, Clara Abraham, Jean-Paul Achkar, Tariq Ahmad, Leila Amininejad, Ashwin N. Ananthakrishnan, Vibeke Andersen, Jane M. Andrews, Leonard Baidoo, Tobias Balschun, Peter A. Bampton, Alain Bitton, Gabrielle Boucher, Stephan Brand, Carsten Büning, Ariella Cohain, Sven Cichon, Mauro D’Amato, Dirk De Jong, Kathy L. Devaney, Marla Dubinsky, Cathryn Edwards, David Ellinghaus, Lynnette R. Ferguson, Denis Franchimont, Karin Fransen, Richard Gearty, Michel Georges, Christian Gieger, Jürgen Glas, Talin Haritunians, Ailsa Hart, Chris Hawkey, Matija Hedl, Xinli Hu, Tom H. Karlsen, Limas Kupcinskis, Subra Kugathasan, Anna Latiano, Debby Laukens, Ian C. Lawrance, Charlie W. Lees, Edouard Louis, Gillian Mahy, John Mansfield, Angharad R. Morgan, Craig Mowat, William Newman, Orazio Palmieri, Cyriel Y. Ponsioen, Uros Potocnik, Natalie J. Prescott, Miguel Regueiro, Jerome I. Rotter, Richard K. Russell, Jeremy D. Sanderson, Miquel Sans, Jack Satsangi, Stefan Schreiber, Lisa A. Simms, Jurgita Sventoraityte, Stephan R. Targan,

- Kent D. Taylor, Mark Tremelling, Hein W. Verspaget, Martine De Vos, Cisca Wijmenga, David C. Wilson, Juliane Winkelmann, Ramnik J. Xavier, Sebastian Zeisig, Bin Zhang, Clarence K. Zhang, Hongyu Zhao, Mark S. Silverberg, Vito Annese, Hakon Hakonarson, Steven R. Brant, Graham Radford-Smith, Christopher G. Mathew, John D. Rioux, Eric E. Schadt, Mark J. Daly, Andre Franke, Miles Parkes, Severine Vermeire, Jeffrey C. Barrett, and Judy H Cho. Host–microbe interactions have shaped the genetic architecture of inflammatory bowel disease. *Nature*, 491(7422):119–124, November 2012. ISSN 0028-0836, 1476-4687. doi: 10.1038/nature11582. URL <http://www.nature.com/articles/nature11582>.
- The LifeLines Cohort Study, Jian Yang, Andrew Bakshi, Zhihong Zhu, Gibran Hemani, Anna A E Vinkhuyzen, Sang Hong Lee, Matthew R Robinson, John R B Perry, Ilja M Nolte, Jana V van Vliet-Ostaptchouk, Harold Snieder, Tonu Esko, Lili Milani, Reedik Mägi, Andres Metspalu, Anders Hamsten, Patrik K E Magnusson, Nancy L Pedersen, Erik Ingelsson, Nicole Soranzo, Matthew C Keller, Naomi R Wray, Michael E Goddard, and Peter M Visscher. Genetic variance estimation with imputed variants finds negligible missing heritability for human height and body mass index. *Nature Genetics*, 47(10): 1114–1120, October 2015. ISSN 1061-4036, 1546-1718. doi: 10.1038/ng.3390. URL <http://www.nature.com/articles/ng.3390>.
- The UK-PSC Consortium, The International IBD Genetics Consortium, The International PSC Study Group, Sun-Gou Ji, Brian D Juran, Sören Mucha, Trine Folseraas, Luke Jostins, Espen Melum, Natsuhiko Kumasaka, Elizabeth J Atkinson, Erik M Schlicht, Jimmy Z Liu, Tejas Shah, Javier Gutierrez-Achury, Kirsten M Boberg, Annika Bergquist, Severine Vermeire, Bertus Eksteen, Peter R Durie, Martti Farkkila, Tobias Müller, Christoph Schramm, Martina Sterneck, Tobias J Weismüller, Daniel N Gotthardt, David Ellinghaus, Felix Braun, Andreas Teufel, Mattias Laudes, Wolfgang Lieb, Gunnar Jacobs, Ulrich Beuers, Rinse K Weersma, Cisca Wijmenga, Hanns-Ulrich Marschall, Piotr Milkiewicz, Albert Pares, Kimmo Kontula, Olivier Chazouillères, Pietro Invernizzi, Elizabeth Goode, Kelly Spiess, Carmel Moore, Jennifer Sambrook, Willem H Ouwehand, David J Roberts, John Danesh, Annarosa Floreani, Aliya F Gulamhusein, John E Eaton, Stefan Schreiber, Catalina Coltescu, Christopher L Bowlus, Velimir A Luketic, Joseph A Odin, Kapil B Chopra, Kris V Kowdley, Naga Chalasani, Michael P Manns, Brijesh Srivastava, George Mells, Richard N Sandford, Graeme Alexander, Daniel J Gaffney, Roger W Chapman, Gideon M Hirschfield, Mariza de Andrade, Simon M Rushbrook, Andre Franke, Tom H Karlsen, Konstantinos N Lazaridis, and Carl A Anderson. Genome-wide association study of primary sclerosing cholangitis identifies new risk loci and quantifies the genetic relationship with inflammatory bowel disease. *Nature Genetics*, 49(2):269–273, February 2017. ISSN 1061-4036, 1546-1718. doi: 10.1038/ng.3745. URL <http://www.nature.com/articles/ng.3745>.
- Simon F. Thomsen. Genetics of asthma: an introduction for the clinician. *European Clinical Respiratory Journal*, 2(1):24643, January 2015. ISSN 2001-8525. doi: 10.3402/ecrj.v2.24643. URL <https://www.tandfonline.com/doi/full/10.3402/ecrj.v2.24643>.
- Ali Torkamani, Nathan E. Wineinger, and Eric J. Topol. The personal and clinical utility of polygenic risk scores. *Nature Reviews Genetics*, 19(9):581–590, September 2018. ISSN 1471-0056, 1471-0064. doi: 10.1038/s41576-018-0018-x. URL <http://www.nature.com/articles/s41576-018-0018-x>.

- Michael Tsang, Dehua Cheng, and Yan Liu. Detecting statistical interactions from neural network weights. *arXiv preprint arXiv:1705.04977*, 2017.
- K. Van Steen. Travelling the world of gene-gene interactions. *Briefings in Bioinformatics*, 13 (1):1–19, January 2012a. ISSN 1467-5463, 1477-4054. doi: 10.1093/bib/bbr012. URL <https://academic.oup.com/bib/article-lookup/doi/10.1093/bib/bbr012>.
- K. Van Steen. Travelling the world of gene-gene interactions. *Briefings in Bioinformatics*, 13 (1):1–19, January 2012b. ISSN 1467-5463, 1477-4054. doi: 10.1093/bib/bbr012. URL <https://academic.oup.com/bib/article-lookup/doi/10.1093/bib/bbr012>.
- Aravind Vasudevan, Andrew Anderson, and David Gregg. Parallel multi channel convolution using general matrix multiplication. In *2017 IEEE 28th International Conference on Application-specific Systems, Architectures and Processors (ASAP)*, pages 19–24. IEEE, 2017.
- Bjarni J. Vilhjálmsón, Jian Yang, Hilary K. Finucane, Alexander Gusev, Sara Lindström, Stephan Ripke, Giulio Genovese, Po-Ru Loh, Gaurav Bhatia, Ron Do, Tristan Hayeck, Hong-Hee Won, Sekar Kathiresan, Michele Pato, Carlos Pato, Rulla Tamimi, Eli Stahl, Noah Zaitlen, Bogdan Pasaniuc, Gillian Belbin, Eimear E. Kenny, Mikkel H. Schierup, Philip De Jager, Nikolaos A. Patsopoulos, Steve McCarroll, Mark Daly, Shaun Purcell, Daniel Chasman, Benjamin Neale, Michael Goddard, Peter M. Visscher, Peter Kraft, Nick Patterson, Alkes L. Price, Stephan Ripke, Benjamin M. Neale, Aiden Corvin, James T.R. Walters, Kai-How Farh, Peter A. Holmans, Phil Lee, Brendan Bulik-Sullivan, David A. Collier, Hailiang Huang, Tune H. Pers, Ingrid Agartz, Esben Agerbo, Margot Albus, Madeline Alexander, Farooq Amin, Silviu A. Bacanu, Martin Begemann, Richard A. Belliveau, Judit Bene, Sarah E. Bergen, Elizabeth Bevilacqua, Tim B. Bigdeli, Donald W. Black, Richard Bruggeman, Nancy G. Buccola, Randy L. Buckner, William Byerley, Wiepke Cahn, Guiqing Cai, Dominique Champion, Rita M. Cantor, Vaughan J. Carr, Noa Carrera, Stanley V. Catts, Kimberly D. Chambert, Raymond C.K. Chan, Ronald Y.L. Chen, Eric Y.H. Chen, Wei Cheng, Eric F.C. Cheung, Siow Ann Chong, C. Robert Cloninger, David Cohen, Nadine Cohen, Paul Cormican, Nick Craddock, James J. Crowley, David Curtis, Michael Davidson, Kenneth L. Davis, Franziska Degenhardt, Jurgen Del Favero, Lynn E. DeLisi, Ditte Demontis, Dimitris Dikeos, Timothy Dinan, Srdjan Djurovic, Gary Donohoe, Elodie Drapeau, Jubao Duan, Frank Dudbridge, Naser Durmishi, Peter Eichhammer, Johan Eriksson, Valentina Escott-Price, Laurent Essioux, Ayman H. Fanous, Martilias S. Farrell, Josef Frank, Lude Franke, Robert Freedman, Nelson B. Freimer, Marion Friedl, Joseph I. Friedman, Menachem Fromer, Giulio Genovese, Lyudmila Georgieva, Elliot S. Gershon, Ina Giegling, Paola Giusti-Rodriguez, Stephanie Godard, Jacqueline I. Goldstein, Vera Golimbet, Srihari Gopal, Jacob Gratten, Jakob Grove, Lieuwe de Haan, Christian Hammer, Marian L. Hamshere, Mark Hansen, Thomas Hansen, Vahram Haroutunian, Annette M. Hartmann, Frans A. Henskens, Stefan Herms, Joel N. Hirschhorn, Per Hoffmann, Andrea Hofman, Mads V. Hollegaard, David M. Hougaard, Masashi Ikeda, Inge Joa, Antonio Julia, Rene S. Kahn, Luba Kalaydjieva, Sena Karachanak-Yankova, Juha Karjalainen, David Kavanagh, Matthew C. Keller, Brian J. Kelly, James L. Kennedy, Andrey Khrunin, Yunjung Kim, Janis Klovins, James A. Knowles, Bettina Konte, Vaidutis Kucinskas, Zita Ausrele Kucinskiene, Hana Kuzelova-Ptackova, Anna K. Kahler, Claudine Laurent, Jimmy Lee Chee Keong, S. Hong Lee, Sophie E. Legge, Bernard Lerer, Miaoxin Li, Tao

Li, Kung-Yee Liang, Jeffrey Lieberman, Svetlana Limborska, Carmel M. Loughland, Jan Lubinski, Jouko Lnnqvist, Milan Macek, Patrik K.E. Magnusson, Brion S. Maher, Wolfgang Maier, Jacques Mallet, Sara Marsal, Manuel Mattheisen, Morten Mattingsdal, Robert W. McCarley, Colm McDonald, Andrew M. McIntosh, Sandra Meier, Carin J. Meijer, Bela Melegh, Ingrid Melle, Raquelle I. Mesholam-Gately, Andres Metspalu, Patricia T. Michie, Lili Milani, Vihra Milanova, Younes Mokrab, Derek W. Morris, Ole Mors, Preben B. Mortensen, Kieran C. Murphy, Robin M. Murray, Inez Myin-Germeys, Bertram Mller-Myhsok, Mari Nelis, Igor Nenadic, Deborah A. Nertney, Gerald Nestadt, Kristin K. Nicodemus, Liene Nikitina-Zake, Laura Nisenbaum, Annelie Nordin, Eadbhard O'Callaghan, Colm O'Dushlaine, F. Anthony O'Neill, Sang-Yun Oh, Ann Olincy, Line Olsen, Jim Van Os, Christos Pantelis, George N. Papadimitriou, Sergi Papiol, Elena Parkhomenko, Michele T. Pato, Tiina Paunio, Milica Pejovic-Milovancevic, Diana O. Perkins, Olli Pietilinen, Jonathan Pimm, Andrew J. Pocklington, John Powell, Alkes Price, Ann E. Pulver, Shaun M. Purcell, Digby Quested, Henrik B. Rasmussen, Abraham Reichenberg, Mark A. Reimers, Alexander L. Richards, Joshua L. Roffman, Panos Roussos, Douglas M. Ruderfer, Veikko Salomaa, Alan R. Sanders, Ulrich Schall, Christian R. Schubert, Thomas G. Schulze, Sibylle G. Schwab, Edward M. Scolnick, Rodney J. Scott, Larry J. Seidman, Jianxin Shi, Engilbert Sigurdsson, Teimuraz Silagadze, Jeremy M. Silverman, Kang Sim, Petr Slominsky, Jordan W. Smoller, Hon-Cheong So, Chris C.A. Spencer, Eli A. Stahl, Hreinn Stefansson, Stacy Steinberg, Elisabeth Stogmann, Richard E. Straub, Eric Strengman, Jana Strohmaier, T. Scott Stroup, Mythily Subramaniam, Jaana Suvisaari, Dragan M. Svrakic, Jin P. Szatkiewicz, Erik Sderman, Srinivas Thirumalai, Draga Toncheva, Paul A. Tooney, Sarah Tosato, Juha Veijola, John Waddington, Dermot Walsh, Dai Wang, Qiang Wang, Bradley T. Webb, Mark Weiser, Dieter B. Wildenauer, Nigel M. Williams, Stephanie Williams, Stephanie H. Witt, Aaron R. Wolen, Emily H.M. Wong, Brandon K. Wormley, Jing Qin Wu, Hualin Simon Xi, Clement C. Zai, Xuebin Zheng, Fritz Zimprich, Naomi R. Wray, Kari Stefansson, Peter M. Visscher, Rolf Adolfsson, Ole A. Andreassen, Douglas H.R. Blackwood, Elvira Bramon, Joseph D. Buxbaum, Anders D. Børglum, Sven Cichon, Ariel Darvasi, Enrico Domenici, Hannelore Ehrenreich, Tonu Esko, Pablo V. Gejman, Michael Gill, Hugh Gurling, Christina M. Hultman, Nakao Iwata, Assen V. Jablensky, Erik G. Jonsson, Kenneth S. Kendler, George Kirov, Jo Knight, Todd Lencz, Douglas F. Levinson, Qingqin S. Li, Jianjun Liu, Anil K. Malhotra, Steven A. McCarroll, Andrew McQuillin, Jennifer L. Moran, Preben B. Mortensen, Bryan J. Mowry, Markus M. Nthen, Roel A. Ophoff, Michael J. Owen, Aarno Palotie, Carlos N. Pato, Tracey L. Petryshen, Danielle Posthuma, Marcella Rietschel, Brien P. Riley, Dan Rujescu, Pak C. Sham, Pamela Sklar, David St. Clair, Daniel R. Weinberger, Jens R. Wendland, Thomas Werge, Mark J. Daly, Patrick F. Sullivan, Michael C. O'Donovan, Peter Kraft, David J. Hunter, Muriel Adank, Habibul Ahsan, Kristiina Aittomäki, Laura Baglietto, Sonja Berndt, Carl Blomquist, Federico Canzian, Jenny Chang-Claude, Stephen J. Chanock, Laura Crisponi, Kamila Czene, Norbert Dahmen, Isabel dos Santos Silva, Douglas Easton, A. Heather Eliassen, Jonine Figueroa, Olivia Fletcher, Montserrat Garcia-Closas, Mia M. Gaudet, Lorna Gibson, Christopher A. Haiman, Per Hall, Aditi Hazra, Rebecca Hein, Brian E. Henderson, Albert Hofman, John L. Hopper, Astrid Irwanto, Mattias Johansson, Rudolf Kaaks, Muhammad G. Kibriya, Peter Lichtner, Sara Lindström, Jianjun Liu, Eiliv Lund, Enes Makalic, Alfons Meindl, Hanne Meijers-Heijboer, Bertram Müller-Myhsok, Taru A. Muranen, Heli Nevanlinna, Petra H. Peeters, Julian Peto, Ross L. Prentice, Nazneen Rahman, María José Sánchez, Daniel F. Schmidt,

- Rita K. Schmutzler, Melissa C. Southey, Rulla Tamimi, Ruth Travis, Clare Turnbull, Andre G. Uitterlinden, Rob B. van der Loo, Quinten Waisfisz, Zhaoming Wang, Alice S. Whittemore, Rose Yang, and Wei Zheng. Modeling Linkage Disequilibrium Increases Accuracy of Polygenic Risk Scores. *The American Journal of Human Genetics*, 97(4):576–592, October 2015. ISSN 00029297. doi: 10.1016/j.ajhg.2015.09.001. URL <https://linkinghub.elsevier.com/retrieve/pii/S0002929715003651>.
- Peter M. Visscher, Naomi R. Wray, Qian Zhang, Pamela Sklar, Mark I. McCarthy, Matthew A. Brown, and Jian Yang. 10 Years of GWAS Discovery: Biology, Function, and Translation. *The American Journal of Human Genetics*, 101(1):5–22, July 2017. ISSN 00029297. doi: 10.1016/j.ajhg.2017.06.005. URL <https://linkinghub.elsevier.com/retrieve/pii/S0002929717302409>.
- Peter M. Visscher, Matthew A. Brown, Mark I. McCarthy, and Jian Yang. Five Years of GWAS Discovery. *The American Journal of Human Genetics*, 90(1):7–24, January 2012. ISSN 00029297. doi: 10.1016/j.ajhg.2011.11.029. URL <https://linkinghub.elsevier.com/retrieve/pii/S0002929711005337>.
- E Vittinghoff and DC Bauer. Case-only analysis of treatment–covariate interactions in clinical trials. *Biometrics*, 62(3):769–776, 2006.
- Theo Vos, Amanuel Alemu Abajobir, Kalkidan Hassen Abate, Cristiana Abbafati, Kaja M Abbas, Foad Abd-Allah, Rizwan Suliankatchi Abdulkader, Abdishakur M Abdulle, Teshome Abuka Abebo, Semaw Ferede Abera, Victor Aboyans, Laith J Abu-Raddad, Ilana N Ackerman, Abdu Abdullahi Adamu, Olatunji Adetokunboh, Mohsen Afarideh, Ashkan Afshin, Sanjay Kumar Agarwal, Rakesh Aggarwal, Anurag Agrawal, Sutapa Agrawal, Hamid Ahmadieh, Muktar Beshir Ahmed, Miloud Taki Eddine Aichour, Amani Nidhal Aichour, Ibtihel Aichour, Sneha Aiyar, Rufus Olusola Akinyemi, Nadia Akseer, Faris Hasan Al Lami, Fares Alahdab, Ziyad Al-Aly, Khurshid Alam, Noore Alam, Tahiya Alam, Deena Alasfoor, Kefyalew Addis Alene, Raghieb Ali, Reza Alizadeh-Navaei, Ala'a Alkerwi, François Alla, Peter Allebeck, Christine Allen, Fatma Al-Maskari, Rajaa Al-Raddadi, Ubai Alsharif, Shirina Alsowaidi, Khalid A Altirkawi, Azmeraw T Amare, Erfan Amini, Walid Ammar, Yaw Ampem Amoako, Hjalte H Andersen, Carl Abelardo T Antonio, Palwasha Anwari, Johan Ärnlöv, Al Artaman, Krishna Kumar Aryal, Hamid Asayesh, Solomon W Asgedom, Reza Assadi, Tesfay Mehari Atey, Niguse Tadele Atnafu, Sachin R Atre, Leticia Avila-Burgos, Euripide Frinel G Arthur Avokphako, Ashish Awasthi, Umar Bacha, Alaa Badawi, Kalpana Balakrishnan, Amitava Banerjee, Marlina S Bannick, Aleksandra Barac, Ryan M Barber, Suzanne L Barker-Collo, Till Bärnighausen, Simon Barquera, Lars Barregard, Lope H Barrero, Sanjay Basu, Bob Battista, Katherine E Battle, Bernhard T Baune, Shahrzad Bazargan-Hejazi, Justin Beardsley, Neeraj Bedi, Ettore Beghi, Yannick BÉjot, Bayu Be-gashaw Bekele, Michelle L Bell, Derrick A Bennett, Isabela M Bensenor, Jennifer Benson, Adugnaw Berhane, Derbew Fikadu Berhe, Eduardo Bernabé, Balem Demtsu Betsu, Mircea Beuran, Addisu Shunu Beyene, Neeraj Bhala, Anil Bhansali, Samir Bhatt, Zulfiqar A Bhutta, Sibhatu Biadgilign, Burcu Kucuk Bicer, Kelly Bienhoff, Boris Bikbov, Charles Birungi, Stan Biryukov, Donal Bisanzio, Habtamu Mellie Bizuayehu, Dube Jara Boneya, Soufiane Boufous, Rupert R A Bourne, Alexandra Brazinova, Traolach S Brugha, Rachelle Buchbinder, Lemma Negesa Bulto Bulto, Blair R Bumgarner, Zahid A Butt, Lucero Cahuana-Hurtado, Ewan Cameron, Mate Car, HÉlène Carabin, Jonathan R

Carapetis, Rosario Cárdenas, David O Carpenter, Juan Jesus Carrero, Austin Carter, Felix Carvalho, Daniel C Casey, Valeria Caso, Carlos A Castañeda-Orjuela, Chris D Castle, Ferrán Catalá-López, Hsing-Yi Chang, Jung-Chen Chang, Fiona J Charlson, Honglei Chen, Mirriam Chibalabala, Chioma Ezinne Chibueze, Vesper Hichilombwe Chisumpa, Abdulaal A Chitheer, Devasahayam Jesudas Christopher, Liliana G Ciobanu, Massimo Cirillo, Danny Colombara, Cyrus Cooper, Paolo Angelo Cortesi, Michael H Criqui, John A Crump, Abel Fekadu Dadi, Koustuv Dalal, Lalit Dandona, Rakhi Dandona, José das Neves, Dragos V Davitoiu, Barbora de Courten, Diego De De Leo, Barthelemy Kuate Defo, Louisa Degenhardt, Selina Deiparine, Robert P Dellavalle, Kebede Deribe, Don C Des Jarlais, Subhojit Dey, Samath D Dharmaratne, Preet Kaur Dhillon, Daniel Dicker, Eric L Ding, Shirin Djalalinia, Huyen Phuc Do, E Ray Dorsey, Kadine Priscila Bender dos Santos, Dirk Douwes-Schultz, Kerrie E Doyle, Tim R Driscoll, Manisha Dubey, Bruce Bartholow Duncan, Ziad Ziad El-Khatib, Jerisha Ellerstrand, Ahmadali Enayati, Aman Yesuf Endries, Sergey Petrovich Ermakov, Holly E Erskine, Babak Eshrati, Sharareh Eskandarieh, Alireza Esteghamati, Kara Estep, Fanuel Belayneh Bekele Fanuel, Carla Sofia E Sa Farinha, André Faro, Farshad Farzadfar, Mir Sohail Fazeli, Valery L Feigin, Seyed-Mohammad Fereshtehnejad, João C Fernandes, Alize J Ferrari, Tesfaye Regassa Feyissa, Irina Filip, Florian Fischer, Christina Fitzmaurice, Abraham D Flaxman, Luisa Sorio Flor, Nataliya Foigt, Kyle J Foreman, Richard C Franklin, Nancy Fullman, Thomas Fürst, Joao M Furtado, Neal D Futran, Emmanuela Gakidou, Morsaleh Ganji, Alberto L Garcia-Basteiro, Teshome Gebre, Tsegaye Tewelde Gebrehiwot, Ayele Geleto, Bikila Lencha Gemechu, Hailay Abrha Gesesew, Peter W Gething, Alireza Ghajar, Katherine B Gibney, Paramjit Singh Gill, Richard F Gillum, Ibrahim Abdelmageem Mohamed Ginawi, Ababi Zergaw Giref, Melkamu Dedefo Gishu, Giorgia Giussani, William W Godwin, Audra L Gold, Ellen M Goldberg, Philimon N Gona, Amador Goodridge, Sameer Vali Gopalani, Atsushi Goto, Alessandra Carvalho Goulart, Max Griswold, Harish Chander Gugnani, Rahul Gupta, Rajeev Gupta, Tanush Gupta, Vipin Gupta, Nima Hafezi-Nejad, Gessesew Bugssa Hailu, Alemayehu Desalegne Hailu, Randah Ribhi Hamadeh, Samer Hamidi, Alexis J Handal, Graeme J Hankey, Sarah Wulf Hanson, Yuantao Hao, Hilda L Harb, Habtamu Abera Hareri, Josep Maria Haro, James Harvey, Mohammad Sadegh Hassanvand, Rasmus Havmoeller, Caitlin Hawley, Simon I Hay, Roderick J Hay, Nathaniel J Henry, Ileana Beatriz Heredia-Pi, Julio Montañez Hernandez, Pouria Heydarpour, Hans W Hoek, Howard J Hoffman, Nobuyuki Horita, H Dean Hosgood, Sorin Hostiuc, Peter J Hotez, Damian G Hoy, Aung Soe Htet, Guoqing Hu, Hsiang Huang, Chantal Huynh, Kim Moesgaard Iburg, Ehimario Uche Igumbor, Chad Ikeda, Caleb Mackay Salpeter Irvine, Kathryn H Jacobsen, Nader Jahanmehr, Mihajlo B Jakovljevic, Simerjot K Jassal, Mehdi Javanbakht, Sudha P Jayaraman, Panniyammakal Jeemon, Paul N Jensen, Vivekanand Jha, Guohong Jiang, Denny John, Sarah Charlotte Johnson, Catherine O Johnson, Jost B Jonas, Mikk Jürisson, Zubair Kabir, Rajendra Kadel, Amaha Kahsay, Ritul Kamal, Haidong Kan, Nadim E Karam, André Karch, Corine Kakizi Karema, Amir Kasaeian, Getachew Mullu Kassa, Nigussie Assefa Kassaw, Nicholas J Kassebaum, Anshul Kastor, Srinivasa Vittal Katikireddi, Anil Kaul, Norito Kawakami, Peter Njenga Keiyoro, Andre Pascal Kengne, Andre Keren, Yousef Saleh Khader, Ibrahim A Khalil, Ejaz Ahmad Khan, Young-Ho Khang, Ardeshir Khosravi, Jagdish Khubchandani, Aliasghar Ahmad Kiadaliri, Christian Kieling, Yun Jin Kim, Daniel Kim, Pauline Kim, Ruth W Kimokoti, Yohannes Kinfu, Adnan Kisa, Katarzyna A Kissimova-Skarbek, Mika Kivimaki, Ann Kristin Knudsen, Yoshihiro Kokubo, Dhaval Kolte, Jacek A

Kopec, Soewarta Kosen, Parvaiz A Koul, Ai Koyanagi, Michael Kravchenko, Sanjay Krishnaswami, Kristopher J Krohn, G Anil Kumar, Pushpendra Kumar, Sanjiv Kumar, Hmwe H Kyu, Dharmesh Kumar Lal, Ratilal Lalloo, Nkurunziza Lambert, Qing Lan, Anders Larsson, Pablo M Lavados, Janet L Leasher, Paul H Lee, Jong-Tae Lee, James Leigh, Cheru Tesema Leshargie, Janni Leung, Ricky Leung, Miriam Levi, Yichong Li, Yongmei Li, Darya Li Kappe, Xiaofeng Liang, Misgan Legesse Liben, Stephen S Lim, Shai Linn, Patrick Y Liu, Angela Liu, Shiwei Liu, Yang Liu, Rakesh Lodha, Giancarlo Logroscino, Stephanie J London, Katharine J Looker, Alan D Lopez, Stefan Lorkowski, Paulo A Lotufo, Nicola Low, Rafael Lozano, Timothy C D Lucas, Erlyn Rachelle King Macarayan, Hassan Magdy Abd El Razek, Mohammed Magdy Abd El Razek, Mahdi Mahdavi, Marek Majdan, Reza Majdzadeh, Azeem Majeed, Reza Malekzadeh, Rajesh Malhotra, Deborah Carvalho Malta, Abdullah A Mamun, Helena Manguerra, Treh Manhertz, Ana Mantilla, Lorenzo G Mantovani, Chabila C Mapoma, Laurie B Marczak, Jose Martinez-Raga, Francisco Rogerlândio Martins-Melo, Ira Martopullo, Winfried März, Manu Raj Mathur, Mohsen Mazidi, Colm McAlinden, Madeline McGaughey, John J McGrath, Martin McKee, Claire McNellan, Suresh Mehata, Man Mohan Mehndiratta, Tefera Chane Mekonnen, Peter Memiah, Ziad A Memish, Walter Mendoza, Mubarek Abera Mengistie, Desalegn Tadesse Mengistu, George A Mensah, Tuomo J Meretoja, Atte Meretoja, Haftay Berhane Mezgebe, Renata Micha, Anoushka Millear, Ted R Miller, Edward J Mills, Mojde Mirarefin, Erkin M Mirrakhimov, Awoke Misganaw, Shiva Raj Mishra, Philip B Mitchell, Karzan Abdulmuhsin Mohammad, Alireza Mohammadi, Kedir Endris Mohammed, Shafiu Mohammed, Sanjay K Mohanty, Ali H Mokdad, Sarah K Mollenkopf, Lorenzo Monasta, Marcella Montico, Maziar Moradi-Lakeh, Paula Moraga, Rintaro Mori, Chloe Morozoff, Shane D Morrison, Mark Moses, Cliff Mountjoy-Venning, Kalayu Birhane Mruts, Ulrich O Mueller, Kate Muller, Michele E Murdoch, Gudlavalleti Venkata Satyanarayana Murthy, Kamarul Imran Musa, Jean B Nachega, Gabriele Nagel, Mohsen Naghavi, Aliya Naheed, Kovin S Naidoo, Luigi Naldi, Vinay Nangia, Gopalakrishnan Natarajan, Dumessa Edessa Negasa, Ruxandra Irina Negoii, Ionut Negoii, Charles R Newton, Josephine Wanjiku Ngunjiri, Trang Huyen Nguyen, Quyen Le Nguyen, Cuong Tat Nguyen, Grant Nguyen, Minh Nguyen, Emma Nichols, Dina Nur Anggraini Ningrum, Sandra Nolte, Vuong Minh Nong, Bo Norrving, Jean Jacques N Noubiap, Martin J O'Donnell, Felix Akpojene Ogbo, In-Hwan Oh, Anselm Okoro, Olanrewaju Oladimeji, Tinuke Oluwasefunmi Olagunju, Andrew Toyin Olagunju, Helen E Olsen, Bolajoko Olubukunola Olusanya, Jacob Olusegun Olusanya, Kanyin Ong, John Nelson Opio, Eyal Oren, Alberto Ortiz, Aaron Osgood-Zimmerman, Majdi Osman, Mayowa O Owolabi, Mahesh Pa, Rosana E Pacella, Adrian Pana, Basant Kumar Panda, Christina Papachristou, Eun-Kee Park, Charles D Parry, Mahboubeh Parsaeian, Scott B Patten, George C Patton, Katherine Paulson, Neil Pearce, David M Pereira, Norberto Perico, Konrad Pesudovs, Carrie Beth Peterson, Max Petzold, Michael Robert Phillips, David M Pigott, Julian David Pillay, Christine Pinho, Dietrich Plass, Martin A Pletcher, Svetlana Popova, Richie G Poulton, Farshad Pourmalek, Dorairaj Prabhakaran, Noela M Prasad, Narayan Prasad, Carrie Purcell, Mostafa Qorbani, Reginald Quansah, Beatriz Paulina Ayala Quintanilla, Rynaz H S Rabiee, Amir Radfar, Anwar Rafay, Kazem Rahimi, Afarin Rahimi-Movaghar, Vafa Rahimi-Movaghar, Mohammad Hifz Ur Rahman, Mahfuzar Rahman, Rajesh Kumar Rai, Sasa Rajsic, Usha Ram, Chhabi Lal Ranabhat, Zane Rankin, Puja C Rao, Paturi Vishnupriya Rao, Salman Rawaf, Sarah E Ray, Robert C Reiner, Nikolas Reinig, Marissa B Reitsma, Giuseppe Remuzzi, Andre M N Renzaho, Serge Resnikoff, Satar

Rezaei, Antonio L Ribeiro, Luca Ronfani, Gholamreza Roshandel, Gregory A Roth, Ambuj Roy, Enrico Rubagotti, George Mugambage Ruhago, Soheil Saadat, Nafis Sadat, Mahdi Safdarian, Sare Safi, Saeid Safiri, Rajesh Sagar, Ramesh Sahathevan, Joseph Salama, Huda Omer Ba Saleem, Joshua A Salomon, Sundeep Santosh Salvi, Abdallah M Samy, Juan R Sanabria, Damian Santomauro, Itamar S Santos, João Vasco Santos, Milena M Santric Milicevic, Benn Sartorius, Maheswar Satpathy, Monika Sawhney, Sonia Saxena, Maria Inês Schmidt, Ione J C Schneider, Ben Schöttker, David C Schwebel, Falk Schwendicke, Soraya Seedat, Sadaf G Sepanlou, Edson E Servan-Mori, Tesfaye Setegn, Katya Anne Shackelford, Amira Shaheen, Masood Ali Shaikh, Mansour Shamsipour, Sheikh Mohammed Shariful Islam, Jayendra Sharma, Rajesh Sharma, Jun She, Peilin Shi, Chloe Shields, Girma Temam Shifa, Mika Shigematsu, Yukito Shinohara, Rahman Shiri, Reza Shirkoohi, Shreya Shirude, Kawkab Shishani, Mark G Shrimel, Abla Mehio Sibai, Inga Dora Sigfusdottir, Diego Augusto Santos Silva, João Pedro Silva, Dayane Gabriele Alves Silveira, Jasvinder A Singh, Narinder Pal Singh, Dharendra Narain Sinha, Eirini Skiadaresi, Vegard Skirbekk, Erica Leigh Slepak, Amber Sligar, David L Smith, Mari Smith, Badr H A Sobaih, Eugene Sobngwi, Reed J D Sorensen, Tatiane Cristina Moraes Sousa, Luciano A Sposato, Chandrashekhar T Sreeramareddy, Vinay Srinivasan, Jeffrey D Stanaway, Vasiliki Stathopoulou, Nicholas Steel, Murray B Stein, Dan J Stein, Timothy J Steiner, Caitlyn Steiner, Sabine Steinke, Mark Andrew Stokes, Lars Jacob Stovner, Bryan Strub, Michelle Subart, Muawiyyah Babale Sufiyan, Bruno F Sunguya, Patrick J Sur, Soumya Swaminathan, Bryan L Sykes, Dillon O Sylte, Rafael Tabarés-Seisdedos, Getachew Redae Taffere, Jukka S Takala, Nikhil Tandon, Mohammad Tavakkoli, Nuno Taveira, Hugh R Taylor, Arash Tehrani-Banihashemi, Tesfalidet Tekelab, Abdullah Sulieman Terkawi, Dawit Jember Tesfaye, Belay Tessema, Ornwipa Thamsuwan, Katie E Thomas, Amanda G Thrift, Tenaw Yimer Tiruye, Ruoyan Tobe-Gai, Mette C Tollanes, Marcello Tonelli, Roman Topor-Madry, Miguel Tortajada, Mathilde Touvier, Bach Xuan Tran, Suryakant Tripathi, Christopher Troeger, Thomas Truelsen, Derrick Tsoi, Kald Beshir Tuem, Emin Murat Tuzcu, Stefanos Tyrovolas, Kingsley N Ukwaja, Eduardo A Undurraga, Chigozie Jesse Uneke, Rachel Updike, Olalekan A Uthman, Benjamin S Chudi Uzochukwu, Job F M van Boven, Santosh Varughese, Tommi Vasankari, S Venkatesh, Narayanaswamy Venketasubramanian, Ramesh Vidavalur, Francesco S Violante, Sergey K Vladimirov, Vasiliy Victorovich Vlassov, Stein Emil Vollset, Fiseha Wadilo, Tolassa Wakayo, Yuan-Pang Wang, Marcia Weaver, Scott Weichenthal, Elisabete Weiderpass, Robert G Weintraub, Andrea Werdecker, Ronny Westerman, Harvey A Whiteford, Tissa Wijeratne, Charles Shey Wiysonge, Charles D A Wolfe, Rachel Woodbrook, Anthony D Woolf, Abdulhalik Workicho, Denis Xavier, Gelin Xu, Simon Yadgir, Mohsen Yaghoubi, Bereket Yakob, Lijing L Yan, Yuichiro Yano, Pengpeng Ye, Hassen Hamid Yimam, Paul Yip, Naohiro Yonemoto, Seok-Jun Yoon, Marcel Yotebieng, Mustafa Z Younis, Zoubida Zaidi, Maysaa El Sayed Zaki, Elias Asfaw Zegeye, Zerihun Menlkalew Zenebe, Xueying Zhang, Maigeng Zhou, Ben Zipkin, Sanjay Zodpey, Liesl Joanna Zuhlke, and Christopher J L Murray. Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. *The Lancet*, 390(10100):1211–1259, September 2017. ISSN 01406736. doi: 10.1016/S0140-6736(17)32154-2. URL <https://linkinghub.elsevier.com/retrieve/pii/S0140673617321542>.

Damjan Vukcevic, Eliana Hechter, Chris Spencer, and Peter Donnelly. Disease model distortion in association studies. *Genetic Epidemiology*, 35(4):278–290, May 2011.

ISSN 0741-0395, 1098-2272. doi: 10.1002/gepi.20576. URL <https://onlinelibrary.wiley.com/doi/10.1002/gepi.20576>.

- Urmo Vösa, Anniqve Claringbould, Harm-Jan Westra, Marc Jan Bonder, Patrick Deelen, Biao Zeng, Holger Kirsten, Ashis Saha, Roman Kreuzhuber, Silva Kasela, Natalia Pervjakova, Isabel Alvaes, Marie-Julie Fave, Mawusse Agbessi, Mark Christiansen, Rick Jansen, Ilkka Seppälä, Lin Tong, Alexander Teumer, Katharina Schramm, Gibran Hemani, Joost Verlouw, Hanieh Yaghootkar, Reyhan Sönmez, Andrew Brown, Viktorija Kukushkina, Anette Kalnapenkis, Sina Rüeger, Eleonora Porcu, Jaanika Kronberg-Guzman, Johannes Kettunen, Joseph Powell, Bennett Lee, Futao Zhang, Wibowo Arindrarto, Frank Beutner, BIOS Consortium, Harm Brugge, i2QTL Consortium, Julia Dmitreva, Mahmoud Elansary, Benjamin P. Fairfax, Michel Georges, Bastiaan T. Heijmans, Mika Kähönen, Yungil Kim, Julian C. Knight, Peter Kovacs, Knut Krohn, Shuang Li, Markus Loeffler, Urko M. Marigorta, Hailang Mei, Yukihide Momozawa, Martina Müller-Nurasyid, Matthias Nauck, Michel Nivard, Brenda Penninx, Jonathan Pritchard, Olli Raitakari, Olaf Rotzchke, Eline P. Slagboom, Coen D.A. Stehouwer, Michael Stumvoll, Patrick Sullivan, Peter A.C. 't Hoen, Joachim Thiery, Anke Tönjes, Jenny van Dongen, Maarten van Iterson, Jan Veldink, Uwe Völker, Cisca Wijmenga, Morris Swertz, Anand Andiappan, Grant W. Montgomery, Samuli Ripatti, Markus Perola, Zoltan Kutalik, Emmanouil Dermitzakis, Sven Bergmann, Timothy Frayling, Joyce van Meurs, Holger Prokisch, Habibul Ahsan, Brandon Pierce, Terho Lehtimäki, Dorret Boomsma, Bruce M. Psaty, Sina A. Gharib, Philip Awadalla, Lili Milani, Willem Ouwehand, Kate Downes, Oliver Stegle, Alexis Battle, Jian Yang, Peter M. Visscher, Markus Scholz, Gregory Gibson, Tõnu Esko, and Lude Franke. Unraveling the polygenic architecture of complex traits using blood eQTL metaanalysis. preprint, Genomics, October 2018. URL <http://biorxiv.org/lookup/doi/10.1101/447367>.
- Louise V Wain, Nick Shrine, Suzanne Miller, Victoria E Jackson, Ioanna Ntalla, María Soler Artigas, Charlotte K Billington, Abdul Kader Kheirallah, Richard Allen, James P Cook, Kelly Probert, Ma'en Obeidat, Yohan Bossé, Ke Hao, Dirkje S Postma, Peter D Paré, Adaikalavan Ramasamy, Reedik Mägi, Evelin Mihailov, Eva Reinmaa, Erik Melén, Jared O'Connell, Eleni Frangou, Olivier Delaneau, Colin Freeman, Desislava Petkova, Mark McCarthy, Ian Sayers, Panos Deloukas, Richard Hubbard, Ian Pavord, Anna L Hansell, Neil C Thomson, Eleftheria Zeggini, Andrew P Morris, Jonathan Marchini, David P Strachan, Martin D Tobin, and Ian P Hall. Novel insights into the genetics of smoking behaviour, lung function, and chronic obstructive pulmonary disease (UK BiLEVE): a genetic association study in UK Biobank. *The Lancet Respiratory Medicine*, 3(10):769–781, October 2015. ISSN 22132600. doi: 10.1016/S2213-2600(15)00283-0. URL <https://linkinghub.elsevier.com/retrieve/pii/S2213260015002830>.
- Pierrick Wainschtein, Deepti P. Jain, Loic Yengo, Zhili Zheng, TOPMed Anthropometry Working Group, Trans-Omics for Precision Medicine Consortium, L. Adrienne Cupples, Aladdin H. Shadyab, Barbara McKnight, Benjamin M. Shoemaker, Braxton D. Mitchell, Bruce M. Psaty, Charles Kooperberg, Dan Roden, Dawood Darbar, Donna K. Arnett, Elizabeth A. Regan, Eric Boerwinkle, Jerome I. Rotter, Matthew A. Allison, Merry-Lynn N. McDonald, Mina K Chung, Nicholas L. Smith, Patrick T. Ellinor, Ramachandran S. Vasani, Rasika A. Mathias, Stephen S. Rich, Susan R. Heckbert, Susan Redline, Xiuqing Guo, Y.-D Ida Chen, Ching-Ti Liu, Mariza de Andrade, Lisa R. Yanek, Christine M. Albert, Ryan D. Hernandez, Stephen T. McGarvey, Kari E. North, Leslie A.

- Lange, Bruce S. Weir, Cathy C. Laurie, Jian Yang, and Peter M. Visscher. Recovery of trait heritability from whole genome sequence data. preprint, Genetics, March 2019. URL <http://biorxiv.org/lookup/doi/10.1101/588020>.
- Xiang Wan, Can Yang, Qiang Yang, Hong Xue, Xiaodan Fan, Nelson L.S. Tang, and Weichuan Yu. BOOST: A Fast Approach to Detecting Gene-Gene Interactions in Genome-wide Case-Control Studies. *The American Journal of Human Genetics*, 87(3): 325–340, September 2010. ISSN 00029297. doi: 10.1016/j.ajhg.2010.07.021. URL <https://linkinghub.elsevier.com/retrieve/pii/S0002929710003782>.
- Gao Wang, Abhishek Sarkar, Peter Carbonetto, and Matthew Stephens. A simple new approach to variable selection in regression, with application to genetic fine mapping. *Journal of the Royal Statistical Society: Series B (Statistical Methodology)*, 82(5): 1273–1300, December 2020. ISSN 1369-7412, 1467-9868. doi: 10.1111/rssb.12388. URL <https://onlinelibrary.wiley.com/doi/10.1111/rssb.12388>.
- Jianhua Wang, Dandan Huang, Yao Zhou, Hongcheng Yao, Huanhuan Liu, Sinan Zhai, Chengwei Wu, Zhanye Zheng, Ke Zhao, Zhao Wang, Xianfu Yi, Shijie Zhang, Xiaorong Liu, Zipeng Liu, Kexin Chen, Ying Yu, Pak Chung Sham, and Mulin Jun Li. CAUSALdb: a database for disease/trait causal variants identified using summary statistics of genome-wide association studies. *Nucleic Acids Research*, page gkz1026, November 2019. ISSN 0305-1048, 1362-4962. doi: 10.1093/nar/gkz1026. URL <https://academic.oup.com/nar/advance-article/doi/10.1093/nar/gkz1026/5613679>.
- Xuefeng Wang, Robert C. Elston, and Xiaofeng Zhu. The Meaning of Interaction. *Human Heredity*, 70(4):269–277, 2010. ISSN 1423-0062, 0001-5652. doi: 10.1159/000321967. URL <https://www.karger.com/Article/FullText/321967>.
- Xuefeng Wang, Robert C. Elston, and Xiaofeng Zhu. Statistical interaction in human genetics: how should we model it if we are looking for biological interaction? *Nature Reviews Genetics*, 12(1):74–74, January 2011. ISSN 1471-0056, 1471-0064. doi: 10.1038/nrg2579-c2. URL <http://www.nature.com/articles/nrg2579-c2>.
- Wen-Hua Wei, Yunfei Guo, Alida S.D. Kindt, Tony R. Merriman, Colin A. Semple, Kai Wang, and Chris S. Haley. Abundant local interactions in the 4p16.1 region suggest functional mechanisms underlying SLC2A9 associations with human serum uric acid. *Human Molecular Genetics*, 23(19):5061–5068, October 2014a. ISSN 0964-6906, 1460-2083. doi: 10.1093/hmg/ddu227. URL <https://academic.oup.com/hmg/article-lookup/doi/10.1093/hmg/ddu227>.
- Wen-Hua Wei, Gibran Hemani, and Chris S. Haley. Detecting epistasis in human complex traits. *Nature Reviews Genetics*, 15(11):722–733, November 2014b. ISSN 1471-0056, 1471-0064. doi: 10.1038/nrg3747. URL <http://www.nature.com/articles/nrg3747>.
- Omer Weissbrod, Dan Geiger, and Saharon Rosset. Multikernel linear mixed models for complex phenotype prediction. *Genome Research*, 26(7):969–979, July 2016. ISSN 1088-9051, 1549-5469. doi: 10.1101/gr.201996.115. URL <http://genome.cshlp.org/lookup/doi/10.1101/gr.201996.115>.

- Juyang Weng, Narendra Ahuja, and Thomas S Huang. Cresceptron: a self-organizing neural network which grows adaptively. In *[Proceedings 1992] IJCNN International Joint Conference on Neural Networks*, volume 1, pages 576–581. IEEE, 1992.
- Paul Werbos and Paul John. Beyond regression : new tools for prediction and analysis in the behavioral sciences /. 01 1974.
- Rick L. Williams. A Note on Robust Variance Estimation for Cluster-Correlated Data. *Biometrics*, 56(2):645–646, June 2000. ISSN 0006341X. doi: 10.1111/j.0006-341X.2000.00645.x. URL <http://doi.wiley.com/10.1111/j.0006-341X.2000.00645.x>.
- Genevieve L. Wojcik, Mariaelisa Graff, Katherine K. Nishimura, Ran Tao, Jeffrey Haessler, Christopher R. Gignoux, Heather M. Highland, Yesha M. Patel, Elena P. Sorokin, Christy L. Avery, Gillian M. Belbin, Stephanie A. Bien, Iona Cheng, Sinead Cullina, Chani J. Hodonsky, Yao Hu, Laura M. Huckins, Janina Jeff, Anne E. Justice, Jonathan M. Kocarnik, Unhee Lim, Bridget M. Lin, Yingchang Lu, Sarah C. Nelson, Sung-Shim L. Park, Hannah Poisner, Michael H. Preuss, Melissa A. Richard, Claudia Schurmann, Veronica W. Setiawan, Alexandra Sockell, Karan Vahi, Marie Verbanck, Abhishek Vishnu, Ryan W. Walker, Kristin L. Young, Niha Zubair, Victor Acuña-Alonso, Jose Luis Ambite, Kathleen C. Barnes, Eric Boerwinkle, Erwin P. Bottinger, Carlos D. Bustamante, Christian Caberto, Samuel Canizales-Quinteros, Matthew P. Conomos, Ewa Deelman, Ron Do, Kimberly Doheny, Lindsay Fernández-Rhodes, Myriam Fornage, Benyam Hailu, Gerardo Heiss, Brenna M. Henn, Lucia A. Hindorff, Rebecca D. Jackson, Cecelia A. Laurie, Cathy C. Laurie, Yuqing Li, Dan-Yu Lin, Andres Moreno-Estrada, Girish Nadkarni, Paul J. Norman, Loreall C. Pooler, Alexander P. Reiner, Jane Romm, Chiara Sabatti, Karla Sandoval, Xin Sheng, Eli A. Stahl, Daniel O. Stram, Timothy A. Thornton, Christina L. Wassel, Lynne R. Wilkens, Cheryl A. Winkler, Sachi Yoneyama, Steven Buyske, Christopher A. Haiman, Charles Kooperberg, Loic Le Marchand, Ruth J. F. Loos, Tara C. Matise, Kari E. North, Ulrike Peters, Eimear E. Kenny, and Christopher S. Carlson. Genetic analyses of diverse populations improves discovery for complex traits. *Nature*, 570(7762):514–518, June 2019. ISSN 0028-0836, 1476-4687. doi: 10.1038/s41586-019-1310-4. URL <http://www.nature.com/articles/s41586-019-1310-4>.
- Sharon L I Wong and Maria B Sukkar. The SPARC protein: an overview of its role in lung cancer and pulmonary fibrosis and its potential role in chronic airways disease: SPARC in lung inflammation, remodelling and malignancy. *British Journal of Pharmacology*, 174(1):3–14, January 2017. ISSN 00071188. doi: 10.1111/bph.13653. URL <http://doi.wiley.com/10.1111/bph.13653>.
- Andrew R. Wood, Marcus A. Tuke, Mike A. Nalls, Dena G. Hernandez, Stefania Bandinelli, Andrew B. Singleton, David Melzer, Luigi Ferrucci, Timothy M. Frayling, and Michael N. Weedon. Another explanation for apparent epistasis. *Nature*, 514:E3, October 2014. URL <https://doi.org/10.1038/nature13691>.
- Naomi R. Wray, Cisca Wijmenga, Patrick F. Sullivan, Jian Yang, and Peter M. Visscher. Common Disease Is More Complex Than Implied by the Core Gene Omnigenic Model. *Cell*, 173(7):1573–1580, June 2018. ISSN 00928674. doi: 10.1016/j.cell.2018.05.051. URL <https://linkinghub.elsevier.com/retrieve/pii/S0092867418307141>.

- Sewall Wright. *The roles of mutation, inbreeding, crossbreeding, and selection in evolution*, volume 1. na, 1932.
- Paul R. WTCCC, David G. Clayton, Lon R. Cardon, Nick Craddock, Panos Deloukas, Audrey Duncanson, Dominic P. Kwiatkowski, Mark I. McCarthy, Willem H. Ouwehand, Nilesh J. Samani, John A. Todd, Peter Donnelly, Jeffrey C. Barrett, Paul R. Burton, Dan Davison, Peter Donnelly, Doug Easton, David Evans, Hin-Tak Leung, Jonathan L. Marchini, Andrew P. Morris, Chris C. A. Spencer, Martin D. Tobin, Lon R. Cardon, David G. Clayton, Antony P. Attwood, James P. Boorman, Barbara Cant, Ursula Everson, Judith M. Hussey, Jennifer D. Jolley, Alexandra S. Knight, Kerstin Koch, Elizabeth Meech, Sarah Nutland, Christopher V. Prowse, Helen E. Stevens, Niall C. Taylor, Graham R. Walters, Neil M. Walker, Nicholas A. Watkins, Thilo Winzer, John A. Todd, Willem H. Ouwehand, Richard W. Jones, Wendy L. McArdle, Susan M. Ring, David P. Strachan, Marcus Pembrey, Gerome Breen, David St Clair, Sian Caesar, Katherine Gordon-Smith, Lisa Jones, Christine Fraser, Elaine K. Green, Detelina Grozeva, Marian L. Hamshere, Peter A. Holmans, Ian R. Jones, George Kirov, Valentina Moskvina, Ivan Nikolov, Michael C. O'Donovan, Michael J. Owen, Nick Craddock, David A. Collier, Amanda Elkin, Anne Farmer, Richard Williamson, Peter McGuffin, Allan H. Young, I. Nicol Ferrier, Stephen G. Ball, Anthony J. Balmforth, Jennifer H. Barrett, D. Timothy Bishop, Mark M. Iles, Azhar Maqbool, Nadira Yuldasheva, Alistair S. Hall, Peter S. Braund, Paul R. Burton, Richard J. Dixon, Massimo Mangino, Suzanne Stevens, Martin D. Tobin, John R. Thompson, Nilesh J. Samani, Francesca Bredin, Mark Tremelling, Miles Parkes, Hazel Drummond, Charles W. Lees, Elaine R. Nimmo, Jack Satsangi, Sheila A. Fisher, Alastair Forbes, Cathryn M. Lewis, Clive M. Onnie, Natalie J. Prescott, Jeremy Sanderson, Christopher G. Mathew, Jamie Barbour, M. Khalid Mohiuddin, Catherine E. Todhunter, John C. Mansfield, Tariq Ahmad, Fraser R. Cummings, Derek P. Jewell, John Webster, Morris J. Brown, David G. Clayton, G. Mark Lathrop, John Connell, Anna Dominiczak, Nilesh J. Samani, Carolina A. Braga Marcano, Beverley Burke, Richard Dobson, Johannie Gungadoo, Kate L. Lee, Patricia B. Munroe, Stephen J. Newhouse, Abiodun Onipinla, Chris Wallace, Mingzhan Xue, Mark Caulfield, Martin Farrall, Anne Barton, , The Biologics in RA Genetics Genomics (BRAGGS), Ian N. Bruce, Hannah Donovan, Steve Eyre, Paul D. Gilbert, Samantha L. Hider, Anne M. Hinks, Sally L. John, Catherine Potter, Alan J. Silman, Deborah P. M. Symmons, Wendy Thomson, Jane Worthington, David G. Clayton, David B. Dunger, Sarah Nutland, Helen E. Stevens, Neil M. Walker, Barry Widmer, John A. Todd, Timothy M. Frayling, Rachel M. Freathy, Hana Lango, John R. B. Perry, Beverley M. Shields, Michael N. Weedon, Andrew T. Hattersley, Graham A. Hitman, Mark Walker, Kate S. Elliott, Christopher J. Groves, Cecilia M. Lindgren, Nigel W. Rayner, Nicholas J. Timpson, Eleftheria Zeggini, Mark I. McCarthy, Melanie Newport, Giorgio Sirugo, Emily Lyons, Fredrik Vannberg, Adrian V. S. Hill, Linda A. Bradbury, Claire Farrar, Jennifer J. Pointon, Paul Wordsworth, Matthew A. Brown, Jayne A. Franklyn, Joanne M. Heward, Matthew J. Simmonds, Stephen C. L. Gough, Sheila Seal, Breast Cancer Susceptibility Collaboration (UK), Michael R. Stratton, Nazneen Rahman, Maria Ban, An Goris, Stephen J. Sawcer, Alastair Compston, David Conway, Muminatou Jallow, Melanie Newport, Giorgio Sirugo, Kirk A. Rockett, Dominic P. Kwiatkowski, Suzannah J. Bumpstead, Amy Chaney, Kate Downes, Mohammed J. R. Ghori, Rhian Gwilliam, Sarah E. Hunt, Michael Inouye, Andrew Keniry, Emma King, Ralph McGinnis, Simon Potter, Rathi Ravindrarajah, Pamela Whittaker, Claire Widdon, David Withers, Panos Deloukas, Hin-Tak Leung, Sarah Nutland, Helen E. Stevens, Neil M. Walker, John A. Todd, Doug

- Easton, David G. Clayton, Paul R. Burton, Martin D. Tobin, Jeffrey C. Barrett, David Evans, Andrew P. Morris, Lon R. Cardon, Niall J. Cardin, Dan Davison, Teresa Ferreira, Joanne Pereira-Gale, Ingileif B. Hallgrímsdóttir, Bryan N. Howie, Jonathan L. Marchini, Chris C. A. Spencer, Zhan Su, Yik Ying Teo, Damjan Vukcevic, Peter Donnelly, David Bentley, Matthew A. Brown, Lon R. Cardon, Mark Caulfield, David G. Clayton, Alistair Compston, Nick Craddock, Panos Deloukas, Peter Donnelly, Martin Farrall, Stephen C. L. Gough, Alistair S. Hall, Andrew T. Hattersley, Adrian V. S. Hill, Dominic P. Kwiatkowski, Christopher G. Mathew, Mark I. McCarthy, Willem H. Ouwehand, Miles Parkes, Marcus Pembrey, Nazneen Rahman, Nilesh J. Samani, Michael R. Stratton, John A. Todd, and Jane Worthington. Genome-wide association study of 14,000 cases of seven common diseases and 3,000 shared controls. *Nature*, 447(7145): 661–678, June 2007. ISSN 0028-0836, 1476-4687. doi: 10.1038/nature05911. URL <http://www.nature.com/doifinder/10.1038/nature05911>.
- Ting Xie, Samina Akbar, Maria G. Stathopoulou, Thierry Oster, Christine Masson, Frances T. Yen, and Sophie Visvikis-Siest. Epistatic interaction of apolipoprotein E and lipolysis-stimulated lipoprotein receptor genetic variants is associated with Alzheimer’s disease. *Neurobiology of Aging*, 69:292.e1–292.e5, September 2018. ISSN 01974580. doi: 10.1016/j.neurobiolaging.2018.04.013. URL <https://linkinghub.elsevier.com/retrieve/pii/S0197458018301477>.
- ChangJiang Xu, Ioanna Tachmazidou, Klaudia Walter, Antonio Ciampi, Eleftheria Zeggini, Celia M. T. Greenwood, and the UK10K Consortium. Estimating Genome-Wide Significance for Whole-Genome Sequencing Studies. *Genetic Epidemiology*, 38(4): 281–290, April 2014. ISSN 0741-0395, 1098-2272. doi: 10.1002/gepi.21797. URL <https://onlinelibrary.wiley.com/doi/10.1002/gepi.21797>.
- Yu Xu, Dragana Vuckovic, Scott C Ritchie, Parsa Akbari, Tao Jiang, Jason Grealey, Adam S. Butterworth, Willem H Ouwehand, David J Roberts, Emanuele Di Angelantonio, John Danesh, Nicole Soranzo, and Michael Inouye. Learning polygenic scores for human blood cell traits. preprint, *Genetics*, February 2020. URL <http://biorxiv.org/lookup/doi/10.1101/2020.02.17.952788>.
- Mohsen Yaghoubi, Amin Adibi, Abdollah Safari, J. Mark FitzGerald, and Mohsen Sadatsafavi. The Projected Economic and Health Burden of Uncontrolled Asthma in the United States. *American Journal of Respiratory and Critical Care Medicine*, 200(9):1102–1112, November 2019. ISSN 1073-449X, 1535-4970. doi: 10.1164/rccm.201901-0016OC. URL <https://www.atsjournals.org/doi/10.1164/rccm.201901-0016OC>.
- Jian Yang, S. Hong Lee, Michael E. Goddard, and Peter M. Visscher. GCTA: A Tool for Genome-wide Complex Trait Analysis. *The American Journal of Human Genetics*, 88(1):76–82, January 2011. ISSN 00029297. doi: 10.1016/j.ajhg.2010.11.011. URL <https://linkinghub.elsevier.com/retrieve/pii/S0002929710005987>.
- Jian Yang, Noah A Zaitlen, Michael E Goddard, Peter M Visscher, and Alkes L Price. Advantages and pitfalls in the application of mixed-model association methods. *Nature genetics*, 46(2):100–106, 2014.
- Loic Yengo, Julia Sidorenko, Kathryn E Kemper, Zhili Zheng, Andrew R Wood, Michael N Weedon, Timothy M Frayling, Joel Hirschhorn, Jian Yang, Peter M Visscher, and the

- GIANT Consortium. Meta-analysis of genome-wide association studies for height and body mass index in ~700000 individuals of European ancestry. *Human Molecular Genetics*, 27(20):3641–3649, October 2018. ISSN 0964-6906, 1460-2083. doi: 10.1093/hmg/ddy271. URL <https://academic.oup.com/hmg/article/27/20/3641/5067845>.
- Michael K. Yu, Jianzhu Ma, Jasmin Fisher, Jason F. Kreisberg, Benjamin J. Raphael, and Trey Ideker. Visible Machine Learning for Biomedicine. *Cell*, 173(7):1562–1565, June 2018. ISSN 00928674. doi: 10.1016/j.cell.2018.05.056. URL <https://linkinghub.elsevier.com/retrieve/pii/S0092867418307190>.
- Sergey Zagoruyko and Nikos Komodakis. Wide residual networks. *arXiv preprint arXiv:1605.07146*, 2016.
- Shuai Zhang, Lina Yao, Aixin Sun, and Yi Tay. Deep learning based recommender system: A survey and new perspectives. *ACM Computing Surveys (CSUR)*, 52(1):1–38, 2019.
- Zhong-Qiu Zhao, Peng Zheng, Shou-tao Xu, and Xindong Wu. Object detection with deep learning: A review. *IEEE transactions on neural networks and learning systems*, 30(11):3212–3232, 2019.
- Grace X Y Zheng, Billy T Lau, Michael Schnall-Levin, Mirna Jarosz, John M Bell, Christopher M Hindson, Sofia Kyriazopoulou-Panagiotopoulou, Donald A Masquelier, Landon Merrill, Jessica M Terry, Patrice A Mudivarti, Paul W Wyatt, Rajiv Bharadwaj, Anthony J Makarewicz, Yuan Li, Phillip Belgrader, Andrew D Price, Adam J Lowe, Patrick Marks, Gerard M Vurens, Paul Hardenbol, Luz Montesclaros, Melissa Luo, Lawrence Greenfield, Alexander Wong, David E Birch, Steven W Short, Keith P Bjornson, Pranav Patel, Erik S Hopmans, Christina Wood, Sukhvinder Kaur, Glenn K Lockwood, David Stafford, Joshua P Delaney, Indira Wu, Heather S Ordonez, Susan M Grimes, Stephanie Greer, Josephine Y Lee, Kamila Belhocine, Kristina M Giorda, William H Heaton, Geoffrey P McDermott, Zachary W Bent, Francesca Meschi, Nikola O Kondov, Ryan Wilson, Jorge A Bernate, Shawn Gauby, Alex Kindwall, Clara Bermejo, Adrian N Fehr, Adrian Chan, Serge Saxonov, Kevin D Ness, Benjamin J Hindson, and Hanlee P Ji. Haplotyping germline and cancer genomes with high-throughput linked-read sequencing. *Nature Biotechnology*, 34(3):303–311, March 2016. ISSN 1087-0156, 1546-1696. doi: 10.1038/nbt.3432. URL <http://www.nature.com/articles/nbt.3432>.
- Jian Zhou and Olga G Troyanskaya. Predicting effects of noncoding variants with deep learning-based sequence model. *Nature Methods*, 12(10):931–934, October 2015. ISSN 1548-7091, 1548-7105. doi: 10.1038/nmeth.3547. URL <http://www.nature.com/articles/nmeth.3547>.
- Jian Zhou, Chandra L. Theesfeld, Kevin Yao, Kathleen M. Chen, Aaron K. Wong, and Olga G. Troyanskaya. Deep learning sequence-based ab initio prediction of variant effects on expression and disease risk. *Nature Genetics*, 50(8):1171–1179, August 2018. ISSN 1061-4036, 1546-1718. doi: 10.1038/s41588-018-0160-6. URL <http://www.nature.com/articles/s41588-018-0160-6>.
- Jian Zhou, Christopher Y Park, Chandra L Theesfeld, Aaron K Wong, Yuan Yuan, Claudia Scheckel, John J Fak, Julien Funk, Kevin Yao, Yoko Tajima, et al. Whole-genome deep-learning analysis identifies contribution of noncoding mutations to autism risk. *Nature genetics*, 51(6):973–980, 2019.

- Zhaozhong Zhu, Xi Zhu, Cong-Lin Liu, Huwenbo Shi, Sipeng Shen, Yunqi Yang, Kohei Hasegawa, Carlos A. Camargo, and Liming Liang. Shared genetics of asthma and mental health disorders: a large-scale genome-wide cross-trait analysis. *European Respiratory Journal*, 54(6):1901507, December 2019. ISSN 0903-1936, 1399-3003. doi: 10.1183/13993003.01507-2019. URL <http://erj.ersjournals.com/lookup/doi/10.1183/13993003.01507-2019>.
- Zhihong Zhu, Futao Zhang, Han Hu, Andrew Bakshi, Matthew R Robinson, Joseph E Powell, Grant W Montgomery, Michael E Goddard, Naomi R Wray, Peter M Visscher, and Jian Yang. Integration of summary data from GWAS and eQTL studies predicts complex trait gene targets. *Nature Genetics*, 48(5):481–487, May 2016. ISSN 1061-4036, 1546-1718. doi: 10.1038/ng.3538. URL <http://www.nature.com/articles/ng.3538>.

