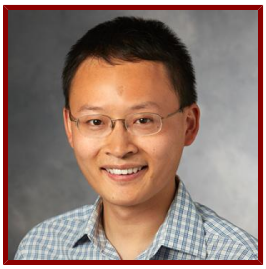
Stanford



James Zou

Assistant Professor of Biomedical Data Science and, by courtesy, of Computer Science and of Electrical Engineering

Bio

BIO

I am an Assistant Professor of Biomedical Data Science and, by courtesy, of Computer Science and Electrical Engineering at Stanford University. I work on making machine learning more reliable, human-compatible and statistically rigorous, and am especially interested in applications in human disease and health. I received my Ph.D from Harvard in 2014, and was at one time a member of Microsoft Research, a Gates Scholar at Cambridge and a Simons fellow at U.C. Berkeley. I joined Stanford in 2016 and am excited to also be a Chan-Zuckerberg Investigator. We are also a part of the Stanford AI Lab. My research is supported by the Sloan Fellowship, the NSF CAREER Award, and the Google and Tencent AI awards.

ACADEMIC APPOINTMENTS

- Assistant Professor, Biomedical Data Science
- Assistant Professor (By courtesy), Computer Science
- Assistant Professor (By courtesy), Electrical Engineering
- Member, Bio-X
- Faculty Affiliate, Institute for Human-Centered Artificial Intelligence (HAI)
- Member, Wu Tsai Neurosciences Institute

HONORS AND AWARDS

- Sloan Research Fellowship, Sloan Foundation (2021)
- NSF CAREER Award, NSF (2020)
- RECOMB Best Paper, RECOMB (2019)
- Google Faculty Award, Google (2018)
- Chan-Zuckerberg Investigator, CZ Biohub (2017)
- Simons Research Fellow, Simons Foundation (2014)
- NSF GRFP, NSF (2008)
- Gates-Cambridge Scholar, Gates Foundation (2007)

LINKS

- My website: https://www.james-zou.com/
- Twitter: https://twitter.com/james_y_zou

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

My group works on both foundations of statistical machine learning and applications in biomedicine and healthcare. We develop new technologies that make ML more accountable to humans, more reliable/robust and reveals core scientific insights.

We want our ML to be impactful and beneficial, and as such, we are deeply motivated by transformative applications in biotech and health. We collaborate with and advise many academic and industry groups.

Teaching

COURSES

2021-22

- Value of Data and AI: CS 320 (Win)

2020-21

- Deep Learning in Genomics and Biomedicine: BIODS 237, BIOMEDIN 273B, CS 273B, GENE 236 (Aut)
- Race, Data Algorithms, and Health: BIODS 240 (Aut)
- Topics in Biomedical Data Science: Large-scale inference: BIODS 215 (Win)
- Value of Data and AI: CS 320 (Win)
- Workshop in Biostatistics: BIODS 260C, STATS 260C (Spr)

2019-20

- AI Interpretability and Fairness: CS 81SI (Spr)
- Data science and AI for COVID-19: CS 472 (Spr)
- Deep Learning in Genomics and Biomedicine: BIODS 237, BIOMEDIN 273B, CS 273B, GENE 236 (Aut)
- Topics in Biomedical Data Science: Large-scale inference: BIODS 215 (Win)
- Value of Data and AI: CS 320 (Win)
- Workshop in Biostatistics: BIODS 260C, STATS 260C (Spr)

2018-19

- Deep Learning in Genomics and Biomedicine: BIODS 237, BIOMEDIN 273B, CS 273B, GENE 236 (Aut)
- Workshop in Biostatistics: BIODS 260B, STATS 260B (Win)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Louis Blankemeier, Jiaqi Jiang, Siyi Tang

Orals Chair

Katherine McNamara, Alex Tseng

Postdoctoral Faculty Sponsor

Yiqun Chen, Roxana Daneshjou, Zhi Huang

Doctoral Dissertation Advisor (AC)

Tony Ginart, Ruishan Liu, Jaime Roquero Gimenez, Eric Sun, Kailas Vodrahalli, Eric Wu, Kevin Wu, Zhenqin Wu

Master's Program Advisor

Zixian Ma, Albert Pun, Anthony Tzen, Rachael Wang, Eunice Yang, Yuhui Zhang

Doctoral (Program)

Lingjiao Chen, Bryan He, John Hughes, Weixin Liang, Kyle Swanson, Garrett Thomas, Kevin Wu, Mert Yuksekgonul

Postdoctoral Research Mentor

Yongchan Kwon

Publications

PUBLICATIONS

- **BABEL enables cross-modality translation between multiomic profiles at single-cell resolution.** *Proceedings of the National Academy of Sciences of the United States of America*
  Wu, K. E., Yost, K. E., Chang, H. Y., Zou, J.
  2021; 118 (15)
- **Evaluating eligibility criteria of oncology trials using real-world data and AI.** *Nature*
  Liu, R., Rizzo, S., Whipple, S., Pal, N., Pineda, A. L., Lu, M., Arnieri, B., Lu, Y., Capra, W., Copping, R., Zou, J.
  2021
- **How medical AI devices are evaluated: limitations and recommendations from an analysis of FDA approvals.** *Nature medicine*
  Wu, E., Wu, K., Daneshjou, R., Ouyang, D., Ho, D. E., Zou, J.
  2021
- **Integrating spatial gene expression and breast tumour morphology via deep learning.** *Nature biomedical engineering*
  He, B., Bergenstrahle, L., Stenbeck, L., Abid, A., Andersson, A., Borg, A., Maaskola, J., Lundeberg, J., Zou, J.
  2020
- **Video-based AI for beat-to-beat assessment of cardiac function.** *Nature*
  Ouyang, D., He, B., Ghorbani, A., Yuan, N., Ebinger, J., Langlotz, C. P., Heidenreich, P. A., Harrington, R. A., Liang, D. H., Ashley, E. A., Zou, J. Y.
  2020; 580 (7802): 252-256
- **How Much Does Your Data Exploration Overfit? Controlling Bias via Information Usage** *IEEE TRANSACTIONS ON INFORMATION THEORY*
  Russo, D., Zou, J.
  2020; 66 (1): 302–23
- **Fast and covariate-adaptive method amplifies detection power in large-scale multiplehypothesis testing.** *Nature communications*
  Zhang, M. J., Xia, F., Zou, J.
  2019; 10 (1): 3433
- **Large dataset enables prediction of repair after CRISPR-Cas9 editing in primary T cells.** *Nature biotechnology*
  Leenay, R. T., Aghazadeh, A., Hiatt, J., Tse, D., Roth, T. L., Apathy, R., Shifrut, E., Hultquist, J. F., Krogan, N., Wu, Z., Cirolia, G., Canaj, H., Leonetti, et al
  2019
- **Making AI Forget You: Data Deletion in Machine Learning**
  Ginart, A. A., Guan, M. Y., Valiant, G., Zou, J., Wallach, H., Larochelle, H., Beygelzimer, A., d'Alche-Buc, F., Fox, E., Garnett, R.
  NEURAL INFORMATION PROCESSING SYSTEMS (NIPS).2019
- **Interpretation of Neural Networks Is Fragile**
  Ghorbani, A., Abid, A., Zou, J., AAAI
  ASSOC ADVANCEMENT ARTIFICIAL INTELLIGENCE.2019: 3681–88
- **Ensuring that biomedical AI benefits diverse populations.** *EBioMedicine*
  Zou, J., Schiebinger, L.
  2021: 103358

- **Data valuation for medical imaging using Shapley value and application to a large-scale chest X-ray dataset.** *Scientific reports*
  Tang, S., Ghorbani, A., Yamashita, R., Rehman, S., Dunnmon, J. A., Zou, J., Rubin, D. L.
  2021; 11 (1): 8366

- **How to evaluate deep learning for cancer diagnostics - factors and recommendations.** *Biochimica et biophysica acta. Reviews on cancer*
  Daneshjou, R., He, B., Ouyang, D., Zou, J.
  2021: 188515

- **TrueImage: A Machine Learning Algorithm to Improve the Quality of Telehealth Photos.** *Pacific Symposium on Biocomputing. Pacific Symposium on Biocomputing*
  Vodrahalli, K., Daneshjou, R., Novoa, R. A., Chiou, A., Ko, J. M., Zou, J.
  2021; 26: 220–31

- **Mouse aging cell atlas analysis reveals global and cell type-specific aging signatures.** *eLife*
  Zhang, M. J., Pisco, A. O., Darmanis, S., Zou, J.
  2021; 10

- **Variation in COVID-19 Data Reporting Across India: 6Months into the Pandemic.** *Journal of the Indian Institute of Science*
  Vasudevan, V., Gnanasekaran, A., Sankar, V., Vasudevan, S. A., Zou, J.
  2020: 1–8

- **Association of Rapid Eye Movement Sleep With Mortality in Middle-aged and Older Adults.** *JAMA neurology*
  Leary, E. B., Watson, K. T., Ancoli-Israel, S., Redline, S., Yaffe, K., Ravelo, L. A., Peppard, P. E., Zou, J., Goodman, S. N., Mignot, E., Stone, K. L.
  2020

- **Deep learning models to detect hidden clinical correlates** *LANCET DIGITAL HEALTH*
  Ouyang, D., Zou, J.
  2020; 2 (7): E334–E335

- **Deep learning models to detect hidden clinical correlates.** *The Lancet. Digital health*
  Ouyang, D., Zou, J.
  2020; 2 (7): e334-e335

- **Clinical Genetics Lacks Standard Definitions and Protocols for the Collection and Use of Diversity Measures.** *American journal of human genetics*
  Popejoy, A. B., Crooks, K. R., Fullerton, S. M., Hindorff, L. A., Hooker, G. W., Koenig, B. A., Pino, N., Ramos, E. M., Ritter, D. I., Wand, H., Wright, M. W., Yudell, M., Zou, et al
  2020

- **RNA-GPS predicts high-resolution RNA subcellular localization and highlights the role of splicing.** *RNA (New York, N.Y.)*
  Wu, K. E., Parker, K. R., Fazal, F. M., Chang, H., Zou, J.
  2020

- **Video-based AI for beat-to-beat assessment of cardiac function** *NATURE*
  Ouyang, D., He, B., Ghorbani, A., Yuan, N., Ebinger, J., Langlotz, C. P., Heidenreich, P. A., Harrington, R. A., Liang, D. H., Ashley, E. A., Zou, J. Y.
  2020

- **A benchmark of algorithms for the analysis of pooled CRISPR screens.** *Genome biology*
  Bodapati, S., Daley, T. P., Lin, X., Zou, J., Qi, L. S.
  2020; 21 (1): 62

- **An online platform for interactive feedback in biomedical machine learning** *NATURE MACHINE INTELLIGENCE*
  Abid, A., Abdalla, A., Abid, A., Khan, D., Alfozan, A., Zou, J.
  2020; 2 (2): 86–88

- **Deep learning interpretation of echocardiograms.** *NPJ digital medicine*
  Ghorbani, A., Ouyang, D., Abid, A., He, B., Chen, J. H., Harrington, R. A., Liang, D. H., Ashley, E. A., Zou, J. Y.
  2020; 3 (1): 10

- **LitGen: Genetic Literature Recommendation Guided by Human Explanations.** *Pacific Symposium on Biocomputing. Pacific Symposium on Biocomputing*
  Nie, A. n., Pineda, A. L., Wright, M. W., Wand, H. n., Wulf, B. n., Costa, H. A., Patel, R. Y., Bustamante, C. D., Zou, J. n.

2020; 25: 67–78

- **NCI Workshop on Artificial Intelligence in Radiation Oncology: Training the Next Generation.** *Practical radiation oncology*
  Kang, J. n., Thompson, R. F., Aneja, S. n., Lehman, C. n., Trister, A. n., Zou, J. n., Obcemea, C. n., El Naqa, I. n.
  2020
- **Predicting target genes of noncoding regulatory variants with ICE.** *Bioinformatics (Oxford, England)*
  Wu, Z. n., Ioannidis, N. M., Zou, J. n.
  2020
- **PB-Net: Automatic peak integration by sequential deep learning for multiple reaction monitoring.** *Journal of proteomics*
  Wu, Z. n., Serie, D. n., Xu, G. n., Zou, J. n.
  2020: 103820
- **Beyond User Self-Reported Likert Scale Ratings: A Comparison Model for Automatic Dialog Evaluation**
  Liang, W., Zou, J., Yu, Z., Assoc Computat Linguist
  ASSOC COMPUTATIONAL LINGUISTICS-ACL.2020: 1363–74
- **RNA-GPS Predicts SARS-CoV-2 RNA Localization to Host Mitochondria and Nucleolus.** *bioRxiv : the preprint server for biology*
  Wu, K. n., Zou, J. n., Chang, H. Y.
  2020
- **RNA-GPS Predicts SARS-CoV-2 RNA Residency to Host Mitochondria and Nucleolus.** *Cell systems*
  Wu, K. E., Fazal, F. M., Parker, K. R., Zou, J. n., Chang, H. Y.
  2020
- **Deep profiling of protease substrate specificity enabled by dual random and scanned human proteome substrate phage libraries.** *Proceedings of the National Academy of Sciences of the United States of America*
  Zhou, J. n., Li, S. n., Leung, K. K., O'Donovan, B. n., Zou, J. Y., DeRisi, J. L., Wells, J. A.
  2020
- **A single-cell transcriptomic atlas characterizes ageing tissues in the mouse.** *Nature*
  2020
- **Deep learning interpretation of echocardiograms.** *NPJ digital medicine*
  Ghorbani, A., Ouyang, D., Abid, A., He, B., Chen, J. H., Harrington, R. A., Liang, D. H., Ashley, E. A., Zou, J. Y.
  2020; 3: 10
- **Sex and gender analysis improves science and engineering.** *Nature*
  Tannenbaum, C., Ellis, R. P., Eyssel, F., Zou, J., Schiebinger, L.
  2019; 575 (7781): 137–46
- **VetTag: improving automated veterinary diagnosis coding via large-scale language modeling.** *NPJ digital medicine*
  Zhang, Y., Nie, A., Zehnder, A., Page, R. L., Zou, J.
  2019; 2: 35
- **VetTag: improving automated veterinary diagnosis coding via large-scale language modeling** *NPJ DIGITAL MEDICINE*
  Zhang, Y., Nie, A., Zehnder, A., Page, R. L., Zou, J.
  2019; 2
- **Modeling Spatial Correlation of Transcripts with Application to Developing Pancreas** *SCIENTIFIC REPORTS*
  Liu, R., Mignardi, M., Jones, R., Enge, M., Kim, S. K., Quake, S. R., Zou, J.
  2019; 9
- **Modeling Spatial Correlation of Transcripts with Application to Developing Pancreas.** *Scientific reports*
  Liu, R., Mignardi, M., Jones, R., Enge, M., Kim, S. K., Quake, S. R., Zou, J.
  2019; 9 (1): 5592
- **A large CRISPR-induced bystander mutation causes immune dysregulation.** *Communications biology*
  Simeonov, D. R., Brandt, A. J., Chan, A. Y., Cortez, J. T., Li, Z., Woo, J. M., Lee, Y., Carvalho, C. M., Indart, A. C., Roth, T. L., Zou, J., May, A. P., Lupski, et al

2019; 2: 70

- **Multiaccuracy: Black-Box Post-Processing for Fairness in Classification**
  Kim, M. P., Ghorbani, A., Zou, J., Assoc Comp Machinery
  ASSOC COMPUTING MACHINERY.2019: 247–54

- **Contrastive Multivariate Singular Spectrum Analysis**
  Dirie, A., Abid, A., Zou, J., IEEE
  IEEE.2019: 1122–27

- **Contingent Payment Mechanisms for Resource Utilization**
  Ma, H., Meir, R., Parkes, D. C., Zou, J., Assoc Comp Machinery
  ASSOC COMPUTING MACHINERY.2019: 422–30

- **Improving the Stability of the Knockoff Procedure: Multiple Simultaneous Knockoffs and Entropy Maximization**
  Gimenez, J., Zou, J., Chaudhuri, K., Sugiyama, M.
  MICROTOME PUBLISHING.2019

- **Knockoffs for the Mass: New Feature Importance Statistics with False Discovery Guarantees**
  Gimenez, J., Ghorbani, A., Zou, J., Chaudhuri, K., Sugiyama, M.
  MICROTOME PUBLISHING.2019

- **Towards Automatic Concept-based Explanations**
  Ghorbani, A., Wexler, J., Zou, J., Kim, B., Wallach, H., Larochelle, H., Beygelzimer, A., d'Alche-Buc, F., Fox, E., Garnett, R.
  NEURAL INFORMATION PROCESSING SYSTEMS (NIPS).2019

- **A primer on deep learning in genomics.** *Nature genetics*
  Zou, J., Huss, M., Abid, A., Mohammadi, P., Torkamani, A., Telenti, A.
  2018

- **The clinical imperative for inclusivity: Race, ethnicity, and ancestry (REA) in genomics.** *Human mutation*
  Popejoy, A. B., Ritter, D. I., Crooks, K., Currey, E., Fullerton, S. M., Hindorff, L. A., Koenig, B., Ramos, E. M., Sorokin, E. P., Wand, H., Wright, M. W., Zou, J., Gignoux, et al
  2018; 39 (11): 1713–20

- **DeepTag: inferring diagnoses from veterinary clinical notes.** *NPJ digital medicine*
  Nie, A., Zehnder, A., Page, R. L., Zhang, Y., Pineda, A. L., Rivas, M. A., Bustamante, C. D., Zou, J.
  2018; 1: 60

- **DeepTag: inferring diagnoses from veterinary clinical notes** *NPJ DIGITAL MEDICINE*
  Nie, A., Zehnder, A., Page, R. L., Zhang, Y., Pineda, A., Rivas, M. A., Bustamante, C. D., Zou, J.
  2018; 1

- **Integrative proteomics and bioinformatic prediction enable a high-confidence apicoplast proteome in malaria parasites.** *PLoS biology*
  Boucher, M. J., Ghosh, S., Zhang, L., Lal, A., Jang, S. W., Ju, A., Zhang, S., Wang, X., Ralph, S. A., Zou, J., Elias, J. E., Yeh, E.
  2018; 16 (9): e2005895

- **Design AI so that it's fair** *NATURE*
  Zou, J., Schiebinger, L.
  2018; 559 (7714): 324–26

- **Exploring patterns enriched in a dataset with contrastive principal component analysis** *NATURE COMMUNICATIONS*
  Abid, A., Zhang, M. J., Bagaria, V. K., Zou, J.
  2018; 9: 2134

- **Word embeddings quantify 100 years of gender and ethnic stereotypes** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Garg, N., Schiebinger, L., Jurafsky, D., Zou, J.
  2018; 115 (16): E3635–E3644

- **Autowarp: Learning a Warping Distance from Unlabeled Time Series Using Sequence Autoencoders**

Abid, A., Zou, J., Bengio, S., Wallach, H., Larochelle, H., Grauman, K., CesaBianchi, N., Garnett, R.
NEURAL INFORMATION PROCESSING SYSTEMS (NIPS).2018

- **Embedding for Informative Missingness: Deep Learning With Incomplete Data**
  Ghorbani, A., Zou, J. Y., IEEE
  IEEE.2018: 437–45

- **The Effects of Memory Replay in Reinforcement Learning**
  Liu, R., Zou, J., IEEE
  IEEE.2018: 478–85

- **Diabetes reversal by inhibition of the low-molecular-weight tyrosine phosphatase** *NATURE CHEMICAL BIOLOGY*
  Stanford, S. M., Aleshin, A. E., Zhang, V., Ardecky, R. J., Hedrick, M. P., Zou, J., Ganji, S. R., Bliss, M. R., Yamamoto, F., Bobkov, A. A., Kiselar, J., Liu, Y., Cadwell, et al
  2017; 13 (6): 624-?

- **Correcting for cell-type heterogeneity in DNA methylation: a comprehensive evaluation.** *Nature methods*
  Rahmani, E., Zaitlen, N., Baran, Y., Eng, C., Hu, D., Galanter, J., Oh, S., Burchard, E. G., Eskin, E., Zou, J., Halperin, E.
  2017; 14 (3): 218-219

- **NeuralFDR: Learning Discovery Thresholds from Hypothesis Features**
  Xia, F., Zhang, M. J., Zou, J., Tse, D., Guyon, Luxburg, U. V., Bengio, S., Wallach, H., Fergus, R., Vishwanathan, S., Garnett, R.
  NEURAL INFORMATION PROCESSING SYSTEMS (NIPS).2017

- **Quantifying unobserved protein-coding variants in human populations provides a roadmap for large-scale sequencing projects.** *Nature communications*
  Zou, J., Valiant, G., Valiant, P., Karczewski, K., Chan, S. O., Samocha, K., Lek, M., Sunyaev, S., Daly, M., MacArthur, D. G.
  2016; 7: 13293-?

- **Limits on Active to Sterile Neutrino Oscillations from Disappearance Searches in the MINOS, Daya Bay, and Bugey-3 Experiments** *PHYSICAL REVIEW LETTERS*
  Adamson, P., An, F. P., Anghel, I., Aurisano, A., Balantekin, A. B., Band, H. R., Barr, G., Bishai, M., Blake, A., Blyth, S., Bock, G. J., Bogert, D., Cao, et al
  2016; 117 (15)

- **Hierarchical Patterning of Multifunctional Conducting Polymer Nanoparticles as a Bionic Platform for Topographic Contact Guidance** *ACS NANO*
  Ho, D., Zou, J., Chen, X., Munshi, A., Smith, N. M., Agarwal, V., Hodgetts, S. I., Plant, G. W., Bakker, A. J., Harvey, A. R., Luzinov, I., Iyer, K. S.
  2015; 9 (2): 1767-1774

- **Endovascular Repair With the Chimney Technique for Stanford Type B Aortic Dissection Involving Right-Sided Arch With Mirror Image Branching** *JOURNAL OF ENDOVASCULAR THERAPY*
  Ma, H., Yang, H., Xu, W., Zou, J., Jiang, J., Jiao, Y., Zhang, X.
  2013; 20 (3): 283-288

- **Conversion of Human Fibroblasts to Functional Endothelial Cells by Defined Factors** *ARTERIOSCLEROSIS THROMBOSIS AND VASCULAR BIOLOGY*
  Li, J., Huang, N. F., Zou, J., Laurent, T. J., Lee, J. C., Okogbaa, J., Cooke, J. P., Ding, S.
  2013; 33 (6): 1366-?

- **Amino Acid Homeostasis Modulates Salicylic Acid-Associated Redox Status and Defense Responses in Arabidopsis** *PLANT CELL*
  Liu, G., Ji, Y., Bhuiyan, N. H., Pilot, G., Selvaraj, G., Zou, J., Wei, Y.
  2010; 22 (11): 3845-3863

- **Alcoholic neurobiology: Changes in dependence and recovery** *12th International Congress of the International-Society-for-Biomedical-Research-on-Alcoholism*
  Crews, F. T., Buckley, T., Dodd, P. R., Ende, G., Foley, N., Harper, C., He, J., Innes, D., Loh, E. W., Pfefferbaum, A., Zou, J., SULLIVAN, E. V.
  WILEY-BLACKWELL.2005: 1504–13

- **ANTI-IL-6 MONOCLONAL-ANTIBODIES PROTECT AGAINST LETHAL ESCHERICHIA-COLI INFECTION AND LETHAL TUMOR-NECROSIS-FACTOR-ALPHA CHALLENGE IN MICE** *JOURNAL OF IMMUNOLOGY*
  STARNES, H. F., PEARCE, M. K., Tewari, A., Yim, J. H., Zou, J. C., Abrams, J. S.
  1990; 145 (12): 4185-4191