Stanford



Timothy Keyes

- MD Student, expected graduation Spring 2027
- Ph.D. Student in Cancer Biology, admitted Winter 2018
- MSTP Student
- Curriculum Vitae available Online

Bio

BIO

Timothy is an MD/PhD student studying cancer biology and biomedical informatics at the Stanford University School of Medicine. He is a joint member of Kara Davis's laboratory in the Department of Pediatrics and Garry Nolan's Laboratory in the Department of Pathology.

As a biomedical data scientist, Timothy's research focuses on the application of machine learning to single-cell data analysis in the context of pediatric leukemia. Through the use of emerging, high-throughout single-cell technologies such as mass cytometry and sequence-based cytometry, Timothy's research is designed to build predictive models of patient outcomes - such as relapse or minimal residual disease (MRD) - at the point of diagnosis. To do so, he uses a variety of computational tools including generalized linear models, clustering, and deep learning. In addition, his work prioritizes constructing easy-to-use, highly-reproducible data analysis pipelines that can be shared as open-source tools for the scientific community.

Outside of science, Timothy has a longstanding interest in human rights and social justice work among members of the lesbian, gay, bisexual, transgender, and queer (LGBTQ+) community. He currently serves as the resident data scientist for the Medical Student Pride Alliance (MSPA), a 501(c)(3) non-profit organization that advocates for diversity, equity, and inclusion for LGBTQ+ medicals students in medical schools across the United States. As a data scientist at MSPA, Timothy analyzes and visualizes data to guide MSPA's strategic decision-making as well as for academic publication. He also advises and mentors other student members of MSPA performing data analysis in Python and R.

In recognition of his accomplishments, Timothy has received several institutional and national award for both research and advocacy. These include a National Research Service Award (NRSA) from the National Cancer Institute, a Junior Leadership Award from the Building the Next Generation of Academic Physicians (BNGAP) LGBT Workforce, Stanford Medicine’s Integrated Strategic Plan Star Award, and a Point Foundation Scholarship.

HONORS AND AWARDS

- Point Foundation Graduate Student Scholarship, Point Foundation (2020)
- Ruth L. Kirschstein Pre-doctoral National Research Service Award, National Institutes of Health (National Cancer Institute) (2019)
- Community Impact Award, Stanford University (2019)
- Integrated Strategic Plan Star Award, Stanford Medicine (2019)
- Junior Leadership Award, Building the Next Generation of Academic Physicians (BNGAP) LGBT Workforce (2019)
- Award for Excellence in Promotion of Diversity and Societal Citizenship, Stanford University School of Medicine (2018)

MEMBERSHIP ORGANIZATIONS

- LGBT-Meds, Financial Officer (former)
- SUMMA: Stanford University Minority Medical Alliance, Chair (former)
- Medical Student Pride Alliance (MSPA), Assistant Director for Data Analytics

EDUCATION AND CERTIFICATIONS

- Doctor of Philosophy, Stanford University , CANBI-PHD (2024)
- Bachelor of Arts, Princeton University , Psychology (2014)
- Master of Science, Stanford University , BMDS-MS (2024)
- B.A., Princeton University , Psychology and Neuroscience (2014)

Publications

PUBLICATIONS

- **An Electronic Health Record-Integrated, Large Language Model-Powered Tool to Triage Surgical Patients.** *JAMA network open*
  Wang, J., Keyes, T., Liang, A. S., Ma, S. P., Shen, J., Liu, J., Ambers, N., Pandya, A., Pandya, R., Hom, J., Steele, N., Chen, J. H., Schulman, et al
  2026; 9 (8): e2629579

- **Automating clinical history extraction for flow cytometry panel selection using an EHR-integrated large language model.** *Cytometry. Part B, Clinical cytometry*
  Rojansky, R., Keyes, T., Oak, J.
  2026

- **Challenges in AI Based Tumor Board Case Summarization and Recommendations.** *Research square*
  Yim, W. W., Damm, H., Pakull, T. M., Preston, S., Keyes, T., Ellis-Caleo, T. J., Sun, Z., Yetisgen, M., Codella, N., Wei, M., Bekheet, F., Neal, J. W., Shah, et al
  2026

- **Why and How to Monitor Deployed AI Systems in Health Care.** *NEJM catalyst innovations in care delivery*
  Keyes, T., Callahan, A., Pandya, A. S., Ambers, N., Banda, J. M., Fuentes, M., Lugtu, C., Masariya, P., Nallan, S., O'Brien, C., Wang, T., Alsentzer, E., Chen, et al
  2026; 7 (6): CAT250372

- **Why and How to Monitor Deployed AI Systems in Health Care** *NEJM CATALYST INNOVATIONS IN CARE DELIVERY*
  Keyes, T., Callahan, A., Pandya, A. S., Ambers, N., Banda, J. M., Fuentes, M., Lugtu, C., Masariya, P., Nallan, S., O'Brien, C., Wang, T., Alsentzer, E., Chen, et al
  2026; 7 (6)

- **Physician-Reported Safety Outcomes of AI-Generated Hospital Course Summaries.** *JAMA network open*
  Grolleau, F., Liang, A. S., Keyes, T., Ma, S. P., Lew, T., Huynh, T. R., Steele, N., Chung, P., Qin, P., Chandra, G., Wang, S. F., Mullen, E., Carpenter, et al
  2026; 9 (5): e2616556

- **Use of a large language model integrated within the electronic medical record for the evaluation of surgical site infections - Northern California, 2025.** *Infection control and hospital epidemiology*
  Miranti, E., Keyes, T., Ayala, A., Ambers, N., Newman, G., de Leon, E., Viana-Cardenas, E. P., Tariq, W., Sampson, M., Salinas, J. L.
  2026: 1-3

- **MedFactEval and MedAgentBrief: A Framework and Workflow for Generating and Evaluating Factual Clinical Summaries.** *Pacific Symposium on Biocomputing. Pacific Symposium on Biocomputing*
  Grolleau, F., Alsentzer, E., Keyes, T., Chung, P., Swaminathan, A., Aali, A., Hom, J., Huynh, T., Lew, T., Liang, A., Chu, W., Steele, N., Lin, et al
  2026; 31: 388-399

- **DHODH as a Targetable Metabolic Achilles' Heel for chemo-resistant B-ALL.** *Blood*
  Liu, Y., Jiang, H., Liu, J., Stuani, L., Merchant, M. J., Jager, A., Koladiya, A., Chang, T. C., Domizi, P., Sarno, J., Wang, A., Keyes, T., Jedoui, et al

2026

- **Holistic evaluation of large language models for medical tasks with MedHELM.** *Nature medicine*
  Bedi, S., Cui, H., Fuentes, M., Unell, A., Wornow, M., Banda, J. M., Kotecha, N., Keyes, T., Mai, Y., Oez, M., Qiu, H., Jain, S., Schettini, et al
  2026
- **Designing Clinically Useful AI: A Blueprint for Impact** *NEJM AI*
  Parsa, S., Keyes, T., Dash, D., Char, D., Mello, M. M., Callahan, A., Smith, M. A., Lee, S., Wang, T., Salisbury, H., Goto, S., Parikh, V., Mahaffey, et al
  2026; 3 (2)
- **MedFactEval and MedAgentBrief: A Framework and Workflow for Generating and Evaluating Factual Clinical Summaries**
  Grolleau, F., Alsentzer, E., Keyes, T., Chung, P., Swaminathan, A., Aali, A., Hom, J., Tridu Huynh, Lew, T., Liang, A., Chu, W., Steele, N., Lin, C., et al
  edited by Altman, R. B., Hunter, L., Ritchie, M. D., Murray, T., Klein, T. E.
  WORLD SCIENTIFIC PUBL CO PTE LTD.2026: 388-399
- **Using secure artificial intelligence agents integrated within the electronic medical record for the evaluation of blood culture appropriateness-Northern California, 2025.** *Infection control and hospital epidemiology*
  Rodriguez-Nava, G., Keyes, T., Ambers, N., Miranti, E., Viana-Cardenas, E. P., Tariq, W., Sampson, M. M., Salinas, J. L.
  2025: 1-4
- **Target Product Profile to Evaluate the Clinical Utility, Financial Impact, and Ethical Implications of an AI-Based HCM Detection Model**
  Parsa, S., Keyes, T., Dash, D., Mello, M., Salisbury, H., Callahan, A., Goto, S., Salerno, M., Parikh, V., Mahaffey, K., Ashley, E., Shah, N., Jain, et al
  LIPPINCOTT WILLIAMS & WILKINS.2025
- **Multi-omic analysis of early minimal residual disease identifies functional and transcriptomic signatures of treatment resistance in pediatric B-cell acute lymphoblastic leukemia**
  Scribano, R., Delgado, A., Domizi, P., Buracchi, C., Jager, A., Keyes, T., Bugarin, C., Gaipa, G., Davis, K., Sarno, J.
  ELSEVIER.2025: 334-335
- **Annotation-free discovery of disease-relevant cells in single-cell datasets.** *Science advances*
  Craig, E., Keyes, T. J., Sarno, J., D'Silva, J. P., Domizi, P., Zaslavsky, M., Tsai, A., Glass, D., Nolan, G. P., Hastie, T., Tibshirani, R., Davis, K. L.
  2025; 11 (35): eadv5019
- **Uridine Metabolism as a Targetable Metabolic Achilles' Heel for chemo-resistant B-ALL.** *bioRxiv : the preprint server for biology*
  Liu, Y., Jiang, H., Liu, J., Stuani, L., Merchant, M., Jager, A., Koladiya, A., Chang, T. C., Domizi, P., Sarno, J., Keyes, T., Jedoui, D., Wang, et al
  2025
- **The tidyomics ecosystem: enhancing omic data analyses.** *Nature methods*
  Hutchison, W. J., Keyes, T. J., Crowell, H. L., Serizay, J., Soneson, C., Davis, E. S., Sato, N., Moses, L., Tarlinton, B., Nahid, A. A., Kosmac, M., Clayssen, Q., Yuan, et al
  2024
- **Thetidyomicsecosystem: Enhancing omic data analyses.** *bioRxiv : the preprint server for biology*
  Hutchison, W. J., Keyes, T. J., tidyomics Consortium, Crowell, H. L., Serizay, J., Soneson, C., Davis, E. S., Sato, N., Moses, L., Tarlinton, B., Nahid, A. A., Kosmac, M., Clayssen, Q., et al
  2024
- **Sociodemographic factors and research experience impact MD-PhD program acceptance** *JCI INSIGHT*
  Williams, D., Christophers, B., Keyes, T., Kumar, R., Granovetter, M. C., Adigun, A., Olivera, J., Pura-Bryant, J., Smith, C., Okafor, C., Shibre, M., Daye, D., Akabas, et al
  2024; 9 (3)
- **Teaching LGBTQ+ Health, a Web-Based Faculty Development Course: Program Evaluation Study Using the RE-AIM Framework.** *JMIR medical education*
  Gisondi, M. A., Keyes, T., Zucker, S., Bumgardner, D.
  2023; 9: e47777
- **Single-cell technologies uncover intra-tumor heterogeneity in childhood cancers.** *Seminars in immunopathology*
  Lo, Y., Liu, Y., Kammersgaard, M., Koladiya, A., Keyes, T. J., Davis, K. L.
  2023

- **tidytof: a user-friendly framework for scalable and reproducible high-dimensional cytometry data analysis.** *Bioinformatics advances*
  Keyes, T. J., Koladiya, A., Lo, Y., Nolan, G. P., Davis, K. L.
  2023; 3 (1): vbad071

- **Improved Relapse Prediction in Pediatric Acute Myeloid Leukemia By Deconvolving Lineage-Specific and CancerSpecific Features in Single-Cell Data**
  Keyes, T., Jager, A., Krueger, M., Plevritis, S., Tibshirani, R., Aplenc, R., Nolan, G. P., Redell, M. S., Davis, K. L.
  AMER SOC HEMATOLOGY.2022: 6288-6289

- **CytofIn enables integrated analysis of public mass cytometry datasets using generalized anchors.** *Nature communications*
  Lo, Y., Keyes, T. J., Jager, A., Sarno, J., Domizi, P., Majeti, R., Sakamoto, K. M., Lacayo, N., Mullighan, C. G., Waters, J., Sahaf, B., Bendall, S. C., Davis, et al
  2022; 13 (1): 934

- **Documenting Social Media Engagement as Scholarship: A New Model for Assessing Academic Accomplishment for the Health Professions.** *Journal of medical Internet research*
  Acquaviva, K. D., Mugele, J., Abadilla, N., Adamson, T., Bernstein, S. L., Bhayani, R. K., Büchi, A. E., Burbage, D., Carroll, C. L., Davis, S. P., Dhawan, N., English, K., Grier, et al
  2020; 22 (12): e25070

- **Progressive B Cell Loss in Revertant X-SCID.** *Journal of clinical immunology*
  Lin, C. H., Kuehn, H. S., Thauland, T. J., Lee, C. M., De Ravin, S. S., Malech, H. L., Keyes, T. J., Jager, A., Davis, K. L., Garcia-Lloret, M. I., Rosenzweig, S. D., Butte, M. J.
  2020

- **A Cancer Biologist's Primer on Machine Learning Applications in High-Dimensional Cytometry.** *Cytometry. Part A : the journal of the International Society for Analytical Cytology*
  Keyes, T. J., Domizi, P., Lo, Y., Nolan, G. P., Davis, K. L.
  2020

- **Medical Student Pride Alliance: The first national LGBTQ+ medical student affinity organisation.** *Medical education*
  Goetz, T. G., Zucker, S., Keyes, T., Gisondi, M.
  2020; 54 (5): 471-472

- **Student Education About Pre-exposure Prophylaxis (PrEP) Varies Between Regions of the United States.** *Journal of general internal medicine*
  Bunting, S. R., Garber, S. S., Goldstein, R. H., Ritchie, T. D., Batteson, T. J., Keyes, T. J.
  2020

- **Navigating Controversy: A Critical Element of Medical Education** *ACADEMIC MEDICINE*
  Jia, J. L., Kamceva, M., Keyes, T. J.
  2018; 93 (12): 1750

- **Navigating Controversy: A Critical Element of Medical Education.** *Academic medicine : journal of the Association of American Medical Colleges*
  Jia, J. L., Kamceva, M. n., Keyes, T. J.
  2018; 93 (12): 1750

- **Structural and functional features of central nervous system lymphatic vessels** *NATURE*
  Louveau, A., Smirnov, I., Keyes, T. J., Eccles, J. D., Rouhani, S. J., Peske, J. D., Derecki, N. C., Castle, D., Mandell, J. W., Lee, K. S., Harris, T. H., Kipnis, J.
  2015; 523 (7560): 337-?