Josiah Aklilu

Curriculum Vitae

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Education

Sept 2020 – Dec 2025 **Ph.D. in Biomedical Data Science**, *Stanford University*, Stanford, CA, USA, GPA: 3.88/4.0
Advised by Prof. Serena Yeung-Levy. Dissertation: *Foundations for Large-scale Analysis of Laparoscopic Surgery with Computer Vision*.
Completed Coursework: Convex Optimization (EE364A), Deep Learning for Computer Vision (CS231n), Natural Language Processing with Deep Learning (CS224n), Applied Multivariate Statistics, Representations and Algorithms for Computational Molecular Biology, Statistical Inference, Data Science for Medicine.

Sept 2016 – June 2020 **B.S. in Mathematics, Computer Science, and Physics**, *University of Denver*, Denver, CO, USA, GPA: 3.95/4.0

Experience

Jan 2026 – Present **Research Engineer**, *Google DeepMind*, Mountain View, CA
Developing unified and efficient multimodal embedding models (including EmbeddingGemma 2) and representation learning methods.

June 2025 – Sept 2025 **PhD Research Intern**, *Apple AIML – Health AI*, Cupertino, CA
Trained multimodal large language models for video action differencing augmented with IMU-based motion signals, building a training harness for over 25,000 video pairs synchronized with 6-channel IMU data.

June 2024 – Sept 2024 **PhD Research Intern, Biomedical AI for Precision Health**, *Microsoft Research (Health Futures)*, Redmond, WA
Conducted DINOv2-style self-supervised pretraining of large vision models on 2M+ CT volumes and constructed a paired radiology report-image benchmark for RECIST tumor progression evaluation.

Sept 2021 – Dec 2022 **Graduate Teaching Assistant**, *Stanford University*, Stanford, CA
TA for Representations & Algorithms for Computational Molecular Biology; held office hours and guided 100+ students through sequence alignment, HMMs, protein energetics, and statistical learning.

Aug 2017 – Aug 2019 **Recitation Instructor**, *University of Denver*, Denver, CO
Led recitation sections for Introduction to Data Structures and Algorithms and Discrete Structures, covering graph theory, runtime complexity, combinatorics, and probability.

June 2018 – Aug 2018 **Undergraduate Teaching Assistant**, *University of Denver*, Denver, CO
TA for NoSQL Databases for Big Data; guided 20+ students through querying graph (Neo4j) and document-based (MongoDB) database systems.

Publications & Preprints

2026 H. S. Vera, S. Dua, J. Andonov, S. Smoot, S. Russo, I. Llanos, . . . , **J. Aklilu**, et al. *EmbeddingGemma 2: Unified and Efficient Multimodal Representations.* arXiv:2610.37364, 2026.

2026 R. D'Cunha, A. Lozano, X. Sun, D. V. Jarquin, M. W. Sun, **J. Aklilu**, J. Burgess, Y. Zhang, . . . , R. Tibshirani, J. J. Nirschl, S. Yeung-Levy. *MMBU: A Massive Multi-modal Biomedical Understanding Benchmark to Probe the Perception Capabilities of Vision-Language Models.* European Conference on Computer Vision (ECCV), 2026.

2026 E. Sui*, C. Egeland*, X. Wang, A. Song, R. Li, J. Villarreal, A. Rau, **J. Aklilu**, A. Brown, . . . , J. Jopling, S. Yeung-Levy. *Computer vision-based retrieval of steps and intraoperative adverse events in laparoscopic cholecystectomy.* npj Digital Surgery, 1(1):12, 2026.

2026 A. H. Lee*, A. Conti*, M. Leipzig, C. K. Nobuhara, R. Dale, J. A. Villarreal, C. Egeland, A. Brown, A. Song, B. Sutjiadi, **J. Aklilu**, . . . , S. Yeung-Levy, J. K. Jopling. *Consensus operational definitions of surgical meta-competencies for computer vision-driven performance assessment: a multi-institutional Delphi study.* Surgical Endoscopy, 2026.

2026 **J. G. Aklilu.** *Foundations for Large-scale Analysis of Laparoscopic Surgery with Computer Vision.* Ph.D. Dissertation, Stanford University, 2026.

Under Review **J. Aklilu**, F. Zhu, F. Wang, S. Yeung-Levy, V. Chan, S. Ren. *Distilling Expert Commentary from Exocentric Video and IMU-based Motion Signals.* Under Review.

In Progress **J. Aklilu**, X. Wang, Q. Liu, S. Yeung-Levy, J. M. Zambrano Chaves. *Measuring Query Complexity in Pursuit of Hybrid Reasoners.* Work in Progress.

2025 **J. Aklilu***, J. A. Villarreal*, C. K. Nobuhara, C. Egeland, X. Wang, E. Sui, A. Brown, . . . , S. Yeung-Levy. *Automated Video-Based Analysis of Surgical Meta-competencies Using Computer Vision.* medRxiv, 2025.

2025 **J. Aklilu**, X. Wang, S. Yeung-Levy. *Zero-shot Action Localization via the Confidence of Large Vision-Language Models.* CVPR Workshop on Video Large Language Models (VidLLMs), 2025.

2025 A. Lozano*, M. W. Sun*, J. Burgess*, L. Chen, J. J. Nirschl, J. Gu, I. Lopez, **J. Aklilu**, A. Rau, A. W. Katzer, Y. Zhang, C. Chiu, X. Wang, A. S. Song, R. Tibshirani, S. Yeung-Levy. *BIOMEDICA: An Open Biomedical Image-Caption Archive, Dataset, and Vision-Language Models Derived from Scientific Literature.* Computer Vision and Pattern Recognition (CVPR), 2025.

2025 Y. Zhang, Y. Su, Y. Liu, X. Wang, J. Burgess, E. Sui, C. Wang, **J. Aklilu**, A. Lozano, A. Wei, L. Schmidt, S. Yeung-Levy. *AutoConverter: Automated Generation of Challenging Multiple-Choice Questions for Vision Language Model Evaluation.* Computer Vision and Pattern Recognition (CVPR), 2025.

2025 A. Lozano, M. W. Sun, J. Burgess, J. J. Nirschl, C. Polzak, Y. Zhang, L. Chen, . . . , **J. Aklilu**, . . . , R. Tibshirani, S. Yeung-Levy. *A Large-Scale Vision-Language Dataset Derived from Open Scientific Literature to Advance Biomedical Generalist AI.* arXiv:2503.22727, 2025.

2025 A. Rau, M. Endo, **J. Aklilu**, J. Heo, K. Saab, A. Paderno, J. Jopling, F. C. Holsinger, S. Yeung-Levy. *Systematic Evaluation of Large Vision-Language Models for Surgical Artificial Intelligence.* arXiv:2504.02799, 2025.

2025 G. H. Olsen*, E. D. Goodman*, **J. G. Aklilu**, S. Bartoletti, K. S. Hung, J. H. Yang, E. C. Sorenson, J. K. Jopling, S. Yeung-Levy, D. E. Azagury. *Using Artificial Intelligence to Model Expert Panel Diagnosis of Cholecystitis Severity.* Surgical Endoscopy, 39(10), 2025.

2024 A. Rau, **J. Aklilu**, F. C. Holsinger, S. Yeung-Levy. *Depth-guided NeRF Training via Earth Mover's Distance.* European Conference on Computer Vision (ECCV), 2024.

2024 S. R. Gupte*, **J. Aklilu***, J. J. Nirschl, S. Yeung-Levy. *Revisiting Active Learning in the Era of Vision Foundation Models.* Transactions on Machine Learning Research (TMLR), 2024.

2024 **J. G. Aklilu**, M. W. Sun, S. Goel, S. Bartoletti, A. Rau, G. Olsen, K. S. Hung, S. L. Mintz, V. Luong, A. Milstein, M. J. Ott, R. Tibshirani, J. K. Jopling, E. C. Sorenson, D. E. Azagury*, S. Yeung-Levy*. *Artificial Intelligence Identifies Factors Associated with Blood Loss and Surgical Experience in Laparoscopic Cholecystectomy Videos.* New England Journal of Medicine AI (NEJM AI), 1(2), 2024.

2022 **J. Aklilu** and S. Yeung-Levy. *ALGES: Active Learning with Gradient Embeddings for Semantic Segmentation of Laparoscopic Surgical Images.* Proceedings of Machine Learning for Health Care (PMLR), 182, 2022.

Honors & Awards

2020 – 2023 William K. Bowes Jr. Fellow, Stanford Graduate Fellowship

2020 University of Denver Distinction in Computer Science

2019 University of Denver Hornbeck Scholar

Leadership & Service

June 2020 – Aug 2020 **Academic Fellow**, *Stanford ADVANCE Summer Institute*, Stanford, CA
Completed an advanced statistical computing curriculum in R and participated in weekly graduate research development workshops.

Sept 2019 – June 2020 **Treasurer**, *Black Student Alliance @ DU*, Denver, CO
Co-managed an organizational budget of $8,000+ and collaborated with affinity group leadership to fund campus programming.

March 2017 – June 2020 **Peer Leader**, *Equity in STEM (E-STEM)*, Denver, CO
Mentored incoming first-year students from underrepresented backgrounds and organized orientation programming.

March 2017 – June 2020 **Planning Committee Leader & Facilitator**, *Black Male Initiative Summit @ DU*, Denver, CO
Co-organized the 2018 and 2019 summits and facilitated workshops on leadership and education for 10–15 high school students.

Aug 2017 – Aug 2019 **Advisory Board Member**, *Ritchie School of Engineering & Computer Science*, Denver, CO
Advised faculty leadership on curriculum modernization and departmental improvements for undergraduate and graduate programs.

Skills & Interests

Languages Python, R, SQL, Bash

Frameworks & Tools PyTorch, JAX, TensorFlow, Hugging Face, DeepSpeed, Accelerate, Slurm, Git, GCP, Linux

Research Interests Multimodal embedding models, contrastive representation learning, video understanding, vision-language reasoning, surgical computer vision