

Dig Vijay Kumar Yarlagadda

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EDUCATION

Doctor of Philosophy in Computational Biology and Medicine 07/2020 - 12/2026

Tri-Institutional Program at Cornell University, Sloan Kettering Institute, & Rockefeller University

Advisors: Christina Leslie and Joan Massagué; Rotations: Dana Pe'er and Quaid Morris

Dissertation: Representation Learning for Modeling the Spatial Architecture of Cancer

Master of Science in Computer Science 01/2016 - 12/2017

University of Missouri-Kansas City; GPA: 4.0/4.0; Advisor: Praveen Rao

Thesis: One-Shot Learning Model for Cancer Diagnosis from Histopathological Images

Bachelor of Technology in Electronics and Communication Engineering 08/2011 - 09/2015

Sree Vidyanikethan Engineering College, India; first class with distinction

Senior project: Efficient image compression using predictive vector quantization

RESEARCH INTERESTS

My research interests lie at the interface of artificial intelligence and biology. I develop multimodal representation learning methods, 3D generative models, and vision models for spatial and single-cell transcriptomics, combining these models with experiments and clinical specimen analyses to study cellular programs and tissue interactions that sustain residual disease.

PUBLICATIONS

* indicates equal contribution.

Yarlagadda, D., & Leslie, C. **Nicheverse: modeling spatial architecture using discrete representation learning.** *Manuscript in preparation.* nicheverse.org

Yarlagadda, D., Wang, Z., Jiang, H., Vuong, L., López-Sanmiguel, A., Yang, C.-Y., Kotecha, R.R., Chen, Y.-B., Hakimi, A.A., Leslie, C., & Massagué, J. 2026. **Developmental reversion underlies resistance to immune checkpoint blockade in kidney cancer.** *bioRxiv. Under revision at Cancer Cell.*

Hussain, Z.*, Yarlagadda, D.*, Li, Q., Tezcan, N., . . . , Deborde, S., Leslie, C., & Sherman, M.H. 2026. **Invasion status stratifies the composition of the human pancreatic cancer perineural niche.** *bioRxiv. Under review at Cancer Discovery.*

Yarlagadda, D., Massagué, J., & Leslie, C. 2023. **Discrete representation learning for modeling imaging-based spatial transcriptomics data.** *Workshop on Bioimage Computing, International Conference on Computer Vision (ICCV).* **Oral.**

Yarlagadda, D., Rao, P., Rao, D., & Tawfik, O. 2019. **A system for one-shot learning of cervical cancer cell classification in histopathology images.** *SPIE Medical Imaging.*

Yarlagadda, D., & Leslie, C. 2026. **CellSplat: End-to-end 3D Gaussian splatting for cellular decomposition of spatial transcriptomics.** *Workshop on End-to-End 3D Learning, Conference on Computer Vision and Pattern Recognition (CVPR).*

- Yarlagadda, D., & Leslie, C. 2026. **Spatially-aware cell type annotation using hierarchical vector-quantized variational autoencoders.** *Workshop on Computer Vision for Science, Conference on Computer Vision and Pattern Recognition (CVPR).*
- Schüffler, P.*, Yarlagadda, D.*, ..., & Fuchs, T. 2021. **Overcoming an annotation hurdle: Digitizing pen annotations from whole slide images.** *Journal of Pathology Informatics*, 12.
- Ho, D., Yarlagadda, D., ..., & Fuchs, T. 2021. **Deep multi-magnification networks for multi-class breast cancer image segmentation.** *Computerized Medical Imaging and Graphics*, 88.
- Lopez Barron, D.E., Yarlagadda, D., Rao, P., Tawfik, O., & Rao, D. 2018. **Scalable storage of whole slide images and fast retrieval of tiles using Apache Spark.** *SPIE Medical Imaging.*
- Lee, J., ..., Yarlagadda, D., ..., & Massagué, J. 2024. **TGF- β and RAS jointly unmask primed enhancers to drive metastasis.** *Cell.*
- Chan, J., ..., Yarlagadda, D., ..., Pe'er, D., & Rudin, C. 2021. **Signatures of plasticity, metastasis, and immunosuppression in an atlas of human small cell lung cancer.** *Cancer Cell.*
- Xie, C., ..., Yarlagadda, D., ..., & Fuchs, T. 2020. **Beyond classification: Whole-slide tissue histopathology analysis by end-to-end part learning.** *Medical Imaging with Deep Learning, Proceedings of Machine Learning Research (PMLR)*, 121:843-856. **Oral.**
- Schüffler, P.J., Geneslaw, L., Yarlagadda, D., ..., & Fuchs, T. 2021. **Integrated digital pathology at scale: A solution for clinical diagnostics and cancer research at a large academic medical center.** *Journal of the American Medical Informatics Association*, 28(9):1874-1884.
- D'Alfonso, T.M., ..., Yarlagadda, D., ..., & Tan, L.K. 2021. **Multi-magnification-based machine learning as an ancillary tool for the pathologic assessment of shaved margins for breast carcinoma lumpectomy specimens.** *Modern Pathology.*
- Schüffler, P., ..., Yarlagadda, D., ..., & Hameed, M. 2022. **Efficient visualization of whole slide images in web-based viewers for digital pathology.** *Archives of Pathology & Laboratory Medicine*, 146:1273-1280.
- Kim, D., ..., Yarlagadda, D., ..., & Hanna, M. 2020. **(Re)Defining the high-power field for digital pathology.** *Journal of Pathology Informatics*, 11.

RESEARCH EXPERIENCE

PhD student, Leslie Lab & Massagué Lab

Memorial Sloan Kettering Cancer Center

Advisors: Christina Leslie, Joan Massagué

Jul 2020 - Dec 2026

- **Nicheverse:** enables scalable, interpretable modeling of imaging-based spatial transcriptomics data by representing each cell together with its local tissue context through paired codebooks, allowing us to compare recurrent cellular states and tissue environments across large spatial cohorts.
- **Developmental reversion in clear cell renal cell carcinoma:** spatial and single-cell profiling revealed that cancer cells occupy a continuous axis of embryonic nephrogenesis and that immune checkpoint blockade enriches for developmentally committed states. Nicheverse identified relative CD8⁺ T-cell exclusion in regions enriched for these states. Immunocompetent mouse models recapitulated the enrichment of nephrogenic persister cells after checkpoint blockade.

- **CellSplat:** performs transcript-to-nucleus assignment in imaging-based spatial transcriptomics by modeling nuclei as anisotropic 3D Gaussians. The geometry of these Gaussians is optimized directly against the volumetric DAPI signal and 3D transcript coordinates.
- **Perineural invasion in pancreatic ductal adenocarcinoma:** developed the imaging-based spatial transcriptomics framework and analyzed invaded and noninvaded nerve neighborhoods, resolving differences in malignant, stromal and immune organization.

Summer Intern, Troyanskaya Lab, Center for Computational Biology

Flatiron Institute, NY

Advisor: Olga Troyanskaya

May 2024 - Aug 2024

- Built vision-language foundation models jointly embedding light-sheet microscopy and bulk/single-cell genomics datasets of embryonic development.

Machine Learning Engineer, Fuchs Lab

Memorial Sloan Kettering Cancer Center

Advisor: Thomas J. Fuchs

Sep 2018 - Jun 2020

- Developed C++/CUDA kernels for gigapixel whole-slide image tiling, streaming I/O and on-the-fly augmentation, and multi-GPU pipelines for weakly supervised and self-supervised pretraining across more than 25 cancer types.

Graduate Research Assistant, Rao Lab

UMKC, Kansas City, MO

Advisor: Praveen Rao

May 2016 - Dec 2017

- Developed memory-augmented one-shot learning models for cervical cell classification with limited labels.
- Built an Apache Spark-based distributed in-memory platform for whole-slide image storage and tile retrieval.

PROFESSIONAL EXPERIENCE

AgShift

Santa Clara, CA

Deep Learning Engineer

Sep 2017 - Aug 2018

- Developed convolutional neural networks for produce grading from multispectral and natural images; external advisor: Dilip Krishnan.

Strayos

St. Louis, MO

Computer Vision & Machine Learning Engineer

Mar 2017 - Aug 2017

- Developed 3D reconstruction, point-cloud processing and structure-from-motion pipelines for drone imagery.

PATENTS

- Machine learning model for analyzing pathology data from metastatic sites, U.S. Patent 11,449,994 (licensed to Paige.AI)
- End-to-end part learning for image analysis, U.S. Patent Application No. 18/008,133 (licensed to Paige.AI)
- Detection of annotated regions of interest in images, U.S. Patents 11,682,186 and 12,511,861 (licensed to Paige.AI)

- Scalable and efficient whole slide image reader for deep learning and viewer applications, U.S. Patent 12,038,571 (WO2020227401A1) (licensed to Paige.AI)
- Digital pathology records database management, U.S. Patent Application No. 17/911,093 (licensed to Paige.AI)
- Detection of labels in biomedical images, U.S. Patent 12,555,672 (WO2022235564A1) (licensed to Paige.AI)
- System and method for assessing food quality and shelf life prediction using deep learning techniques, U.S. Provisional Patent Application No. 62/686,826

TALKS

Discrete representation learning for modeling imaging-based spatial transcriptomics data

NCI Junior Investigator Meeting, Bethesda, MD (Invited Talk)	2024
WEHI Spatial Technology Symposium, Melbourne (Invited Talk)	2025
Spatial Biology Summit, Stanford University (Poster)	2024
ICCV Bioimage Computing Workshop, Paris, France (Oral)	2023

Developmental reversion underlies resistance to immune checkpoint blockade in kidney cancer

Cancer Biology and Genetics Program Seminar, MSKCC (Invited Talk)	2025
Gerry Metastasis Center Metastasis Club, MSKCC (Invited Talk)	2025
Ritesh Kotecha Lab, Memorial Sloan Kettering Cancer Center (Invited Talk)	2025
NCI Junior Investigator Meeting, Bethesda, MD (Invited Talk)	2023

MENTORING EXPERIENCE

Research Mentor, Memorial Sloan Kettering Cancer Center

- Joel Pepper (Computer Science, PhD)
- Leah Morales (Computational Biology, PhD)
- Shenni Liang (Computational Biology, PhD)
- Thahmina Ali (Computational Biology, PhD)
- Hang Yin (Immunology, PhD)
- Haskeerat Minhas (Computational Biology, MS)
- Kyle Kuo (Computer Science, undergraduate)

SERVICE

Reviewer, Neural Information Processing Systems (NeurIPS)	2019, 2020, 2021, 2023, 2025
Reviewer, International Conference on Learning Representations (ICLR)	2022, 2024, 2025, 2026
Reviewer, International Conference on Machine Learning (ICML)	2024, 2026
Reviewer, Conference on Computer Vision and Pattern Recognition (CVPR)	2026
Reviewer, Conference on Health, Inference, and Learning (CHIL)	2022
Reviewer, Computers in Biology and Medicine	
Reviewer, PLOS ONE	
Organizer, AI for Overcoming Global Disparities in Cancer Care Workshop, ICLR	2020

SKILLS

Computational: Python, C++, CUDA, PyTorch, JAX, TensorFlow, scikit-learn, ScanPy, OpenCV, Point Cloud Library, Eigen, PyVista, Datashader, Apache Spark, Linux, Git

Experimental: mouse models of cancer metastasis; cell culture; functional assays; reporter development; imaging-based spatial transcriptomics; single-cell sequencing; multiplex fluorescence in situ hybridization; microfluidic systems; immunofluorescence and immunohistochemistry; light-sheet microscopy