Joseph Bae

M.D./Ph.D. Student

joseph.bae@stonybrookmedicine.edu
https://joseph-bae.github.io/

EDUCATION

Stony Brook University, Stony Brook, NY
Doctor of Medicine, August 2019-Present
    Selected Coursework: Molecular Foundations of Medicine, Human Anatomy, Human Pathophysiology
Stony Brook University, Stony Brook, NY
Ph.D., Biomedical Informatics, July 2021-March 2025
Selected Coursework: Statistics; Computer Science; Data Analytics and Software Stacks; Computer Vision
University of Southern California, Los Angeles, CA
Master of Science, Medical Biophysics, December 2016-December 2018
    Thesis: *Exploring the effects of CXCR4 inhibition on circulating tumor cell populations in metastatic prostate cancer*
University of Southern California, Los Angeles, CA
Bachelor of Science, Biophysics, August 2014-May 2018
    Magna Cum Laude, MCAT 523

SKILLS

Programming/Scripting Languages: (Fluent) Python, MATLAB; (Familiar) Lua, Java, C++, R, Javascript, SQL
Frameworks/Tools: PyTorch, Tensorflow, Git, Microsoft Office, Sony Vegas, Inkscape
Wet Lab: Immunofluorescence, PCR, cell culture

EXPERIENCE

Ph.D. Student Researcher
Department of Biomedical Informatics, Stony Brook University, December 2019 – March 2025
- Research and create tools for data processing and machine learning modeling of imaging and radiotherapy treatment data for cancer patients under Dr. Prateek Prasanna. Work published in top conferences (CVPR, ICCV, MICCAI, etc.) and journals (see pages 2-3 for full list of publications).

Computer Vision Intern
Siemens Healthineers, Malvern, PA, May 2024 – December 2024
- Developed approaches for few-shot and unsupervised segmentation of volumetric medical images leveraging foundation models. Presented at MEDAGI@MICCAI 2024. Provided in-person anatomy lectures for research scientists covering human physiology and pathology.

Science Officer
PathCheck Foundation, Massachusetts Institute of Technology, August 2020 – February 2021
- Led a multinational team of scientists, doctors, and engineers to develop digital systems for equitable COVID-19 vaccine distribution in the US and other countries (patent pending). Served on the leadership committee for the Vaccines for All Conference hosted at MIT.

Student Researcher
Convergent Sciences Institute in Cancer, University of Southern California, May 2015 – December 2018
- Conducted research on circulating tumor cells in colorectal and prostate cancer using wet lab and computational techniques as a member of the Kuhn Lab. Member of the inaugural class of the Bridge Undergraduate Scientist Program. Assisted in organizing undergraduate researchers and volunteers.

Projects

Characterizing Demographic Biases in Public Radiotherapy Datasets
Stony Brook University, 2025q3
- Analyzed public imaging and genomic datasets for 23,359 patients treated with radiotherapy. Identified significant age, sex, and race disparities relative to U.S. cancer populations to assess potential bias in AI and radiotherapy research. Developed an interactive website to visualize these findings @ https://joseph-bae.github.io/ASTRO2025.html. Work presented at ASTRO 2025.

RADGRAPH
Stony Brook University, 2025q1
- Trained models for graph-based machine learning analysis of 3D CT images for cancer recurrence prediction on large, multi-institutional datasets. Received Trainee Research Prize at RSNA. First author manuscript published in *Radiology: Imaging Cancer*.

Projects (continued)

SAMU

Siemens Healthineers. 2024q2
- Created an efficient foundation model for volumetric medical image segmentation capable of being run on limited GPU resources. Developed during summer intern research with Siemens Healthineers. Presented and published at MEDAGI@MICCAI 2025.

Spatial Radiomics for Brain Metastases Recurrence

Stony Brook University, 2024q2
- Developed a framework for spatial-radiomics modeling of time-to-recurrence for brain metastases patients using 3D MRI imaging and radiation treatment data. Published in *Advances in Radiation Oncology.*

Beating the Streak

Stony Brook University, 2022q3
- Created a system to model batter hitting streaks in Major League Baseball (MLB) using machine learning models and MLB APIs. Developed both backend and frontend for a public-facing website showcasing model predictions.

Awards

- Trainee Research Prize – RSNA 2023
- Facebook COVID-19 Symptom Data Challenge Finalist
- Stanford Biodesign Hackathon 2020 - Best COVID-19 Project Award
- USC Trustee, University, Asian Pacific American Scholarships
- Rose Hills Foundation, USC Provost, Dornsife Scholar, Discovery Scholar Research Fellowships
- Phi Beta Kappa Member
- National Merit Scholar
- Warren Bennis Scholar

Publications

Journal Papers

Wu, J.; **Bae, J.;** Chen, C.; Ryu, S.; Lozeau, D.; Stessin, A.; & Prasanna, P. (2025). Magnetic Resonance Imaging Radiomic Analysis of Radiation-Induced Morphea of the Breast: A Proof-of-Concept Study. *Advances in Radiation Oncology*.

Bae, J.; Mani, K.; Czerwonka, L; Vanison, C; Ryu, S.; & Prasanna, P. (2025). Spatial Radiomic Graphs for Outcome Prediction in Radiotherapy-Treated Head and Neck Squamous Cell Carcinoma Using Pre-Treatment CT. *Radiology: Imaging Cancer*.

Singh, G.; Singh, A.; **Bae, J.;** Manjila, S.; Spektor, V.; Prasanna, P.; & Lignelli, A. (2024). New frontiers in domain-inspired radiomics and radiogenomics: increasing role of molecular diagnostics in CNS tumor classification and grading following WHO CNS-5 updates. *Cancer Imaging*.

Bae, J.; Mani, K.; Zabrocka, E.; Cattell, R.; O'Grady, B.; Payne, D.; Roberson, J.; Ryu, S.; & Prasanna, P. (2024). Pre-treatment Spatially-Aware MRI Radiomics Can Predict Distant Brain Metastases (DBMs) Following Stereotactic Radiosurgery/Radiation Therapy (SRS/SRT). *Advances in Radiation Oncology*.

Bae, J.; Kapse, S.; Singh, G.; Gattu, R.; Ali, S.; Shah, N.; Marshall, C.; Pierce, J.; Phatak, T.; Gupta, A.; Green, J.; Madan, N.; Prasanna, P. (2021) Predicting Mechanical Ventilation and Mortality in COVID-19 Using Radiomics and Deep Learning on Chest Radiographs: A Multi-Institutional Study. *Diagnostics*.

Khullar, R.; Shah, S.; Singh, G.; **Bae, J.**; Gattu, R.; Jain, S.; Green, J.; Anandarangam, T.; Cohen, M.; Madan, N.; & Prasanna, P. (2020). Effects of Prone Ventilation on Oxygenation, Inflammation, and Lung Infiltrates in COVID-19 Related Acute Respiratory Distress Syndrome: A Retrospective Cohort Study. *Journal of Clinical Medicine*.

Conference Papers

Bae, J.; Kapse, S.; Zhou, L.; Mani, K; & Prasanna, P. (2024). HoG-Net: Hierarchical Multi-organ Graph Network for Head and Neck Cancer Recurrence Prediction from CT Images. MICCAI 2024.

Bae, J.; Guo, X; Yerebakan, H; Shinagawa, Y; & Farhand, S. (2024). SAMU: An Efficient and Promptable Foundation Model for Medical Image Segmentation. MEDAGI@MICCAI 2024.

Zhou, L.; Liu, H.; **Bae, J.;** Samaras, D.; Prasanna, P. (2023). Self Pre-training with Masked Autoencoders for Medical Image Classification and Segmentation. ISBI 2023

Konwer, A.; Hu, X.; **Bae, J.;** Xu, X.; Chen, C.; Prasanna, P. (2023). Enhancing Modality-Agnostic Representations via Meta-Learning for Brain Tumor Segmentation. ICCV 2023

Zhou, L.; Liu, H.; **Bae, J.;** He, J.; Samaras, D.; Prasanna, P. (2023). Token Sparsification for Faster Medical Image Segmentation. IPMI 2023

Bae, J.; Cattell, R.; Zabrocka, E.; Roberson, J.; Payne, D.; Mani, K.; Prasanna, P. Pre-Treatment Radiomics from Radiotherapy Dose Regions Predict Distant Brain Metastases in Stereotactic Radiosurgery. In *Medical Imaging 2022: Physics of Medical Imaging*; SPIE, 2022.

Konwer, A.; Xu, X.; **Bae, J.**; Chen, C.; Prasanna, P. Temporal Context Matters: Enhancing Single Image Prediction With Disease Progression Representations. *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition* 2022.

Konwer, A.; **Bae, J.**; Singh, G.; Gattu, R.; Ali, S.; Green, J.; Phatak, T.; Gupta, A.; Chen, C.; Saltz, J.; Prasanna, P. Predicting COVID-19 Lung Infiltrate Progression on Chest Radiographs Using Spatio-Temporal LSTM Based Encoder-Decoder Network; *Medical Vision with Deep Learning* 2021.

Zhou, L.; **Bae, J.**; Liu, H.; Singh, G.; Green, J.; Samaras, D.; Prasanna, P. Chest Radiograph Disentanglement for COVID-19 Outcome Prediction. In *Medical Image Computing and Computer Assisted Intervention – MICCAI* 2021.

Konwer, A.; **Bae, J.**; Singh, G.; Gattu, R.; Ali, S.; Green, J.; Phatak, T.; Prasanna, P. Attention-Based Multi-Scale Gated Recurrent Encoder with Novel Correlation Loss for COVID-19 Progression Prediction. In *Medical Image Computing and Computer Assisted Intervention – MICCAI* 2021.

Cowan, C.; **Bae, J.**; Singh, G.; Khullar, R.; Shah, S.; Madan, N.; Prasanna, P. Evolution of Chest Radiograph Radiomics and Association with Respiratory and Inflammatory Parameters in COVID-19 Patients Undergoing Prone Ventilation: Preliminary Findings; International Society for Optics and Photonics 2021.

Conference Abstracts

Bae, J. & Cha, B. (2025). Identifying Age, Race, and Sex Biases in Public Imaging and Genomic Datasets for Radiotherapy Patients. ASTRO 2025.

Bae, J.; Torre-Healy, L.; Wu, J.; Pang, L.; Stessin, A.; Hsia, A.T.; Farrel, R.; Mani, K.M.; Prassan, P.; & Ryu, S. (2025). Stereotactic Radiosurgery (SRS) over Whole Brain Radiotherapy (WBRT) Preserves Brain Volume: An Imaging and Radiomic Analysis. ASTRO 2025.

Bae, J.; Mani, K.; Noldner, C.; Czerwonka, L.; Ryu, S.; & Prasanna, P. (2024). Do Spatial-Radiomics Improve Prediction of Locoregional Recurrence Following Radiotherapy for HNSCC? Multidisciplinary Head and Neck Cancers Symposium 2024.

Bae, J. & Prasanna, P. (2023). Graph-Based Spatially-Aware Radiomics Improves Prediction of Locoregional Recurrence in Radiotherapy-Treated Head and Neck Squamous Cell Carcinoma. RSNA 2023 *Oral Presentation (Trainee Research Prize)*

Bae, J; Mani, K.; Zabrocka, E.; Cattel, R.; O'Grady, B.; Payne, D.; Roberson, J.; Ryu, S.; Prasanna, P. (2023). Predictive Value of Pre-Treatment MRI Radiomics for Distant Brain Metastases Following Stereotactic Radiosurgery/Radiotherapy. ASTRO 2023.

Bae, J.; Prasanna, P.; Gadgeel, S. (2022). Pre-treatment CT Radiomics Predicts Survival in Chemo-Immunotherapy-treated Small Cell Lung Cancer. ESMO 2022

Noldner, C.; **Bae, J.**; Kartsonis, W.; Cattell, R.; Soft, S.; Sehgal, G.; Pierce, A.; Patel, M.; Ryu, S.; Czerwonka, L.; Prasanna, P.; Mani, K. Pre-Radiation CT-based Radiomic Features Predict Locoregional and Distant Failure in Locally Advanced Head and Neck Cancer. *Multidisciplinary Thoracic Cancer Symposium* 2022.

Bae, J.; Zabrocka, E.; Rodriguez, C.; Payne, D.; Ryu, S.; Prasanna, P.; Mani, K. Prediction of Regional and Distant Failure after Definitive Thoracic Stereotactic Body Radiation Therapy Using Pre-Treatment CT-Based Radiomic Analysis, *Multidisciplinary Thoracic Cancer Symposium* 2021.

Presentations:

Graph-Based Spatially-Aware Radiomics Improves Prediction of Locoregional Recurrence in Radiotherapy-Treated Head and Neck Squamous Cell Carcinoma. RSNA 2023 *Oral Presentation (Trainee Research Prize)*.

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Pre-Treatment Radiomics from Radiotherapy Dose Regions Predict Distant Brain Metastases in Stereotactic Radiosurgery. SPIE Medical Imaging 2022 *Oral Presentation.*

Computational Biomarkers for Treatment Response in Radiotherapy. MSTP Research Retreat 2022 *Poster Presentation.*

Analyzing the Role of CXCR4 in Metastatic Prostate Cancer through Single-Cell Analysis. Cell Biophysics: Measurement, Modulation, and Modeling. 2017. *Poster Presentation.*

Understanding the Metastatic Niche: The Role of CXCR4 in Prostate Cancer Homing to the Bone Marrow. West Coast Biological Sciences Research Conference. 2016. *Poster Presentation.*