# Joseph Bae
M.D./Ph.D. Student

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

## EDUCATION

**Stony Brook University, Stony Brook, NY**
*Ph.D., Biomedical Informatics, July 2021-Present*
Selected Coursework: Statistics; Computer Science; Data Analytics and Software Stacks; Imaging Informatics Analysis; Computer Vision

**Stony Brook University, Stony Brook, NY**
*Doctor of Medicine, August 2019-Present*
Selected Coursework: Molecular Foundations of Medicine, Human Anatomy, Human Pathophysiology
MCAT: 523

**University of Southern California, Los Angeles, CA**
*Master of Science, Medical Biophysics, December 2016-December 2018*

## SKILLS

**Programming/Scripting Languages**: (Fluent) Python, MATLAB; (Familiar) Java, C++, 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 - Present*
- 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).

**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

**Spatial Radiomics for Brain Metastases Recurrence**
*Stony Brook University, Spring 2024*
- 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.*

**RADGRAPH**
*Stony Brook University, Fall 2023*
- 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 2023. Work currently in submission.

**Beating the Streak**
*Stony Brook University, Fall 2022*
- 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

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## Publications

### *Journal Papers*

**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*. (Accepted for publication)

**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*

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.** & 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.;** 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; 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.

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**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)*

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*