SADHANA RAVIKUMAR

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- Bioengineering, Ph.D. with experience in designing, developing and evaluating machine learning and deep learning solutions for analyzing biomedical imaging datasets.
- Collaborated with a cross-functional team of engineers, pathologists and clinicians on projects related to developing quantitative imaging biomarkers for Alzheimer's disease, leading to five first-author peer-reviewed conference and journal publications and 9+ conference presentations.

EDUCATION

University of Pennsylvania — Philadelphia, PA
Ph.D. Bioengineering; *GPA 4.0/4.0* — *Aug. 2017 - Aug. 2022*

Carnegie Mellon University (CMU) — Pittsburgh, PA
MSc. Biomedical Engineering; *GPA 3.86/4.0* — *Aug. 2015 - May 2017*

University of Cape Town (UCT) — Cape Town, South Africa
BSc Electrical Engineering; *with first class honors* — *Jan. 2011 - Dec. 2014*

TECHNICAL SKILLS

Programming Languages	C/C++, Python, MATLAB, shell scripting
Tools/Libraries	Pytorch, scikit-learn, R, CMake, ITK/VTK, Git, HPC/cloud computing

RESEARCH EXPERIENCE

University of Pennsylvania — Philadelphia, PA

Postdoctoral Research Fellow, Penn Image Computing and Science Laboratory — *Aug 2022 - present*

Graduate Researcher, Penn Image Computing and Science Laboratory — *Aug. 2017 - July 2022*

· Thesis: Characterizing medial temporal lobe neurodegeneration due to tau pathology in Alzheimer's Disease using postmortem imaging.

· Constructed a probabilistic atlas of the MTL from complex, high-resolution ex vivo MRI using a customized group-wise image registration pipeline.

· Combined MRI measures with histopathological data to identify patterns of neurodegeneration specific to Alzheimer's disease pathology during the early stages of the disease, resulting in a first author journal publication.

· Developed and validated deep learning models for segmentation of brain tissue in ex vivo MRI.

· Developed an image segmentation interpolation tool to facilitate large-scale data annotation. Implemented this tool as a new feature in ITK-SNAP, a commonly used medical imaging software

Genentech — San Francisco, CA

Product Development - Personalized Healthcare Data Sciecne Imaging Intern — *May - Dec. 2021*

· Designed, implemented and evaluated deep learning methods for end-to-end image classification and segmentation applied to clinical brain MRI data for the detection of amyloid-related imaging abnormalities.

· Presented novel methods and key findings to the team and during a Project Showcase, attended by all Genentech employees.

Carnegie Mellon University — Pittsburgh, PA

Graduate Researcher, Chase Lab — *Aug. 2015 - May 2017*

· Thesis: Tracking chronically recorded neurons using pairwise cross-correlograms.

· Developed a machine learning classifier for the identification of stable neurons from long term neural spike recordings obtained from Brain Computer Interface (BCI) studies aimed at studying neural activity changes associated with learning in non-human primates.

PUBLICATIONS

Peer-reviewed Manuscripts

- Ravikumar, S., Wisse, L.E.M., Lim, S., ..., et al. (2021). Ex vivo MRI atlas of the human medial temporal lobe: characterizing neurodegeneration due to tau pathology. **Acta neuropathologica communications**, 9(1), 1-14.
- Wisse, L.E.M.*, Ravikumar, S.*, Ittyerah, R., ..., et al. (2021) Downstream effects of polypathology on neurodegeneration of medial temporal lobe subregions. **Acta neuropathologica communications** 9(1), 1-11 (* = co-first authors)
- Xie, L., Wisse, L. E., Wang, J., Ravikumar, S., ..., et al. (2023). Deep label fusion: A generalizable hybrid multi-atlas and deep convolutional neural network for medical image segmentation. Medical Image Analysis, 83, 102683.
- Sadaghiani, S., Trotman, W., Lim, S. A., Chung, E., Ittyerah, R., Ravikumar, S. ,..., et al.(2022). Associations of phosphorylated tau pathology with whole-hemisphere ex vivo morphometry in 7 tesla MRI. **Alzheimer's & Dementia**
- Yushkevich, P. A., Muñoz López, M., Iñiguez de Onzoño Martin, M. M., Ittyerah, R., Lim, S., Ravikumar ,..., et al. (2021). Three-dimensional mapping of neurofibrillary tangle burden in the human medial temporal lobe. **Brain**, 144(9), 2784-2797.
- Zhou, X., Tien, R. N., Ravikumar, S., Chase, S. M. (2019). Distinct types of neural reorganization during long-term learning. **Journal of neurophysiology**, 121(4), 1329-1341.

Peer-reviewed Conference Proceedings

- Ravikumar, S., Wisse, L.E.M., Lim, S., ..., et al. (2021) Unfolding the medial temporal lobe cortex to characterize neurodegeneration due to Alzheimer's disease pathology using ex vivo imaging. **Machine Learning in Clinical Neuroimaging Wokshop at MICCAI 2021**
- Ravikumar, S., Wisse, L., Ittyerah, R., ..., et al. Building an ex vivo atlas of the earliest brain regions affected by Alzheimer's Disease Pathology. **In 2020 IEEE 17th International Symposium on Biomedical Imaging (ISBI 2020)** (pp. 113-117). IEEE.
- Yushkevich, P. A., de Onzoño Martin, M. M. I., Ittyerah, R., Lim, S., Lavery, M., Wang, J., ..., Ravikumar S, ..., et al. 3D mapping of tau neurofibrillary tangle pathology in the human medial temporal lobe. **In 2020 IEEE 17th International Symposium on Biomedical Imaging (ISBI 2020)** (pp. 1312-1316). IEEE.
- Ravikumar, S., Wisse, L., Gao, Y., Gerig, G., Yushkevich, P. Facilitating manual segmentation of 3D datasets using contour and intensity guided interpolation. **In 2019 IEEE 16th International Symposium on Biomedical Imaging (ISBI 2019)** (pp. 714-718). IEEE.
- Xie, L., Wisse, L. E., Wang, J., Ravikumar, S., Glenn, T., Luther, A., ..., et al. (2021). Deep Label Fusion: A 3D end-to-end hybrid multi-atlas segmentation and deep learning pipeline. **In International Conference on Information Processing in Medical Imaging (IPMI 2019)** (pp. 428-439). Springer, Cham.

PRESENTATIONS

Talks

- Alzheimer's Association International Conference (2020 & 2022)
- University of Southern Maine Data Science Ensemble Seminar (2022) *(Invited Guest Speaker)*
- Hippocampal Subfields Group Webinar (2021) *(Selected Speaker)*
- Pendergrass Day Symposium (2021) *(Awarded Summa Cum Laude distinction)*
- Machine Learning in Clinical Neuroimaging Wokshop (2021)
- International Symposium on Biomedical Imaging (2020)
- Mahoney Institute for Neurosciences Symposium (2019) *(Received an Honorable Mention)*

Posters

- Alzheimer's Association International Conference (2021)
- CNDR Marian S. Ware Research Retreat (2019)
- Pendergrass Day Symposium (2019)

- International Symposium on Biomedical Imaging (2019)
- Pendergrass Day Symposium (2020) *(Awarded Magna Cum Laude distinction)*

HONORS & AWARDS

- Summa Cum Laude Distinction, Pendergrass Symposium (2021)
- Magna Cum Laude Distinction, Pendergrass Symposium (2020)
- Graduate and Professional Student Assembly (GAPSA) Travel award (2019,2022)
- Biomedical Engineering Summer Graduate Fellowship (2016) *(CMU)*
- Biomedical Engineering Scholarship (Fall 2016) *(CMU)*
- Rhodes Scholarship Finalist (2015)
- University of Cape Town (UCT) Faculty of Engineering Scholarship (2012 & 2013)
- Class Medal for Electrical Engineering (Top Student of the class) (2012)
- University of Cape Town Deans Merrit List 2011-2014

MENTORSHIP & LEADERSHIP POSITIONS

- UPenn Bioengineering Applicant-Support Program (Fall 2020): Assisted to applicants from under-served or under-represented communities in the PhD admissions process.
- Graduate Association of Bioengineering, University of Pennsylvania
  - Mentorship chair (2018-2020): Organized roundtable discussions, mentorship programs and social events for undergraduates from the Penn BMES chapter to meet informally with current BE graduate students and participate in discussions related to careers and/or graduate school.
  - Recruitment chair (2017-2018): Assisted in the organization of recruitment events for prospective graduate students interviewing for the Bioengineering PhD program.
- Graduate Student Mentor, CMU Biomedical Engineering (2016)

TEACHING EXPERIENCE

- Biomedical Image Analysis, University of Pennsylvania
  - Guest Lecture, Fall 2022 (taught a 1.5 hr lecture on "Groupwise Registration and Atlas Building" to a graduate-level class of 50 students)
  - Teaching assistant, Fall 2019
- Introduction to Scientific Computing, University of Pennsylvania
  - Teaching Assistant, Fall 2018:
- Introduction to Biomechanics, Carnegie Mellon University
  - Teaching Assistant, Fall 2016
- Introduction to Biomedical Engineering, Carnegie Mellon University
  - Teaching Assistant, Spring 2016
- Signals and Systems I & II, University of Cape Town
  - Teaching Assistant, Spring 2013 & 2014:

PROFESSIONAL SERVICE

- Reviewer for the International Symposium on Biomedical Imaging (ISBI) 2021 - 2023
- Program Committee and Reviewer for the MICCAI Brain Lesion (BrainLes) Workhop (2019)