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Ramya Muthukrishnan

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EDUCATION

Massachusetts Institute of Technology | Cambridge, MA   Expected May 2029
Ph.D. Candidate
Advisor: Dr. Polina Golland
Department: Electrical Engineering and Computer Science (EECS)
Research area: motion tracking, equivariant learning, self-driving MRI
Fellowships: MIT-Takeda Fellowship (2024-25), MIT Abdul Latif Jameel Clinic Fellowship for Machine Learning in Health (2023-24)
Leadership: EECS Graduate Student Association board member

University of Pennsylvania | Philadelphia, PA   May 2023
Master of Science in Engineering
Major: Data Science | *GPA:* 3.97/4.00
Thesis: Graph neural networks for scalable, real-world coverage control in distributed multi-robot systems
Advisor: Dr. Alejandro Ribeiro
Relevant Coursework: Learning in Robotics; Deep Learning; Graph Neural Networks; Machine Learning; Optimization
Awards: Best Departmental Masters Thesis

University of Pennsylvania | Philadelphia, PA   May 2022
Bachelor of Applied Science
Major: Computer Science | *Minor:* Data Science | *GPA:* 3.99/4.00

EXPERIENCE

MIT Lincoln Laboratory, *Research Intern* | Lexington, MA   May 2022 – May 2023
- Developed a novel transformer-based algorithm that solves the inverse physics problem of object shape estimation from spatiotemporal radar signals. Utilized PyTorch, Git, and Hydra.
- Collaborated with a team of 7 employees to design an SE(3)-equivariant neural network to solve the forward physics problem of radar signal generation from object shape.

Penn Center for Neuroengineering and Therapeutics, *Undergraduate Researcher* | Philadelphia, PA   May 2019 – Aug 2022
- Developed a deep learning pipeline (UNet) for automated segmentation of surgically removed tissue from over 3GB of brain MRI data and built it into a pipeline for clinical use. Utilized Tensorflow, Keras, and Google Cloud.
- Investigated template-based data augmentation techniques to improve training a large language model for automated seizure frequency extraction from clinical notes.

Penn Center for Biomedical Image Computing and Analytics, *Undergraduate Researcher* | Philadelphia, PA   Aug 2021 – Oct 2022
- Collaborated with a team of 5 students to develop a federated learning tool for training and deploying a novel deep learning architecture for quantitative breast density estimation from mammography.
- Utilized PyTorch and OpenFL.

Expedition Technology, *Machine Learning Intern* | Herndon, VA   May 2021 – Aug 2021
- Collaborated with an Agile team of 5 employees to develop a deep learning model (VoxelNet) for object detection in 3D point clouds from over 5GB of raw point cloud data.
- Implemented a novel self-supervised learning method to pretrain the model on an unlabeled dataset.
- Participated in weekly scrum meetings and code reviews. Utilized technologies such as PyTorch, Tensorflow, S3, EC2, Docker, Git/BitBucket, Jupyter, Jenkins, and Jira.

University of Pennsylvania, *Teaching Assistant* | Philadelphia, PA   Jan 2021 – May 2023
- Courses taught: Deep Learning, Senior Design, Machine Learning, Big Data Analytics
- Hold office hours and recitations covering class concepts, curate and grade homework and exams, and mentor student groups on term projects.

PUBLICATIONS AND PREPRINTS

Billot B., **Muthukrishnan R.**, Abaci-Turk E., Grant P.E., Ayache N., Delingette H., Golland P. (2025). Spatial regularization for improved accuracy and interpretability in keypoint-based registration. *arXiV.*

Agarwal S., **Muthukrishnan R.**, Gosrich W., Kumar V., Ribeiro A. (2025). LPAC: Learnable Perception-Action-Communication Loops with Applications to Coverage Control. Accepted to *IEEE Transactions on Robotics.*

Arnold T.C.*, **Muthukrishnan R.***, Pattnaik A.R., Gibson A., Sinha N., Das S., Litt B., Englot D.J., Morgan V.L., Davis K.A., Stein J.M. (2022). Deep learning-based automated segmentation of resection cavities on postsurgical epilepsy MRI. *NeuroImage: Clinical.*
Denotes equal contribution

Muthukrishnan R., Heyler A., Katti K., Pati S., Mankowski W., Alahari A., Sanborn M., Conant E.F., Chaudhari P., Kontos D., Bakas S. (2022). MammoFL: mammographic breast density estimation using federated learning. *arXiV.*

Xie K., Gallager R.S., Conrad E.C., Garrick C.O., Baldassano S.N., Bernabei J.M., Galer P.D., Ghosn N.J., Greenblatt A.S., Jennings T., Kornspun A., Kulick-Soper C.V., Panchal J.M., Pattnaik A.R., Scheid B.H., Wei D., Weitzman M., **Muthukrishnan R.**, Kim J., Litt B., Ellis C.A., Roth D. (2022). Extracting seizure frequency from epilepsy clinic notes: a machine reading approach to natural language processing. *Journal of the American Medical Informatics Association: JAMIA,* ocac2018.

PRESENTATIONS AND POSTERS

Muthukrishnan R., Billot B., Gagoski B., Firenze M., Soldatelli M., Grant P.E., Golland P. (2025). 3D fetal head pose estimation from MRI navigators with equivariant neural networks. Presented poster at *2025 ISMRM & ISMRT Annual Meeting & Exhibition.*

Kohler C., Vaska N., **Muthukrishnan R.**, Choi W., Park J.Y., Goodwin J., Caceres R., Walters R. (2023). Symmetric Models for Radar Response Modeling. In *Proceedings of the 2nd NeurIPS Workshop on Symmetry and Geometry in Neural Representations.*

Muthukrishnan R., Goodwin J., Kern A., Vaska N., Caceres R. (2023). InvRT: solving radar inverse problems with transformers. Presented orally at *2nd AAAI Workshop on AI to Accelerate Science and Engineering.*

Arnold T.C.*, **Muthukrishnan R.***, Gibson A., Davis K.A., Litt B., Stein J.M. (2021). DeepResection: automated segmentation of postoperative epilepsy neuroimaging. Poster presented at *59th Annual Meeting of the American Society of Neuroradiology*.