AISHWARYA H. BALWANI

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RESEARCH INTERESTS

Theoretical & Computational Neuroscience, Machine Learning

- Analysis of Artificial & Biological Neural Networks
- Sparse, Low-Rank & Low-Dimensional Representations of Data
- Transferability, Interpretability & Generalizability of Features in Deep Neural Networks
- Group & Representation Theory, Differential Geometry & Topology

EDUCATION

Georgia Institute of Technology

- PhD, Electrical & Computer Engineering, 2018-Present.
  Minor: Mathematics
- MS, Electrical & Computer Engineering, 2016-2018.

University of Mumbai

- BE, Electronics & Telecommunication, 2012-2016. (First Class with Distinction)

PUBLICATIONS, PREPRINTS & PEER REVIEWED ABSTRACTS

Publications

- Miano J.*, **Balwani A.***, Liu R., Kitchell L., Prasad J., Johnson E., Gray-Roncal W., & Dyer E. "Multi-Scale Modeling and Segmentation of Neural Structure in Thalamocortical X-ray Imagery" to appear, *IEEE International Conference on Image Processing (ICIP)*, 2021.
- Prasad, J., **Balwani, A.**, Johnson, E., Miano, J., Sampathkumar, V., De Andrade, V., ... & Dyer, E. "A three-dimensional thalamocortical dataset for characterizing brain heterogeneity." *Nature Scientific Data*, 2020.
- Liu, R., Subakan, C., **Balwani, A.**, Whitesell, J., Harris, J., Koyejo, S., & Dyer, E. "A generative modeling approach for interpreting population-level variability in brain structure." *International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*, 2020.
- **Balwani, A.**, & Dyer E. "Modeling variability in brain architecture with deep feature learning." *2019 53rd Asilomar Conference on Signals, Systems, and Computers. IEEE*, 2019.
- Milligan K., **Balwani A.**, Dyer E. "Brain Mapping at High Resolutions: Challenges and Opportunities." *Current Opinion in Biomedical Engineering*, 2019.
- Lee T., Kumar A., **Balwani A.**, Brittain D., Kinn S., Tovey C., Dyer E., da Costa N., Reid R., Forest C., & Bumbarger D. "Large-scale neuroanatomy using LASSO: Loop based Automated Serial Sectioning Operation." *PloS one*, 13.10, 2018.

Preprints

- **Balwani A.**, & Dyer E. "A Deep Feature Learning Approach for Mapping the Brain's Microarchitecture and Organization." *bioRxiv*, 2020.

In Preparation

- **Balwani A.**, Miano J., Liu R., Prasad J., Johnson E., Gray-Roncal W., & Dyer E. "Modeling Neural Structure Across Multiple Spatial Scales with Multi-Task Representation Learning."
- **Balwani A.**, & Dyer E. "Revealing Multi-Scale Latent Factors of Neural Structure using Representational Geometry."

Workshop Papers & Peer Reviewed Abstracts

- **Balwani A.**, & Dyer E. "Modeling Brain Microarchitecture with Deep Representation Learning." (Poster), *ML Interpretability for Scientific Discovery, ICML*, 2020.
- **Balwani A.**, Miano J., Prasad J., & Dyer E. "Learning to Segment at Multiple Scales." (Poster), *BioImage Informatics*, 2019.
- Milligan K., **Balwani A.**, Maguire A., Margulies S., & Dyer E. "Deep Learning for Characterization of Neuroinflammation in Traumatic Brain Injury." (Poster), *BioImage Informatics*, 2019.

RESEARCH & WORK EXPERIENCE

- Graduate Research Assistant, Georgia Institute of Technology
  - Summer 2021 – Present: Predictive coding and the role of feedback in cortical microcircuits, Dimensionality of representations in neural networks across learning and brain areas.
  - Summer 2018 – Spring 2021: Representation learning, Transfer/Meta and Multi-task learning, Sparse and low-rank representations of data, Models of brain structure and organization.
- Graduate Student, Georgia Institute of Technology
  - Meta-learning biologically plausible update rules for unsupervised and semi-supervised representation learning (Spring 2021)
  - Modeling visual invariance with group-theoretic regularization (Spring 2021)
  - Neural event recovery from noisy data via sparse deconvolution (Spring 2018)
  - Deep learning in autonomous driving (Fall 2017)
- R&D Intern (Algorithms Team), Intellifusion, China (Summer 2017)
  - Areas of Research: Image Processing, Digital Signal Processing, Machine Learning, Data Compression and Encryption.

TEACHING & MENTORING EXPERIENCE

Teaching Assistant

- Professional and Technical Communications for ECE, Georgia Tech (Summer 2021)
- Data Analytics for Engineers, Georgia Tech (Fall 2019, 2018)
- Hands-On Tech Day Camp, Georgia Tech (June 2019)
- Deep Learning for Microscopy Image Analysis, Marine Biological Laboratory (May 2019)
- Mathematical Foundations for Data Science, Georgia Tech (Spring 2018)

Junior Instructor

- Embedded Systems & IoT, Eduvance (Summer 2016)

HONOURS & AWARDS

Academic Awards & Fellowships

- ECE Coulter MS Fellowship, Georgia Institute of Technology, 2016-2017

Competitions & Hackathons

- Winner (Technical Track) – Hacklytics, Data Science at Georgia Tech, 2019
- Winner (Best Project) – AI/ML for Social Good Hackathon at Georgia Tech, 2018
- Gold Award - IEEE UBTech-Education Robotics Design Challenge, 2017

Registration & Travel Awards

- ICML Diversity and Inclusion Fellowship, 2020

PROFESSIONAL SERVICE

Reviewing

- Journals: Distill
- Workshops: Workshop on Geometrical and Topological Representation Learning (ICLR 2021), Topological Data Analysis and Beyond (NeurIPS 2020), Lifelong Learning Workshop (ICML 2020), Workshop on Continual Learning in Computer Vision (CVPR 2020, 2021)
- Other: Neuromatch Academy 2020, President's Undergraduate Research Awards – Georgia Tech (Spring 2020, 2021; Summer 2021; Fall 2020)

Professional & Student Organizations

- Senator (ECE), Graduate Student Association, Georgia Institute of Technology, 2017-2018

WORKSHOPS & SEMINARS

Attendee

- Banach Center – Oberwolfach Graduate Seminar: Mathematics of Deep Learning, Institute of Mathematics, Polish Academy of Sciences (November 2019)
- Foundation of Data Science Summer School, Georgia Institute of Technology (August 2019)
- Spinning Up in RL Workshop, OpenAI (February 2019)