## Savan Ghosal

Contact
Information

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## Professional Summary

- Data science researcher with 5+ years of experience in high dimensional data analysis which involves building data modality agnostic robust and interpretable models for medical image analysis.
- Developed and built a collaborative network with scientists across the globe, and engaged in multiple collaborative projects which led to 5 publications in peer reviewed conferences and journals.
- Passionate about finding practical and innovative solutions for different machine learning problems like classification, prediction through data-driven learning and inference on real life data.

#### EDUCATION

Department of Electrical And Computer Engineering, Johns Hopkins University, Ph.D., 2022 (expected)

• Advisor: Prof. Archana Venkataraman

Department of Applied Mathematics And Statistics, Johns Hopkins University, M.S.E., Spring 2021 (expected)

• GPA: 4.0/4.0 (ongoing)

# Department of Electronics and Telecommunication Engineering, Jadavpur University, B.E., 2017

- Honors Thesis: A novel non-rigid registration method for zebrafish larval images
- Advisor: Prof. Ananda Shankar Chowdhury
- CGPA: 9.3/10.0

## RESEARCH INTERESTS

Diagnostic Modeling, Multiview Learning, Machine Learning, Deep Learning

## RESEARCH SKILLS

- Predictive Modeling.
- Designing robust optimization algorithms.
- Building data modality agnostic transferable and generalizable models.
- Handling large p, small n problems
- Generative-discriminative modelling.
- Handling missing data.
- Incorporating hierarchical structures in deeplearning models.
- Developing interpretable feature detection techniques.

## RESEARCH EXPERIENCE

#### Johns Hopkins University

Graduate Research Assistant

2017 -

Advisor: Prof. Archana Venkataraman, Department of Electrical and Computer Engineering

- G-MIND: An End-to-End Multimodal Imaging-Genetics Framework for Biomarker Identification and Disease Classification
  - Developed a novel deep neural network to integrate high dimensional multimodal data like brain imaging and genetics data.
  - Performed a classification task, while handling missing data.

- Identified and ranked features using an interpretable network.
- Bridging Imaging, Genetics, and Diagnosis in a Coupled Low-Dimensional Framework
  - Designed a novel generative-discriminative model for disease classification and feature selection.
  - Developed an ADMM based robust optimization strategy that enhances the reproducibility of the model.
  - Incorporated biological structures by using the interconnectedness information of different features.
- A Generative-Predictive Framework to Capture Altered Brain Activity in fMRI and its Association with Genetic Risk: Application to Schizophrenia
  - Implemented a generative-predictive framework that captures the differences in regional brain activity between a neurotypical cohort and a clinical population.
  - Incorporated polygenic risk scores to identify neuroimaging endophenotypes.

## University of Alberta, Canada

Research Assistant

2016

Advisor: Prof. Nilanjan Ray, Department of Computing Science Science.

- Deep Deformable Image Registration
  - Implemented a deep deformable registration algorithm for MRI images.
  - Improved the non-convex optimization of diffeomorphic demons by introducing Fully Convolutional Neural Networks (FCNN).

## Jadavpur University, India & University of Padova, Italy

Undergraduate Researcher

2015-2017

Advisor: Prof. Ananda Shankar Chowdhury, Department of Electronics and Telecommunication Engineering.

- A novel non-rigid registration method for zebrafish larval images
  - Proposed an unique patch based coarse-to-fine algorithm for non-rigid registration of volumetric zebrafish larval image datasets.
  - An overlapping patch based approach was taken to find accurate correspondence using minimum weight bipartite graphs.

### Publications

- **S. Ghosal**, *et al.*, "A Generative-Discriminative Framework that Integrates Imaging, Genetic, and Diagnosis into Coupled Low Dimensional Space", NeuroImage 2021. (In submission)
- **S. Ghosal**, et al., "G-MIND: An End-to-End Multimodal Imaging-Genetics Framework for Biomarker Identification and Disease Classification", Proc. SPIE, Medical Imaging 2021: Image Processing. arXiv:2101.11656

#### Selected for Special Oral Presentation ("Deep Dive")

- S. Ghosal, et al., "Bridging Imaging, Genetics, and Diagnosis in a Coupled Low-dimensional Framework", in MICCAI: Medical Image Computing and Computer Assisted Intervention, 2019. Selected for Early Acceptance
- **S. Ghosal**, et al., "A generative-predictive framework to capture altered brain activity in fMRI and its association with genetic risk: application to Schizophrenia", Proc. SPIE 10949, Medical Imaging 2019: Image Processing.

Sayan Ghosal, Nilanjan Ray, Deep deformable registration: Enhancing accuracy by fully convolutional neural net, Pattern Recognition Letters.

**S. Ghosal**, et al., "A novel non-rigid registration algorithm for zebrafish larval images," 2017 39th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC).

REVIEWER ACTIVITY  $\bullet$  NeuroImage

• MICCAI: Intl Conference on Medical Image Computing and Computer Assisted Intervention

TUTORING AND MENTORSHIP • HopHacks2020 (Mentor) • Signals, Systems and Learning (TA)

HONORS AND AWARDS

• MICCAI Student Participation Award

2020

• Mitacs Globalink Research Fellowship Award

2016

Relevant Skills

Programming Languages: MATLAB, Python, LATEX

Libraries: PyTorch