

# Shantanu Ghosh<sup>(he/him)</sup>

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https://shantanu-ai.github.io/ • Google scholar

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## Research Interests

**Method:** Robustness, Generalization, Trustworthy Machine Learning, Multimodal learning, Explainable AI.

**Applications:** Joint modeling of medical images (chest-X-rays or 2D mammograms) and reports for lung diseases (e.g., pneumonia) and breast cancer predictions.

## Education

### Boston University

Doctor of Philosophy, Electrical Engineering

Advisor(s): [Dr. Kayhan Batmanghelich](#)

Boston, Massachusetts, USA

Jan 2023 – Dec 2026 (Expected)

### University of Pittsburgh (Transferred to BU)

Doctor of Philosophy, Intelligent Systems

Advisor(s): [Dr. Kayhan Batmanghelich](#)

Pittsburgh, Pennsylvania, USA

Aug 2021 – Dec 2022

### Carnegie Mellon University

PCHE Cross registered student

**Courses:** Foundations of Causation and Machine Learning (PHI 80625) and Visual Learning and Recognition (RI 16824)

Pittsburgh, Pennsylvania, USA

Aug 2021 – Dec 2022

### University of Florida

Master of Science, Computer Science, **3.88/4.00**

Advisor: [Dr. Mattia Proserpi](#)

Gainesville, Florida, USA

Aug 2019 – May 2021

## Publications

### Under-review/Preprint

- [P2] **Semantic Consistency-Based Uncertainty Quantification for Factuality in Radiology Report Generation**

Chenyu Wang, Weichao Zhou, **Shantanu Ghosh**, Kayhan Batmanghelich, Wenchao Li

- [P1] **LADDER: Language Driven Slice Discovery and Error Rectification**

**Shantanu Ghosh**, Rayan Syed, Chenyu Wang, Clare B. Poynton, Shyam Visweswaran, Kayhan Batmanghelich  
[\[Paper\]](#) [\[Code\]](#)

### Conference Proceedings

- [C6] **Mammo-CLIP: A Vision Language Foundation Model to Enhance Data Efficiency and Robustness in Mammography**

**Shantanu Ghosh**, Clare B. Poynton, Shyam Visweswaran, Kayhan Batmanghelich

International Conference on Medical Image Computing and Computer Assisted Intervention (**MICCAI**), 2024.  
(Early accept, top 11%) [\[Project\]](#) [\[Paper\]](#) [\[Code\]](#)

- [C5] **Distilling BlackBox to Interpretable models for Efficient Transfer Learning**

**Shantanu Ghosh**, Ke Yu, Kayhan Batmanghelich

International Conference on Medical Image Computing and Computer Assisted Intervention (**MICCAI**), 2023.  
(Early accept, top 14%) [\[Project\]](#) [\[Paper\]](#) [\[Code\]](#)

- [C4] **Dividing and Conquering a BlackBox to a Mixture of Interpretable Models: Route, Interpret, Repeat**

**Shantanu Ghosh**, Ke Yu, Forough Arabshahi, Kayhan Batmanghelich

International Conference on Machine Learning (**ICML**), 2023. [\[Project\]](#) [\[Paper\]](#) [\[Code\]](#)

- [C3] ***DR-VIDAL - Doubly Robust Variational Information-theoretic Deep Adversarial Learning for Counterfactual Prediction and Treatment Effect Estimation***  
**Shantanu Ghosh**, Zheng Feng, Jiang Bian, Kevin Butler, Mattia Prosperi  
 American Medical Informatics Association (**AMIA**) Symposium, 2022 (**Oral**). [\[Paper\]](#) [\[Code\]](#)
- [C2] ***Anatomy-Guided Weakly-Supervised Abnormality Localization in Chest X-rays***  
 Ke Yu, **Shantanu Ghosh**, Zhexiong Liu, Christopher Deible, Kayhan Batmanghelich  
 International Conference on Medical Image Computing and Computer Assisted Intervention (**MICCAI**), 2022. [\[Paper\]](#) [\[Code\]](#)
- [C1] ***Causal AI with Real World Data: Do Statins Protect From Alzheimer's Disease Onset?***  
 Mattia Prosperi, **Shantanu Ghosh**, Zhaoyi Chen, Marco Salemi, Tianchen Lyu, Jiang Bian  
 International Conference on Medical and Health Informatics (**ICMHI**), 2021. [\[Paper\]](#)

## Journal Articles

- [J3] ***Anatomy-specific Progression Classification in Chest Radiographs via Weakly-Supervised Learning***  
 Ke Yu, **Shantanu Ghosh**, Zhexiong Liu, Clare Poynton, Christopher Deible, Kayhan Batmanghelich  
 Radiology: Artificial Intelligence, (**RAD: AI**), **IF:8.1**, 2024 [\[Paper\]](#) [\[Code\]](#).
- [J2] ***Propensity Score Synthetic Augmentation Matching using Generative Adversarial Networks (PSSAM-GAN)***  
**Shantanu Ghosh**, Christina Boucher, Jiang Bian, Mattia Prosperi  
 Journal of Computer Methods and Programs in Bio-medicine Update, 2021. [\[Paper\]](#) [\[Code\]](#)
- [J1] ***Deep Propensity Network using a Sparse Autoencoder for Estimation of Treatment Effects***  
**Shantanu Ghosh**, Jiang Bian, Yi Guo, Mattia Prosperi  
 Journal of the American Medical Informatics Association (**JAMIA**), **IF:4.7**, 2021. [\[Paper\]](#) [\[Code\]](#)

## Peer reviewed workshops

- [W3] ***Distributionally robust self-supervised learning for tabular data***  
**Shantanu Ghosh**, Tiankang Xie, Mikhail Kuznetsov  
 Table Representation Learning Workshop (**TRL**), NeurIPS, 2024. [\[Paper\]](#) [\[Code\]](#)
- [W2] ***Tackling Shortcut Learning in Deep Neural Networks: An Iterative Approach with Interpretable Models***  
**Shantanu Ghosh**, Ke Yu, Forough Arabshahi, Kayhan Batmanghelich  
 Workshop on Spurious Correlations, Invariance and Stability (**SCIS**), ICML, 2023. [\[Paper\]](#) [\[Poster\]](#)
- [W1] ***Bridging the Gap: From Post Hoc Explanations to Inherently Interpretable Models for Medical Imaging***  
**Shantanu Ghosh**, Ke Yu, Forough Arabshahi, Kayhan Batmanghelich  
 Workshop on Interpretable Machine Learning in Healthcare (**IMLH**), ICML, 2023. [\[Paper\]](#) [\[Poster\]](#)

## Research Experience

### Boston University

Graduate Research Assistant

Boston, Massachusetts, USA

Batman Lab

Jan 2023 – Present

- **Advisor(s):** [Dr. Kayhan Batmanghelich](#)
- **Research Area:** Explainable AI; Computer Vision; Medical Imaging.
- Currently developing a slice discovery and mitigation algorithm using vision language (VLM) models and LLMs to reason and fix classifier's mistakes.
- Developed the first vision language foundation model for 2D mammograms [C6]. (**Early**) **Accepted at MICCAI, 2024**
- Applied the mixture of interpretable models to (1) eliminate the class imbalance problem and (2) enable efficient transfer learning to an unseen domain with limited training data [C5]. (**Early**) **Accepted at MICCAI, 2023.**

## University of Pittsburgh

### Graduate Student Researcher

Batman Lab

Pittsburgh, Pennsylvania, USA

Aug 2021 – Dec 2022

- **Advisor(s):** [Dr. Kayhan Batmanghelich](#), [Dr. Forough Arabshahi](#)
- **Research Area:** Explainable AI; Computer Vision; Medical Imaging.
- Introduced an iterative algorithm to carve out a mixture of interpretable models from a Blackbox, each specializing in a different subset of data to provide instance-specific First-order logic-based explanations using human-understandable concepts. Also, our method detected and removed the shortcuts, enhancing robustness [C4]. **Accepted at ICML, 2023.**
- Localized Pneumonia and Pneumothorax from **MIMIC-CXR** dataset by leveraging the anatomical landmarks (weak labels) using the **Stanford RadGraph NLP pipeline** [C2, J3]. **Accepted at MICCAI, 2022.**
- Investigated why **lottery ticket hypothesis** works using: **Concept activation vectors (TCAV)** and **Grad-CAM**. [\[Code\]](#) [\[Report\]](#)

## University of Florida

### Graduate Research Assistant

Florida Institute for Cybersecurity (FICS) Research

Gainesville, Florida, USA

Mar 2021 – Jul 2021

- **Advisor(s):** [Dr. Mattia Prosperi](#), [Dr. Kevin Butler](#)
- **Research Area:** Causal Inference, Deep Learning.
- Developed a novel deep learning framework to (1) generate the counterfactual outcomes based on treatment using a Generative Adversarial Network with **information-theoretic** regularization; (2) utilized the counterfactual outcomes to estimate the individual treatment effect (ITE) using **doubly robust optimization** for faster convergence [C1]. **Accepted at AMIA Symposium (Oral), 2022.**

## University of Florida

### Research Assistant

Data Intelligence Systems Lab (DISL)

Gainesville, Florida, USA

Jan 2020 – Feb 2021

- **Advisor(s):** [Dr. Mattia Prosperi](#), [Dr. Jiang Bian](#)
- **Research Area:** Causal Inference, Deep Learning.
- Designed a novel algorithm using a Generative Adversarial Network to generate synthetic treated samples to remove imbalance within an observational dataset for **P propensity score matching** [J2]. **Accepted at Computer Methods and Programs in Bio-medicine Update.**
- Developed a **sparse autoencoder** to reduce the dimensionality of the covariates of the patients to calculate the **P propensity score** in an efficient way to estimate the average treatment effect (ATE) of the treatment [J1]. **Accepted at JAMIA**

## Industry Experience

### Amazon

#### Applied Scientist II Intern

AWS, Security Analytics and AI Research (SAAR). Mentor: [Dr. Mikhail Kuznetsov](#)

NYC, New York, USA

Jun 2024 – Sep 2024

- Developed a framework to learn robust representations to fix systematic errors in pre-trained self-supervised models for tabular data. Publication at **TRL@NeurIPS 2024**. Patent under-review.

### Lexmark International India Pvt Ltd

#### Software Engineering Professional II

Kolkata, India

Oct 2016 – Jul 2019

- Developed the ISP component of the product **Publishing Platform for Retail (PPR)**.

### Cognizant Technology Solutions India Pvt Ltd

#### Associate, Projects

Kolkata, India

Mar 2013 – Sep 2016

- Developed **WCF** web services in the Contract First Approach using Service Oriented Architecture.

## Skills

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- **Languages.** Python, C/C++, Java, C#/.Net, Javascript, HTML/CSS
- **Machine Learning.** TensorFlow, PyTorch, Scikit-learn
- **Web Development.** Angular, Node.js, WCF
- **Database.** MySQL, Oracle 9i/10g, MS SQL Server, DB2

## Graduate Courses

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- Fundamentals of Machine Learning
- Machine Learning
- Advanced Machine Learning
- Deep Learning for Computer Graphics
- Causal Inference and Machine Learning
- Visual Learning and Recognition
- Mathematics for Intelligent Systems
- Fundamentals of Probability
- Numerical Optimization
- Analysis of Algorithms
- Advanced Data Structures

## Honors & Awards

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- Received the **Achievement Award** of 4500 USD during the admission of graduate studies in the University of Florida in Fall 2019.
- Received the **Star Employee** award in Q4, 2013 and Q4, 2015 in Cognizant Technology Solutions.

## Academic Service

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### Journal Review.....

Journal of Biomedical Informatics (JBI), Medical Image Analysis (MedIA), Journal of the American Medical Informatics Association (JAMIA), Journal of Computer Methods and Programs in Biomedicine (CMPB), Biometrical Journal, Information Fusion

### Conference Review.....

ICLR (2024, 2025), AAAI (2024, 2025), AISTATS (2025), NeurIPS (2023, 2024), MICCAI (2024), CVPR (2024, 2025), CLeaR (2024, 2025), ACM BCB (2022)

### Workshop Review.....

GenAI4Health@NeurIPS (2024), CRL@NeurIPS (2023), SCIS@ICML (2023), IMLH@ICML (2023)

## Teaching Experience

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- Introduction to Software Engineering (EC 327) - Fall 2023
- Deep Learning (EC 523) - Fall 2024

## Student Mentoring

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- [Rayan Syed](#), Undergraduate Student, Boston University
- [Abhishek Varshney](#), Masters Student, Boston University
- [Akshat Gurbuxani](#), Masters Student, Boston University

## Talks

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- *DR-VIDAL for Counterfactual Prediction and Treatment Effect Estimation*, Oral Talk, AMIA 2022 Annual Symposium, Nov 2022 [\[Talk\]](#) [\[Slides\]](#)
- *Divide and Conquer: Carving Out Concept-based Models out of BlackBox for More Efficient Transfer Learning*
  - Fall ISP AI Forum, University of Pittsburgh, Nov 2023 [\[Talk\]](#) [\[Slides\]](#)
  - MedAI Group, Stanford University, Oct 2024 [\[Talk\]](#) [\[Slides\]](#)