

Shantanu Ghosh^(he/him)

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https://shantanu-ai.github.io/ • 📄 Google scholar
Last updated on June 19, 2024

Research Interests

Reasoning in vision language models, Explainable AI (X-AI), Computer Vision, Medical Imaging.

Education

Boston University <i>Doctor of Philosophy, Electrical Engineering</i> Advisor(s): Dr. Kayhan Batmanghelich	Boston, Massachusetts, USA <i>Jan 2023 – Dec 2026 (Expected)</i>
University of Pittsburgh (Transferred to BU) <i>Doctor of Philosophy, Intelligent Systems</i> Advisor(s): Dr. Kayhan Batmanghelich	Pittsburgh, Pennsylvania, USA <i>Aug 2021 – Dec 2022</i>
Carnegie Mellon University <i>PCHE Cross registered student</i> Courses: Foundations of Causation and Machine Learning (PHI 80625) and Visual Learning and Recognition (RI 16824)	Pittsburgh, Pennsylvania, USA <i>Aug 2021 – Dec 2022</i>
University of Florida <i>Master of Science, Computer Science, 3.88/4.00</i> Advisor: Dr. Mattia Prosperi	Gainesville, Florida, USA <i>Aug 2019 – May 2021</i>

Publications

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%) [\[Paper\]](#) [\[Code\]](#)
- [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**).
- [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**), 2021. [\[Paper\]](#) [\[Code\]](#)

Peer reviewed workshops.....

- [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 algorithm using vision language (VLM) multimodal model (e.g., CLIP) to reason why a classifier makes mistakes while detecting breast cancer using breast mammograms and explain with large language models (LLMs).
- Continuing my research by applying the mixture of interpretable models on a real-world Chest-X-Ray dataset – MIMIC-CXR to (1) eliminate the class imbalance problem; (2) transfer efficiently to an unseen domain with limited training data. **(Early) Accepted at MICCAI, 2023.**

University of Pittsburgh.....

Graduate Student Researcher

Pittsburgh, Pennsylvania, USA

Batman Lab

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 effectively detected and removed the shortcut (biased) concepts from the Blackbox, making it robust. **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**. **Accepted at MICCAI, 2022.**
- Investigated why **lottery ticket hypothesis** works or fails in terms of explainability metrics – **Concept activation vectors (TCAV)** and **Grad-CAM** based saliency maps. [\[Code\]](#) [\[Report\]](#)

University of Florida

Graduate Research Assistant

Gainesville, Florida, USA

Florida Institute for Cybersecurity (FICS) Research

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. **Accepted at AMIA Symposium (Oral), 2022.**

University of Florida

Research Assistant

Gainesville, Florida, USA

Data Intelligence Systems Lab (DISL)

Jan 2020 – Feb 2021

- **Advisor(s):** Dr. Mattia Prosperi, Dr. Jian 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 **Propensity score matching**. **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 **Propensity score** in an efficient way to estimate the average treatment effect (ATE) of the treatment. **Accepted at JAMIA.**

Industry Experience

Amazon

Applied Scientist Intern

NYC, New York, USA

AWS, Security Analytics and AI Research (SAAR)

Jun 2024 – Sep 2024

- Discovering systematic errors in self-supervised models for AWS logs.

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

- **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

- 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

- 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

Journal Review

- Medical Image Analysis (MedIA)
- Journal of the American Medical Informatics Association (JAMIA)
- Journal of Computer Methods and Programs in Biomedicine (CMPB)
- Biometrical Journal

Conference Review

- Medical Image Computing and Computer Assisted Intervention (MICCAI) 2024
- IEEE / CVF Computer Vision and Pattern Recognition Conference (CVPR) - 2024
- Causal Learning and Reasoning (CLearR) - 2024
- International Conference on Learning Representations (ICLR) - 2024
- Association for the Advancement of Artificial Intelligence (AAAI) - 2024
- Neural Information Processing Systems (NeurIPS) - 2023, 2024
- ACM Conference on Bioinformatics, Computational Biology, and Health Informatics (BCB) - 2022

Workshop Review

- Workshop on Causal Representation Learning workshop (CRL), NeurIPS 2023
- Workshop on Spurious Correlations, Invariance and Stability (SCIS), ICML - 2023
- Workshop on Interpretable Machine Learning in Healthcare (IMLH), ICML - 2023

Teaching Experience

Introduction to Software Engineering (EC 327) - Fall 2023

Talks

- Oral Talk, AMIA 2022 Annual Symposium, Nov 2022 [\[Talk\]](#) [\[Slides\]](#)
- Fall ISP AI Forum, University of Pittsburgh, Nov 2023 [\[Talk\]](#) [\[Slides\]](#)