Shantanu Ghosh

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Shantanu Ghosh • Last updated on October 27, 2022

Research Interests

Explainable AI; Computer Vision; Medical Imaging; Deep Learning; Causal Inference

Education

University of Pittsburgh **Pittsburgh, Pennsylvania, USA**
Doctor of Philosophy, Intelligent Systems *August 2021 – Present*
Advisor(s): Dr. Kayhan Batmanghelich

Carnegie Mellon University **Pittsburgh, Pennsylvania, USA**
PCHE Cross registered student, ***4.11/4.00*** *August 2021 – Jan 2023*
Courses*: Foundations of Causation and Machine Learning (PHI 80625) and Visual Learning and Recognition (RI 16824)*

University of Florida **Gainesville, Florida, USA**
Master of Science, Computer Science, ***3.88/4.00*** *August 2019 – May 2021*
Advisor: Dr. Mattia Prosperi

Research Experience

Batman Lab

Graduate Student Researcher **Pittsburgh, Pennsylvania**
University of Pittsburgh *May 2021 –Present*

- **Advisor(s):** Dr. Kayhan Batmanghelich
- **Research Area**: Explainable AI; Causal Inference; Computer Vision; Medical Imaging.
- Currently developing novel algorithm to explain the prediction of a black box classifier periodically with the help of network pruning using **lottery ticket hypothesis**. In this project, we want to extract the explainable concepts from a black-box deep learning model iteratively using a neuro-symbolic explainable model. Also, we aim to extract the shortcut (biased) concepts from the black-box through the concepts and iteratively remove them from the features of the black-box.
- Conducted research to leverage the anatomical landmarks (weak labels) from **Stanford RadGraph NLP pipleline** to create an attention driven algorithm to detect Pneumonia and Pneumothorax from **MIMIC-CXR** dataset.

Florida Institute for Cybersecurity Research (FICS)

Graduate Research Assistant **Gainesville, Florida**
University of Florida *Jan 2021 – May 2021*

- **Advisor(s):** Dr. Kevin Butler
- **Research Area**: Causal Inference, Adversarial Machine Learning.
- Designed a robust deep learning model amalgamating the theories of **Causal Graphs** and **Deep Variational Information Bottleneck**.
- Developed robust deep learning models using Causal Inference and performed adversarial attacks on them.
- Replicated the experiments discussed in the papers **"Deep Variational Information Bottleneck"** (Alemi et al.) and **"A Causal View on Robustness of Neural Networks"** (Zhang et al.) in **Pytorch**.

Data Intelligence Systems Lab (DISL)

Research Assistant **Gainesville, Florida**
University of Florida *Feb 2020 – Dec 2020*

- **Advisor(s):** Dr. Mattia Prosperi, Dr. Jian Bian
- **Research Area**: Causal Inference, Deep Learning.
- Performed research on developing models for estimating the Individual Treatment Effect (ITE) using **Doubly Robust estimation** and **Information Theoretic Deep Generative models**.
- Performed research on calculation of Propensity Scores using deep **Sparse Autoencoder** based model.
- Developed a novel algorithm using **Generative Adversarial Networks** to generate synthetic treated samples to remove imbalance within a observational dataset for Propensity score matching.

Multimedia Communications and Networking Laboratory (MCN)

Independent Researcher **Gainesville, Florida**
University of Florida *Feb 2020 – May 2020*

- **Advisor(s):** Dr. Dapeng (Oliver) Wu
- **Research Area**: Computer Vision, Multitask Learning.
- Developed a Deep Convolutional Multitask Neural Network(**MTL-TCNN**) to classify textures under the supervision of Dr Prof Dapeng Oliver Wu of the Department of Electrical & Computer Engineering in the University of Florida. **[Report] [Code]**

Publications

Conference Proceedings

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

Journal Articles

1. ***Propensity Score Synthetic Augmentation Matching using Generative Adversarial Networks (PSSAM-GAN)*** **[Code]**
   Shantanu Ghosh, Christina Boucher, Jiang Bian, Mattia Prosperi
   Journal of Computer Methods and Programs in Bio-medicine Update, 2021
2. ***Deep Propensity Network using a Sparse Autoencoder for Estimation of Treatment***

***Effects* [Code]**
Shantanu Ghosh, Jiang Bian, Yi Guo, Mattia Prosperi
Journal of the American Medical Informatics Association, 2021

Industry Experience

Lexmark International India Pvt Ltd

Software Engineering Professional II **Kolkata, India**
Oct 2016 – July 2019

- Worked as a full stack developer to develop the ISP component of the product Publishing Platform for Retail(PPR) using **C# .Net 4.5**, **Angular**, **HTML5** and **SQL Server** with active participation in 2 major releases. Performed unit testing using **Jasmine/Karma Framework**.
- Worked on the Lexmark Digital Media Platform, a multi-tenant enterprise video content management platform hosted in Amazon Web Services.

Cognizant Technology Solutions India Pvt Ltd

Associate, Projects **Kolkata, India**
March 2013 – September 2016

- Worked as a senior developer to develop WCF web services in the Contract First Approach to provide a secure communication channel between the different In-house applications using Service Oriented Architecture (SOA), C# .Net 4.5, Oracle Client 11g.
- Trained C# to new recruits in Cognizant Academy.

Skills

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

Graduate Courses

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