

Shantanu Ghosh

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Research Interests

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

Education

University of Pittsburgh

Doctor of Philosophy, Intelligent Systems

Advisors: Dr. Kayhan Batmanghelich, Dr. Sofia Triantafillou

Pittsburgh, Pennsylvania

August 2021 – Present

University of Florida

Master of Science, Computer Science, 3.88/4.00

Advisor: Dr. Mattia Proserpio

Gainesville, Florida

August 2019 – May 2021

West Bengal University of Technology

Bachelor of Technology

Computer Science and Engineering, 8.38/10.00

Kolkata, India

Aug, 2008 – June, 2012

Research Experience

Batman Lab

Graduate Student Researcher

University of Pittsburgh

Pittsburgh, Pennsylvania

May 2021 – Present

○ **Advisors:** Dr. Kayhan Batmanghelich, Dr. Sofia Triantafillou

○ **Research Area:** Explainable AI; Causal Inference; Computer Vision; Medical Imaging.

Florida Institute for Cybersecurity Research (FICS)

Graduate Research Assistant

University of Florida

Gainesville, Florida

Jan 2021 – May 2021

○ **Advisor:** 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

University of Florida

Gainesville, Florida

Feb 2020 – Dec 2020

- **Advisors:** 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

University of Florida

Gainesville, Florida

Feb 2020 – May 2020

- **Advisor:** 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. **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.

Journal Articles.....

1. **Propensity Score Synthetic Augmentation Matching using Generative Adversarial Networks (PSSAM-GAN) [Code]**
Shantanu Ghosh, 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 2019

- 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.

Course Projects

Dataset augmentation using InfoGAN and CGAN.....

Deep Learning for Computer Graphics

Gainesville, Florida

University of Florida

Oct 2020 – Dec 2020

- Implemented dataset augmentation on MNIST and CIFAR10 using InfoGAN and ConditionalGAN to improve the classification accuracy of an image classifier. **[Report]** **[Code]**

Deep Colorization with CNN.....

Deep Learning for Computer Graphics

Gainesville, Florida

University of Florida

Oct 2020 – Nov 2020

- Designed a deep CNN which is trained to color grayscale face images with one channel and size 128 x 128 per image to produce a full-colored image with 3 channels. We transformed the RGB image to LAB colorspace (Lightness, A, and B) which was easier to extract the lightness channel from the image that would be then fed into CNN to predict the color values of the image using regression. **[Report]** **[Code]**

Hashtag Counter.....

Advanced Data Structures

Gainesville, Florida

University of Florida

March 2020 – April 2020

- Implemented a system to find the most popular hashtags that appear on social media using Max Fibonacci Heap data structure and a max priority structure to find out the most popular hashtags. Tested the code with 1M hashtags. **[Report]** **[Code]**

Classification of Handwritten Characters

Fundamentals of Machine Learning

Gainesville, Florida

University of Florida

Oct 2019 – Dec 2019

- Inspired by the famous architecture "Lenet-5", developed a deep CNN model to classify Handwritten Characters using a custom Handwritten Character Dataset prepared by Prof Alina Zare by utilizing the Adam Optimizer, Batch Normalization and dropout and achieved a classification accuracy of **97.3%** on a customised data set prepared by Prof Zare **[Code]**

Implementation of P2P network

Computer Networks

Gainesville, Florida

University of Florida

Nov 2019 - Dec 2019

- Created a peer-to-peer(P2P) network for file downloading. Developed components – peer and file owner. The file owner has a file, and breaks the file into chunks of 100KB. Each peer connects to the file owner to download some chunks with the help of two threads, one acting as a server that uploads the local chunks to another peer (referred to as upload neighbor), and the other acting as a client that downloads chunks from a third peer (referred to as download neighbor). Tested the code with max 5 peers and max file size of 13.3 MB. **[Code]**

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
- Distributed Operating Systems
- Computer Networks
- Mathematics for Intelligent Systems
- Advanced Data Structures
- Machine Learning
- Deep Learning Computer Graphics
- Fundamentals of Probability
- Advanced Machine Learning
- Analysis of Algorithms
- Numerical Optimization

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.
- Recipient of the **National Scholarship** Award from **Central Government Human Resource Development Department of Higher Education, India** for excellent result in Higher Secondary Examination in the state of West Bengal, India.
- Topped with **1%** of all candidates appeared in **West Bengal Joint Entrance Examination** in 2008.