

# Muhammad Hasan Ferdous

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## Education

<b>Ph.D. in Information Systems</b> - Focus on Causal Discovery from Complex Multivariate Time Series Data, University of Maryland, Baltimore County (UMBC) CGPA: 3.809/4.0	<i>January 2021 – Present</i>
<b>M.S. in Information Systems</b> , University of Maryland, Baltimore County (UMBC) CGPA: 3.809/4.0	<i>January 2021 – December 2023</i>
<b>B.Sc. in Statistics</b> , University of Dhaka, Bangladesh <i>Result: 1st Class</i>	<i>May 2005 – December 2010</i>

## Skills

**Languages:** Python, R

**Frameworks/Libraries:** TensorFlow, PyTorch, scikit-learn, NumPy, Pandas, Matplotlib, Seaborn

**ML/AI:** Causal Inference, Causal Discovery, Deep Learning, Time Series Analysis

**Tools/Platforms:** Git, Google Colab, Jupyter, PyCharm, VSCode, Anaconda

**Miscellaneous:** Data Wrangling, Model Optimization, Unix/Linux, LaTeX

## Experience

<b>University of Maryland, Baltimore County</b> - Graduate Teaching Assistant	<i>Spring 2025</i>
<ul style="list-style-type: none"><li>Provided teaching support for the <i>Structured Systems Analysis and Design</i> course.</li><li>Assisted students in understanding system analysis methodologies, process modeling, and structured design principles.</li><li>Conducted review sessions, and graded assignments to reinforce course objectives.</li></ul>	
<b>University of Maryland, Baltimore County</b> - Graduate Research Assistant	<i>November 2024 – December 2024</i>
<ul style="list-style-type: none"><li>Collaborated with faculty to explore a novel approach for identifying long-term causal effects by decomposing multivariate time series data.</li><li>Designed and implemented methodologies to preprocess and analyze complex multivariate time series, enabling robust causal discovery.</li><li>Conducted extensive research on advanced decomposition techniques and their applications in causal discovery.</li><li>Documented findings and contributed to the development of a framework for validating causal relationships in time series data.</li></ul>	
<b>University of Maryland, Baltimore County</b> - Graduate Teaching Assistant	<i>Spring 2022 – Spring 2024</i>
<ul style="list-style-type: none"><li>Supported the delivery of courses such as <i>Management Information Systems</i>, <i>Database Program Development</i>, and <i>Advanced Database Project</i> by assisting students and ensuring effective course management.</li><li>Reviewed and refined instructional materials to better align with course objectives, enhancing clarity and accessibility for students.</li><li>Facilitated one-on-one and group tutoring sessions, working closely with faculty to improve the overall effectiveness and organization of course activities.</li></ul>	
<b>University of Maryland, Baltimore County</b> - Graduate Research Assistant	<i>Fall 2021</i>

- Conducted an extensive review of foundational literature on causality and causal discovery methods.
- Acquired proficiency in key theoretical concepts and methodologies related to causal inference.
- Familiarized with tools and techniques for time series analysis and causal discovery.
- Collaborated with research mentors to design an approach for future empirical studies on causal discovery.

**University of Maryland, Baltimore County - Graduate Teaching Assistant**

Spring 2021

- Provided academic support for the *Database Program Development* course, facilitating seamless course execution and addressing student inquiries.
- Improved course materials by refining content, aligning resources with learning objectives, and offering actionable feedback to enhance student comprehension.
- Delivered personalized tutoring sessions and worked collaboratively with faculty to optimize course delivery, fostering an engaging and supportive learning environment.

## Publications

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### Peer-Reviewed Papers

- M.H. Ferdous, U. Hasan, M.O. Gani. **CDANs: Temporal Causal Discovery from Autocorrelated and Non-Stationary Time Series Data**. *Machine Learning for Healthcare Conference*, pp. 186–207, 2023.
- M.H. Ferdous, U. Hasan, M.O. Gani. **eCDANs: Efficient Temporal Causal Discovery from Autocorrelated and Non-Stationary Data (Student Abstract)**. *Proceedings of the AAAI Conference on Artificial Intelligence*, vol. 37(13), pp. 16208, 2023.

### Submitted Papers

- M.H. Ferdous, M.O. Gani. **DCD: Decomposition-based Causal Discovery from Autocorrelated and Non-Stationary Temporal Data**. Submitted to KDD 2025.
- M.H. Ferdous, E. Hossain, M.O. Gani. **TimeGraph: A Comprehensive Benchmark Dataset for Time Series Causal Discovery**. Submitted to KDD 2025.

### Accepted Workshop Paper

- E. Hossain, M.H. Ferdous, J. Wang, A. Subramanian, M.O. Gani. **Correlation to Causation: A Causal Deep Learning Framework for Arctic Sea Ice Prediction**. Accepted at the *Causal AI for Robust Decision Making (CARD 2025)* workshop, under IEEE PerCom 2025.

### Presentations and Posters

- **DCD: Decomposition-based Causal Discovery from Autocorrelated and Non-Stationary Temporal Data**, presented at COEIT Research Day, 2025.
- **Attention-based Causal Discovery from Autocorrelated and Non-Stationary Temporal Data**, presented at COET Research Day, 2024.
- **eCDANs: Efficient Temporal Causal Discovery from Autocorrelated and Non-Stationary Time Series Data**, presented at AAAI Conference, 2023.
- **CDANs: Temporal Causal Discovery from Autocorrelated and Non-Stationary Time Series Data**, presented at Machine Learning for Healthcare Conference, 2023, and IS Student Research Symposium, 2022.

## Projects

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- **Analyzing Effects of Communal Mobility on Covid-19 Spread and Mortality Rate in the United States**  
Collaborated on a project to analyze the impact of communal mobility patterns on the spread and mortality rates of Covid-19 using statistical and machine learning techniques.
- **Predicting the Age of Abalone from Physical Measurements**  
Developed and evaluated regression models to predict the age of abalone based on physical measurements, leveraging feature engineering and model optimization techniques.
- **Estimation of the Causal Effect of BMI on Diabetes in Pima Indian Women**  
Applied causal inference methods to estimate the causal relationship between BMI and diabetes prevalence among Pima Indian women.
- **Exploratory Data Analysis on Vaccine Adverse Event Reports Datasets**  
Conducted in-depth exploratory data analysis on vaccine adverse event reports to identify trends and potential safety concerns, collaborating with a multidisciplinary team.
- **A Causal AI-Based Framework for Reliable and Optimal Decision-Making in Healthcare Contexts**  
Designed a causal AI framework to aid in healthcare decision-making by integrating causal inference techniques with machine learning models.
- **Drone Behavior Prediction Using On-Board Sensor Data and Supervised Learning**  
Built predictive models to analyze and forecast drone behavior using sensor data, focusing on reliability and accuracy in supervised learning.
- **Sentiment Analysis Using Twitter and Its Effect on the Stock Market for Selected Stocks**  
Conducted sentiment analysis on Twitter data to study its influence on stock market trends, using natural language processing and predictive analytics.