HAMZA REZA PAVEL

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Education

The University of Texas at Arlington   **August 2019 - May 2025 (Expected)**
Ph.D. in Computer Science   *Arlington, Texas, USA*

Shahjalal University of Science and Technology   **January 2011 - October 2015**
B.Sc. in Computer Science and Engineering   *Sylhet, Bangladesh*

Research Interest

Human-Computer Interaction, Human-Robot Interaction, Graph Theory, Data Mining, Machine Learning, Computer Vision.

Relevant Coursework

- Parallel Processing
- Design and Analysis of Algorithms
- IoT and Networking
- Machine Learning
- Distributed Systems
- Advance Topics in Database Systems
- Data Mining
- Advance Intelligent Systems
- Neural Networks
- Data Analysis and Modeling Techniques
- Advance Software Engineering

Experience

The University of Texas at Arlington   **August 2019 – Present**
Graduate Teaching Assistant/Research Associate   *Arlington, Texas*

- Developed Machine Learning and Deep Learning-based solutions to detect activities from RGB videos for assessing attention in children.
- Built deep learning models to detect cognitive fatigue of individuals from RGB videos of their gait.
- Created novel heuristic-based algorithms to detect centrality measures in homogeneous multi-layer networks.
- Designed experimental setup for human-centric data collection. Interviewed and collected physiological data using the designed setup.
- Built prototype of a VR-based executive function assessment system.
- TA for *Intro to Programming*, *Advanced Topics in Database Systems*, *Data Mining*, and *Database Systems* courses.

Chaldal   **August 2018 – July 2019**
Senior Software Engineer   *Dhaka, Bangladesh*

- Developed a tool named *TypeAlgebra* to generate service layer APIs and front-end code from predefined state machines which reduced the development time of in-house tools by 70%.
- Created the back-end of in-house communication tools to replace email using *TypeAlgebra*.
- Implemented a verification system for transactions made using foreign credit cards to reduce fraud.

Enosis Solutions Limited   **October 2015 – July 2018**
Software Engineer/Senior Software Engineer   *Dhaka, Bangladesh*

- Added functionalities and custom GUI components to a cross-platform GUI framework for Windows and Linux written in C++ using MFC, OpenGL, etc.
- Developed GUI for a CAD application to visualize the outputs of thermal and static simulations using C++, QT, and OpenGL.

Publications

- Qiyuan An, **Hamza Reza Pavel**, Ayon Roy and Fillia Makedon. "Residual Graph Network for Assessing Cognitive Fatigue from Gait Cycle Analysis" **Accepted** In Proceedings of the 17th International Conference on PErvasive Technologies Related to Assistive Environments. (2024)

- Ashish Jaiswal, Gaurav Nale, Qiyuan An, **Hamza Reza Pavel**, Enamul Karim, Sneh Acharya and Fillia Makedon. "An Assistive Robotic System for Cognitive State Assessment in Individuals with Spinal Cord Injury." **Accepted** In Proceedings of the 17th International Conference on PErvasive Technologies Related to Assistive Environments. 2024.

- Enamul Karim, **Hamza Reza Pavel**, Sama Nikanfar, Aref Hebri, Ayon Roy, Harish Ram Nambiappan, Ashish Jaiswal, Glenn R. Wylie, and Fillia Makedon. "Examining the Landscape of Cognitive Fatigue Detection: A Comprehensive Survey." Technologies 12, no. 3. 2024.

- **Hamza Reza Pavel**, Enamul Karim, Ashish Jaiswal, Sneh Acharya, Gaurav Nale, Michail Theofanidis, and Fillia Makedon. "Assessment of Cognitive Fatigue from Gait Cycle Analysis." Technologies 11, no. 1. 2023.

- Enamul Karim, **Hamza Reza Pavel**, Ashish Jaiswal, Mohammad Zaki Zadeh, Michail Theofanidis, Glenn Wylie, and Fillia Makedon. "An EEG-based Cognitive Fatigue Detection System." In Proceedings of the 16th International Conference on PErvasive Technologies Related to Assistive Environments, pp. 131-136. 2023.

- Ashish Jaiswal, Aref Hebri, **Hamza Reza Pavel**, Mohammad Zaki Zadeh, and Fillia Makedon. "SmartFunction: An Immersive Vr System To Assess Attention Using Embodied Cognition." In Proceedings of the 16th International Conference on PErvasive Technologies Related to Assistive Environments, pp. 485-490. 2023.

- **Hamza Reza Pavel**, Anamitra Roy, Abhishek Santra, and Sharma Chakravarthy. "Closeness Centrality Detection in Homogeneous Multilayer Networks." In Proceedings of the 15th International Joint Conference on Knowledge Discovery, Knowledge Engineering and Knowledge Management (IC3K 2023) - KDIR, pages 17-29. 2023

- Mohammad Zaki Zadeh, Ashish Jaiswal, **Hamza Reza Pavel**, Aref Hebri, Rithik Kapoor, and Fillia Makedon. "Large-Scale Self-Supervised Human Activity Recognition." In Proceedings of the 15th International Conference on PErvasive Technologies Related to Assistive Environments, pp. 298-299. 2022.

- **Hamza Reza Pavel**, Enamul Karim, Mohammad Zaki Zadeh, Ashish Jaiswal, Rithik Kapoor, and Fillia Makedon. "Automated System to Measure Static Balancing in Children to Assess Executive Function." In Proceedings of the 15th International Conference on PErvasive Technologies Related to Assistive Environments, pp. 569-575. 2022.

- **Hamza Reza Pavel**, Anamitra Roy, Abhishek Santra, and Sharma Chakravarthy. "Degree Centrality Definition, and Its Computation for Homogeneous Multilayer Networks Using Heuristics-Based Algorithms." In International Joint Conference on Knowledge Discovery, Knowledge Engineering, and Knowledge Management, pp. 28-52. Cham: Springer Nature Switzerland. 2022.

- **Hamza Reza Pavel**, Abhishek Santra, and Sharma Chakravarthy "Degree centrality algorithms for homogeneous multilayer networks." In Proceedings of the 14th International Joint Conference on Knowledge Discovery, Knowledge Engineering and Knowledge Management (IC3K 2022) - KDIR, pages 51–62. 2022.

Selected Projects

SmartFunction: Immersive VR System to Assess Executive Functions
Heracleia Human-Centered Computing Lab @ UTA, 2023 - Present

- Building on the success of a previous NSF-funded project, the Automated Test of Embodied Cognition (ATEC), this project aims to translate complex cognitive tasks into an immersive VR environment for a comprehensive assessment suite. The initiative focuses on creating an accessible, low-cost solution for a diverse range of users including educators, healthcare professionals, and employers across various industries. My role involves overseeing the translation of ATEC into VR, developing innovative assessment tasks, conducting user studies for personalization, and strategizing for scalability and commercialization.

DARE: A Personalized Assistive Robotic System That Assesses Cognitive Fatigue In Persons With Paralysis (NSF Grant: 2226164)
Heracleia Human-Centered Computing Lab @ UTA, 2022 - Present

- The objective of this project is to design and develop an end-to-end personalized assistive robotic system, called iRCSA (Intelligent Robotic Cooperation for Safe Assistance), to recognize, assess, and respond to a human's cognitive fatigue during human-robot cooperation. The focus of the system is on human-robot cooperative tasks where a human with SCI and a robot cooperate during daily tasks (e.g., cooking). Students who have experienced SCI will be involved in every stage of the project, to ensure the acceptability and usability of the proposed system. This project will develop an end-to-end framework for online cognitive fatigue assessment as part of the proposed Human-Robot Cooperation (HRC) system, which constitutes a breakthrough in the ability to effectively integrate the human component in the adaptation (personalization)

of assistive robots and address key HRC challenges through these three thrusts : The development of a novel human-technology system for online cognitive fatigue assessment using multimodal data; the development of an adaptive robotic system for personalized interaction based on cognitive fatigue assessment; and an experimental testbed of HRC scenarios to enable HRC, machine/deep learning, and robotic systems computational advances. My role involves developing data collection and preprocessing frameworks, collecting data from human subjects, analysis of collected data, and developing novel machine/deep learning models.

NetSplicer: Scalable Decoupling-Based Algorithms for Multilayer Network Analysis (NSF Grant: 1955798)
Information Technology Laboratory @ UTA, 2021

- This project aims to develop NetSplicer, a collection of scalable and high-performance algorithms for the analysis of multilayer networks, which are powerful tools for modeling complex systems in social, economic, biological, and technological domains. The core approach of NetSplicer is network decoupling, a technique that subdivides a multilayer network into components for analysis using existing graph algorithms. This approach addresses challenges such as reducing information loss, preserving structural and semantic information, and developing scalable algorithms that can handle various layers of a network. As a part of this project, I have developed novel algorithms to detect Degree and Closeness Centrality in Homogenous Multi-layer Networks.

Technical Skills

Languages: Python, C/C++, C#, F#, Java, Javascript, SQL, Bash, TypeScript, HTML, CSS.
Libraries/Frameworks: Keras, PyTorch, Tensorflow, NumPy, Pandas, Matplotlib, Scikit-learn, ROS, React, QT.
Research Skills: Data Collection, User interviews, Human-Computer Interaction, Data analysis, Experiment Design, Machine Learning, Deep Learning, Large Language Models.

Awards & Fellowships

- **Doctoral Consortium Award**, ACM PETRA 2022/2023, Greece
- **Graduate School Travel Grant**, UTA 2023, USA
- **I-Engage Mentorship Summer Research Grant**, UTA 2023, USA
- **Best Poster Award**, ACM PETRA 2022, Greece
- **STEM Fellowship**, UTA 2019 - Present, USA

Services

- Mentored REU Undergraduate Students at Heracleia Human-Centered Computing Lab, 2022 - Present
- Served as the Session Chair and Conference Coordinator for the 16th PErvasive Technologies Related to Assistive Environments (PETRA) conference, 2023.
- Served as the Treasurer and Executive Member of the Bangladesh Student Organization at the University of Texas at Arlington, 2022.