BIOGRAPHICAL SKETCH

Sheikh Rabiul Islam was born and raised in Bangladesh. He received a bachelor's degree in Computer Science from Islamic University of Technology in 2010. He worked in Robi Axiata Ltd. and Teletalk Bangladesh Ltd. for four years in their software development division. In August 2015, Islam started his Ph.D. in the Department of Computer Science at Tennessee Tech University. He received a Master of Science in Computer Science in May 2018. He is expected to receive his Ph.D. degree in May 2020. He has contributed to the area of Explainable Artificial Intelligence (XAI), Cybersecurity, Data mining, and Big Data analytics. Islam is going to join as an Assistant Professor in the Department of Computing Sciences at the University of Hartford starting from August 2020.

EDUCATION

Ph.D. Engineering
Tennessee Tech University, 2015-2020 (expected)

M.S. Computer Science
Tennessee Tech University, 2015-2018

B.S. Computer Science
Islamic University of Technology, 2007-2010

Funding Acknowledgements

Thanks to Tennessee Tech's College of Engineering (CoE) for Carnegie Fellowship, Cyber-security Education, Research and Outreach Center (CEROC) for GRA, and Department of Computer Science for GTA support during his doctoral studies.

College of Engineering

TENNESSEE TECH

The Department of

Computer Science

Announces the Dissertation Defense

of

Sheikh Rabiul Islam

In Partial Fulfillment of the Requirements

For the degree of

Doctor of Philosophy in Engineering

April 2, 2020

1:30 p.m.

Held in

Johnson Hall 302

Tennessee Tech University

Zoom Link: https://tntech.zoom.us/j/542548704

FIELD OF STUDY

Computer Science

Subfields: Explainable Artificial Intelligence, Data Mining, Big Data Analytics, and Cybersecurity

DISSERTATION TOPIC

Domain Knowledge Aided Explainable Artificial Intelligence

EXAMINING COMMITTEE

Dr. William Eberle (Co-chairperson)

Dr. Sheikh K. Ghafoor (Co-chairperson)

Dr. Doug Talbert

Dr. Mike Rogers

Dr. Sid Bundy

Dr. Ambareen Siraj

ABSTRACT

In the age of the Internet of Things (IoT) and ''Big Data'', a voluminous, heterogeneous stream of data from billions of internet-connected devices has necessitated the adoption of Artificial Intelligence (AI) based models in many real-world applications. Although the capability of learning very complex functions has made these models robust, most of the successful models are ''black box'' in nature as they lack the ability to explain the decision process in human terms. As a result, this leads to ethical and trust issues in critical applications of relevant domains (e.g., Health-care, Security, and Finance) for potential implications to human interests, rights, and lives. Research suggests that a multidisciplinary effort and leveraging of useful domain knowledge could lead to a viable solution to explainable AI systems that produce human friendly decisions. However, Explainable Artificial Intelligence (XAI) is still an emerging field of research, where uncovering domain-specific useful knowledge is challenging, and incorporating domain knowledge in a ''black-box'' system for better explainability is underutilized. To address these issues, we propose and demonstrate a way to extract useful domain knowledge from the application domain, and incorporate that into a ''black box'' model for better explanations of decisions. Our understanding from experiments on bankruptcy prediction and intrusion detection reveals that the incorporation of domain knowledge makes the output of the ''black box" model more explainable with negligible deviation in performance. In addition, the introduced generalization provides better execution time and resilience with unknown cases (e.g., attacks) while retaining most of the important information. Finally, although XAI lacks formalization and is an open problem, we propose and formulate an approach that suggests a reasonable and model-agnostic way to quantify the extent of explainability in XAI methods.