JESSE ABLES

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EDUCATION

Doctor of Philosophy | *Computer Science*   Jan. 2020 – Dec. 2023
Mississippi State University   Starkville, Mississippi

Master of Science | *Cyber Security and Operations*   Jan. 2018 – Dec. 2019
Mississippi State University   Starkville, Mississippi

Bachelor of Science | *Software Engineering*   Aug. 2013 – May 2016
Mississippi State University   Starkville, Mississippi

Study Abroad   Feb. 2015 – May 2015
Korean Advanced Institute of Science and Technology   Daejeon, South Korea

Engineering Major   Aug. 2012 – July 2013
Holmes Community College   Ridgeland, Mississippi

PUBLICATIONS

- **J. Ables**, T. Kirby, S. Mittal, S. Rahimi, I. Banicescu, M. Seale, "Explainable Intrusion Detection Systems Using Competitive Learning Techniques", To Be Published

  Competitive Learning (CL) techniques are a class of white box machine learning algorithms where nodes (neurons) compete against one another. This competition causes nodes to become champions for abstract representations of data. Using these techniques, we create accurate Explainable Intrusion Detection Systems (X-IDS) that are competitive with current black box Error Based Learning (EBL) models. A significant benefit to using white box CL algorithms is their innate explainability, which allows their explanations to be more trustworthy than current EBL explanation methods.

- **J. Ables**, N. Childers, W. Anderson, S. Mittal, S. Rahimi, I. Banicescu, M. Seale, "Eclectic Rule Extraction for Explainability of Deep Neural Network based Intrusion Detection Systems", To Be Published

  Rule Extraction (RE) is a white box technique used to extract rulesets from trained neural networks. Currently, the field of XAI and X-IDS is facing an issue of trust. Both in the models that are being explained and the algorithms that are creating the explanations. Eclectic, white box RE is a trustworthy explanation technique that can be used to generate highly accurate explanations. This work details a customizable eclectic RE algorithm and performs a cost-benefit analysis of the algorithm's various parameters.

- **J. Ables**, T. Kirby, W. Anderson, S. Mittal, S. Rahimi, I. Banicescu, M. Seale, "Creating an Explainable Intrusion Detection System Using Self Organizing Maps", 2022 IEEE Symposium Series on Computational Intelligence, Singapore, December 2022

  The Self Organizing Map (SOM) is an algorithm that compresses high-dimensional data into a 2-Dimensional representation. Using SOM, we are able to create an Explainable Intrusion Detection System (X-IDS) that can create both visual and statistical explanations. Our explainable architecture is designed using DARPA's recommendation for explainable systems. Using our architecture, we show the benefits explanations have for intrusion detection. Additionally, we demonstrate how a user could use explanations to form conclusions about how and why the model creates predictions.

- S. Neupane, **J. Ables**, W. Anderson, S. Mittal, S. Rahimi, I. Banicescu, M. Seale, "Explainable Intrusion Detection Systems (X-IDS): A Survey of Current Methods, Challenges, and Opportunities", IEEE Acess 2022

  This survey examines the current landscape of Explainable Intrusion Detection Systems (X-IDS) and addresses the associated challenges, including their relevance to designing an X-IDS. The discussion covers both black box and white box approaches, analyzing their trade-offs in terms of performance and explanatory capabilities. We propose a human-in-the-loop architecture as a design guideline for X-IDS. Research recommendations highlight the importance of defining explainability for IDS, crafting explanations for stakeholders, and establishing metrics to assess explanations.

- S. Iannucci, **J. Ables**, W. Anderson, B. Abburi, V. Cardellini, I. Banicescu, "A Performance-Oriented Comparison of Neural Network Approaches for Anomaly-based Intrusion Detection", 2021 IEEE Symposium Series on Computational Intelligence, Orlando, Florida, December 2021

  This study focuses on four unsupervised anomaly detection algorithms all based on artificial neural networks. Experiments assess the trade-offs between effectiveness and performance using NSL-KDD and CIC-IDS-2017 datasets. Results highlight that no single algorithm outperforms others in both aspects. Notably, algorithms utilizing Recurrent Neural Networks are effective due to their temporal dependency utilization, albeit at the cost of longer execution times.

WORK EXPERIENCE

Assistant Professor of Computer Science
Aug 2024 – Current
University of South Alabama — Mobile, Alabama

- Write grant proposals to secure funding for cutting-edge research in cybersecurity, AI, and system protection
- Lead research projects in cybersecurity and artificial intelligence, publishing findings in peer-reviewed journals and conferences
- Teach undergraduate and graduate-level courses in software engineering, computer science, and artificial intelligence
- Mentor students in research, guiding them through projects in areas such as Explainable AI, Intrusion Detection Systems, and machine learning

Adjunct Professor of Computer Science
Sept 2024 – Current
Mississippi State University — Starkville, Mississippi

- Lead and advise research teams on topics such as cyber security, machine learning, and explainable artificial intelligence.
- Mentor graduate students in research, writing, and experimental analysis with the goal of publishing peer-reviewed works

Postdoctoral Research Fellow
Feb 2024 – Aug 2024
NSPARC - Mississippi State University — Starkville, Mississippi

- Research unemployment insurance fraud and design customized machine learning fraud detector
- Write proposals to secure funding for various cybersecurity-related projects
- Advise programming and non-technical research teams in AI-related content

Graduate Research Assistant
Jun 2019 – Dec 2023
Mississippi State University — Starkville, Mississippi

- Design Explainable Intrusion Detection Systems funded by U.S. Army Engineer Research and Development Center (ERDC)
- Create explanation frameworks using white-box techniques including Self Organizing Maps and Deep Neural Network Rule Extraction
- Research on automated intrusion detection and anomaly detection
- Perform performance analysis of intrusion detection algorithms

Graduate Teaching Assistant
Mississippi State University

Jan 2018 – Jan 2019

Starkville, Mississippi

- CSE 1284 Introduction to Computer Programming - Responsible for creating and giving lectures on introductory to intermediate programming concepts to undergraduates. Created exams, graded papers, and tutored students
- CSE 1284 Introduction to Computer Programming Lab - Taught programming concepts and problem solving skills through programming exercises
- CSE 1233 Computer Programming 'C' - Tutored and lectured students in introductory to intermediate programming skills in C

CONFERENCES AND PRESENTATIONS

Explainable Artificial Intelligence in Cyber Security
University of Texas at El Paso Invited Talk

2023

El Paso, Texas

The Evolution of Self Organizing Maps
Mississippi State University Soft Computing Lecture

2023

Starkville, Mississippi

Creating an Explainable Intrusion Detection System Using Self Organizing Maps
IEEE Symposium Series on Computational Intelligence

2022

Singapore

A Performance-Oriented Comparison of Neural Network Approaches for Anomaly-based Intrusion Detection
IEEE Symposium Series on Computational Intelligence

2021

Orlando, Florida

HONORS AND AWARDS

CyberForce 2019 Red Team
Aided the CyberForce competition by participating as a Red Team member

Fall 2019

CyberForce 2019 Scholarship
Scholarship awarded for participating in the CyberForce Competition

Fall 2019

Facebook 2019 Enigma Scholars Scholarship
Sponsorship by Facebook to attend Enigma 2019 in Burlingame, California

Spring 2019

CodePath Software Security Certification
Completion of the CodePath Secure Software Engineering Course

Fall 2018

Dean's List
Recognition for distinguished students at Mississippi State University

Fall 2014, Fall 2015

Study Abroad Scholarships
Scholarships awarded for distinguished students studying abroad

Spring 2015

Phi Theta Kappa Scholarship
Scholarship awarded for receiving a high GPA at Holmes Community College

Spring 2013

REFERENCES

Dr. Sudip Mittal
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Università Roma Tre

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Dr. Shahram Rahimi
Mississippi State University

Professor and Department Head

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Dr. Ioana Banicescu
Mississippi State University

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Dr. Maxwell Young
Mississippi State University

Associate Professor

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