Alexander Nemecek

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EDUCATION

Case Western Reserve University | Cleveland, OH — Expected: May 2027
Ph.D. Computer Science | 3.8 GPA

Ohio University | Athens, OH — May 2023
B.S. Computer Science | B.S. Psychology | 3.7 GPA

Relevant Coursework: Algorithmic Fairness, Cognitive Linguistics, Cognitive Psychology, Computer Security, Data Science, Data Mining, High Performance Computing, Large Language Models, Machine Learning, Machine Learning on Graphs, Natural Language Processing, Parallel, Distributed, & Web Computing, Software Security

EXPERIENCE

Sandia National Laboratories | Albuquerque, NM — May 2024 – Present
Research and Development Intern

- Trained and fine-tuned large language models (LLMs) on manually collected security datasets for internal software analysis application.
- Integrated LLMs into current training, querying, and evaluation pipeline, achieving ~80% reduction in processing time through optimization techniques.
- Evaluated fine-tuned and baseline LLMs on recognizing and classifying historical internet data.

Case Western Reserve University | Cleveland, OH — Aug 2023 – Present
Research Assistant

- Developed topic-based watermarking algorithm for LLMs, embedding detectable signatures within generated text to address limitations and enhance robustness to various attacks against existing watermarking schemes.
- Led an xLab program project with Progressive Insurance, managing an 8-person team in TypeScript application and machine learning model development with streamlined AWS deployment.
- Conducted literature reviews for conferences on security, privacy, artificial intelligence, and machine learning.

Cisco Systems | Richfield, OH — May – Aug 2023
Hardware Engineer: Software Development Intern

- Developed and deployed software utilizing PHP to search, filter, and compare historical metrics, automating report generation and streamlining operations.
- Implemented efficient pipelines with Python and SQL/Snowflake for data upload, parsing, manipulation, and evaluation, ensuring accuracy.
- Spearheaded comprehensive documentation demonstrating software value to stakeholders, facilitating a smooth transition for incoming team to ensure continuity.

Ohio University | Athens, OH — Sep 2021 – Mar 2023
Data Research Analyst | XR Software Research Engineer

- Directed development of spatial awareness virtual reality application to aid individuals with perception dysfunction disorders, in partnership with the School of Medicine.
- Collaborated with industry partners to create an augmented reality experience enhancing interaction between robots and humans, increasing productivity.
- Conducted comprehensive analysis of identical datasets; compiled graphical visualizations comparing time complexity and accuracy of different implementations.

Sherwin–Williams | Cleveland, OH — May – Aug 2022
Software Engineer Intern

- Transferred and transformed data across multiple enterprise levels; developed OLAP cube models with Snowflake SnowSQL and implemented SQL queries against Snowflake.
- Implemented front-end visualizations using Tableau; validated 20+ KPIs between Tableau end-user layer and Snowflake semantic layer; corrected data mismatches and bugs.

PUBLICATIONS

Conference Posters

- A. Nemecek, Y. Jiang, and E. Ayday, "Topic-Based Watermarks for LLM-Generated Text", *Privacy Enhancing Technologies Symposium (PETS)*, Bristol, UK, July 2024.
- A. Nemecek and C. Mourning, "Detecting Network Attacks using Machine Learning Models", *The Ohio Academy of Science*. Piqua, OH, April 2023.

Preprints

- A. Nemecek, Y. Jiang, and E. Ayday, "Topic-Based Watermarks for LLM-Generated Text", *arXiv: 2404.02138*, April 2024.

RESEARCH & PROJECTS

Ensemble Methodologies Evaluation Aug 2023 – Present

- Compiled and analyzed comparative analysis across ensemble methods including boosting, stacking, Bayesian model averaging, and bucket of models with a focus on boosting methodologies.
- Implemented a modified XGBoost algorithm tailored to imbalanced data and developed novel research extension enhancing capabilities in handling unique data structures, leveraging in-depth knowledge acquired from extensive literature review on boosting and neural network methods.

Choose Ohio First Research Fellowship Aug 2022 – May 2023

- Developed accurate classifiers achieving above 95% accuracy on 12.7 million traces of attacks, providing valuable insights for proactive measures against detrimental outcomes.
- Reviewed machine learning literature to implement pipeline predicting DDoS attacks, utilizing Python (e.g., Scikit-learn, TensorFlow) for feature selection, manipulation, and visualization.

Fostering My Journey: iOS & Android App Aug 2022 – May 2023

- Researched and developed scalable, cross-platform mobile application providing a way of preserving memories for foster children with the possibility of moving in early childhood.
- Leveraged AWS to design cloud architecture for storing user data and providing essential notifications and functions while ensuring privacy and confidentiality of information shared.

SKILLS

Technical Languages: C++ | C# | JavaScript | PHP | Python | TypeScript
Frameworks & Tools: Angular | AWS | Git | React Native | Unity3D
Machine Learning: Hugging Face | LangChain | Scikit-Learn
Data Analysis: MongoDB | Pandas | SQL | Snowflake | SnowSQL | Tableau
Soft Skills: Collaboration | Communication | Problem-Solving