ZACKARY CROSLEY

NEW MEXICO | MAIL@CROSLEYZACK.COM | 925.550.6184 | CROSLEYZACK.COM

EDUCATION

OPERATIONS RESEARCH MILITARY APPLICATIONS COURSE
Certificate · Army Logistics University · Honor Graduate · Dec 2020

MASTER'S OF SCIENCE
Computer Science · Arizona State University · GPA 3.80 · Aug 2019

BACHELOR'S OF SCIENCE
Computer Science · Arizona State University · GPA 3.76 (Magna Cum Laude) · Dec 2017

EXPERIENCE

OPERATIONS RESEARCH ANALYST GS-12
The Research and Analysis Center · Army Futures Command · May 2017 – Present

- Served as developer on a Combined Arms Analysis Tool for the 21st Century (COMBATXXI), a stochastic (Monte Carlo), high resolution, closed-form, discrete event combat simulation.
- Developed a navigation suite in Python to aid in rapid implementation of maneuver behaviors. Library estimated to have saved hundreds of man hours of scenario development per scenario.
  - Created a graph data structure loaded from terrain, storing contextual data (trafficability, node or edge type) for nodes and edges to facilitate intelligent searching and knowledge representation.
  - Optimized graph via functional programming approach with memoization and lazy evaluation.
  - Implemented search methods (A*, Djikstra, Ant Colony Optimization) and heuristics.
  - Designed path manipulation algorithms to produce unit maneuver order stacks.
- Developed Utility AI framework to enable user-defined utility measures (single, dual), considerations (state variables), normalizations, aggregation (combining considerations), and selection methods.
  - Performed literature review of Utility AI publications on applications to combat modeling.
  - Implemented autonomous behaviors using utility framework, such as engagement decisions.
- Developed terrain reasoning methodology as sequential discrete sampling and utility evaluation.
  - Utilized Terrain Reasoning to develop advanced behaviors, such as an automated tank defilade.
- Led efforts to develop high-fidelity Directed Energy Weapon COMBATXXI representation. Coordinated with external agencies and shareholders to define modeling requirements and approach.
- Led model development for an analysis alternative study. Identified required model enhancements and coordinated with integration team on scenario implementation.
- Initiated development of COMBATXXI reinforcement learning framework for modeling behaviors too complex for traditional integration methods.
- Attended military course teaching advanced Operations Research techniques and tools. Studied operations research methods including regression analysis, statistical inferencing, design of experiments, mathematical programming, and data analysis.
  - Conducted study to evaluate tradeoffs of Army platforms using cost models, simulations, and statistical analysis. Examined available data and scenarios to identify constraints, limitations, and assumptions. Prepared briefs covering findings and recommendations for platform acquisition.
  - Received honor graduate recognition for exceptional performance as one of the top five students.

STUDENT RESEARCHER

Security Engineering for Future Computing Lab · Arizona State University · Jul 2017 – Aug 2019

- Worked with Professor Adam Doupé applying inductive programming to software security.
- Worked with members of SEFCOM lab to generalize inductive programming technique presented in paper by Sumit Gulwani (Microsoft). Methodology uses Directed Acyclic Graph intersection to isolate operations that could result in individual characters of output.
- Created novel technique of synthesizing exploits from samples in Capture the Flag (CTF) scenarios.
- Application sniffed network traffic using Scapy and categorized exploits, learned logic of exploit scripts from traffic using inductive programming, and attacked players with synthesized exploit.
- Developed Docker test suite to validate methodology and demonstrate successful replication of exploit script logic.
- Documented research in thesis and presentation at Arizona State University. Research is ongoing and pending publication.

COMPUTER SCIENCE INTERN

High Performance Computing Directorate · Patuxent River Naval Air Station · Jun 2015 – Aug 2016

- Worked at High Performance Computing division on project using machine learning to evaluate existing aircraft Tactics, Techniques, and Procedures (TTPs) and identify superior TTPs.
- Implemented and tested evolutionary algorithms for learning TTPs. Validated algorithm results with Subject Matter Experts on real-world scenarios with modern aircraft data.
- Worked with team to perform IT and maintenance on Windows High Performance Computer (HPC).
- Performed system updates, replaced faulty HPC components, and developed remote job submission program in Microsoft Powershell.
- Job submission program tracked job by user, allowing for scheduling of tests by user-allotted time.

PUBLICATIONS

AUTOMATED REFLECTION OF CTF HOSTILE EXPLOITS (ARCHES)

Z Crosley · A Doupe · Y Shoshitaishvili · R Wang

MINING ASSOCIATIONS IN LARGE GRAPHS FOR DYNAMICALLY INCREMENTED MARKED NODES

A Rai · Z Crosley · S Pacham

PROFICIENCIES

Python	Clojure	Linux	Pandas	Pwntools
Java	Julia	Bash	Numpy	Neo4j
C++	SQL	LaTeX	Scapy	OpenMP

HONORS AND ACTIVITIES

Operations Research Military Applications Course Honor Graduate · 2020
Science Mathematics and Research for Transformation Scholarship · 2016 · 2018
ASU Hacking Club Member · 2018 – 2019
FIRST Robotics Team Mentor · 2017-2019

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