Christopher Okonkwo

Rome, NY 13440
(703) 485-5670
Email: christopher.a.okonkwo@gmail.com
Website: https://crisokonkwo.github.io/about
LinkedIn: linkedin.com/in/christopher-okonkwo-71b4a91a3

Expertise in computer science, specializing in extracting knowledge and insights from multidimensional data, applying Machine Learning algorithms and methods to image and data processing/mining, and predictive models. Technical project lead in basic and applied research and program manager in modeling and simulation, target/object identification and characterization, data analysis, and data visualization. Experienced in mentoring early-career S&Es, and interns emphasizing clear research plans, career development, and overcoming issues in diverse industries.

EDUCATION

Master of Science in Computer Science and Cyber-Security **May 2017**
Norfolk State University, Norfolk, VA
Thesis: Application of Machine Learning Classification Algorithm on Malware Dataset
- *Utilized ML methods for malware classification, which involved static analysis of malicious executable files and classifying them into various malware families.*

Coursework: Data Communication, Computer Security, Operating System, Computer Architecture, Network Defense
Honors and Scholarship:
- GPA: 3.88/4.00
- CyberCorps: Scholarship for Service

Bachelor of Science in Computer Science **July 2014**
Norfolk State University, Norfolk, VA
Honors and Scholarship:
- Magna Cum Laude (3.55/4.00 GPA)
- The Dozoretz National Institute for Mathematics and Applied Sciences Scholar

PROFESSIONAL EXPERIENCE

Executive Officer Information Directorate Director/Commander, DR-02 **2022-2023**
AFRL/RI, Information Directorate, Rome, NY
- Served as the focal point for all staffing activities within Information Directorate, coordinating staff actions with other Action Officers across directorates and organizations.
- Provided high-level operational support to senior executives, managed front-office executives and personnel programs for military and civilian staff.
- Coordinated activities of front office executives and staff, Divisions, and Core Technology Areas, effectively collecting and disseminating information.
- Guided front office staff on directorate policies and led front office staff to support the front office executives efficiently and cohesively.
- Analyzed, provided proposal feedback analysis, and helped organize RI research and development Investment Strategies & IS feedback sessions to aid Senior Leaders in implementing RI's strategic alignment to DoD, AFRL, and RI strategic guidance.
- Proactively identified inefficiencies in processes and worked across the organization to streamline tasks.
- Supported senior executive activities and managed front-office executives and personnel programs for 30+ military and 700+ civilians.

Computer Scientist, DR-02 **2019-2022**
AFRL/RIED, Analytical Systems Branch
- Formed team of early career Scientists and Engineers (S&E) to develop solutions and prototype information systems to revolutionize targeting.
- Led the 3D LiDAR Information Visualization and Exploitation (3DLIVE) project, providing situational awareness and semantic object definition.
- Developed techniques to read and visualize 3D LiDAR data, improving visualization and analysis tools.
- Led investment efforts in 3D LiDAR Information Visualization and exploitation within the intelligence community.
- Led in-house teams on multiple research areas within M&S, Multi-Domain Dynamic Targeting, UAS, and computer vision research projects.
- Developed novel approaches using virtual environments to generate high-quality training data for Deep Learning classifiers.
- Managed projects on domain-agnostic targeting recommendation algorithms
- Managed and facilitated the day-to-day operation of the M&S studio.

Associate Computer Scientist, DR-01 **2017-2019**
AFRL/RIED, Analytical Systems Branch
- Developed a virtual reality environment for creating a Common Operating Picture (COP) using AR/VR, LiDAR data, and the Unity game engine.
- Created an in-house framework for multi-objective optimization for real-time strategy decisions.
- Led research projects for students contributing to Advanced Framework for Simulation, Integration and Modeling (AFSIM) development.
- Managed modeling and simulation in AFSIM as part of an integrated environment.
- Developed Natural Language Processing (NLP) techniques to cluster similar entities between tagged and untagged datasets.
- Leveraged Word2Vec, and Doc2Vec models to create vector representations of documents to classify semantic relationships in documents.

Graduate Research Assistant **2014-2017**
Norfolk State University IA-REDI, Norfolk, VA,
- Supported research and development efforts to create new products, equipment, and processes.
- Applied machine learning algorithms and techniques on malware samples.
- Proposed methods to detect, extract features, and categorize malware samples.
- Developed a cross-platform smartphone application for HackU Competition.
- Designed a cloud-based virtual lab using virtualization software.
- Worked on a machine learning classification project, evaluating the effects of various ML algorithms on malware datasets.
- Assisted professors with academic pursuits by researching information on malware.

INTERNSHIP EXPERIENCE

Summer Student Research Intern **June-August 2016**
Air Force Research Laboratory, Rome, NY
- Worked on the Software Epistemology project, studying and analyzing hash functions.
- Researched hash functions and conducted performance analysis on multiple algorithms.
- Developed an approach for generating new information from data produced by an artifact extraction process.
- Incorporated scalable computation capabilities in TitanDB to support the project's goals.
- Utilized machine learning techniques to derive new knowledge and significantly advance state-of-the-art in automated vulnerability discovery.
- Implemented a sieve analysis concept and applied a custom hashing scheme to mine information.
- Analyzed various cryptographic and non-cryptographic hash functions for their performance, random distribution of hash keys, and low bias.

Summer Student Research Intern **May-August 2015**
Lawrence Livermore National Laboratory, Livermore, CA
- Conducted data analysis and implemented machine learning techniques.
- Generated data models and performed malware groupings into families based on file contents and characteristics.
- Explored similarities in behavioral patterns of malware variants to classify them into nine malware families.
- Utilized ~10,000 malware samples from the Kaggle Malware Classification Challenge.
- Extracted features from byte files (single byte and 2-gram byte frequencies), and assembly files (sections, dlls, opcodes).
- Performed estimation using cross-validation within the provided training set from Kaggle.
- Identified effective features for malware classification and available tools for data modeling.

Robotics Institute Summer Scholar (RISS), Undergraduate Summer Research Intern **June-August 2013**
Carnegie Mellon University, Pittsburgh, PA
- Developed technique for Multiple 3D camera calibration for intelligent workcell project.
- Implemented an efficient algorithm to perform a morphological operation for calibration of multiple 3D cameras.
- Used morphological operations to isolate objects in images and detect a spherical target in the point-cloud frame.
- Developed an adaptive algorithm that leveraged additional knowledge of the 3D-point cloud and applied a distance transform.
- Implemented an adaptive radius method to remove portions of the image and reliably segment the target, irrespective of distance.
- Supported hardware and software installation, configuration, testing and debugging.

Quality of Life Technology (QoLT) Center, Undergraduate Summer Student Intern **May-August 2012**
University of Pittsburgh, Pittsburgh, PA
- Reviewed firmware of the Physical Activity Monitor System's wheel rotation Datalogger (PAMS-DL).
- Developed an Android plug-in application to wirelessly send and receive data.
- Analyzed the validity and reliability of the PAMS-DL for measuring wheelchair rotation and estimating distance traveled with 95% accuracy.
- Conducted wheelchair propulsion tests at various distances and slopes, with data loggers, wheel rotation monitor, and a mobile phone.
- Developed data analysis code in MATLAB for processing and analyzing collected data stored on an Android mobile phone.
- Employed PAMS with motion sensors to measure wheelchair velocity, distance, activity type, and intensity.
- Evaluated potential subject participants to assess suitability for planned studies.

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PUBLICATION

- Kumari, M., Hsieh, G., and Okonkwo, C. A., "Deep Learning Approach to Malware Multi-class Classification Using Image Processing Techniques,"2017 International Conference on Computational Science and Computational Intelligence (CSCI), Las Vegas, NV, 2017, pp. 13-18.
- Okonkwo, C., and Drager, S., "Performance of Various Hash Functions," Proceedings of the 3rd Annual Cincinnati-Dayton INFORMS Conference, Dayton, OH, 2016, pp. 24-31.
- Hiremath, S.V., Ding, D., Okonkwo, C., Hannan, M., and Cooper, R.A., "Validation of a gyroscope based wheel rotation monitor for manual wheelchair users". RESNA Annual Conference, Seattle, WA, 2013.

SKILLS

Programming/Scripting Language: Python, C#, Java, C++, C, HTML/CSS, PHP, MATLAB
Frameworks/Tools: Git, Unity game engine, Apache Spark, Scikit-learn, TensorFlow, PyTorch, LaTex
Software Development: GitHub, BitBucket, Bootstrap, Eclipse, NetBeans
Cybersecurity: Kali Linux, Metasploit, Wireshark, Nmap
Interest: Programming, Computer Vision, Cybersecurity, Big Data analysis, Machine Learning, Software Engineering/Development, Robotics, Web development, Networking/Information Assurance

AWARDS AND CONFERENCES

AFRL/RI Early Career Award nominee, 2022
AFRL/RI Research Team Award Winner, 2018, 2021
AFRL/RI 3rd Quarter Civilian Category II Award Winner, 2019
International Conference on Computational Science and Computational Intelligence, Las Vegas, NV, 2017
Cincinnati-Dayton INFORMS Symposium, Dayton, Ohio, Presenter, 2016
Paper publication presentation, Dayton, Ohio, 2016
Dominion Enterprise HackU Best in Show Winner, 2015
Virginia Commonwealth University Graduate Education Day Panelist, Richmond, Virginia, 2015
Tapia Conference, Boston, Massachusetts, 2015
Second place Robotics Competition, Seattle, Washington, 2014
RESNA conference paper finalist, Seattle, Washington, 2013

PROFESSIONAL ASSOCIATIONS

National Society of Black Engineers, Member
Association for Computing Machinery, Member