SAInt Dashboard

Aerocyonics Security Articles of Interest for Awareness, Outreach, and Actionable Intelligence

ELECOMP Capstone Design Project 2022-2023

Sponsoring Company:

Aerocyonics, Inc.
5775 Post Road #221 East Greenwich, RI 02818
http://www.aerocyonics.com

Company Overview:

Aerocyonics, Inc., headquartered in East Greenwich, Rhode Island, was established to provide expertise in technology sectors such as cyber physical systems security, hardware & software assurance, counterfeit avoidance and detection, and advancement of talent in topic areas.

Aerocyonics Services, one of the divisions within Aerocyonics, Inc., performs critical work in the domains of system security engineering, supply chain risk management, cyber, data analytics, machine learning, education, training, and more.

Aerocyonics Imaging and Logistics conducts research & development and produces products & software solutions in our focus areas, such as ultrafast laser machining, 3D nano-imaging, artificial intelligence, and advanced microelectronics computing architectures to support our markets including integrated manufacturing tools and sophisticated research and detection instruments.

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Project Motivation:

Cyber Physical Systems Security and Supply chain risk management have become an increasingly important topic across industry, government, and academia due to the increase in cyber-attacks by lone wolf bad actors, criminal organizations and nation-state actors. Cyber-attacks are not only used to acquire money or a company's IP but have evolved into the new landscape for geopolitical conflict and war. As microelectronics, computer and Internet technology continues to be introduced into all aspects of society and infrastructure, the increased danger of opportunities for cyber criminals to gain access via vulnerable hardware and software systems becomes an ever-present reality. Companies, government institutions, and individuals must increase their awareness of the security risks and cyber-attack events in order to protect themselves against potential future attacks, and to more quickly react, utilizing actionable intelligence to mitigate threats.

The Aerocyonics Weekly Security Articles of Interest aggregates open and current security articles, documents, advisories, reports, events, videos, podcasts, and patches to raise awareness and engagement of contemporary cyber-physical security issues relevant to systems, software, and hardware. Individuals and organizations need actionable intelligence to address threats.

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Anticipated Best Outcome:

The Anticipated Best Outcome (ABO) is a software tool that can scrape source articles and provide up-to-date information and actionable mitigations to the user by utilizing Deep Neural Networks in Natural Language Processing (NLP). This enhanced tool would enable more extensive reporting options and actionable intelligence, adding further value to the reader community. This would tie current events published through the weekly security articles of interest to dynamic databases, such as The MITRE Corporation's Common Weakness Enumeration (CWE), Common Vulnerabilities & Exposures (CVE), and the Adversarial Tactics, Techniques & Common Knowledge (ATT&CK) databases, as well as the U.S. Department of Homeland Security's (DHS) Common Attack Pattern Enumeration & Classification (CAPEC) and Cybersecurity and Infrastructure Security Agency (CISA) databases (to name a few). The intent is to have a tool that links current events to actionable intelligence in the form of a usable dashboard/GUI.

Project Details:

Overall System Concept

URI Capstone team and Aerocyonics Inc. team to work jointly to establish overall system concept, including:
- Scope of the initial effort
- Optimal approaches for coding, databases and networking
- System security approaches, User levels of access
- Web page structural design and capabilities
- Options and capabilities related to the sorting, categorizing and feeding of scraped and analyzed data to "Advanced Access" Users
- Potential future efforts

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Block Diagram
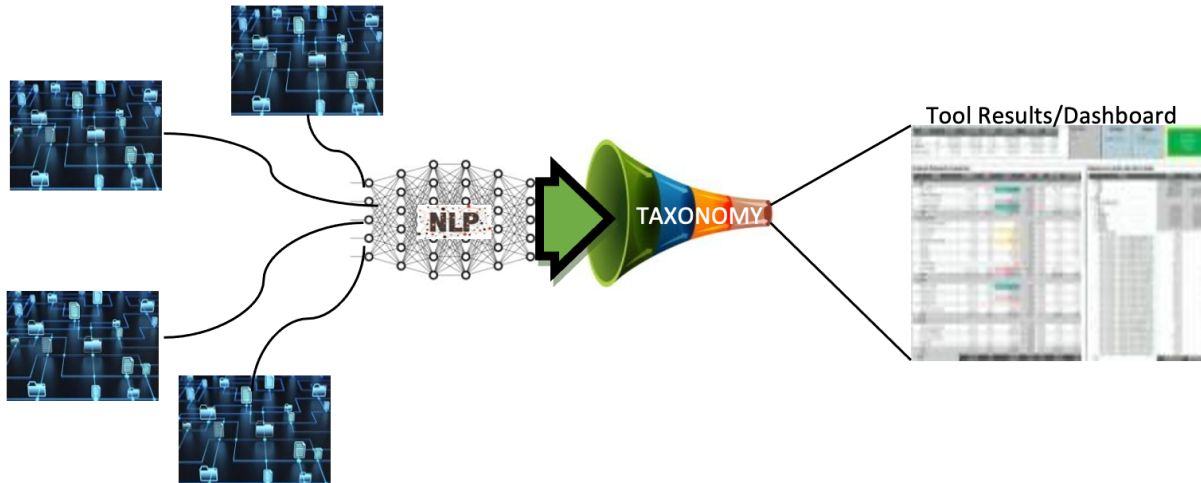
Hardware/Electrical Tasks

Initial list of tasks; URI Capstone team and Aerocyonics Inc. team to work jointly to develop further.

- Investigate requirements for servers/databases/peripherals necessary to store and manage data

Firmware/Software/Computer Tasks

Initial list of tasks; URI Capstone team and Aerocyonics Inc. team to work jointly to develop further.

- Draft Software that Scrapes Articles for Threat/Attack
- Develop Neural Network Analysis with NLP
- Define Taxonomy for Indexing Mitigations
- Develop Software that ties Threat/Attack with Mitigations
- Dashboard GUI that provides tool to the reader

Composition of Team:

- URI Capstone: Primarily Computer Engineers, but possible Electrical Engineers with high computer engineering skills.
- Aerocyonics: Chief Engineer (team lead) and supporting Project Engineers

Skills Required:

Computer Engineering Skills Required:

- Coding & Programming; including but not limited to some or all of the following - JavaScript, Python, Java, TypeScript & C#
- Knowledge and experience in the software development lifecycle (SDLC) – planning, prototyping, testing, deploying & maintaining
- Networking & network connectivity expertise
- Secure coding – knowledge of common vulnerabilities and countermeasures
  - Cryptography – secure coding, common security techniques & methods
- Code reviewing – ability to review and understand existing coding
- Database knowledge – SQL, NoSQL, etc., knowing how to query and effectively store big data
- Communication skills: Ability to perform and effectively communicate within a team structure
- Resilience – the ability to knuckle down, work under pressure and roll with the punches

Electrical Engineering Skills Required:

- NA

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Anticipated Best Outcome's Impact on Company's Business, and Economic Impact

Once accomplished, this software tool and dashboard will provide an actionable instrument for industry, defense, and academia to identify and defend against the emerging dynamic threat environment in the areas of cyber physical system security, supply chain risk management, and hardware and software assurance. The Dashboard/tool will be accessible through the Internet. Controls will be in place to allow for controlled access to reduce the likelihood of unauthorized persons/foreign/bad actors from accessing and making use of the available information. Various levels of service/access can be provided. Preliminary thoughts regarding access levels include the following, but access requirements will evolve as the project progresses.

Basic Access: Access to current articles of interest; minor sorting and categorizing of the articles each week to simplify Users ability to find articles of interest to their background and requirements.

Intermediate Access: Access to archived articles of interest with more sophisticated sorting and categorizing of articles by date, subject matter, industry, etc.

Advanced Access: Access to knowledge and information scraped, sorted and categorized from current and past articles of interest

Automated information feeds of "Advanced Access" information:
Clients specify types/categories of information and each week specific articles of interest and/or specific categories of scraped, sorted and categorized information gets fed to the "Advanced Access" User. Information can be sent via email, automatically fed into a clients database and/or transmitted in some other yet-to-be-determined means.

The exact extent of the initial task will be determined as a result of the initial joint scoping effort between URI Capstone and Aerocyonics, Inc. team members.

Broader Implications of the Best Outcome on the Company's Industry:

Aerocyonics' very basic, current version of the Weekly Security Articles of Interest is used extensively across industry and government to help Users keep current on cybersecurity events and enable them to respond rapidly to critical time-sensitive issues and risks. The consolidation of this content into a more advanced and usable format will allow for a better-informed community that can more quickly react to current events and actionable intelligence which would otherwise not be achieved by relying on individual topic research. Recent Aerocyonics' survey results demonstrated how over 80% of readers utilize the current articles to identify actionable mitigations in their field.

Aerocyonics aims to further develop the weekly Security Articles of Interest to better support the growing reader audience by expanding the offering utilizing Natural Language Processing (NLP) and Machine Learning (ML) to manage and scrape the content in accordance with a taxonomy specific to cyber physical systems security, supply chain risk management, and hardware and software assurance, resulting in actionable intelligence that is easily accessible to the User. This more advanced information can then be provided to clients in various forms, as simple as a weekly email of the information, or even the automatic feeding of scraped, sorted and categorized information into specific fields of a client's database.

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