



MD5

USC
Viterbi
School of Engineering

Innovation for Defense Applications (Hacking 4 Defense)

CSci 532: Spring 2022

Thursday, 3:30-6:50pm

**Solving National Security Issues with the Lean
Launchpad**



About Hacking For Defense™

WHAT IS HACKING FOR DEFENSE?

Hacking for Defense™ is a university-sponsored class that allows students to develop a deep understanding of the problems and needs of government sponsors in the Department of Defense and the Intelligence Community. In a short time, students rapidly iterate prototypes and produce solutions to sponsors' needs.

Capital Business

These college students invent things for the Pentagon, and maybe find a business



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THE COLLEGE COURSE WHERE THE MILITARY ASSIGNS THE HOMEWORK



Capella Space

Hourly, Reliable, and Persistent Imagery of Anywhere on the Globe Delivered to You from Space



H4Di

Universities' best minds solving the nation's toughest problems



M D 5



Innovation for Defense Applications

Spring 2022 (Jan 13th-April 28th) SOS-B2

CSCI 532: Thursday, 3:30-6:50pm

- Solving **national security problems** using Lean Launchpad methodology
- Mission Model Canvas + Beneficiary Discovery
- Interdisciplinary Teams: 3-5 students (Engineering CS, Informatics, Business, Politics, Public Policy)
- Problem Sponsors: DoD/IC + others
- Mentors: LA tech ecosystem
- Military Liaisons: from USC/LA-SoCal military community

Tell us your skills and interests:

(through the survey on the class webpage)

https://docs.google.com/forms/d/e/1FAIpQLSeO29xHjUKuGn7j7Z-rKs5h3dhUdrfhVJ9ZHIBoNVEU53lvHg/viewform?usp=sf_link

PROBLEM TITLE

Translation on Demand

CHALLENGE

Linguist soldiers need a way to more efficiently and consistently translate foreign texts, including highly technical and specialized language, in order to increase soldiers' ability to support complex missions that require intelligence translation.

BACKGROUND

The soldiers within the 341st Military Intelligence Battalion linguistic unit are often tasked with translating classified and unclassified documents to English in a very short period, often within a few hours. Such tasks include a linguistic commander translating emergency warnings for local non-English speaking civilians that contain specific technical or topic-related terms.

Additionally, many soldiers within the battalion are non-native speakers of the foreign language and may not understand specific nuances or highly specialized vocabulary in these unplanned scenarios.

The size of the documents can vary based on mission; however, in some cases, it is impossible for a single person to complete the task within the given time frame. There is also a shortage of security-cleared soldiers with the necessary skills to meet real-time needs for emergency translation and analysis, and there are no tools to support the soldiers who are attempting to complete this work in the field. Thus, soldiers are left unable to meet tight mission deadlines and act on intelligence quickly enough.

OPERATIONAL CONSTRAINTS

- Must be able to operate in remote or deployed locations
- Must not require an increase in soldiers with a security clearance
- Must be able to produce translated text with near-native level proficiency

PROBLEM SPONSOR

Company Commander Captain Nathan Kolmodin, Signals Intelligence Company (D-Co), (nathankolmodin@gmail.com)

PROBLEM SPONSOR LOCATION

Joint Base Lewis-McChord, WA

SENIOR LEADER

Battalion Commander Lieutenant Colonel Teresa Wenner, 341st Military Intelligence Battalion, Washington National Guard

Example of Problem from Past Semester

Challenge:

Linguist soldiers need a way to more efficiently and consistently translate foreign texts, including highly technical and specialized language, in order to increase soldier's ability to support complex missions that require intelligence translation.

PROBLEM TITLE

Network Computer Visibility

CHALLENGE

Air Force test engineers need a common operating picture of the devices on their network in order to perform required mission and maintenance tasks.

BACKGROUND

Air Force test engineers continuously run experiments, utilizing multiple computers on the same network with one computer overseeing the functions of the other computers. In the past, test engineers have been able to view all computers and devices on their network on one computer through a Microsoft tool known as Net View, via the Master Browser Function of Microsoft Windows. However, Microsoft recently disabled the Master Browser function because of discovered security vulnerabilities. As a result, Windows 10 computers no longer include the function.

When a Windows 10 machine assigns itself a Master Browser on a network, the network discovery does not work or does not work correctly. Test engineers must manually input every computer and device on the network each time they run an experiment, which is very timeconsuming and inefficient. A work-around is to disable the Master Browser on the Windows 10 computer, and allow a non-Windows 10 computer (e.g. Windows 7) to be assigned the Master Browser. This allows the network discovery of connected computers to work properly again. However, this workaround isn't sustainable because the Air Force is working on modernizing technology and going forward, only Windows 10 computers will be used. Therefore, Air Force test engineers need a better way to understand all the devices on their network.

OPERATIONAL CONSTRAINTS

- Solution cannot have wireless or cellular capabilities
- Solution cannot have a camera or microphone
- Must work with Windows 10

PROBLEM SPONSOR

David Mulvey, 772nd Test Squadron, Air Force Materiel Command
(david.mulvey.ctr@us.af.mil)

PROBLEM SPONSOR LOCATION

Edwards Air Force Base, CA

SENIOR LEADER

David Cooper, 772nd Test Squadron, Air Force Materiel Command
(david.cooper.26.ctr@us.af.mil)
Ruben Castaneda, 772nd Test Squadron, Air Force Materiel Command
(ruben.castaneda.ctr@us.af.mil)

Example of Problem from Past Semester

Challenge:

Air Force test engineers need a common operating picture of the devices on their network in order to perform required mission and maintenance tasks.

PROBLEM TITLE

Designing an Information Management System to Solve Big Problems

CHALLENGE

452nd Air Mobility Wing personnel need a more efficient process to track and share data on Continuous Process Improvement projects in order to reduce labor redundancies and maximize effective resource use.

BACKGROUND

The 452nd Air Mobility Wing (AMW) consists of twenty-three squadrons representing all military services. For the past six years, 452 AMW personnel have used Lean Six Sigma tools and methodologies to execute Continuous Process Improvement (CPI) and innovation projects. As the Lean Six Sigma student body grows, it is crucial to establish a sustainable system that tracks and shares data between students to support efficient project execution.

Lean Six Sigma is an eight-step process designed to identify, evaluate, and solve problems through careful analysis, planning, and execution. Students are introduced to the process's tools and methodologies first. These students, the 'green belts,' obtain a certification upon completing a project that solves wing and unit process problems. A student earns their 'black belt' when they complete an enterprise-wide project, meaning their project met the needs of multiple squadrons.

Nearly 100 students have taken a Lean Six Sigma course at 452 AMW thus far. Currently, there is no method in place that tracks information about past or ongoing projects, including their subject, relevant progress, or key stakeholders. As more students begin their projects, they run the risk of duplicating efforts and wasting resources if an existing project has already met part of their needs. It is crucial for students to contribute to and draw upon a shared repository of information to streamline Lean Six Sigma project workflow and improve decision-making for senior leaders.

OPERATIONAL CONSTRAINTS

- Must be compatible with both the Unclassified-but-Sensitive Internet Protocol Routing Network (NIPRNET) and Classified-Sensitive Internet Protocol Routing Network (SIPRNET) used on base.
- Must be extendable to be used in different environments, such as a virtual private network (VPN) or on a mobile app, for permissible information.

PROBLEM SPONSOR

GS-12, Scipiaruth Curtis, Wing Process Manager, 452 Air Mobility Wing, U.S. Air Force (scipiaruth.curtis@us.af.mil)

PROBLEM SPONSOR LOCATION

March Air Reserve Base, CA

Example of Problem from Past Semester Challenge:

452nd Air Mobility Wing personnel need a more efficient process to track and share data on Continuous Process Improvement projects in order to reduce labor redundancies and maximize effective resource use.

PROBLEM TITLE

Test, Test, Are You Integrated?

CHALLENGE

Marine Corps Tactical Systems Support Activity test engineers need an intuitive test framework in order to efficiently perform automated testing for communication gear.

BACKGROUND

Marine Corps Tactical Systems Support Activity (MCTSSA) test engineers test communication gear to ensure that it will effectively integrate with existing systems and platforms. Most of the gear is software that requires both automated and manual testing. For automated testing, engineers depend on both commercial and Marine products. Commercially available products test a specific type of application or provide focused simulation or analysis. On the other hand, MCTSSA automation products include an open-source framework and user interface test automation tools that can be used to either test or write the code to test a product.

With this suite of tools, engineers are able to conduct automated testing on most communication software. However, developing the testing script using the open-source framework requires programming knowledge and can be a very slow process. Engineers can use 'record and replay' tools which allow them to mimic a user, record their actions, and convert those actions into the script which runs in the background. These tools allow engineers to identify vulnerabilities or problems with program user interfaces. However, such tools cannot robustly support the graphics-heavy mapping programs that MCTSSA engineers work on and scripts cannot be reused across programs. Therefore, MCTSSA test engineers need a test framework that is easier to learn and use in order to more effectively test communication gear.

OPERATIONAL CONSTRAINTS

- Automated testing often occurs on classified software.
- Solution must be platform and computing language agnostic.

PROBLEM SPONSOR

Garrett Bagat, Systems Engineer, Test Automation Lead, Test and Certification Division, Marine Corps Tactical Systems Support Activity (garrett.bagat@usmc.mil)

PROBLEM SPONSOR LOCATION

Camp Pendleton, San Diego, CA

SENIOR LEADER

Steve Mason, Test Branch Head, Test and Certification Division, Marine Corps Tactical Systems Support Activity (stephen.d.mason@usmc.mil)

Ben Krake, Network Engineer, i3Tech Data Solutions, Inc., Marine Corps Tactical Systems Support Activity (ben.krake@i3Tech.com)

Example of Problem
from Past Semester
Challenge:

Marine Corps
Tactical Systems
Support Activity test
engineers need an
intuitive test
framework in order to
efficiently perform
automate testing for
commercial gear.

PROBLEM TITLE

Aln't it Overwhelming?

CHALLENGE

Marine Corps Tactical Systems Support Activity test engineers need a better understanding of the available automated testing tools in order to reduce the need for manual testing.

BACKGROUND

Marine Corps Tactical Systems Support Activity (MCTSSA) test engineers test communication gear to ensure that it will effectively integrate with existing systems and platforms. Most of the gear is software and requires both automated and manual testing, and MCTSSA engineers depend on both automated and human tools in order to test for software vulnerabilities.

Commercially available products test a specific type of application or provide focused simulation or analysis of the program vulnerabilities and performance. Alternatively, MCTSSA automation products include an open-source framework and test automation tools for a software's user interface that can be used to either directly test or write the code to test a product.

Although test engineers already use automation tools, they lack the awareness of other tools that may enhance or simplify their ability to test software for vulnerabilities. Many of these tools use artificial intelligence (AI) or machine learning (ML) which are both experiencing rapid innovation. In order for test engineers to more strategically plan their automated testing process, they need a better understanding of the landscape of available tools (commercially or open-source) that would reduce the need for manually testing for every potential vulnerability.

OPERATIONAL CONSTRAINTS

- Automated testing often occurs on classified software.
- Solution must be platform and computing language agnostic.

PROBLEM SPONSOR

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 Ben Krake, Network Engineer, i3Tech Data Solutions, Inc., Marine Corps Tactical Systems Support Activity (ben.krake@i3Tech.com)

Example of Problem from Past Semester

Challenge:

Marine Corps Tactical Systems Support Activity test engineers need a better understanding of the available automated testing tools in order to reduce the need for manual testing.



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Next Steps...

- Form Teams
- Apply!!!

APPLY: https://docs.google.com/forms/d/e/1FAIpQLSeO29xHjUKuGn7j7Z-rKs5h3dhUdrfhVJ9ZHIBoNVEU53lvHg/viewform?usp=sf_link