CSCI 5448
Track 3 Project Proposal

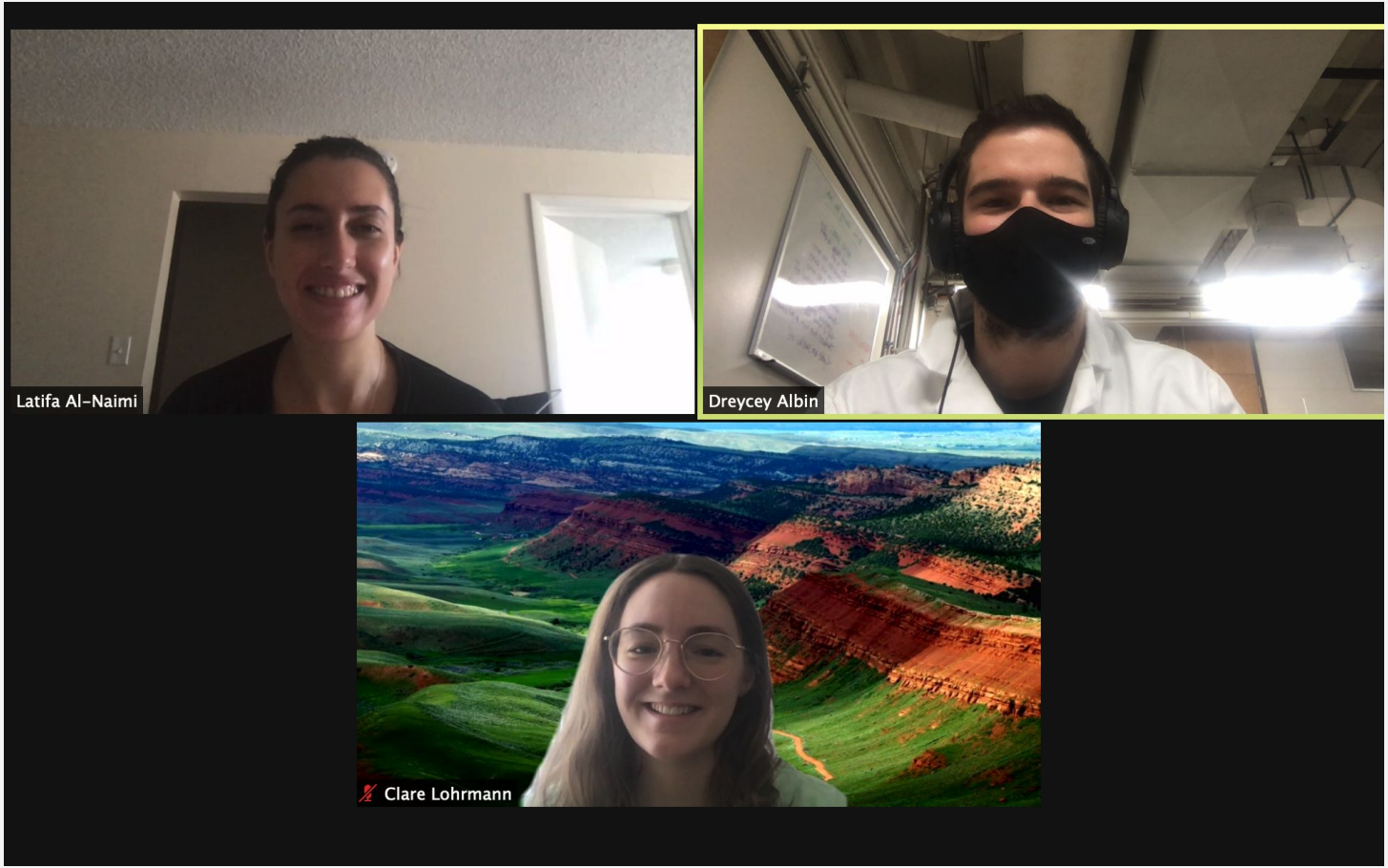
Clare Lohrmann
Dreycey Albin
Latifa Al-Naimi

YOUTUBE LINK:
https://www.youtube.com/watch?v=55XuF_oIwMA

Topic title being proposed (clearly marking the Project Track 3)

Modified Wave Front Method for Coverage Path Planning and Applications to Biosurveillance.

Current Team members



What is the problem you are trying to solve?

Ebola
Rabies
Influenza
SARS-CoV-2
(Chan et al., 2013)

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https://www.crittercontrol.com/wildlife/bats/bat-guano

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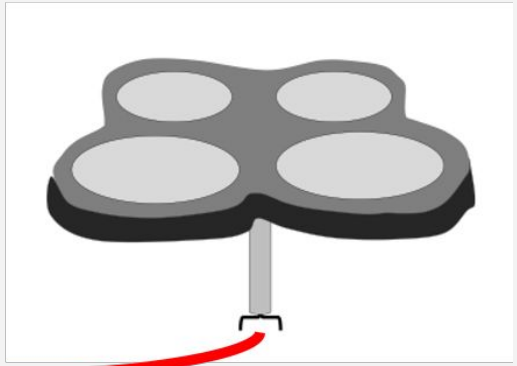
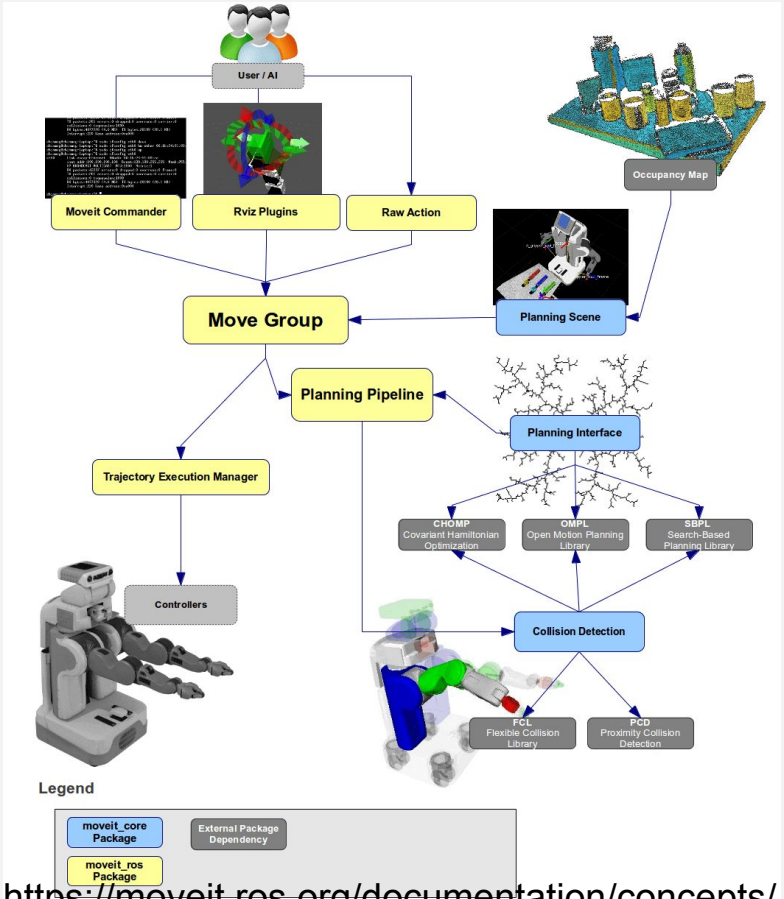
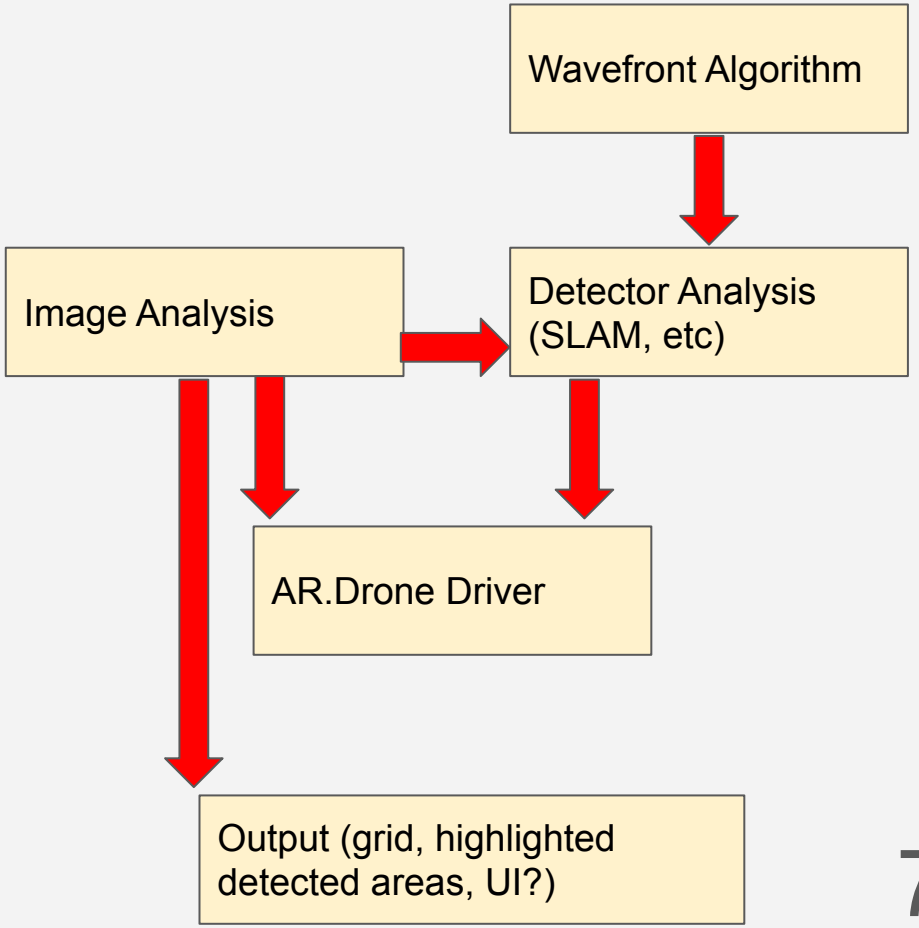


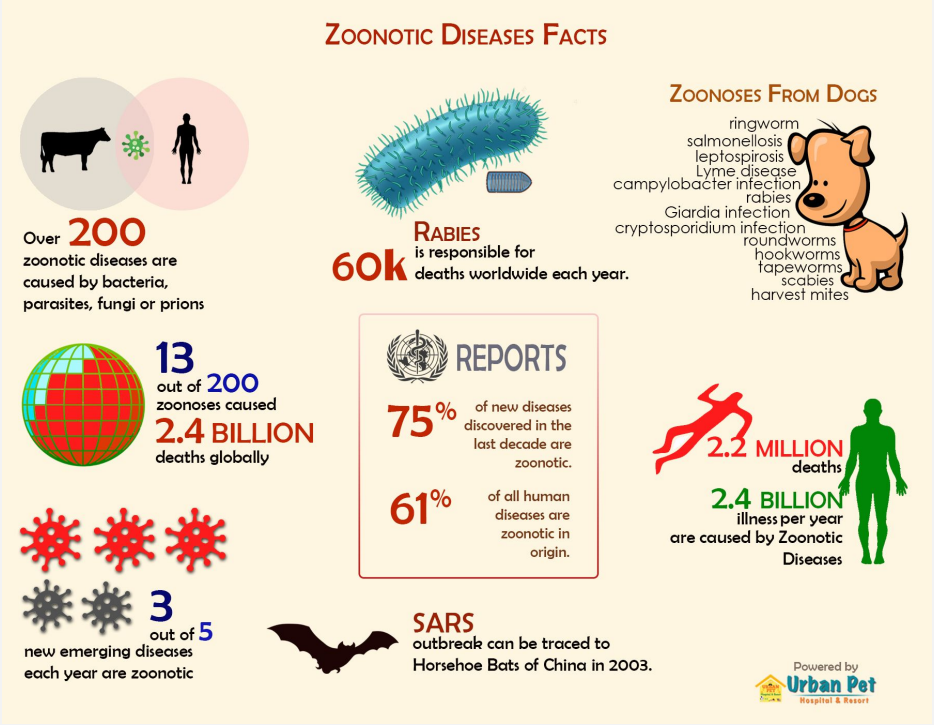
What is the relation to OO and major elements in the class?

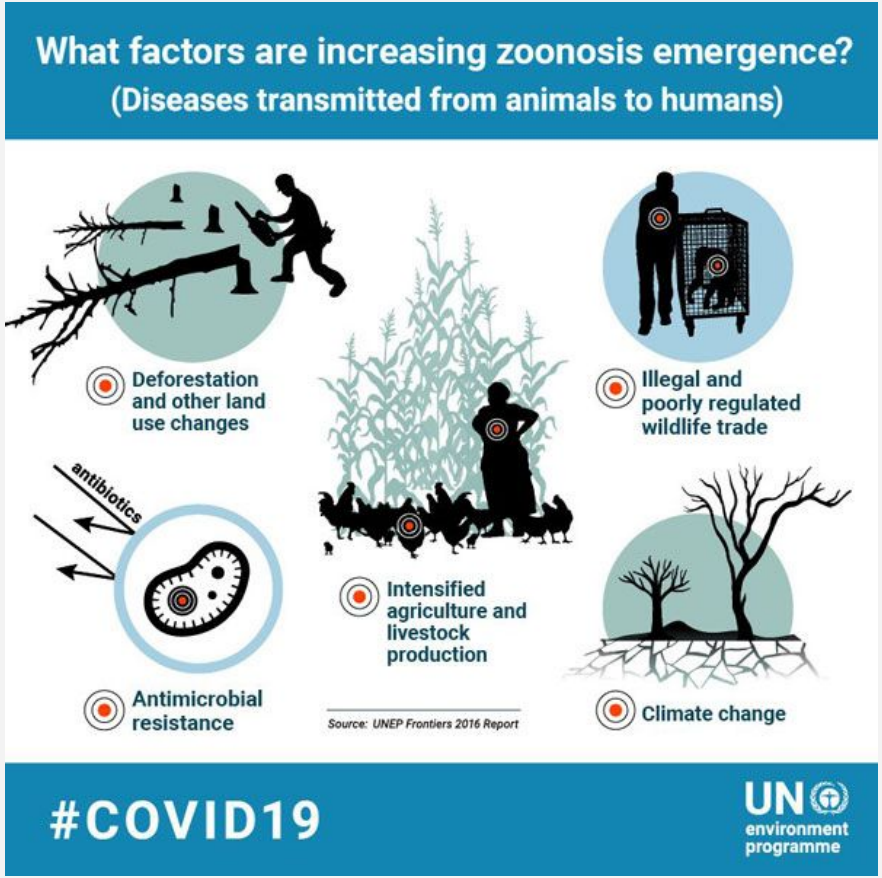


https://moveit.ros.org/documentation/concepts/



Why is the problem important to solve?





What is the current state-of-the-practice or state-of-the-art in solving this problem, and what are its limitations?

EMERGING INFECTIOUS DISEASES

Emerg Infect Dis. 2013 May; 19(5): 743–747.
doi: 10.3201/eid1905.121042
PMCID: PMC3649003
PMID: 23647732

Targeting Surveillance for Zoonotic Virus Discovery

Jordan Levinson,[1] Tiffany L. Bogich,[1] Kevin J. Olival, Jonathan H. Epstein, Christine K. Johnson, William Karesh, and Peter Daszak

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Lab-on-a-Drone: Toward Pinpoint Deployment of Smartphone-Enabled Nucleic Acid-Based Diagnostics for Mobile Health Care

Aashish Priye,[†] Season Wong,[‡] Yuanpeng Bi,[†,¶] Miguel Carpio,[†,¶] Jamison Chang,[†,¶] Mauricio Coen,[†,¶] Danielle Cope,[†,¶] Jacob Harris,[†,¶] James Johnson,[†,¶] Alexandra Keller,[†,¶] Richard Lim,[†,¶] Stanley Lu,[†,¶] Alex Millard,[†,¶] Adriano Pangelinan,[†,¶] Neal Patel,[†,¶] Luke Smith,[†,¶] Kamfai Chan,[‡] and Victor M. Ugaz*[,†,§]

[†]Artie McFerrin Department of Chemical Engineering, Texas A&M University, College Station, Texas 77843-3122, United States
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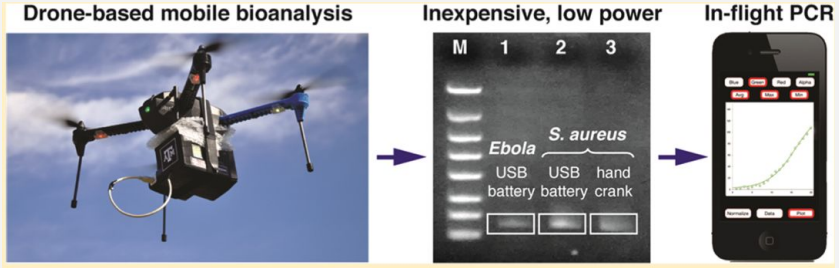
[§]Department of Biomedical Engineering, Texas A&M University, College Station, Texas 77843-3122, United States

Supporting Information



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2019

GLOBAL HEALTH

Scientists Were Hunting for the Next Ebola. Now the U.S. Has Cut Off Their Funding.

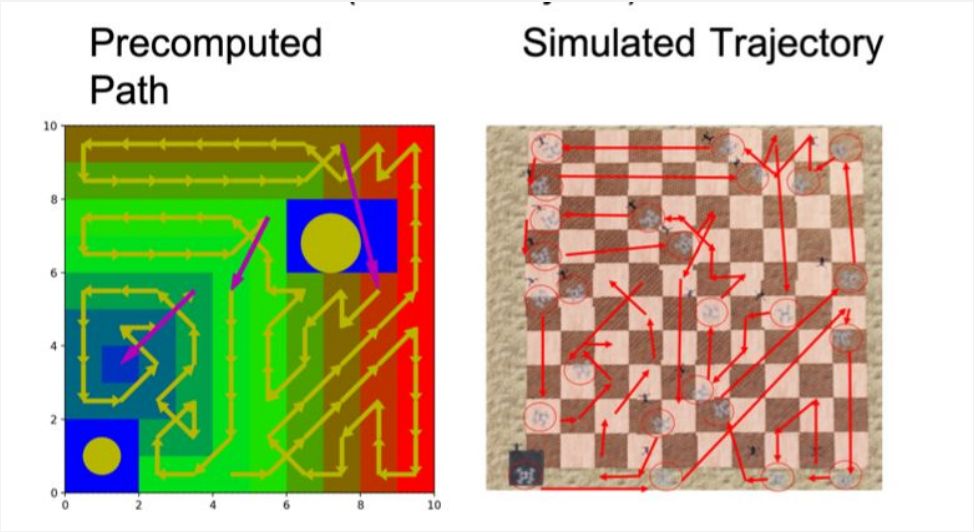
Predict, a government research program, sought to identify animal viruses that might infect humans and to head off new pandemics.

https://www.nytimes.com/2019/10/25/health/predict-usaid-viruses.html

2020

https://www.nytimes.com/2020/02/14/world/asia/china-coronavirus-doctors.html

What is your proposed solution?



1. It’s an aerial vehicle, which are the focus of surveillance missions in general.
2. There is similar research using drones for biological applications.
3. Drones don’t need a pilot, so for dangerous areas (add pics of caves)

https://pubs.acs.org/doi/abs/10.1021/acs.analchem.5b04153

How would you convince the professor, classmates, and the research community that your solution is successful?

1. Error metrics (fecal matter identification)
2. Output that demonstrates a correct, readable location of the objects we’re looking for in a specific range
3. Record a video of the surveillance that includes the generation of the output

What is your personal reason for selecting to research this topic?

Dreycey

- Interested in learning more about ROS (Robotic Operating System)
- The combination of quality software, machine learning, bioinformatics and robotics is too exciting

Latifa

- Interested in learning how to program drones for surveillance
- Interested in learning how to apply design patterns and object-oriented programming in a new context

Clare

- Believe the problem is very important to solve
- Interested in applying OOP and design patterns in a context relevant to my research

References

Chan, J. F. W., To, K. K. W., Tse, H., Jin, D. Y., & Yuen, K. Y. (2013). Interspecies transmission and emergence of novel viruses: lessons from bats and birds. *Trends in microbiology*, *21*(10), 544-555.

What is your proposed solution?

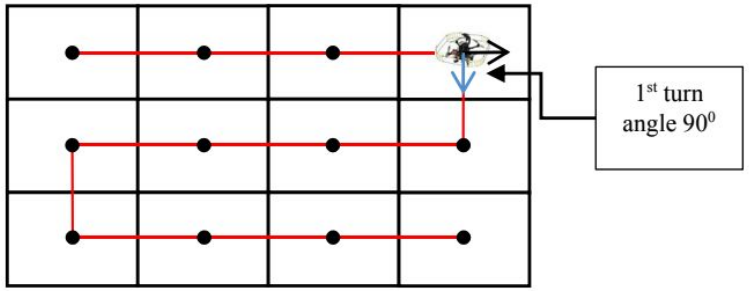
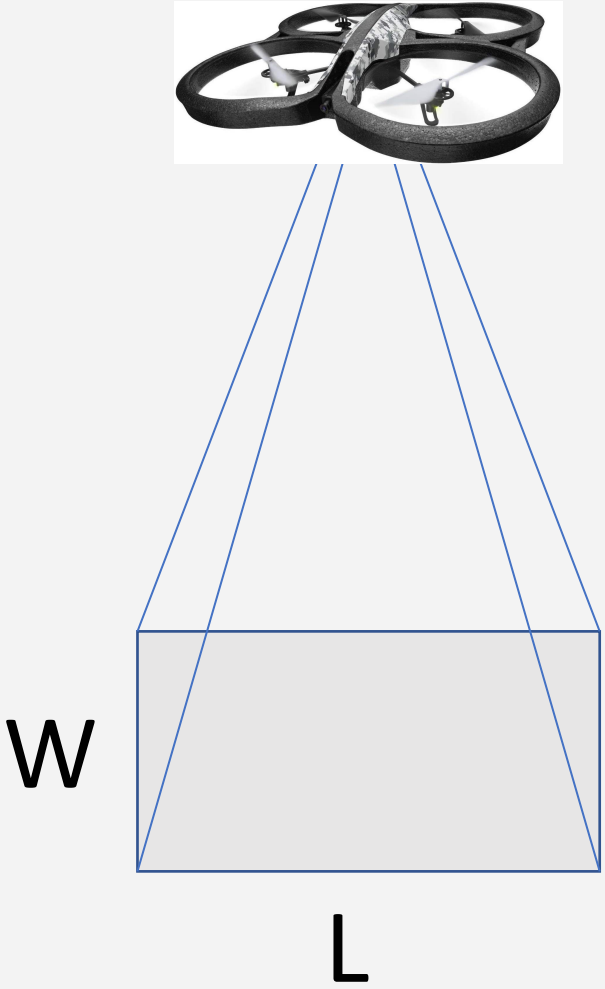


Fig. 4: Example of UAV coverage path



Project Title

(Track 2)

Comparing the practical applications and performance of Java vs C++

CSCI 5448 (OOAD)
Prof. Danny Dig

Proposed by:
Anusha Basavaraja

Problem statement:

- **Why Java is widely preferred at the industrial level even though C++ is relatively faster than Java?**
- **C++ is not obsolete. What sort of industrial applications still prefer using C++?**
- **What are the main factors that drives the developers in the industry to choose/use Java/C++ in their roles?**

Relation with OO and other elements in the class:

- My problem revolves around two major programming languages – Java & C++.
- Both Java & C++ supports Object Oriented Programming paradigm.
- They support – Abstraction, Encapsulation, Inheritance and Polymorphism.
- The code implementation follows various design patterns (best practices followed in various used cases or novel design pattern ideas).

What is the gap and why is it important to fill in:

- From a developer point of view, implementation of program using Java and C++ does not comprise of major differences.
- One who is very well versed in C++ does not require enormous time to switch to Java.
- If a person knows how to code well using a programming language does not imply that he/she is well versed developer.
- A well versed developer is someone who can code well, troubleshoot, debug the code, integrate with respective software/systems, deploy the code in production environment etc.
- In order to debug a code in various systems, just knowing the syntax of programming language will not suffice.
- It requires one to explore and perform more research work on various concepts that is linked with the programming language that is being used.
- The idea of - a developer to be able to understand and incorporate various knowledge pertaining a programming language apart from only knowing the syntax and examples of it is the main reason why these problem statements needs to be explored and researched to find the solutions.
- The solutions to the above problem statements helps the developers to broaden their horizons along with proposing suitable solutions to the industrial problems.

What is the current industry state-of-the-practice related to this problem:

- Java is mainly preferred in industries that are into the development of software applications,
  - Web-based applications
  - Mobile applications
  - Big data technologies
  - Embedded systems …..etc
- Why: simple & flexible coding, platform independent, multithreading etc.
- Some of the companies that use Java are,
  Uber, Google, Netflix, Amazon, Airbnb…..etc

- C++ is mainly preferred in industries that are into the development of,
  - Operating systems
  - Banking applications
  - Browsers
  - Database software …..etc
- Why: speed (performance),pointers, ability to work directly with hardware devices(memory, CPU, hard drive) .
- Some of the companies that use C++ are,
  Evernote, LinkedIn, Microsoft, NASA, Facebook …..etc

Limitations:

Java :

- Slow and poor performance.
- Java requires significant memory.
- Platform limitations.
- Browser plug-ins -> insecure.

C++ :

- Complex code -> large higher level programs.
- Can't support garbage pick-up.
- For a specific OS or platform, the library set is typically chosen that locks.
- Difficulty in debugging.

How would I go about to cover this knowledge gap:

- First step : Get to know the difference b/w Java & C++ program executions in my personal computer practically using different software tools.
- Learn the execution mechanism followed by Java & C++ programs.
- Through available open sources, get more insights on,
  - applications preferring Java programming at industrial level.
  - applications preferring C++ programming at industrial level.
  - performance of Java vs C++ programs.
  - advantages of Java over C++.
  - reasons behind applications still sticking to C++ coding.
  - build comparison models.
- Reach out to respective personalities and collect the information pertaining problem statements.

Personal reason for selecting the above research topic:

- I am an amateur in C++ and Java. Also, a novice in CS domain.
- I believe, starting with such work would help me broaden my knowledge pertaining background of programming languages.
- My prior experience in Java and C++ would help me understand and explore more in this context.
- Being an electronics graduate, apart from knowing how to code in a programming language, I have never tried to understand the background/applications/comparisons/execution mechanisms of programming languages.
- Researching on practical applications and performances of Java and C++ would steer my interest in wanting to know more about the depth of the programming languages which is the key for overall development of a coding professional.

References:

- https://en.wikipedia.org/wiki/Comparison_of_Java_and_C%2B%2B
- https://www.northeastern.edu/graduate/blog/most-popular-programming-languages/
- https://www.upwork.com/resources/java-vs-c-which-language-is-right-for-your-software-project
- https://www.researchgate.net/post/What_useful_features_exist_in_c_over_java_Where_industry_or_environment_is_c_widely_used
- https://www.eecs.uottawa.ca/~tcl/javapres/limitations.html
- https://techvidvan.com/tutorials/pros-and-cons-of-java/
- https://lifehacker.com/what-is-java-is-it-insecure-and-should-i-use-it-5988800
- https://tekslate.com/c-explain-advantages-disadvantages
- https://tekslate.com/c-explain-advantages-disadvantages

Design Patterns in PyTorch vs. TensorFlow: Which lends itself better to object-oriented design?

Elizabeth Spaulding and Sagarika Shreevastava
(Track 2)
Not presenting live. Link to our video:
https://cubouIder.zoom.us/rec/share/InOYkgwC8LypupL_JZwvJ0r3NDkWaMJpUuSW_1JJNasvR-etAXdIy3UqKRvdFHVx.9LRX85iE8zqqF47r?startTime=1612489386000

Overview

- Goal: analyze the object-oriented capabilities of PyTorch and TensorFlow through common design patterns for each
- Examine all phases of the development lifecycle
  - Analysis
  - Design
  - Implementation
- Compare and contrast them: which library lends itself better to object oriented programming?

Why it’s relevant

- Problem: machine learning practitioners often take a “scripting” approach when programming neural networks
- Not many online resources specifically for OO design of neural networks
- Our analysis would be helpful for those trying to design neural networks in an object-oriented fashion
- Personal angle: we would like to learn more about these libraries ourselves