**oneAPI Workshop Report**

Migara Amarasinghe & Diego Abad

**Background**

The FAMU-FSU College of Engineering (specifically, the ECE Department under the supervision of Dr. Shonda Bernadin) hosted its annual Intel Day on April 14th and April 15th. In the span of the previous days, there were three workshops that were scheduled. The first Workshop happened on Friday, April 14th, and the next two happened on Saturday, April 15th. The names of each Workshop respectively are the following:

1. What is Generative AI? – From 6:00 P.M. to 7:00 P.M.
2. AI using OpenVINO and oneAPI Framework – From 9:00 A.M. to 10:15 A.M.
3. Introduction to Heterogeneous Computing and oneAPI – From 10:30 A.M. to 11:50 A.M.

The students responsible for the previous workshops are the following (in order):

1. Maryan Taeb – Intel HBCU Scholar Program
2. Diego Abad – Intel oneAPI Ambassador
3. Migara Amarasinghe – Intel oneAPI Ambassador

**AI using OpenVINO and oneAPI Framework**

Since Diego Abad it's writing this report, I'll go into detail in the reasoning behind the creation of the Workshop. The list of documents used in my Workshop is the following:

1. Intro to oneAPI, the AI Analytics Toolkit, and OpenVINO.pptx
2. Workshop Script.docx
3. How to access the Intel DevCloud.docx
4. Activity Script.docx

My Workshop was divided into three stages: The presentation, the Kahoot Quiz, and the IntelDev Cloud activity.

**The presentation**

This part uses the Intro to oneAPI, the AI Analytics Toolkit, OpenVINO.pptx, and the Workshop Script.docx documents. The first one shows some material regarding the concept of AI, the oneAPI initiative, the oneAPI Base Toolkit, the AI Analytics Toolkit, and the OpenVINO tool. The script basically shows what the presenter will say for each PowerPoint slide. The presentation has the following structure:

1. Title
2. Content
3. Modern AI Problems – How AI and oneAPI relate
4. What is oneAPI? – How does oneAPI solves the previous stated issue
5. oneAPI Applications – Some examples where oneAPI could be used in
6. oneAPI Levels – Different scopes where developers use oneAPI
7. oneAPI Toolkits – Quick Introduction to the oneAPI Toolkits
8. Intel oneAPI Base Toolkit – Showcase the contents and some quick introduction to the Base Toolkit itself and the contents of it
9. Data Parallel C++ –A general concept guide on what the DPC++ language is
10. Included Libraries – The libraries that the Base Toolkit Offers
11. Intel DPC++ Compatibility Tool – Introduction to the Compatibility Tool
12. An example of Compatibility Tool from Diego and Migara's Research Project
13. Transition question
14. Introduction of the AI Analytics Toolkit – This was taught alongside some comments on how this tool places in the previously stated scopes of oneAPI
15. What's included – AI Analytics Toolkit contents
16. General ML – Transition from the AI Analytics Toolkit to some specific libraries used in Machine Learning
17. oneMKL & oneDAL – A quick explanation of what those libraries are and why they are important
18. Deep Learning – Transition to Deep Learning and the libraries that help with this
19. oneDNN – Brief explanation of what oneDNN is and how it affects Deep Learning
20. oneCCL – Brief explanation of what oneCCL is and how it affects Deep Learning
21. Transition Question into OpenVINO
22. What is OpenVINO? – Introduction to OpenVINO, what it is used for, and the components of it
23. OpenVINO utilities – the Utilities that are part of the main components of OpenVINO
24. Model Optimizer – Brief introduction to the Model Optimizer, what it does, and why it is important
25. Inference Engine - Brief introduction to the Inference Engine, what it does, and why it is important
26. OpenVINO Workflow – Graphical Example of the OpenVINO Workflow. Greatly inspired by the content inside the "Introduction to the Intel Distribution of OpenVINO Toolkit" module
27. Open Model Zoo – Quick introduction of what it is and where we use it

In summary, my Workshop focuses on explaining the oneAPI tool and its ramifications from the lowest level of implementation, which is using the Base Toolkit, to more high-level (background use) applications like Deep Learning Inference in OpenVINO. I tried to explain some concepts before we went into the actual oneAPI tools, so the oneAPI concepts are briefly explained rather than in-depth explaining. I believe this was the right call to make since most of the people attending the Workshop were not familiar at all with the terminology that involves oneAPI.

**The Kahoot Quiz**

Kahoot is a website that allows people to create quiz questions similar to the show "Who Wants to be a Millionaire?" where the student or student who gets more correct answers the fastest wins. The title for the Kahoot Quiz is a joke name: SUPER HYPER ULTRA FUN ONEAPI QUIZ. In this case, the questions I asked were the following:

1. What is the goal of oneAPI?
2. Which oneAPI library do you think is a building block for the other oneAPI libraries?
3. Which of the three levels does the OneAPI Base Toolkit fall in?
4. What is the programming language that oneAPI uses?
5. Which of the following could NOT be considered a hardware accelerator?
6. What are the two file extensions that the Intermediate Representation is made out of?
7. Which of the three levels does the Intel AI Analytics Toolkit fall in?
8. What is the inference?
9. Based on the previous presentation, What does "inference" refers to?
10. Which one of these Python Libraries does oneAPI improve?

The questions get harder as their number increase. All of the questions and answers are based on what the participants were exposed to during the presentation. In this part, the top three students received a price from the oneAPI Ambassadors program prices (.

**The Activity**

This part uses the How to Access the Intel DevCloud.docx and Activity Script.docx files.

For the Activity, I decided to use the Intel Dev Cloud and one Inference Engine tutorial from the OpenVINO classification tutorial that can be found in the OpenVINO environment of the Intel Dev Cloud. The Dev Cloud was used for this Activity thanks to being easy to access and configure and not being invasive to the participant's computer. Another reason why I decided to use the Dev Cloud was to avoid running into compatibility issues since not all laptops have the necessary Intel Hardware to run OpenVINO.

The Classification tutorial was modified and then uploaded to my own GitHub repository. The modifications were the removal of all background knowledge inside the Jupyter Notebook from the original tutorial, as well as modifying the order of the code blocks so everything compiles when running the notebook in order. Also, I added the step's name for each part of the inference. The other reason why I used this tutorial was that I could directly ask students to analyze different AI-Generated images using the model uploaded to OpenVINO.

The script of this Activity has the information found in the original classification tutorial but in a more simplified manner for most of its content. I also touched some ground on the different kernels the participant can use to run the code, though it is not advised since the tutorial is based on the 2020 OpenVINO version and doesn't run well with other kernels.

Due to the lack of time, only a few couple of students completed the exercise.

**Conclusions**

Based on the previous, I conclude that there are several things to improve above my Workshop:

1. The oneAPI-specific components should be researched more, specifically for the AI Analytics Toolkit and the OpenVINO part.
2. We should have 2 Kahoot Quiz in between the presentation to keep the audience engaged.
3. The Activity should be shorter, or at least less in-depth, since it takes more time to explain it than doing it.
4. We should have volunteers learn more about the activities before we do them in the Workshop.

Nevertheless, the students who were in this Workshop did a great job at retaining most of the information from the presentation, as well as participating in the Kahoot Quiz and Activity.