Project Name - Medical Image Processing

oneAPI or SYCL mention - SYCL

Team Name - Mind Crusaders

Team Member - Kaamal VN, Harshitaa M S, Abbi Jannanee M, Vishal M

- Your pitch time is for 15 Mins.

- This included 10 mins of presentation and 5 mins of Q&A.

- The presentation will be in person

- Keep it crisp, clear and concise.

- Core components of oneAPI/SYCL used

- Demo is mandatory. (Video or Live demo)

- Highlight oneAPI AI Toolkit & its Libraries /SYCL usage with Stats.

- After pitch, there will be questions from Jury.

Problem Statement

Medical Image Processing - Pneumonia classification

- According to **WHO**, the world pneumonia killed more than 80800 children under the age of 5 in **2017** accounting for **15% all deaths under 5years** while India contributes about **23% of global pneumonia burden**.

- Pneumonia is a prevalent respiratory infection that requires accurate and timely diagnosis for effective treatment.

- In our project, we utilized SYCL, a programming model based on standard C++, for the classification of pneumonia in medical image processing.

- SYCL served as the foundation for our pneumonia classification project, leveraging the power of heterogeneous hardware architectures, such as CPUs, GPUs, and FPGAs.

- With SYCL, we optimized our classification algorithms for parallel processing, enabling faster and more accurate diagnosis.

Architecture – Impact of oneAPI AI Toolkit & its Libraries /SYCL (How oneAPI /SYCL helped you?)
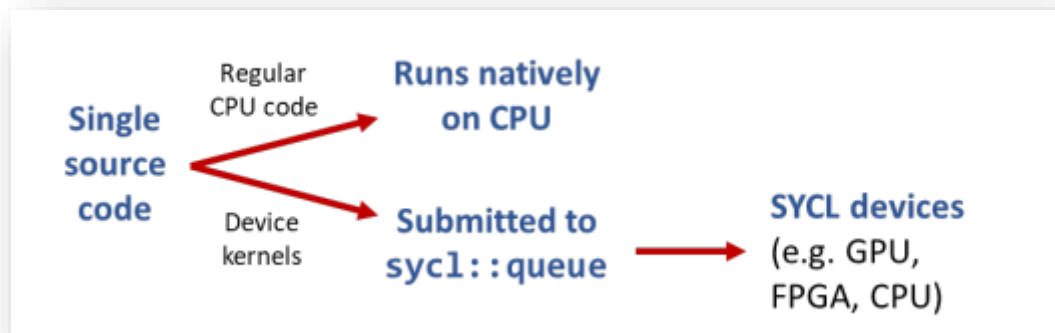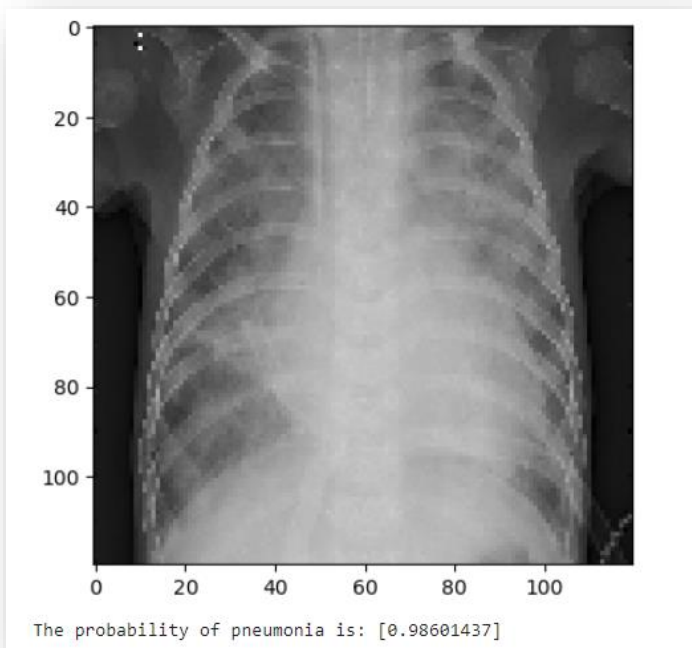
- **Performance Optimization:** Harness the power of parallel programming with fine-grained control over performance which ensures faster and more efficient diagnosis.
- **Portability:** Develop code once and seamlessly execute it on various hardware platforms which supports SYCL standards which is useful when using multiple GPUs.
- **Resource Utilization:** Efficiently utilize CPUs, GPUs, and FPGAs to distribute the workload, optimizing resource utilization and enhancing pneumonia classification algorithms.
- **Streamlined Development:** Leverage SYCL's unified programming model, incorporating pre-implemented functions and algorithmic optimizations to streamline development, deploy models faster, and achieve accurate pneumonia classification.
- **Debugging and Profiling**: We utilized the debugging and profiling capabilities offered by the SYCL framework to analyze the performance of our code.- These tools allowed us to identify bottlenecks, optimize our pneumonia classification algorithms, and improve accuracy and speed.

- SYCL served as the foundation for our pneumonia classification project, providing a robust programming model for heterogeneous computation resources.

Core components of oneAPI AI Toolkit & its Libraries /SYCL used in the project

- **Intel® oneAPI Base Toolkit** – it provides the environment for compiling for DPC++/ SYCL libraries

- **SYCL** – it provides process parallelism which makes the diagnosis efficient and effective

- **oneDNN** – Neural Network Classifier for pneumonia prediction

- **Opencv** - it is used for data preprocessing

Demo Video/Live Demo
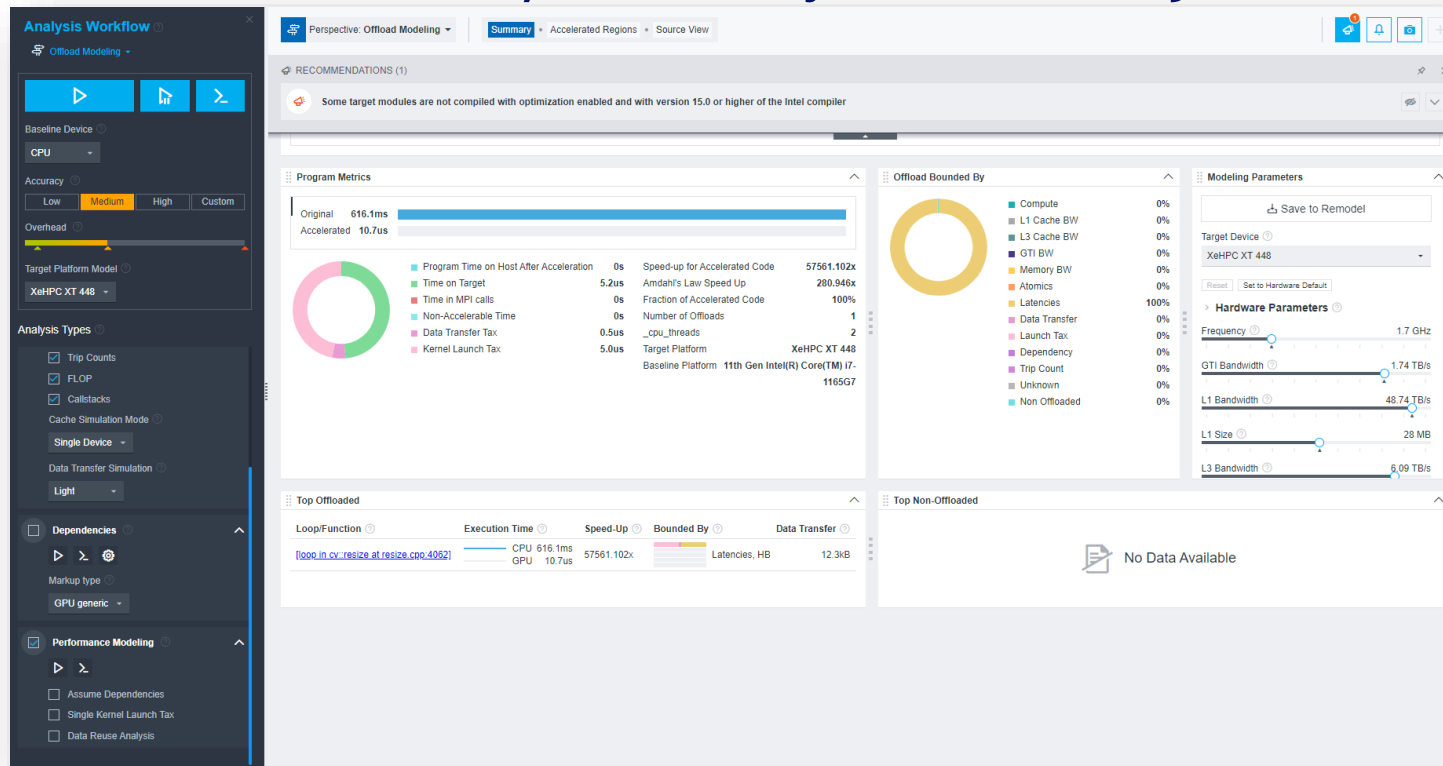# Please elaborate oneAPI AI Toolkit & its Libraries /SYCL usage

The probability of pneumonia is: [0.98601437]

Single source code
- Regular CPU code → **Runs natively on CPU**
- Device kernels → **Submitted to sycl::queue** → **SYCL devices (e.g. GPU, FPGA, CPU)**

GitHub Link (Codes should be public and available after hackathon also)

MEDICAL IMAGE PROCESSING – PNEUMONIA CLASSIFICATION

https://github.com/KaamalVN/intel-oneAPI

Results Summary (focus on unique aspects of oneAPI AI Toolkit & its Libraries /SYCL that you have used)