# Assignment 10

## Lab Overview

This lab is to introduce a profiling software called Intel VTune. VTune is used for the profiling of applications. It can provide a lot of information about an application such as:

- Which parts of the code are performance bottlenecks?
- How many logical cores are being used by the application?
- How many loads and stores does an application have?
- What percentage of execution time has an application stalled on memory operations?

And many more such metrics which can help understand the application better and also helps in understanding how performance of application can be improved.
To know more features, please refer to: Fix Performance Bottlenecks with Intel® VTune™ Profiler

This lab is focused more on the exploration of VTune and objectives of the assignment will also cover the same.

## VTune Installation

For this lab, running Ubuntu is required. Please use Ubuntu 18.04 or later versions. To install the VTune on your system, please refer to the following video:
VTune-Installation.mp4

## Lab Objectives & Guidelines:

Please download required applications from here: CS232-Lab.zip
After extracting folder, go to the extracted folder, open a terminal in the folder and check if the binaries are executing fine using following commands one-by-one:

- ./bfs -f soc-LiveJournal1.sg
- ./cc -f soc-LiveJournal1.sg
- ./pr -f soc-LiveJournal1.sg

If the binaries are not executing properly, run the following commands:

- make clean
- make

After running the above two commands, check again if the binaries are executing fine.

Run the profiling for three applications- BFS (bfs), PageRank (pr) and Connected Components (cc) using input files- hugebubbles-00020.sg & soc-LiveJournal1.sg. Following are the tasks that needs to be completed for all 6 combinations of applications and inputs as part of this assignment:

1. Run **Performance Snapshot** analysis. Report metrics- **IPC, Bad Speculation, Physical Core Utilization, DRAM Bound.**
2. Run **Microarchitecture Exploration** analysis. Report metrics- **Instructions Retired, CPI Rate, Port Utilization, Average CPU Frequency.**
3. Run **Hotspots** analysis. Report **Top Hotspot** function along with % of CPU time.
4. Run **Memory Access** analysis. Report metrics- **Loads, Stores, LLC Miss Count, Average Latency.**
5. Run **Threading** analysis. Report metrics- **Total Thread Count, Wait Time with poor CPU Utilization.**
6. Run **Memory Consumption** analysis. Report all the functions with **Memory Consumption** and **Allocation/Deallocation Delta.**
7. Run any analysis apart from above 6 and report 2 metrics of your choice. Also mention what those metrics signify and how they can be helpful in an analysis. Please ensure to use the same metric for all applications and inputs.

All of the above results are to be compiled in a report along with screenshots. The submission will be followed by a viva to check your understanding of VTune and the metrics.