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Win EE 590

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Machine Learning KNN Algorithm

# Executive Summary

This project is designed to implement the k nearest neighbor algorithm using OpenCL kernel. OpenCL is a low level, cross platform environment to execute program with CPU or GPU. This project focus on the GPU, which is powerful for computing highly paralellable code.

KNN algorithm is one of the most widely used machine learning algorithm. Utilizing the parallel component of the KNN algorithm, this project aimed to speed up the computation time.

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# OpenCL

OpenCL is a framework developed for computing in both CPU and GPU. It specifies based on C99 for control the platform between CPU and GPU. It provide a detail insight for program execute in kernels. It allows programmer to control and understand the memory utilization. Unlike CUDA (another GPU computing programming language specify for NVidia GPU), OpenCL is extremely portable. It allows programmer to natively program on large range of device. Although it does not optimize for speed, OpenCL is portable between many devices.

Ever since OpenCL is started in 2009, many mathematical problems were simulated using OpenCL kernel. Heavy computing mathematical model which are easily parallelable, are best for using kernel computing. Image Ray-tracing is a good example for computing using OpenCL kernel.

# KNN Algorithm

Reference

[Cover TM](https://en.wikipedia.org/wiki/Thomas_M._Cover), [Hart PE](https://en.wikipedia.org/wiki/Peter_E._Hart) (1967). "Nearest neighbor pattern classification". *IEEE Transactions on Information Theory*. **13** (1): 21–27. [doi](https://en.wikipedia.org/wiki/Digital_object_identifier):[10.1109/TIT.1967.1053964](https://dx.doi.org/10.1109%2FTIT.1967.1053964).