Assignment 4

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Title:-

Implement HPC application for AI/ML domain

Objectives:-

Identify and apply the suitable diagram to solve AI/ML problem.

Pre-requisites:-

8 GB RAM, intel i5 12th Gen,
Open MP libraries,
C++

Theory:-

High Performance Computing:

HPC refers to the aggregation of computing power in ways that provide faster processing.

A HPC system leverages massive parallel computing, multiple tasks are simultaneously implemented on multiple computer processors or servers.

A HPC cluster consists of numerous high speed server networked together with a centralized schedular managing parallel.

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HPC & AI:
Artificial Intelligence can be used in HPC to augment the analysis of datasets and produce faster results at the same accuracy level.
The implementation level of HPC on AI requires similar architecture both achieve result by processing large datasets.

Following HPC use cases can benefit from AI capabilities:

1) Financial analysis.
2) Climate science
3) Earth sciences.
4) CAD applications.
5) Scientific simulation.

Integration of HPC & AI:-
Integration of HPC & AI involves the many challenges.
Here's how AI helps to overcome issues occuring in HPC infrastracture.

1) Programming language:-
HPC uses languages like C++, fortran & AI predominantly uses high level languages. To bridge the gap, interfacing tools like CPY CODA, for python) enables AI workflows to leverage HPC capabilities.

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2) Virtualizations & containers:
Container technology like e.g. Docker plays a crucial role in integrating AI & HPC.

3) Increased memory requirements:
AI applications particularly those dealing with large datasets demand high memory resources.
HPC systems are evolving to support increased memory capabilities.

* HPC Use-cases / applications:-

1) Healthcare:
HPC can manage & scale large & complex datasets that helps ML systems to process data faster.

2) Aerospace:
Researchers at NASA uses HPC to train a deep learning algorithm to predict disruptions that arises in GPS navigation for aircraft.

3) Automobile:
The complex ML algorithm that run the autonomous vehicles are generally trained on an HPC technology.