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## Assignment No. 5.

Title : HPC Application

problem statement: Implement HPC Application in AIML domain.

Software & Hordware Requirement: multicore processor, 4GBRAM, Jupyter notebook, python, libraries.

## Theory:

HPC applications in the field of AIMI involve leveraging parallel computing architectures to train and deeply complex models on large datasets effectively. Here's a theoretical overview of implementing an HPC application for AIMI domain.

HPC applications harness the power of parallel processing to accelerate AIML tasks such as model training and inference.

Data parallelism:

In this the dataset is divided into smaller botches & multiple computing units process these botches simultaneously.

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touch unit performs the same operations on its assigned batch of data, allowing for efficient hairing.

model Parallelism

It involves distributing different parts of a model across units. This approach is useful for training by models that cannot fit into memory of a single unit.

Took Parallelism

maximize resource utilization. Can be applied to backs such as data preprocessing, feature extraction, model busing 2 inference.

Optimized algorithms and libraries.

HPC application for AIIML domain utilize optimized algorithms and libraries tailored for parallel computing. These include optimized linear algebra (eg. Intel MFL, NVDIA CUBLABS) distributed deep learning frameworks (eg. Tensorflow, py Torch) and parallel optimization algorithm (e.g. stochostic gradient descent with momentum)

Hardware Acceleration:

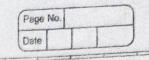
Hardware accelerations such as GPUs and TPUS

play a crucial role in accelerating AIImi work load.

These offer massive parallelism and are optimized

for deep learning tasks enabling sufficient speedup

compared to CPUs.



Scalability and Performance Optimization:

HPC application in AI/ML domain focus on scalibility
and performance optimization to handle large
and performance optimization to handle large
scale datasets Techniques such as asynchronous
arithmetics are employed.

Resource management and Job scheduling.

Efficient resource management and job scheduling are essential for maximizing the utilization of HPC resources.

Job scheduling such as SIVRM, PBSD, kubernates, are used to allocate compute resources, manage job queries.

Monitoring and profiling.

These are employed to analyze the performance of AIIML applications on HPC systems. These help identify bottlenecks, optimize resource utilization and fine tune parameters to achieve optimal performance

Thus we have successfully implemented HPC application for all AIIML domain.