

Q.1 Explain parallel search algorithm

parallel search algorithm is a type of algorithm that leverages the power of multiple processing units or threads to concurrently search through a large search space in parallel, with the goal of finding a solution more quickly than a sequential search algorithm.

There are 4 types of parallel searching algorithms:

- ① Divide and conquer
- ② Depth - First search
- ③ Breadth - First Search
- ④ Best - First Search.

① Divide and conquer :-

In divide and conquer approach, the problem is divide into several small sub-problems. Then the sub-problems are solve recursively and combined to get the solution of the original problem.

② Depth - First - search :-

Depth - First search is an algorithm

for searching a tree or an undirected graph data structure.

Step 8:-

- ① consider a node (root) that is not visited previously and mark it visited.
- ② visit the first adjacent successor node and mark it visited.
- ③ If all the successors nodes of the considered node are already visited or it doesn't have any more successor node, return to its parent node.

③ Breadth First search :-

Breadth First Search is an algorithm for searching a tree or an undirected graph data structure.  
Here, we start with a node and then visit all the adjacent node in the same level and then move to the adjacent successor node in the next level.

④ Best-first Search ;

Best first search is an algo. that traverse a graph to reach a target in the shortest possible path.

UNLIKE BFS & DFS, BFS follows an evaluation function to determine which node is the most appropriate to traverse next.

Q.2 Explain parallel sorting?

Sorting algorithms are designed to efficiently sort a list or array of elements using multiple processing units or threads simultaneously. Parallel sorting algorithm can significantly speed up the sorting process, as they can take advantage of the parallel processing capabilities of modern computer system.

There are several popular parallel sorting algorithms including:

- ① parallel Quicksort :- Quicksort is a popular comparison-based sorting algorithm that can be parallelized effectively. In parallel Quicksort, the input list is partitioned into smaller sub-lists and each processing unit or thread sorts its assigned sub-list.

independently.

② parallel Merge sort :-  
Mergesort is a well-known divide and conquer based sorting algorithm that can also be parallelized efficiently. In parallel mergesort, the input list is divided into smaller sub-lists, which are sorted independently by different processing units or threads.

③ parallel radix sort :- Radixsort is a non-comparison based sorting algorithm that can be parallelized effectively. In parallel Radix Sort, the input elements are sorted based on their individual digits or bits, in parallel.

3

Explain GPU Application.

① Bioinformatics :-

Sequencing and protein docking are very calculating intensive tasks that see a large performance benefit by

using CUDA enabled GPU. There relatively bit of ongoing work on GPUs for a range of bioinformatics and life sciences codes.

### ② Computational finance :-

NVIDIA TESLA GPU acceleration offers financial services firms a competitive advantage by enabling application, such as the widely deployed Monte Carlo simulation, to faster.

### ③ Computational fluid dynamics .

Several ongoing projects on Navier-Stokes models and lattice methods have shown very large speedups using CUDA enabled GPUs.

### ④ Data science , Analytics, and Database .

A increasing number of customer are using GPUs for big data analytics to make better, real-time business decision.

### ⑤ Electronic Design Automation.

- EDA involves a varied set of software algo, and appn that are required for the design of complex neat

generation semiconductor and electronic products.

#### ④ Explain parallel computing for AI/ML

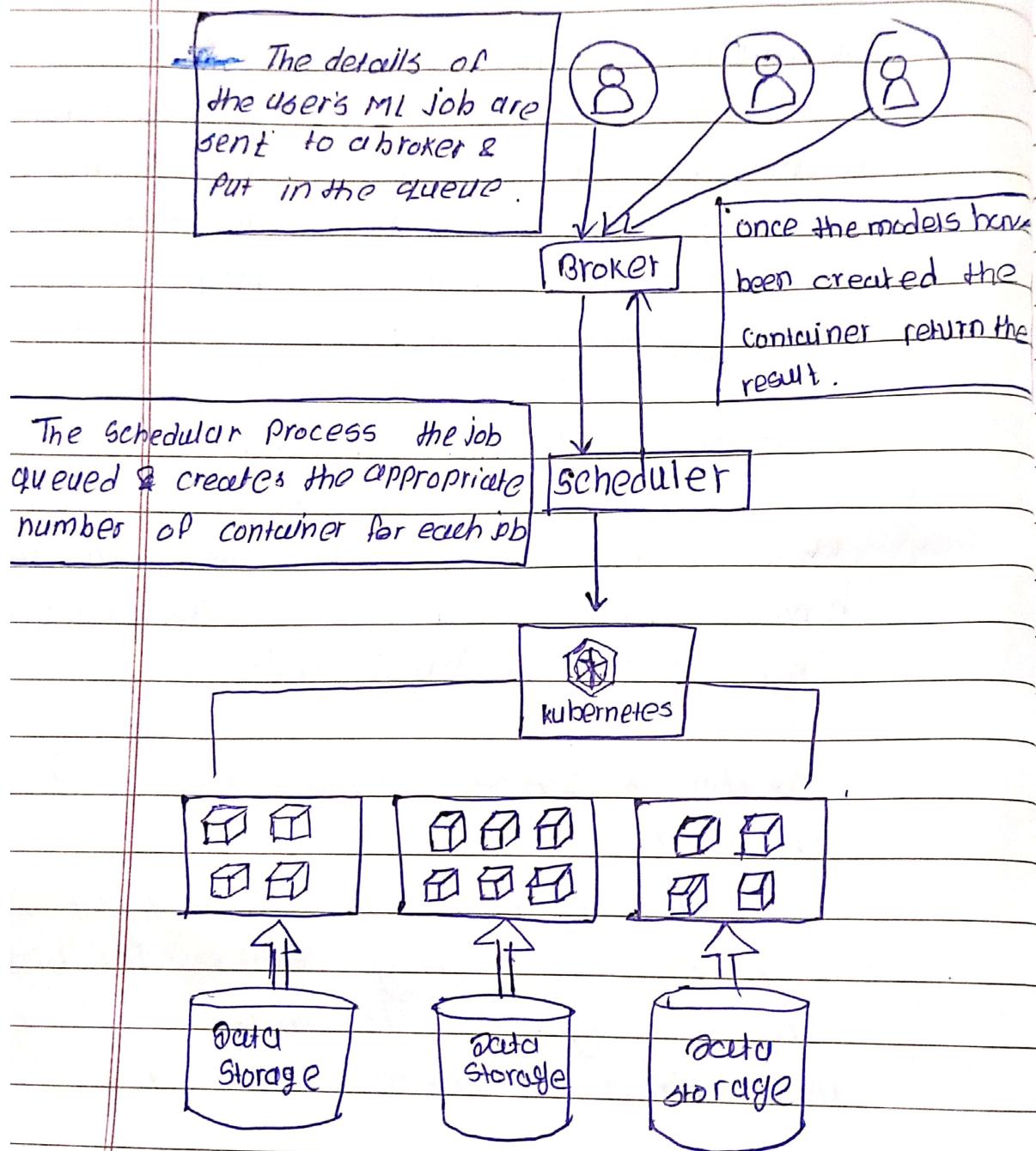


Fig. Parallel computing  
for AI/ML

→ Machine Learning is the application of artificial Intelligence through a family of algorithms that provides system the ability to automatically learn and improve from experience without being explicitly programmed, they have the potential to approximate linear & non-linear relationships, by extracting more information from a data model to achieve higher accuracy.

- python is the language of reference for ML and many libraries provide off-the-shelf machine learning algorithm like scikit-learn, XGBoost, LightGBM.

- you don't know in advance which algorithm will give the best results. Therefore you have to several times. The learning process of model is controlled through hyper parameters that the user has to tune. There is no formula to calculate them, so it can require lots of iteration for each model before finding the good one.

Q.5] Explain frameworks - kubernetes ?

→ Kubernetes is a powerful open-source system, initially developed by Google, for managing containerized applications in a clustered environment. It aims to provide better ways of managing related, distributed components and services across varied infrastructure.

Kubernetes, at its basic level, is a system for running and co-ordinating containerized applications across a cluster of machines. It is a platform designed to completely manage the life cycle of containerized applications and services using methods that provide predictability, scalability and high availability.

- As a Kubernetes user, you can define how your applications should run and the ways they should be able to interact with other applications or the outside world. You can scale

your services up or down, perform graceful rolling update, and switch traffic between different versions of your application to test features or roll back problematic deployments.

- Kubernetes provides interfaces and composable platform primitives that allows you to define and manage your applications with high degrees of flexibility, power, and readability.