## Task 1: Data Science Applications Brainstorm :

1. **Data Science in Transportation** – In transportation data science is used to model the traffic patterns, optimizing food delivery and package delivery.
2. **Sports** - in sports, data science is used to extract performance metrics from videos and making predictive analytics. It also used to keep track of a players past performance.
3. **Government** - government will uses data science for predicting population over time, mining a person's individual data by data mining softwares, and detect anomalies in the system.
4. **Agriculture** – in agriculture, it used for predicting the weather, humidity and wind speed of the environment, keep tracking of growth of plants. It also used for automate the irrigation systems to the crops.
5. **Manufacturing** - In manufacturing, data science is used for 3D modelling designs, control the quality of the products and automate the process of manugacturing.

Task 2: AI, ML, DL Relationship Diagram :
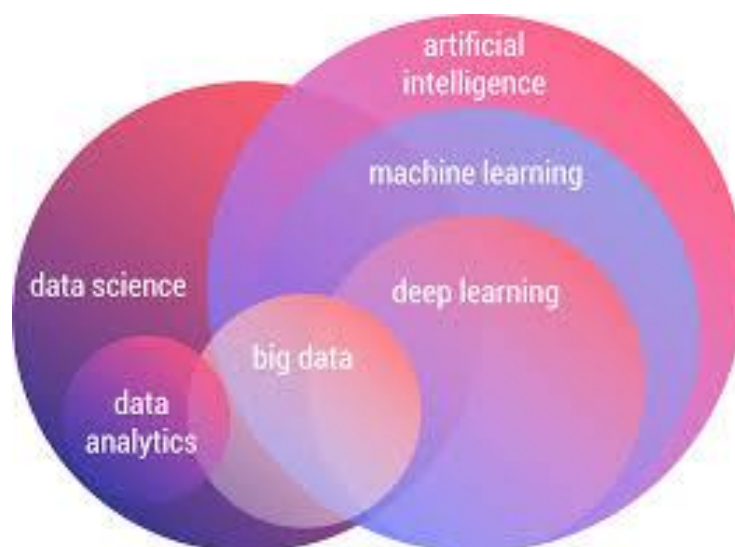
AI is like a top concept which uses the concepts of ml and dl algorithms to make a meta decision.

Machine learning is a subset of ai which uses a defined algorithms to make the computer learns form the datas without being explicitly programmed.

Deep learning is a subset of machine learning with mimics the human brain structure into the computer. It helps the computer to analyze the datas by its features.

Data science is acting as a foundation which provides processed data from raw datas. This helps to computers to make data analysis and learn from the data.

Task 3: Data Scientist Roles Research :

1. **ML/DL Engineer** – The role of ML Engineer is to build machine learning and deep learning models and put them in production and managing them.
2. **Data analyst** – data analyst will clean, process, analyze and visualize the datas. These datas will used in business to find valuable insights and patterns.
3. **Data Engineer** – data engineers build the infrastructure to organize and manage the datas. They uses ETL tools which stands for Extract, Transform and load tools. With this tools, they will retrieves data, processing it into usable format for further processing.

Task 4: Data Science Lifecycle Example :

Weather prediction in agriculture industry

Problem Statement :

The forecasting of weather such as tracking the temperature, wind speed and humidity, allows the outdoor plantations to plan and control agriculture operations. This will improve the quality of crops. However, because the sensing data is complicated, nonlinear, and has several components, it is difficult to reliably anticipate climate changes.

Data Collection :

For this we can use IOT sensors to sense real-time data such as temperature, humidity, windspeed, etc. we can collect the datas from weather stations which gives the historical local weathers. Accessing weather forecast services will results in advanced model predicts the long term and short term weather conditions.

Data Cleaning & Preprocessing :

To remove mistakes and inconsistencies, observational data must be cleaned and quality-checked. To create accurate predictions, missing numbers, and data outliers must be taken care of. Different sources of weather data are frequently used. Continuous spatial representations of weather data are produced using interpolation techniques like kriging or inverse distance weighting. Methods for spatial downscaling improve data resolution to produce forecasts with a finer granularity.

Model Training & Evaluation :

To provide a variety of potential weather scenarios, ensemble forecasting mixes many models and beginning circumstances. This method takes into consideration the inherent uncertainty in weather forecasting and offers probabilistic forecasts, which help with decision-making in ambiguous circumstances. To anticipate certain meteorological events, such as rainfall or storms, support vector machines, decision trees, and neural networks are used.

Deployment & Monitoring :

Deploying and monitoring weather prediction models involves selecting the most accurate model, integrating real-time data from sources like satellites and weather stations, setting up computational infrastructure. Monitoring includes tracking performance metrics such as accuracy and mean absolute error, ensuring data quality, monitoring system health to prevent overloads, detecting model drift, and setting up alerts for any issues that might impact forecast accuracy.

TASK 5 : Data Science and Ethics Discussion

Bias and Fairness:

Bias in data can lead to unfair results, like discrimination in hiring or lending. To make sure things are fair, we start by detecting bias in the data and model outputs. Next, we use diverse data sets that include different groups of people. We also apply techniques to reduce bias, like giving more weight to underrepresented groups. It's important to regularly check the model to see if any new biases appear and to fix them quickly. Lastly, we need to make the decision-making process clear and hold developers responsible for fairness. By doing this, we can create systems that are fair and just for everyone.

Data Science Career Paths

1) **AI/ML Engineer :**

   Responsibilities :

   AI/ML Engineers will design, develop and deploy AI and ML models to automate data pipelines. The train the algorithms to optimize model performance and improves the ability of decision making.

Required skills :

AI/ML Engineers must have strong programming skills like python and java. They must have strong foundation in ml and dl algorithms like naive bayes in order to implement them. They must know how to handle data and analyze them. They must have mathematical background in calculus, linear algebra and probability & statistics.

Career Growth:

AI and ML is a rapidly evolving field with growing demand in various industries, including healthcare, finance, and e-commerce. The World Economic Forum projects a 40% increase in demand for AI and ML specialists by 2027.

2) Data Analyst :

Responsibilities

Data Analysts collect, process, and analyze data to provide actionable insights that help businesses make informed decisions. They create reports, dashboards, and visualizations to present data in a clear and meaningful way. They also identify trends, patterns, and anomalies in the data to support strategic planning.

Required Skills

Data Analysts need strong programming skills, particularly in languages like Python and SQL. They must be proficient in data manipulation and analysis tools such as Excel, Tableau, or Power BI. A solid understanding of statistics, data cleaning techniques, and data visualization principles is essential. They also need good communication skills to effectively convey their findings to non-technical stakeholders.

Career Growth

The demand for Data Analysts is growing rapidly across various industries, including finance, healthcare, retail, and technology. With the increasing importance of data-driven decision-making, the role of Data Analysts is becoming more critical. The World Economic Forum predicts a substantial increase in demand for data professionals, including Data Analysts, by 2027.