Project Planning & Management

Project Name: Land Type Classification using Sentinel-2 Satellite Images

1. Project Proposal

Overview:

This project focuses on leveraging **Deep Neural Networks (DNNs)** to classify different land types (such **agriculture, water, urban areas, desert, roads, and trees**) from Sentinel-2 satellite images from (EuroSAT Dataset) that are ideal for land use classification. The objective of this project is to develop a DNN model that accurately classifies land types, aiding in various applications such as urban planning, environmental monitoring, and resource management. The project will utilize open-source datasets.

Objectives:

- **Data Collection & Processing**: Collect and preprocess satellite imagery data for land classification tasks.
- **Exploratory Data Analysis (EDA):** Understand and preprocess Sentinel-2 satellite image data.
- **Model Selection, Development and Training:** Develop a Deep Learning model (DNN, CNN) for classification.
- **Hyperparameter Tuning:** Optimize model performance using hyperparameter tuning and transfer learning.
- **Dashboard**: Create a **Power BI dashboard** for visualizing classification results.
- **Deployment and Monitoring:** Deploy the model using **Flask/FastAPI** and set up monitoring.

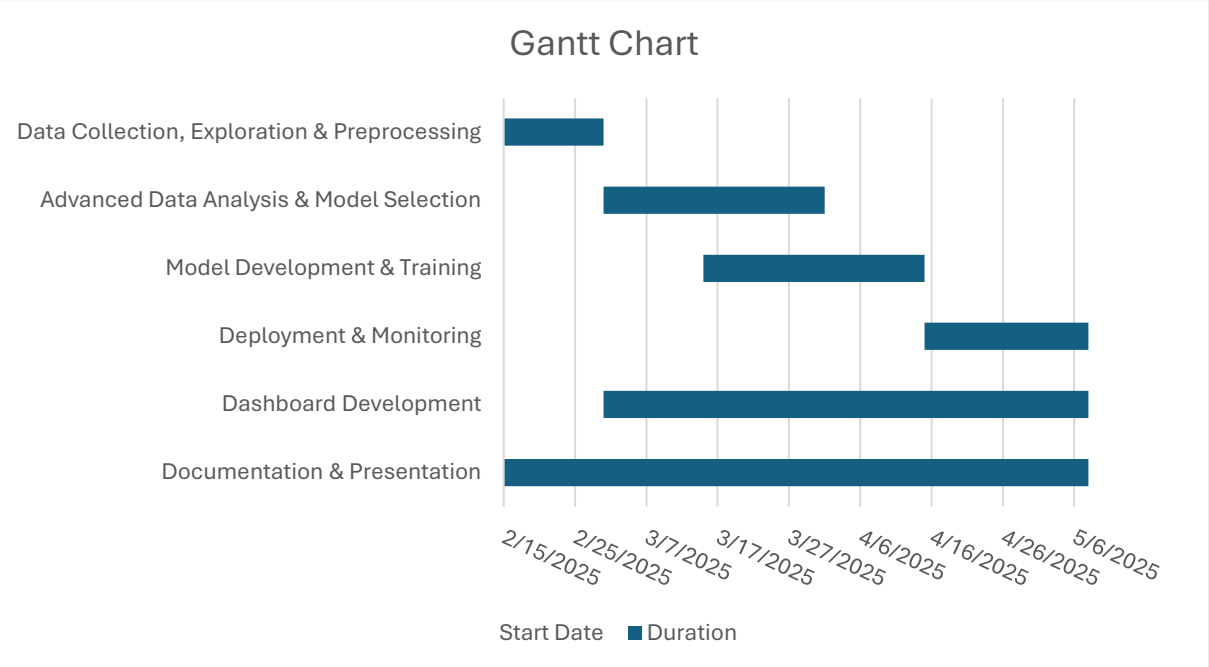
Scope:

- **In-Scope:**
    - Data collection and preprocessing of Sentinel-2 images.
    - Implementing deep learning techniques for classification.
    - Developing an interactive Power BI dashboard for visualization.
    - Model deployment and monitoring.
- **Out-of-Scope:**
    - Real-time satellite image retrieval and processing.
    - Advanced geospatial analytics beyond land classification.

2. Project Plan

Timeline & Milestones

Milestone	Description	Team Members	Duration	Deliverables
M1: Data Collection, Exploration & Preprocessing	Gather, validate, and preprocess satellite images.	Ahmed Selim	14	EDA Report, Cleaned Dataset, Visualizations
M2: Advanced Data Analysis & Model Selection	Perform feature analysis, dimensionality reduction (PCA), select best model.	Mustafa Bayomi, Ahmed Hazem	31	Data Analysis Report, Model Selection Summary
M3: Model Development & Training	Build, train, and optimize deep learning model.	Ahmed Hazem, Ahmed Selim/ Mustafa Bayomi	31	Model Code, Training & Evaluation Report, Trained Model
M4: Deployment & Monitoring	Deploy model and set up monitoring.	John George, Mohamed Yasser	23	Deployed Model, Monitoring Setup
M5: Dashboard Development	Create interactive dashboard using Power BI.	Mohamed Yasser, John George	68	Functional Power BI Dashboard
M6: Documentation & Presentation	Document work and prepare final project presentation.	Ahmed Hazem	82	Final Report, Presentation



Resource Allocation

- **Tools & Technologies:** Python, TensorFlow, PyTorch, Pandas, NumPy, Matplotlib, Google Colab, Power BI, Flask/FastAPI.

3. Task Assignment & Roles

Team Member	Responsibilities
Ahmed Hazem	- Lead the project and ensure timely completion of milestones. - Select, implement, and train deep learning models (CNN). - Experiment with transfer learning and hyperparameter tuning. - Prepare the final project report and presentation.
Ahmed Selim	- Explore and validate the EuroSat dataset. - Preprocess and clean Sentinel-2 images for classification. - Assist in training and optimizing the deep learning model.
Mustafa Bayomi	- Perform Exploratory Data Analysis (EDA) to understand dataset characteristics. - Identify class imbalances and preprocess data accordingly. - Conduct dimensionality reduction (PCA) and visualize feature distributions.
Mohamed Yasser	- Develop a Power BI dashboard for visualizing classification results. - Integrate the model output into Power BI. - Assist in deployment monitoring and performance tracking.
John George	- Develop and deploy an API using Flask/FastAPI to serve the model. - Ensure smooth integration between the trained model and the dashboard. - Optimize server response times and ensure efficient model inference.

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4. Risk Assessment & Mitigation Plan

Risk	Impact	Mitigation Strategy
Low-quality satellite images	High	Perform preprocessing (filtering, noise removal)
Model underperformance	Medium	Experiment with different DNN architectures, hyperparameter tuning
Dashboard performance issues	Medium	Optimize Power BI queries and UI responsiveness
Limited computing resources	High	Use Google Colab or cloud-based GPUs

5. Key Performance Indicators (KPIs)

- **Model Accuracy:** Target **≥90%** classification accuracy.
- **Processing Time:** Model should classify images **within seconds**.
- **User Engagement (Dashboard):** Measure dashboard interaction and usability.
- **Deployment Success:** Ensure the model runs efficiently in production.