FEDERAL INSTITUTE OF SCIENCE AND TECHNOLOGY (FISAT)

Hormis Nagar, Mookkannoor PO, Angamaly, Kochi
Accredited by NAAC with 'A+' Grade

DEPARTMENT OF COMPUTER APPLICATIONS

SYNOPSIS OF THE MAIN PROJECT

Name of the Student	MUHAMMED AFLAH P K
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Name of Project Guide	Dr.Rose Mary Mathew
GitHub ID	https://github.com/maflahpk
Project Title	Deep Convolutional Network-Based Machine Intelligence Model for Cloud Image Classification
Area of the Project	Artificial Intelligence and Machine Learning, Meteorology
Date of Submission	3-1-2025

Description of Project:

With a significant number of observations capturing cloud imagery, there is immense potential to determine and analyze Earth's changing phenomena in real-time. Classifying cloud images provides substantial support to remote sensing communities, particularly in predicting tropical cyclones. This study proposes a classification approach using a Deep Convolutional Neural Network (DCNN), consisting of multiple layers that extract features through a downsampling process to classify cloud images effectively. The DCNN model is trained extensively on cloud image datasets, achieving remarkable prediction accuracy. The framework ensures reduced delivery time for testing images while improving prediction accuracy, leveraging an optimal deep convolutional network and a large number of training dataset instances. The cloud image dataset is sourced from the Meteorological & Oceanographic Satellite Data Archival Centre, which provides extensive cloud imagery for India and its subcontinent. The proposed cloud image classification framework achieves an impressive 94% prediction accuracy using the DCNN model.

Innovative Features for **Weather Forecasting and Cyclone Prediction** Using Cloud Image Classification:

Real-Time Cyclone Detection and Tracking:

- Implement a real-time alert system that identifies cyclones at their formative stages based on cloud patterns, rotation, and density detected in satellite images.
- Use time-series analysis to predict the trajectory, speed, and potential impact zones of cyclones.

Multi-Model Integration for Enhanced Predictions:

- Combine cloud classification with other meteorological models, such as wind speed analysis and ocean temperature mapping, for comprehensive cyclone predictions.
- Integrate data from Doppler radar, buoys, and IoT sensors for accurate weather forecasting.

AI-Powered Early Warning System:

- Develop an AI-based system that automatically generates early warnings for cyclones, heavy rainfall, or thunderstorms, providing alerts to communities and authorities.
- Use thresholds for cloud density, temperature, and pressure to trigger warnings.

Dynamic Cyclone Intensity Estimation:

- Train the model to estimate cyclone intensity (e.g., categories 1-5) by analyzing cloud shapes, spirals, and central dense overcast (CDO) regions.
- Link to external parameters like sea surface temperatures (SST) for better intensity predictions.

Predictive Modeling for Rainfall Intensity:

- Use cloud type, height, and density to forecast rainfall intensity and duration.
- Map high-density cumulonimbus clouds to regions prone to heavy precipitation.

Front End & Back End Tools	HTML, CSS, JavaScript, Bootstrap, Django Templates,python