PROJECT-12

Deep learning project

Project Description: Weather Image Classification using Convolutional Neural Networks (CNNs) This project focuses on developing a deep learning model to classify images of different weather conditions, including lightning, snow, and various atmospheric phenomena. By leveraging Convolutional Neural Networks (CNNs), the system enhances automated weather recognition capabilities.

Tools/Technologies Used:

- Python: Programming language for model development and data processing.
- TensorFlow/Keras: Deep learning framework for building and training CNN models.
- OpenCV: Image preprocessing and augmentation.
- Matplotlib & Seaborn: Data visualization for performance analysis.
- Scikit-learn: Evaluation metrics (precision, recall, F1-score).

Data Collection and Preprocessing:

- Collected and curated a dataset of weather images representing different conditions.
- Applied data augmentation techniques, including rotation, flipping, and normalization, to improve model robustness.

Model Development:

- Built a CNN architecture optimized for weather classification.
- Implemented transfer learning using pre-trained models (ResNet, VGG16) to enhance performance.
- Fine-tuned hyperparameters to improve classification accuracy.

Model Evaluation and Performance Analysis:

- Assessed model performance using precision, recall, and F1-score.
- Visualized training and validation accuracy/loss curves to ensure convergence.

Insights and Impact:

- Developed a high-accuracy weather classification model.

- Potential applications in meteorology, surveillance, and automated weather monitoring systems.

Conclusion: This project successfully demonstrates the effectiveness of CNN-based deep learning models in classifying weather conditions from images. The use of transfer learning and data augmentation significantly enhanced model accuracy. Future improvements may include expanding the dataset and integrating real-time weather prediction systems.