COMSATS University Islamabad – Lahore Campus Department of Computer Engineering

**Weather Image Classification Using Convolutional Neural Networks (CNNs)**

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For the course

# Artificial Intelligence Semester Spring/Fall 202x

Supervised by:

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**CEP Summary**

With the increasing need for automated environmental monitoring systems, this CEP focuses on building a weather classification system using deep learning. The goal is to classify images into four distinct weather conditions: **cloudy**, **lightning**, **rainy**, and **sunrise** using **Convolutional Neural Networks (CNNs)**.

This project is motivated by the growing use of AI in meteorology and smart city applications. Manual observation of weather from image or CCTV feeds is inefficient. A trained CNN can automate this process, aiding both real-time classification and post-event analysis.

The dataset used includes images of various weather types, organized into labeled folders. A CNN model is trained and validated using this dataset to classify unseen weather images with high accuracy. This solution provides a foundation for further extensions such as integrating with real-time camera feeds or mobile apps.

**Objectives / Outcomes**

 To understand and implement a CNN using Keras/TensorFlow.

 To preprocess and structure image data using Python tools.

 To train and validate a weather image classification model.

 To evaluate the model using metrics like accuracy and confusion matrix.

 To develop a baseline AI solution that can support real-world smart weather systems.

**SDGs addressed in the project**

 **Goal 9: Industry, Innovation and Infrastructure**

 **Goal 11: Sustainable Cities and Communities**

 **Goal 13: Climate Action**

**References (if any)**

1. [**Weather-image-dataset**](https://www.kaggle.com/datasets/tamimresearch/weather-image-dataset)