Exploring Vision-Based Models for Land-Usage Classification Using Remote Sensing Imagery Data

Presented By - Group 163
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Motivation - Why Land Use Classification?

- Understanding land-use patterns is crucial for sustainable resource management, urban planning, and environmental conservation.
- When combined with deep learning, these images offer insights for disaster recovery, resource allocation, precision agriculture, biodiversity monitoring, and infrastructure planning. A core challenge is accurately classifying land-use patterns from satellite imagery.

Problem Statement

Enhance the understanding of deep learning (DL) models' usefulness for land-use classification using three vision-based neural networks to classify remote sensing images

Dataset Used

- To explore the task of land-use classification, we use the UC-Merced Land-Use Dataset available at Kaggle [1].

- It contains satellite images of different urban regions in the US extracted from USGS National Map Urban Area Imagery collection.

Input & Output of the Task

- *Input:*

  A RGB satellite image representing a region of land use, e.g., a forest.

- *Output:*

  A predicted class label (e.g., forest, river) corresponding to the land-use image feeded to the network.

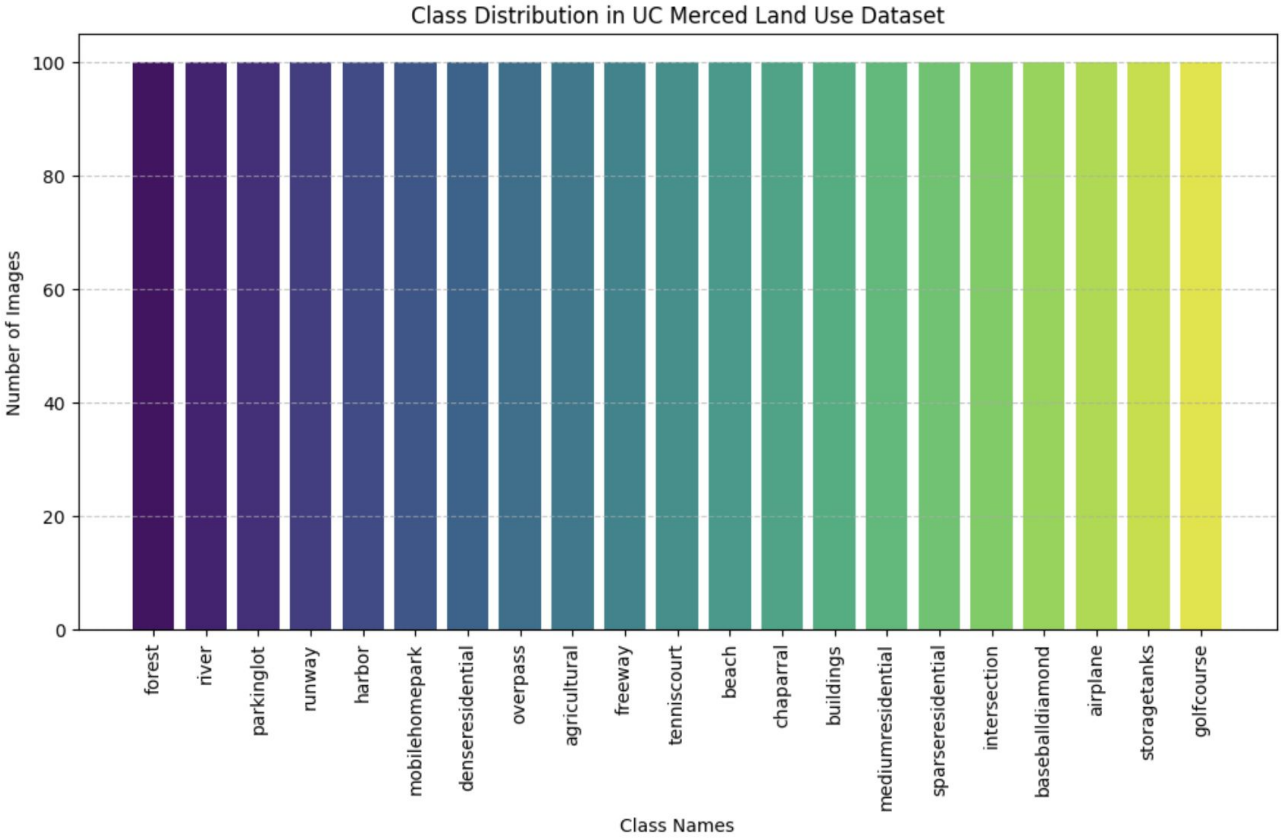
Prior Work

- Rishi has previously worked with vision based models for different classification tasks.

Exploratory Data Analysis (EDA)

Class Distribution

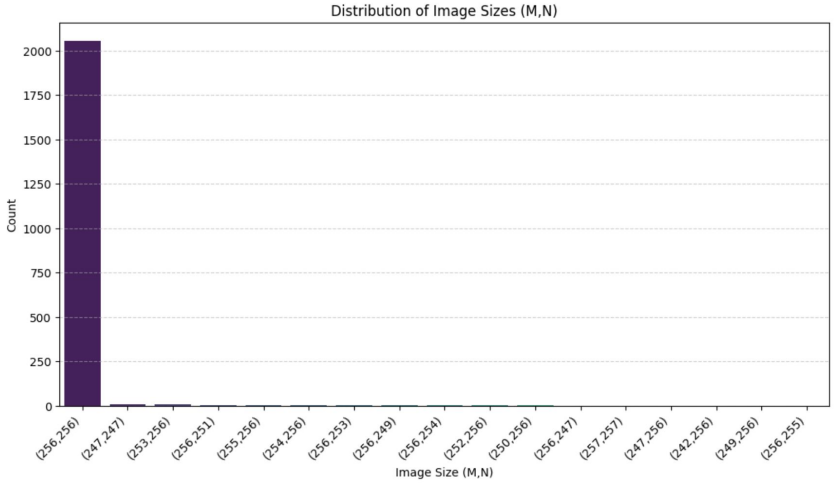
- 21 classes with each having 100 images **(balanced dataset)**



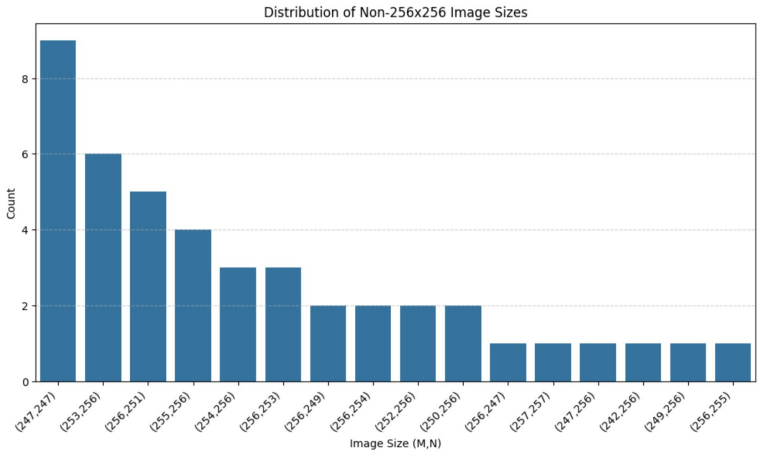
Sample Images for each class

- Below are 1 sample image for each of the 21 land-use classes.

Image Size Distribution



Majority Image size - 256x256. Other image sizes are also there in the dataset



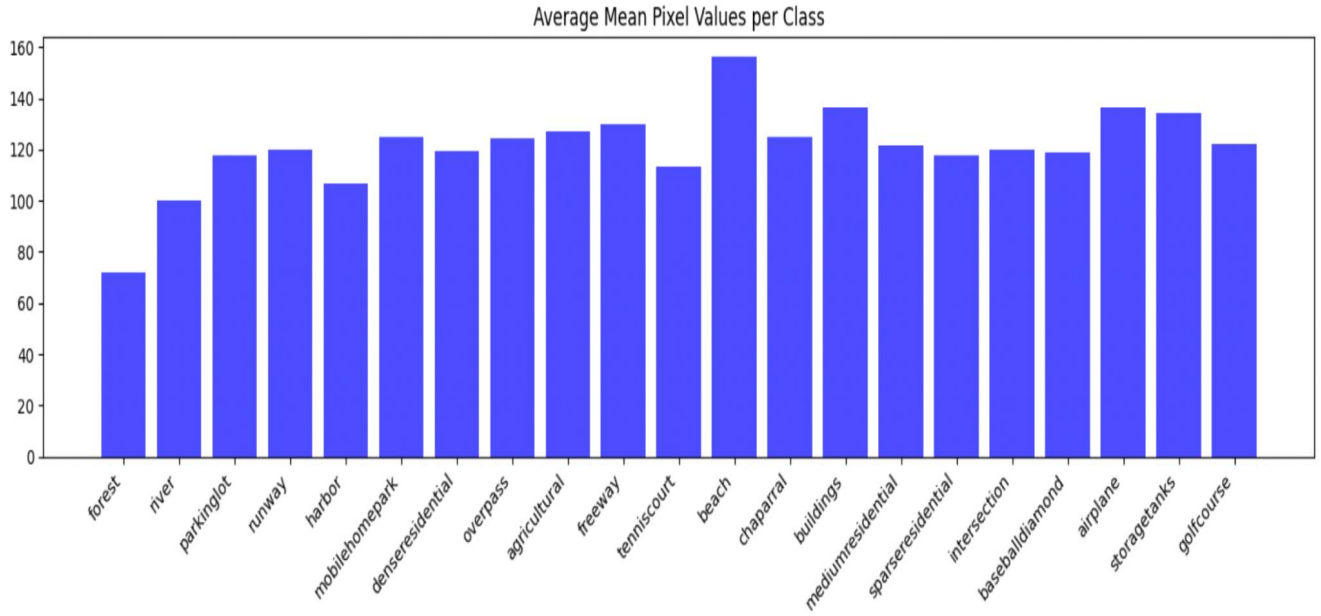
Non 256x256 images are distributed across multiple classes. We will resize them to 256x256 before training and testing our models.

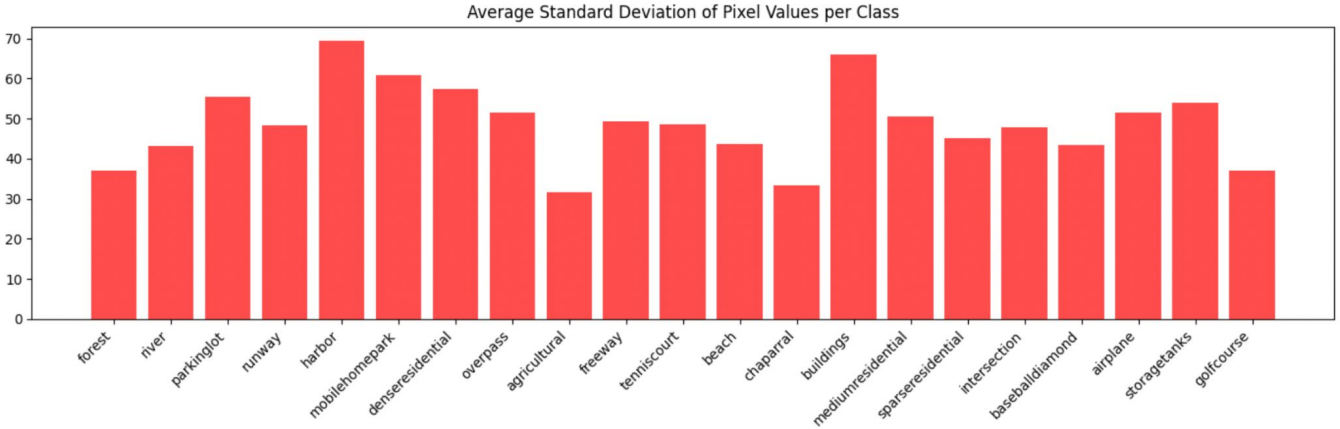
Class Statistical Features (Mean, Std-Dev, Skewness & Kurtosis)

We also measure multiple statistical features for each class using every image pixel values. The statistical features considered in this EDA are as follows:

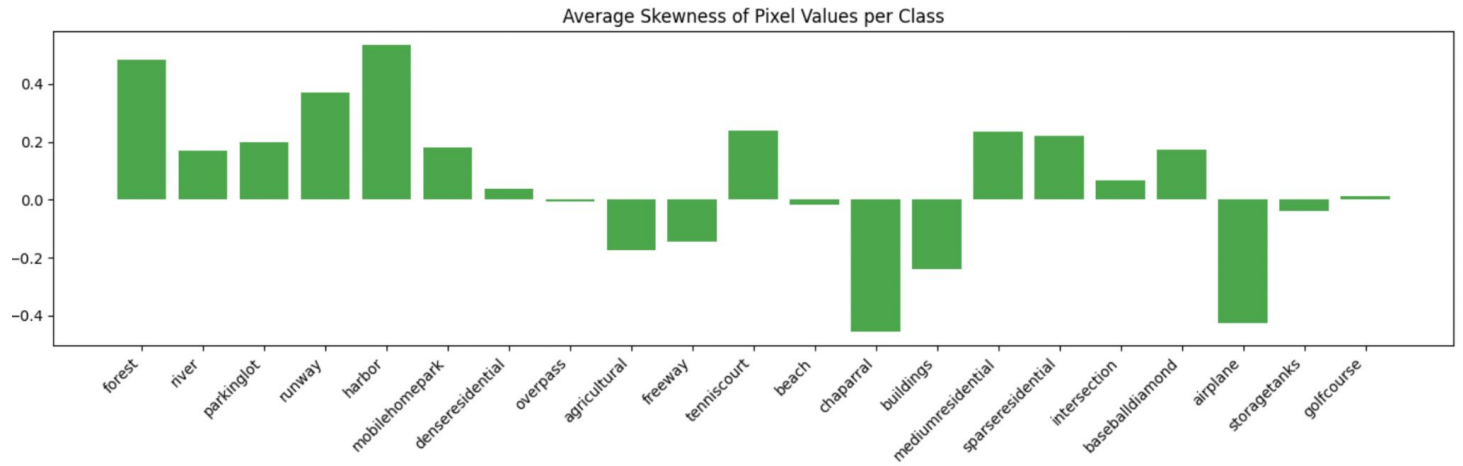
- ***Avg Mean of Pixel values:*** Measures overall brightness
- ***Avg Standard Deviation of Pixel Values:*** Captures contrast/variation
- ***Avg Skewness of Pixel Values:*** Detects asymmetry in distribution
- ***Avg Kurtosis of Pixel Values:*** Identifies presence of outliers

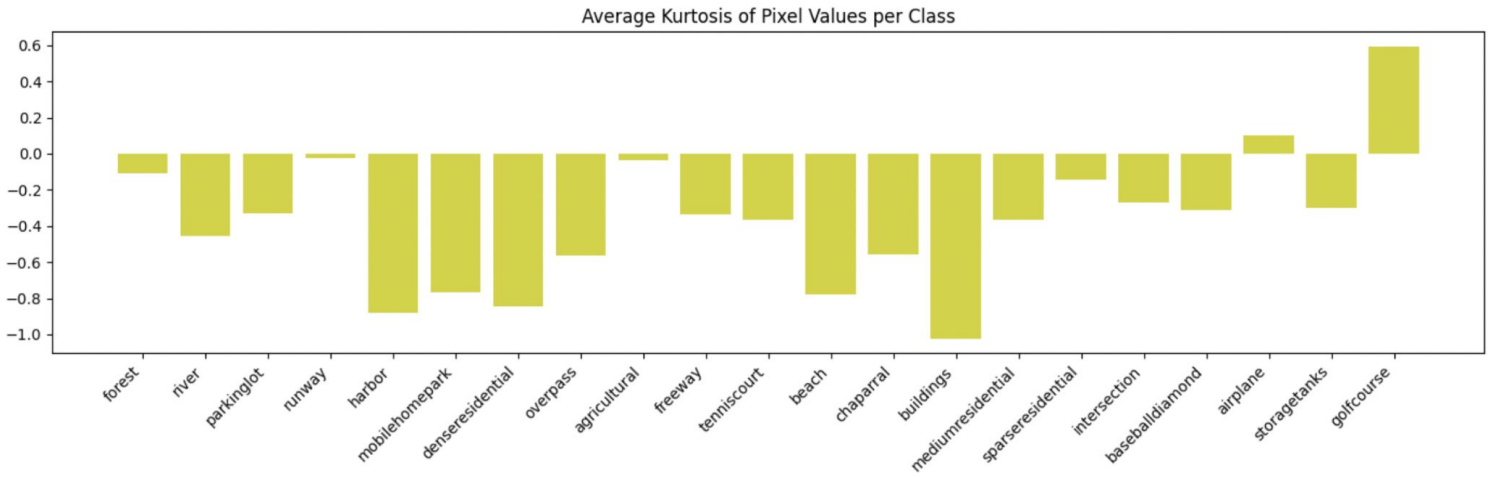
Avg Mean and Std Dev of Pixel Values Across Classes





Avg Skewness and Kurtosis of Pixel Values Across Classes





Reference

[1] UC Merced Land Use Dataset. Available: https://www.kaggle.com/datasets/abdulhasibuddin/uc-merced-land-use-dataset/data.