PROJECT PROPOSAL

JEFFERSON LUIZ ROESLER

[j\_roesler219326@fanshaweonline.ca](mailto:j_roesler219326@fanshaweonline.ca)

INFO -6147 – DEEP LEARNING WITH PYTORCH

PROFESSOR MOHAMMED YOUSEFHUSSIEN

JULY, 2024

**Project Title: Land Use and Land Cover Classification**

**Project Description**

This project aims to classify land use and land cover (LULC) using the EuroSAT dataset and a pre-trained ResNet-18 model available on torchvision. The primary goal is to detect changes in land use over time to identify and monitor informal or illegal constructions. The idea for the future is to transform this project into integrating inputs from the Google Maps API to use geographical coordinates (latitude and longitude) for precise location-based analysis.

**Why is it Good?**

The advantages of this application for a government agency, especially one responsible for property taxes, are significant:

1. **Automated Monitoring**: The system can automatically monitor large areas for changes in land use, which is more efficient than manual inspections.
2. **Detection of Illegal Constructions**: By identifying unlicensed constructions, the system helps in maintaining up-to-date records of property developments, ensuring all taxable constructions are accounted for.
3. **Enhanced Tax Revenue**: Accurate detection and classification of land use changes can lead to a more comprehensive and fair property tax system, potentially increasing tax revenues by including previously unrecorded structures.
4. **Urban Planning Support**: The data generated can assist in urban planning and development, ensuring sustainable and organized growth of the city.
5. **Cost-Effective**: Utilizing satellite images and machine learning reduces the need for extensive on-ground surveys, saving time and resources.

**Methodology**

1. **Data Collection**: Use the EuroSAT dataset for initial training and validation. Integrate Google Maps API to obtain real-time satellite images based on coordinates.
2. **Model Training**: Fine-tune the pre-trained ResNet-18 model on the EuroSAT dataset to classify different types of land use.
3. **Change Detection**: Implement algorithms to compare current and historical satellite images to detect changes in land use.
4. **Database Update**: Develop a system to update the property database with detected changes, highlighting areas with potential illegal constructions.

**Data**

The primary dataset will be the EuroSAT dataset, which contains labeled satellite images. Additional data will be sourced from the Google Maps API, providing up-to-date satellite imagery based on specified geographical coordinates.

**Evaluation**

The system performance will be evaluated through both quantitative and qualitative metrics:

1. **Classification Accuracy**: Measure the accuracy of land use classification using standard metrics like precision, recall, F1-score, and overall accuracy.
2. **Change Detection Accuracy**: Evaluate the system’s ability to detect changes by comparing detected changes with ground truth data where available.

By implementing and evaluating this system, the project aims to provide a robust tool for monitoring land use and supporting government agencies in urban management and tax collection.