Orthoimagery Image Segmentation Project

Overview

The Orthoimagery Image Segmentation project aims to segment drone images into various categories such as water, buildings, vegetation, and other land types. Due to the unavailability of a segmented drone dataset, we utilized similar images from open-source data to train our model. We then applied this model to our dataset, achieving promising results that still have room for improvement.

Project Structure

* **semantic\_segmentation\_using\_opensource\_data.ipynb**: Jupyter notebook containing the code for training the segmentation model using open-source data.
* **models/**: Directory containing the trained models.
* **data/**: Directory containing the open-source training data and our drone image dataset.
* **results/**: Directory to store the output segmented images and performance metrics.
* **requirements.txt**: List of required Python libraries and dependencies.

Dataset

Open-Source Data

We leveraged publicly available datasets similar to our target images for training the segmentation model. These datasets provided pre-segmented images which we used to train our model.

Drone Images

Our dataset consists of drone-captured orthoimagery that requires segmentation into various land types. The model trained on open-source data was used to predict and segment these images.

Model

We used a **MobileNet** model pre-trained on open-source segmented data for its efficiency and accuracy in image segmentation tasks. The model was fine-tuned on our specific segmentation categories.

Code

Training

The training process, including data preprocessing, model training, and evaluation, is detailed in the semantic\_segmentation\_using\_opensource\_data.ipynb notebook.

Prediction

We applied the trained MobileNet model to our drone images, and the segmented outputs were saved in the results/ directory.

Libraries Used

* Python 3.x
* PyTorch
* torchvision
* matplotlib
* numpy
* pandas
* scikit-learn

How to Run

1. **Install the required libraries:**

pip install -r requirements.txt

1. **Run the Jupyter notebook:** Open semantic\_segmentation\_using\_opensource\_data. ipynb in Jupyter Notebook or Jupyter Lab and execute the cells sequentially to train the model and predict the segmentations.

Future Scope

1. **Data Augmentation:** Enhance the training process by incorporating various data augmentation techniques to improve the model's robustness and performance.
2. **Model Optimization:** Experiment with different deep learning architectures and hyperparameters to achieve better segmentation accuracy.
3. **Post-Processing:** Develop post-processing techniques to refine the segmentation results and reduce noise.
4. **Domain-Specific Training:** Collect and annotate a domain-specific dataset with segmented drone images to train the model, ensuring higher accuracy and relevance to our use case.
5. **Integration:** Integrate the segmentation model into a larger pipeline for real-time image analysis and mapping applications.
6. **Evaluation Metrics:** Implement more advanced evaluation metrics to assess the model's performance comprehensively, considering aspects like IoU (Intersection over Union) and F1 Score.

Conclusion

The Orthoimagery Image Segmentation project demonstrates the feasibility of using open-source data to train a segmentation model and applying it to our drone imagery dataset. While the initial results are promising, further improvements can be made to enhance the model's accuracy and applicability in real-world scenarios.

Feel free to contribute to this project by creating pull requests, reporting issues, or suggesting enhancements. Your contributions are greatly appreciated!

**Contact:** For any questions or further information, please contact

Nagarjuna Pendekanti

Email: [nagu07799@gmail.com](mailto:nagu07799@gmail.com)

Phone no: 9408438699