Green Vision

AI and Computer Vision for a Greener Tomorrow

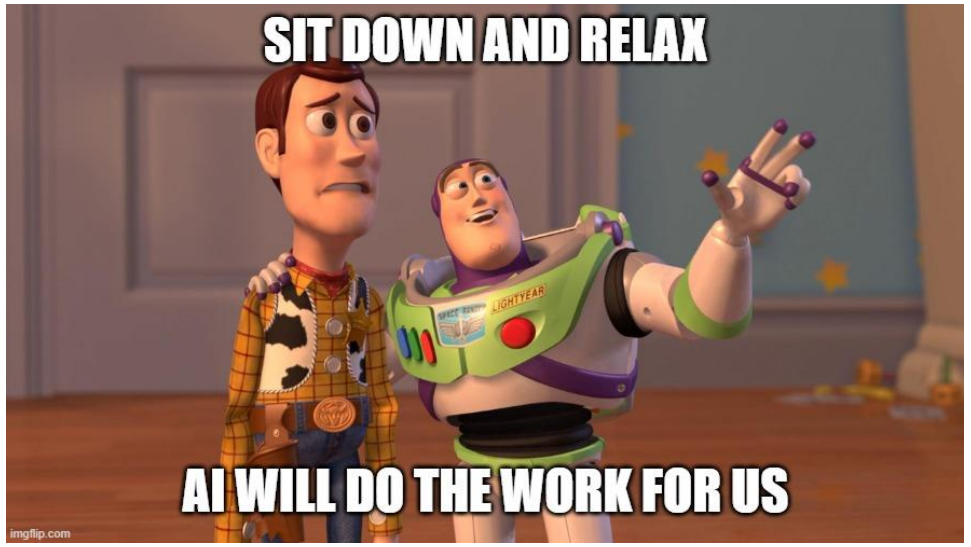
Vivek Chavan & Maryam Arabshahi

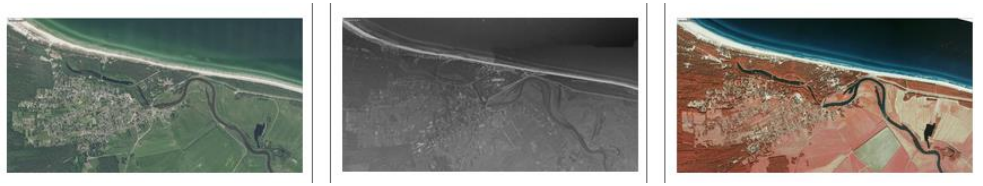
AI GRID Hackathon 2024

Challenge #3: Green Area Recognition

Overview of the Challenge

- Recognising Green Areas in aerial photos.
  - Can the percentage of greening in the urban area be detected?
  - Are there differences in the quality of the greening areas?
  - Can potential for improving the proportion of greening areas be identified?
- Data: Publicly available RGB and CIR images.



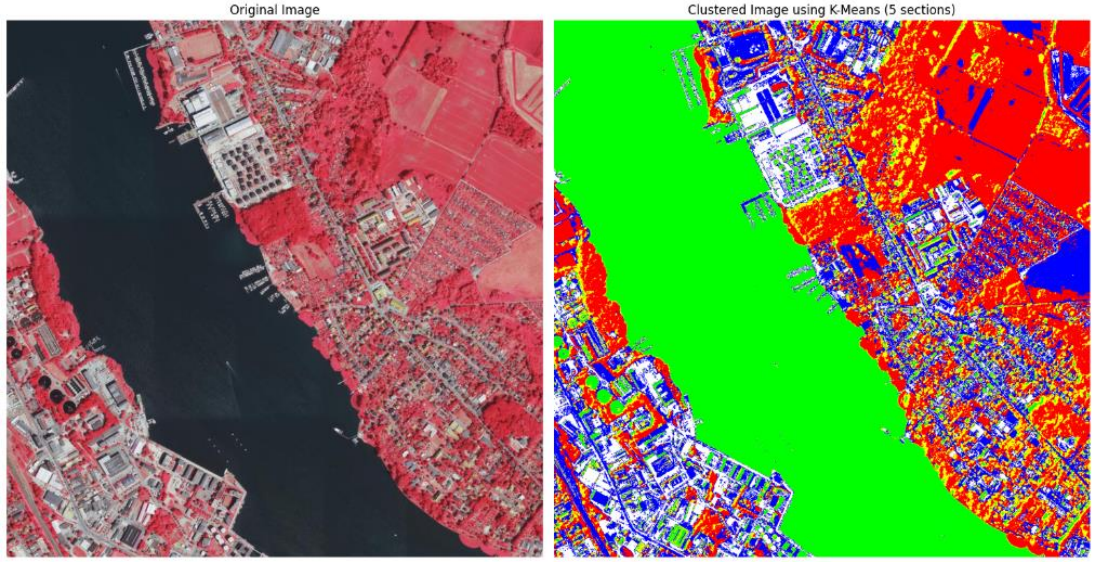


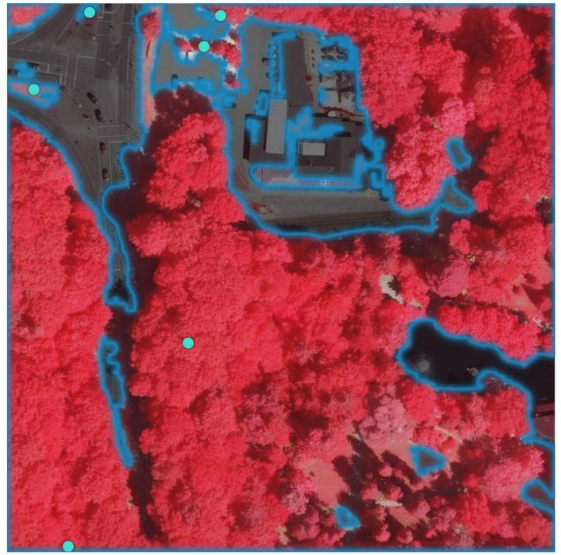
Large size of Images and Data!

DEMO

Approaches

- **Traditional Computer Vision:** Fast and efficient. But lacks generalisability.
- **Deep Learning based methods:** Can be powerful, but require higher compute and may occassionally fail in a non-human like fashion.



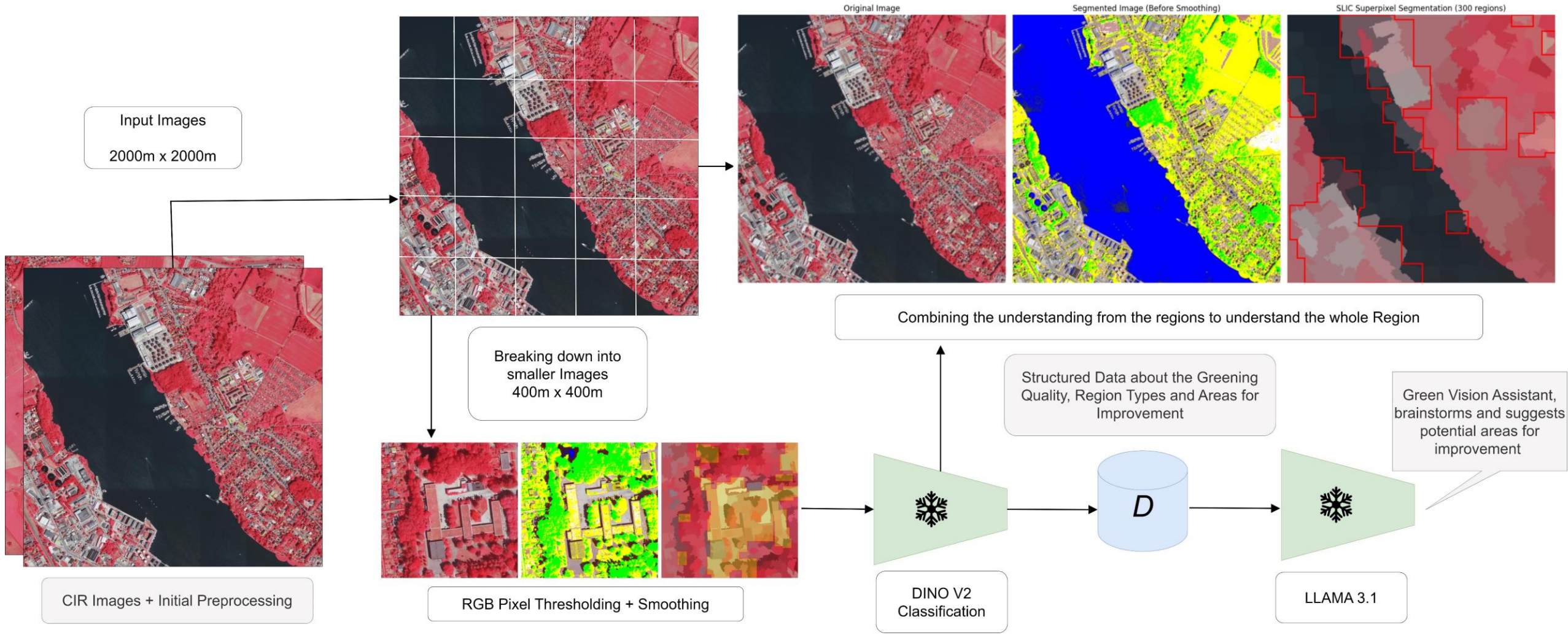


Left: Original
Middle: k-means
Right: Segement Anything

Initial Observations

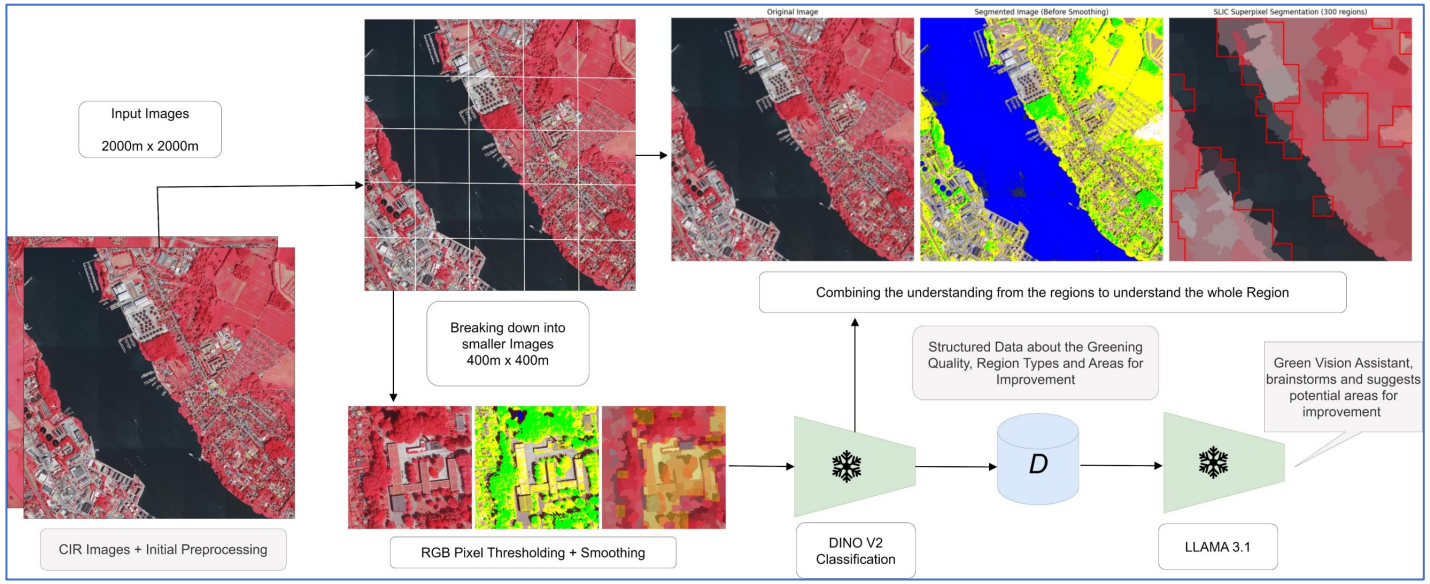
- Challenges: Shadows, water regions, context-dependent applicability.
- Varying qualities of greenery, can be seen, but not visually quantified without any processing.
- SOTA segmentation models do not perform well.
- The data is complicated, but we can use some inductive biases in the data:
  - Lighting conditions are very similar throughout.
  - Residential areas, open-fields etc have a common pattern.
  - CIR images: Plants have low Green pixel intensities.

Our Approach: Single Area Image



Our Approach: City-Wide Planning

- Rostock Metropolian Area: 42 Images (12km x 14km)



Solution: Run a coarser version with a higher compute budget.

Final Observations

- The approach that worked the optimally for us is a combination of traditional image processing and modern Deep Learning methods.
- Our approach is designed to be modular and deployable under various scenarios.
- Can be completely run (inference) on CPU or up to 4GB of vRAM.
- Areas for improvement/futher work:
  - Improving region classification.
  - The current algorithm is conservative when suggesting areas which could be reviewed better.
  - Outputs of LLMs may not be factually accurate, esp. without RAG/finetuning.

Thank you ☺

The implementation is available on our Github Repo: