Urban Forests on the UN Global Platform

Joe Peskett
@joepeskett

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Overview

- Data Science Campus project and methodology
- Implementation on the UN Global Platform services
Urban Forests drivers

- Collaboration with the Natural Capital team within UK ONS.
  - There is a clear stakeholder.
  - There is clear learnings that can be reused and novel techniques to be used.
Alternative methodologies

- Survey
- Crowdsourcing information
- Satellite imagery
Urban Forests Methodology

1. Use Open Street Map (OSM) to generate sample points around 112 towns & cities in the UK
2. Street view images taken at these points
3. Images are segmented to provide a value for percentage vegetation
Urban Forest Methodology
Urban Forest Methodology

1. Percentage of green pixels
   a. Using LAB colour space, random forest used to increase accuracy
2. Pyramid -scene-parsing network (PSP-net) trained on CityScapes dataset to segment each image
Urban Forest Methodology
PSP- net Segmentation

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Methodology Comparison
Results from the Campus

- Total dataset ~17.1 million images
- Technical report
- Open source pipeline on GitHub
- Collaboration with ONS visualisation team
- Implementation on the UN Global Platform
Implementation within the UNGP Methods Service

- Hosting algorithms, methods and microservices
- Dependencies managed per method using containers
- Run on cloud infrastructure, allowing quick scaling
- Methods are called using APIs
- Easy access to cloud datastores
1. Image processing

- Same PSPnet as used for the original pipeline
- You can see that Phil, one of the lead Data Scientists developed this code.
- The model file is loaded in using a function – the model file is saved in the developers storage, though is made available to be used in methods that he has developed.
2. Considerations for cloud implementation

- Keep outputs small
- Can outputs be formatted as inputs for the following method in the pipeline?
- Keep scaling in mind
3. Methods for the pipeline

- OSM points
  - Generate points for requesting images

- Street-view images
  - Download images into cloud storage, filed into way ids.

- Segment images
  - Analyse images/return value of vegetation for each image

- Create composites
  - Use segmentation data with original image to show classes with colours
3. Methods for the pipeline

HighwayScrapeR

Sample a queried area for OSM highways and return points at defined intervals (in metres) along these highways.

API calls: 355

Tags
- Experimental
- Geo
- geospatial
- OSM
- Urban Forests

Permissions
- Algorithmia Platform License
- Internet Access
- Calls Other Algorithms

HighwayScrapeR method

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3. Methods for the pipeline: Image downloader

- All images are saved in cloud-based storage
- Coordinates are kept in the image filename, way_id is in the folder name
4. Composing the pipeline

- OSM points
- Street-view images
- Segment images
- Create composites
5. Asynchronous processing

- All way_ids from overpass API query
  - Split way_ids into queues
    - Take way_id from queue
      - Download images
        - Segment Images
          - Create composite images
    - Take way_id from queue
      - Download images
        - Segment Images
          - Create composite images
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6. Calling the pipeline locally
Pros and Cons of this pipeline

- Use of street-view images
- Incomplete coverage using street-view images
- Timing of street-view image capture
- Ensuring access to data

1. Learning how to work in new ways
2. Modular design of pipeline, allowing reuse of code
Thanks for listening.

Any questions?