Comparing socio-economic characteristics to the built environment using high resolution aerial imagery

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Aims

- To **extract features from aerial image data** using deep learning
- To **classify areas** based on the extracted features
- To link the features of the built environment to **socio-economic characteristics** of the area
- To be able to **transfer** this knowledge across **multiple cities**

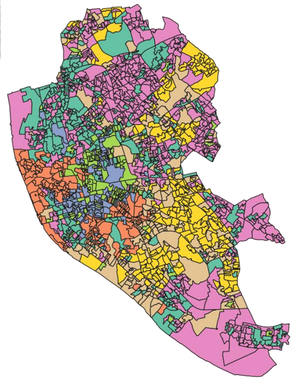
Background

- Human activities are encoded in the landscape – by analysing the features of images of the landscape we can reveal information about human activity
- According to geodemographics, people in areas with similar characteristics behave the same – do areas that look the same have people with the same characteristics?

Data

Aerial imagery

- 25cm resolution
- One image per output area



Output Area Classification (OAC)

- Classifies small areas into one of 8 supergroups, 26 groups or 76 subgroups, based on individual and household characteristics from census data

Methods

Feature extraction

- Convolutional neural networks (CNNs) are often used to classify images, but the outputs can be taken from different layers of the network to extract features from the image
- These extracted features can then be analysed using…

Supervised learning

- Train a model using labelled data to categorise images
- The human tells the model how to classify the data
- In this case, use the image features labelled with the OAC class to train a model to predict the OAC class of an unseen image

Unsupervised learning

- No training data, looks for structure within the data
- The model decides itself what features are important for classifying the data
- In this case, clustering areas by their image features to find areas with a similar built environment

Current plans

- Extract features from aerial images using an already-trained convolutional neural network – not trained for the specific task
- Use the extracted features to train a model which predicts the OAC class, examine the accuracy based on the features from a generic network
- Cluster the output areas by their image features (unsupervised learning) and compare to the classes of the OAC