# Dissertation project ideas – Andy MacLachlan

## How to work best with me

* Send work that I can read through in advance, even if you think it’s rubbish.
* I can provide best methodological and technical advice is your make use of R / a GIS.
* Use GitHub so I can see your code
* If I provide revisions / comments then correct them and send the same (or similar) document back to me, perhaps with an extra section
* Set up a shared folder between us – don’t just email work over
* In meetings have an agenda in mind, come with questions and figures / outputs / flowcharts. Don’t rely on me to just talk at you about your work

## Simulation modelling of people movement for targeted urban greening

## Project

* This extends some of my recent work on optimizing urban greening for heat mitigation as opposed to aesthetics
* The project would undertake similar analysis for a proposed development (assuming access to plans), model temperature and then model population movement through the development to establish the most traversed routes
* Vegetation scenarios would be proposed to reduce temperature
* This would attempt to provide local councils the tools to align with global development goals and sustainability requirements that often metropolitan or state government give little or no methodological advice on. Consequently councils or local government have produced a range of contrasting studies that aren’t directly comparable.
* It could also be extended to look at blue spaces – such as water bodies.

### Skills

* Urban simulation skills – I don’t know anything about this method

### Data

* Planning application data – often open on government websites
* google Earth imagery that will be digitized
* topography data (e.g. UK national LiDAR or similar).

### Students

* Happy to supervise a range of students on this, but they would need to be slightly different projects in different cities.

## Determining factors for predicting forest fires and hazards to urban areas

### Project

* There is quite a lot of work on mapping forest susceptibility but little (I think) on it’s relationship to urban area
* This topic will apply existing (or modify them where appropriate) models but specifically explore the susceptibility in relation to the urban environment
* For example, if an area has a high fire risk is there an appropriate provision of the fire service (e.g. station, medical facilities).
* Could this be informed by data – e.g. temporary fire stations or nearby resources set up annual using a risk map
* <https://www.mdpi.com/2072-4292/12/22/3682>

Data

* MODIS or Landsat
* Open Street Map
* Most likely study area: USA or Australia

### Skills

* Machine learning
* Image classification
* Network analysis

## Detecting informal housing

### Project

* This project could be taken in many different directions..
* Informal settlements could be mapped through time – e.g. stacking Landsat imagery and establishing at what point spectral reflectance changed to represent often highly reflective roofs and subsequently map the expansion over time.
* Furthering this, has the expansion been matched with resources and other commitments outlined in the documents below.
* Alternatively, this could also be considered from a service delivery point of view in terms of fire risk
* <https://cps.ceu.edu/sites/cps.ceu.edu/files/attachment/basicpage/143/slum-upgrading-policies-south-africa.pdf>
* <https://core.ac.uk/download/pdf/205178951.pdf>
* <https://core.ac.uk/download/pdf/37322695.pdf>
* <https://theconversation.com/smoke-alarms-can-save-lives-in-informal-settlements-if-the-design-is-right-146225>
* <https://www.mdpi.com/2071-1050/12/22/9510>

### Data

* Landsat/MODIS

### Skills

* Image classification
* Big data (if looking at trends over time, possibly on Google Earth Engine)

## Is stop and search effective

### Project

* Spatially evaluate the effectiveness of stop and search policies in the UK or elsewhere in deterring or catching crime
* The project will also spatially and temporally explore the racial and ethnic disparities in stop and search data in relation to outcomes
* Other objectives or research questions could explore the spatial distribution of certain offences and allocation of police staff to them.
* Ideally recommendations will be created based on the outcomes for the use of police time - is stop and search really the best use of police time

### Skills

* Spatio-temporal data analysis

### Data

* <https://data.police.uk/data/>

## Exploring inequality in public transport cost (and associated policies)

### Project

* A lot of work and student dissertations have focused on accessibility to transport. However, not much has been done (to my knowledge) on the inequality of pricing (in the UK at least). This is largely because rail lines are privatized in the UK meaning different providers often have different pricing structures.
* This could also be extended to explore average house price data from the Land Registry
* This project would need to be appropriately scoped

### Skills

* Data handling – the fares data looks challenging to manipulate and make appropriate for analysis

### Data

* <https://itsleeds.github.io/UK2GTFS/>
* Fares data: <http://data.atoc.org/fares-data>
* House price data: <https://landregistry.data.gov.uk/app/ukhpi>
* Possibly also public rent data, although private rent data isn’t available