Data Science Campus

Modelling multi-modal transport and service accessibility within the UK

Guy Hannay
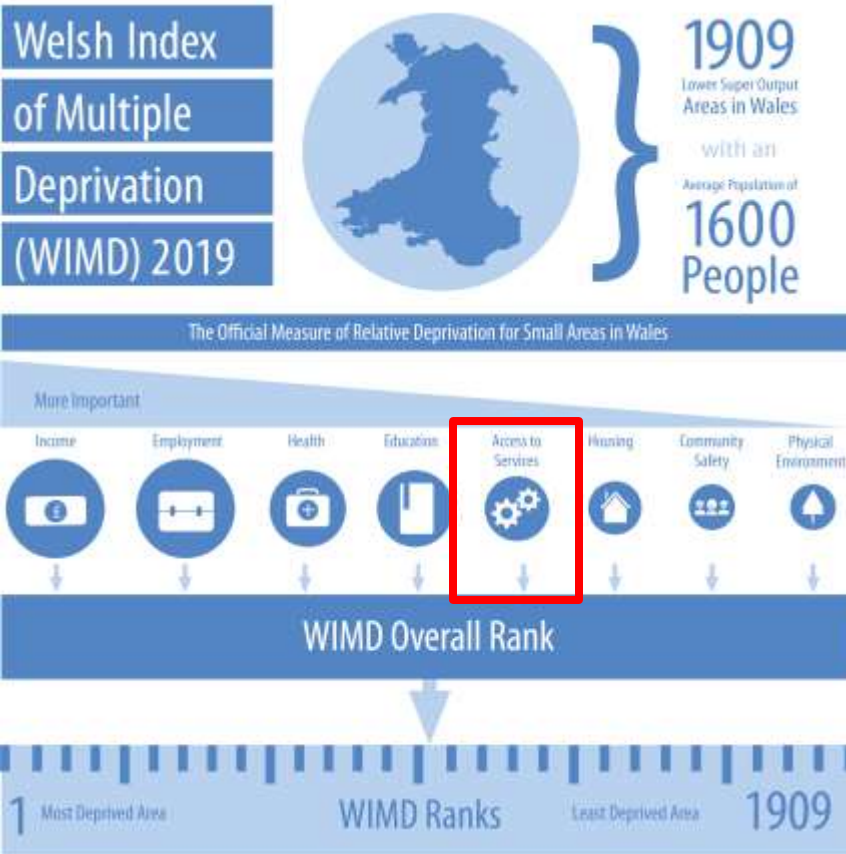Data Scientist | Data Science Campus

Aim

Develop a tool that uses open-source transport data to analyse multi-modal travel in the UK to better understand whether, and how, people can access services.

Background

Initially developed for Welsh Government to allow for more frequent and up-to-date calculations of access to services domain of the Welsh Index of Multiple Deprivation.

Access to Services

- Pharmacy
- Food shop
- GP
- Post office
- Broadband
- Primary school
- Public library
- Sports facility
- Secondary school
- Petrol station

Official Statistics

Strategic Planning

Service Optimisation

Transport Infrastructure

Econometric Analysis

Disability Access

Why?

For policy makers to:

- Introduce transparency

- Create reproducibility – query other use cases

- Use an open service

How?

Creating transport data feeds

- Transport data:
    - UK nationwide bus schedules
        - TransXChange files updated weekly *(DfT)*
    - Train
        - CIF files updates weekly *(Network Rail)*
    - Car, bicycle, and foot travel - *OpenStreetMap*

Different transport, different sources, different formats

- **Solution:** General Transit Feed Specification (GTFS)

- GTFS are a popular type of transport data to draw directions and calculate travel times.

- They also work well with open source network builders, e.g. OpenTripPlanner.
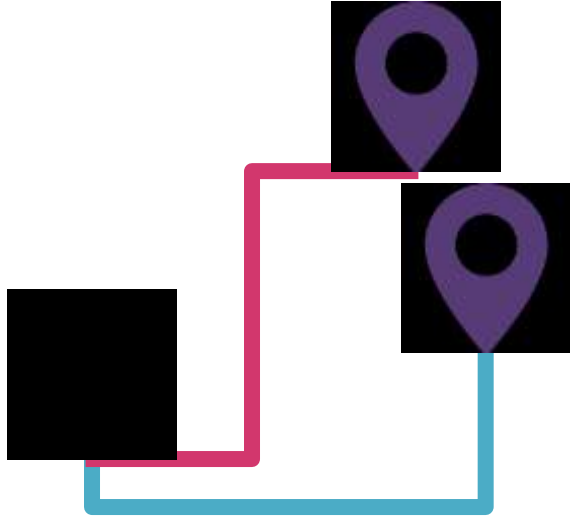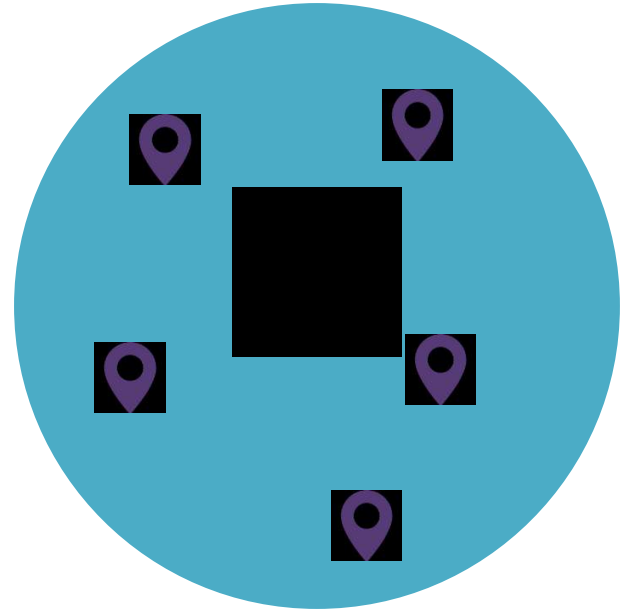
train data

GTFS converter

bus data

Network builder

Point to point

Isochrone

How many people in Wales can reach a sports venue, with a capacity greater than 10,000 within 90 minutes using public transport?
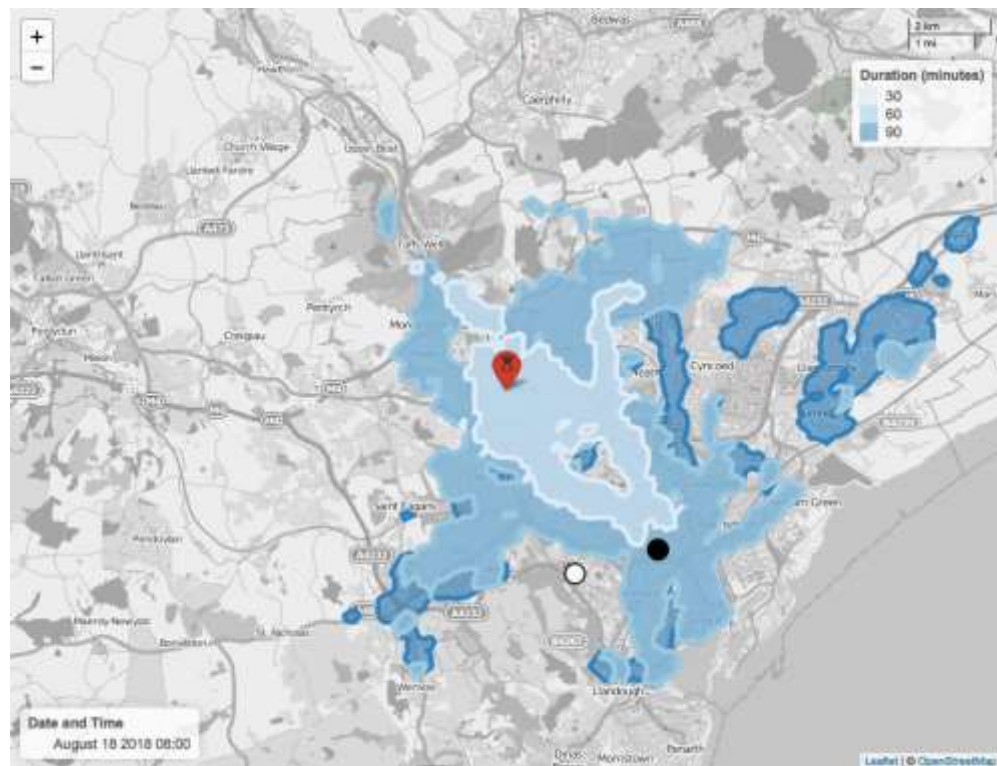
Official Statistics

A map of Wales showing the location of the sports stadiums (black circles) and the
Medium Super Output Area (MSOA) locations (coloured circles)

Travel between Cardiff 008A and Cardiff City Stadium on 1st October 2018
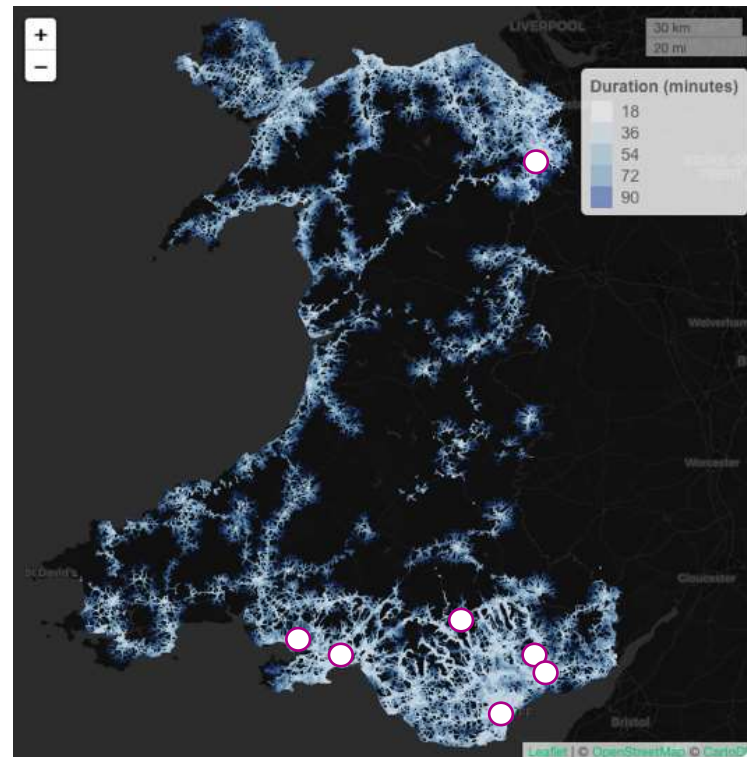between 15:00 and 19:00 at 20 minute intervals, using public transport.

Maximum travel distance (within 90 minutes) from an area in Cardiff on 18th August 2018 between 08:00 and 22:00 at 20 minute intervals, using public transport

MSOA	Cardiff Park	Cardiff City Stadium	Cwmbran Stadium	Liberty Stadium	Parc y Scarlets	Penydarren Park	Principality Stadium	Racecourse Ground	Rodney Parade	SWALEC Stadium	Stadium Count
Blaenau Gwent						72					1
Bridgend	72	72					54			72	4
Cardiff	36	36					36		90	36	5
Denbighshire											0
Merthyr Tydfil	90					36	90			90	4
Pembrokeshire											0
Rhondda Cynon Taf	54	54					36			54	4
Swansea	90			18	72		90				4
Wrexham								18			1
:	:	:	:	:	:	:	:	:	:	:	:
MSOA Count	183	133	63	60	49	75	193	37	104	157	406
Total (Persons)	1,408,983	1,013,372	471,432	461,167	373,73	591,317	1,488,604	280,458	791,88	1,205,478	2,201,32

2,201,322

70% of the Welsh population using MSOA population centroids

10,000+ capacity sports stadium

What is the most optimal Job Centre location (using Public Transport, by distance and cost) for those who are unemployed in Wales?

Service Optimisation

Output Area	Location	Assigned Job Centre
W00000001	Isle of Anglesey	Llangefni
W06000003	Conwy	Rhyl
W06000009	Pembrokeshire	Pembroke Dock

Output Areas	Out	Return	Both	N/A
10,04	8,68	8,83	8,13	1,91

	Fastest	Cheapest
Assigned	6,127	6,935
Nearest*	1,663	895
2nd Nearest*	675	637
3rd Nearest*	402	400
N/A	1,180	1,180

*But not assigned
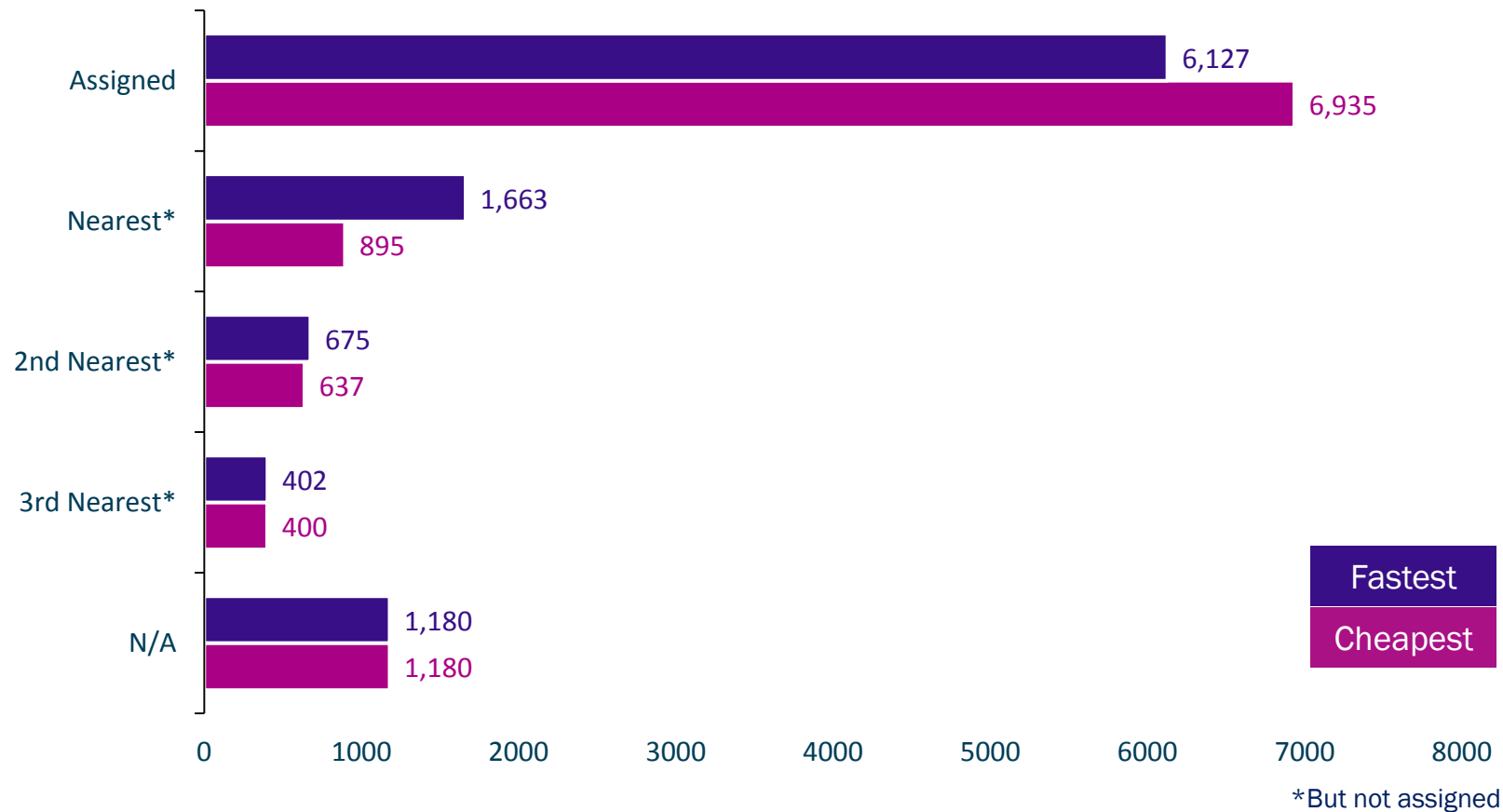
Service Optimisation

e.g. What is the nearest (and most appropriate) Job Centre per household?
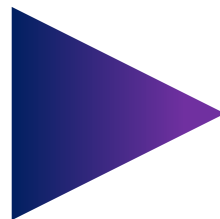
278
Job Centres

33
Average travel time

174
Longest travel time

£3.66
Average cost per journey

£54.89
Most expensive journey

25
Average travel time

151
Longest travel time

£2.49
Average cost per journey

£30.22
Most expensive journey

Official Statistics
e.g. Welsh Government to use for calculating WIMD (Welsh Index of Multiple Deprivation) statistics

Strategic Planning
e.g. Valleys Taskforce, where to locate hubs to help improve prosperity in the South Wales valleys

Service Optimisation
e.g. What is the nearest (and most appropriate) Job Centre per household?

Transport Infrastructure
e.g. South Wales Metro, where should public transport stops be placed, and what should the new timetable be?

Econometric Analysis
e.g. Can we measure night-time economy of regions such as Greater Manchester?

Disability Access
e.g. Can we improve the way we calculate and measure UN Sustainable Development Goals?

What's next?

- UK built network
  - Currently only available for Wales, Scotland, and England
- Google Cloud Platform