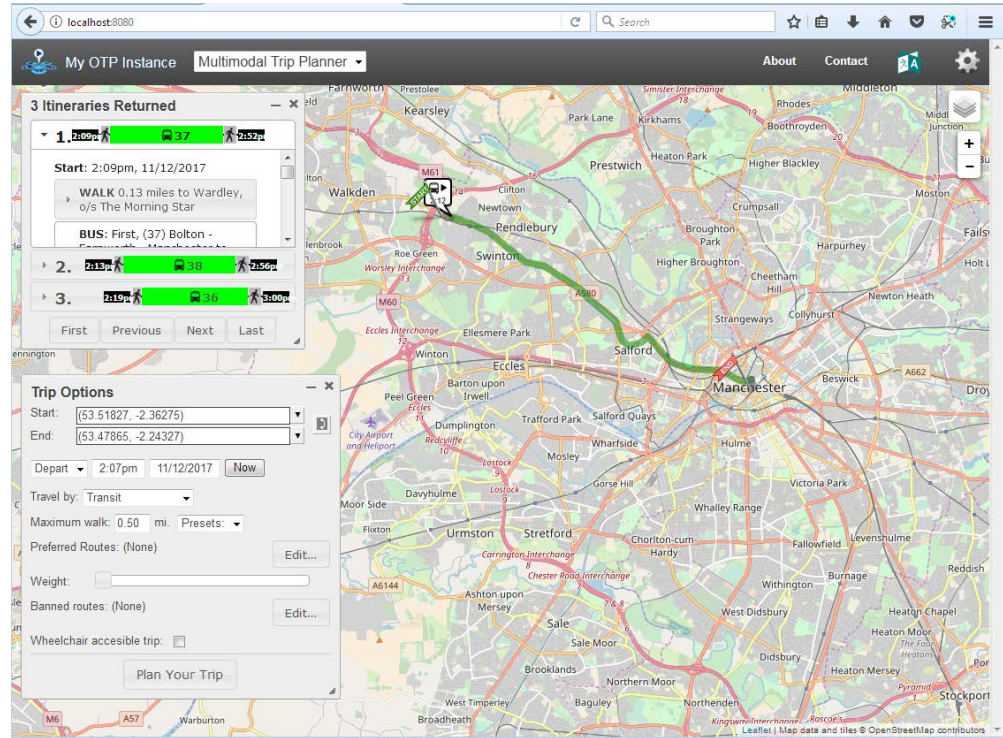# OpenTripPlanner – creating and querying your own multi-modal route planner
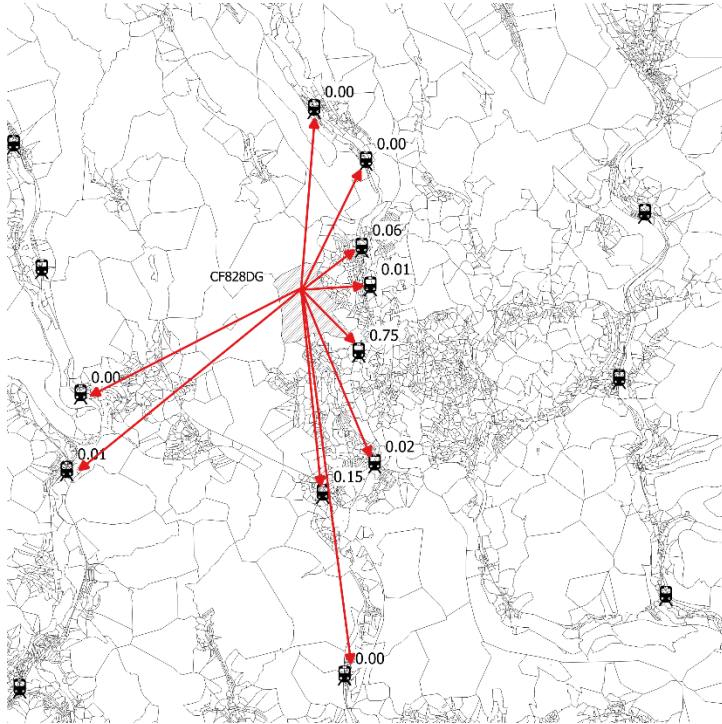
Marcus Young

Transportation Research Group
University of Southampton

16 November 2017

UNIVERSITY OF
Southampton
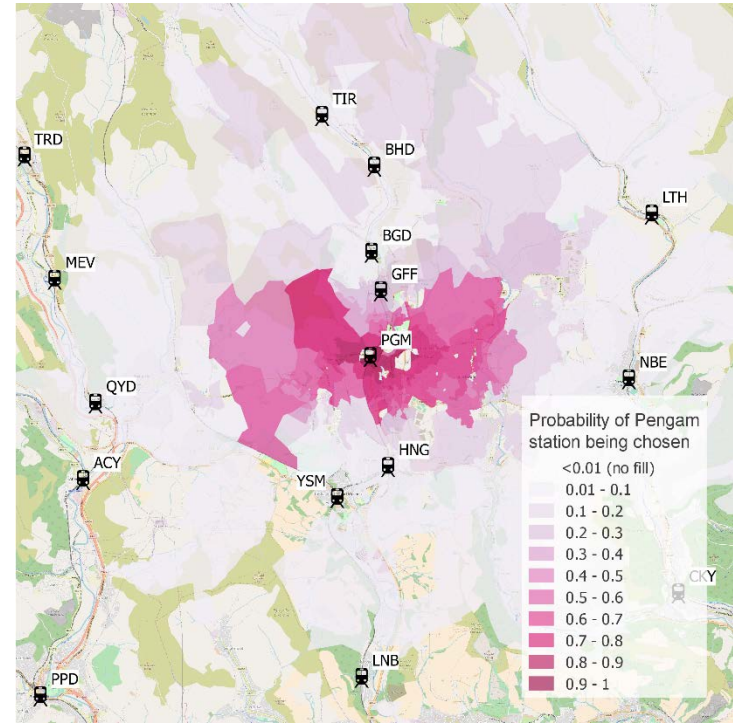
Key part of my research was developing station choice models to define probabilistic station catchments
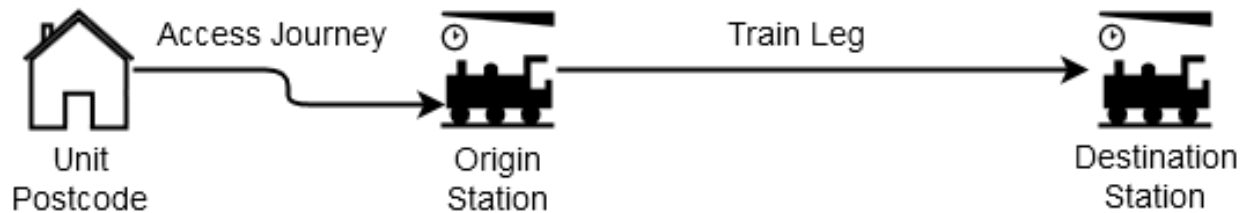

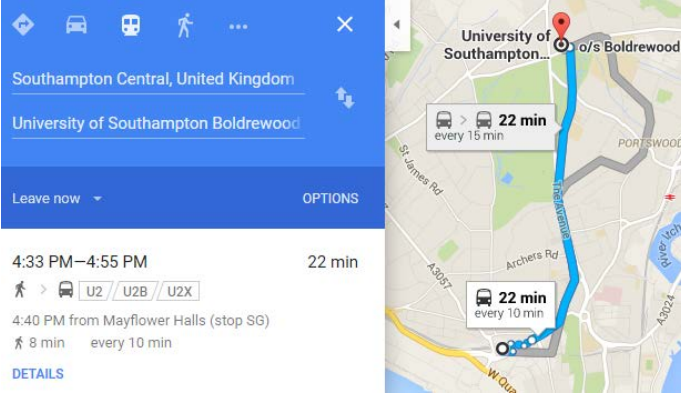Probability of alternative stations being chosen for a postcode

Probabilistic catchment for a station

To calibrate models I needed data on station access journeys and the train leg

individual	Choice set	Chosen	Distance (road)	Time (road)	Duration (mode specific)	Train leg duration	Walk time	Wait time	Transfers	On-train time	Fare
1556	ADR	1	0.64	2.48	9.40	28.33	2.33	0	0	26	6.40
1556	COA	0	2.06	6.13	26.63	26.33	2.33	0	0	24	6.20
1556	WFF	0	3.94	12.93	41.12	43.00	0.00	6	1	37	6.40
1556	CBC	0	3.85	13.20	50.12	41.00	0.00	6	1	35	6.40
1556	HLY	0	7.66	16.03	83.55	34.10	8.10	0	0	26	6.90
1556	KWD	0	5.69	20.10	68.62	58.10	8.10	0	0	50	6.20
1556	BAI	0	5.17	14.73	65.30	19.33	2.33	0	0	17	5.80
1556	CBS	0	3.85	11.27	48.67	23.33	2.33	0	0	21	5.90
1556	CRF	0	8.22	17.32	97.47	36.10	8.10	0	0	28	6.90
1556	DRU	0	3.35	8.92	37.18	33.33	2.33	0	0	31	6.70

Variety of route planning tools were considered, but found unsuitable and rejected
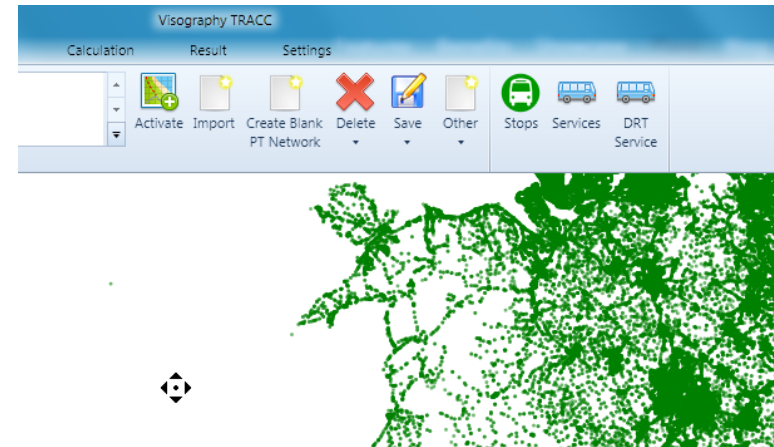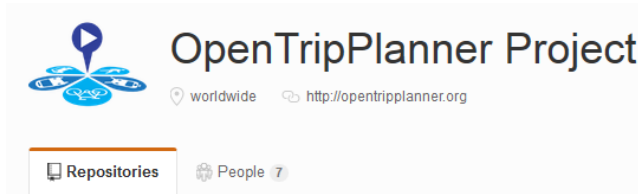

Commercial desktop options – expensive, and restrictive.

Online services - not free and restricted to current services - not useful for planning or retrospective analysis

OpenTripPlanner was selected – open source, cross-platform, with web interface and routing API

GTFS

OpenStreetMap

GeoTIFF
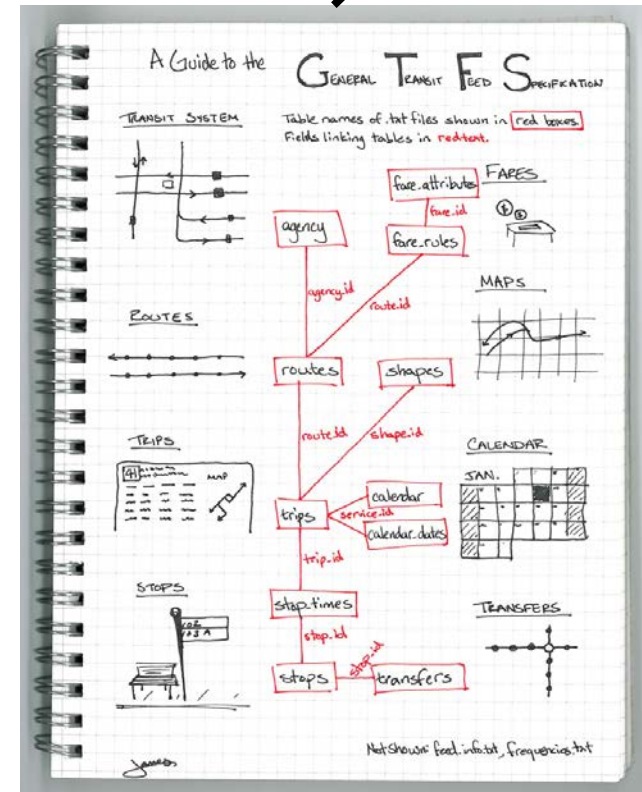
An automated framework to derive explanatory variables from disparate open transport data sources
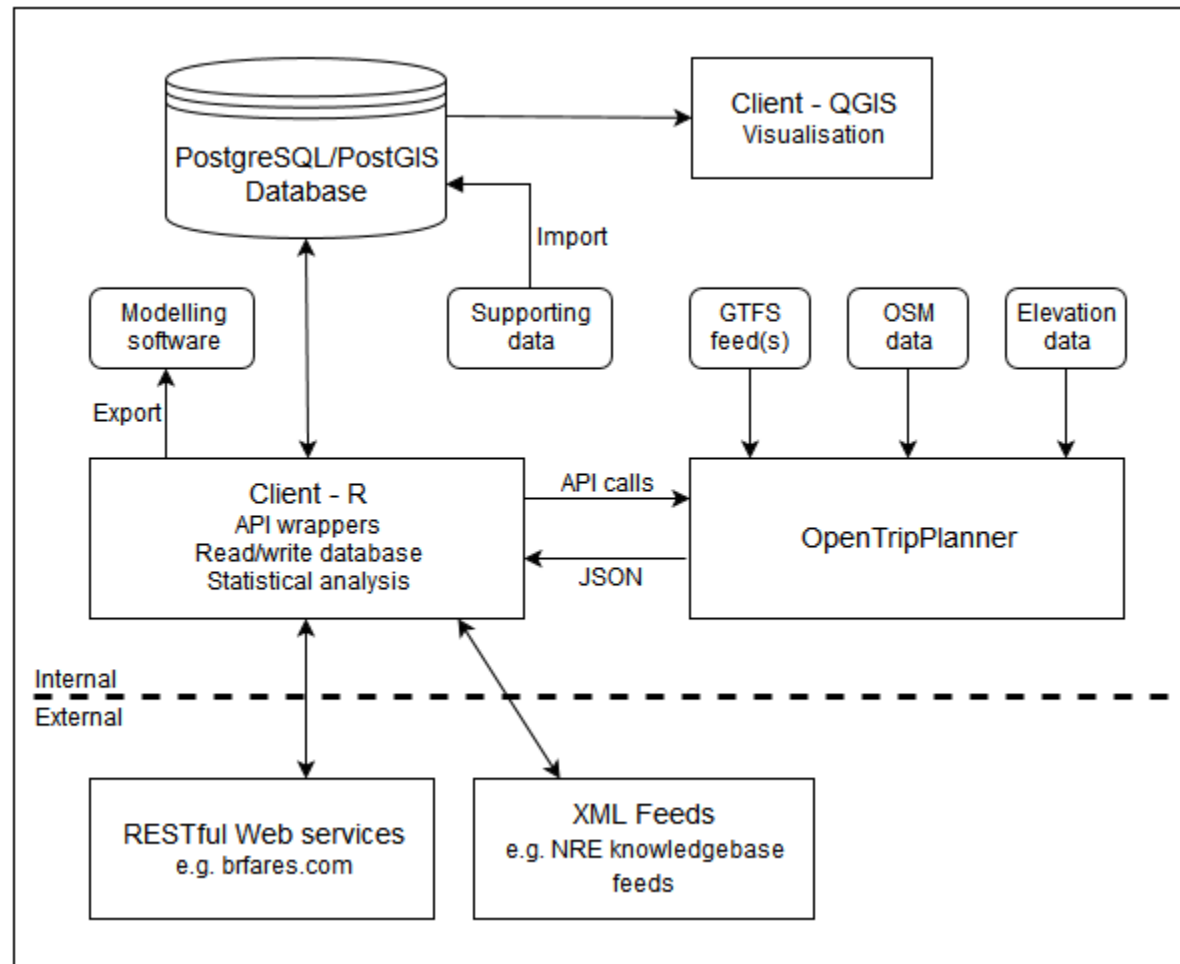
From: Young, Marcus. 2016. "An automated framework to derive model variables from open transport data using R, PostgreSQL and OpenTripPlanner." Paper presented at 24th GIS Research, UK Conference.

Tutorial – Part 1 (approx. 25 mins)

- Build an OTP network graph for Greater Manchester and then launch your OTP instance and test the web interface.

- https://github.com/marcusyoung/otp-tutorial

    - intro-otp.pdf & materials.zip


```
/otp
    otp.jar
    /graphs
        /current
            rail-gtfs.zip
            tfgm-gtfs.zip
            greater-manchester-osm.pbf
            router-config.json
```
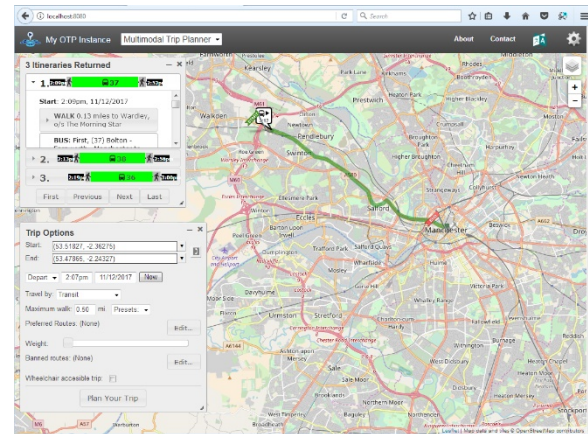


```
java -Xmx2G -jar otp.jar --build graphs/current
```

```
java -Xmx2G -jar otp.jar --router current --graphs graphs --server
```

Tutorial – Part 2 (approx. 40 mins)

- Query the OTP Isochrone API to obtain travel-time polygons for accessing Manchester Airport.

- Assess impact of new service

- No OTP instance? Use: otp.graspit.co.uk

```
library(httr)
airport_current <- GET(
  "http://localhost:8080/otp/routers/current/isochrone",
  query = list(
    fromPlace = "53.3627432,-2.2729342", # latlong of Man
    mode = "WALK,TRANSIT", # modes we want the route plan
    date = "07-10-2017",
    time= "08:00am",
    maxWalkDistance = 1600, # in metres
    walkReluctance = 5,
    minTransferTime = 600, # in secs (allow 10 minutes)
    cutoffSec = 900,
    cutoffSec = 1800,
    cutoffSec = 2700,
    cutoffSec = 3600,
    cutoffSec = 4500,
    cutoffSec = 5400
  )
)
```


Travel-time to Manchester Airport by public transport (minutes)
- 15
- 30
- 45
- 60
- 75
- 90
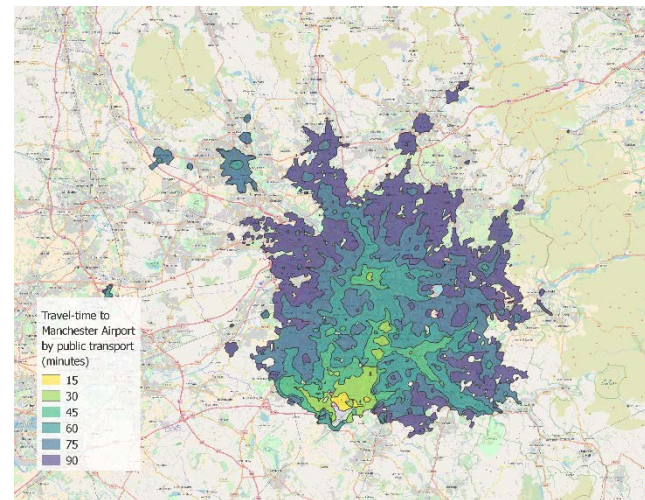
Tutorial – Part 3 (approx. 40 mins)

- Use an R script to automate querying the OTP route planner API

- Look up route to Manchester Airport by public transport for each LSOA in Greater Manchester

```
# Call otpTripTime to get attributes of
  otpTripTime(
    otpcon,
    from = '53.43329,-2.13357',
    to =   '53.36274,-2.27293',
    modes = 'WALK,TRANSIT',
    detail = TRUE,
    date = '2017-07-12',
    time = '08:00am',
    maxWalkDistance = '1600',
    walkReluctance = '5',
    minTransferTime = '600'
  )
```


Number of transfers to get to airport
- 0
- 1
- 2
- 3
- 4
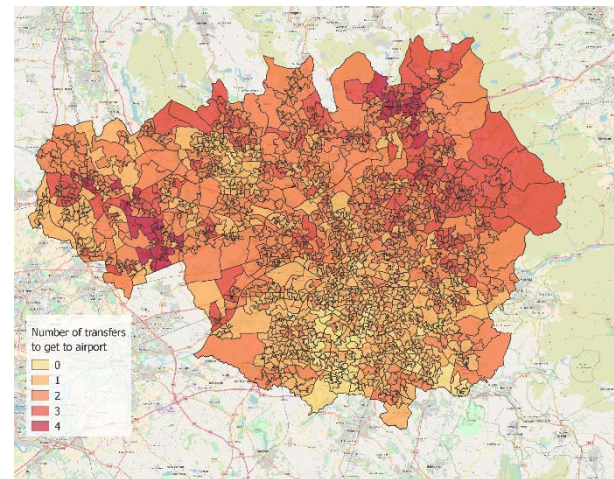
	code	easting	northing	latlong	status	duration	waitingtime	transfers
1	E01005756	391223	392954	53.43329,-2.13357	OK	49.50	10.03	1
2	E01005757	390660	391186	53.41739,-2.14199	OK	41.95	0.03	0
3	E01005754	390870	392662	53.43066,-2.13888	OK	55.47	10.03	1
4	E01005755	391140	391965	53.4244,-2.13479	OK	44.23	10.03	1