An automated demand forecasting model for new railway stations

DAFNI for transport research: 24 March 2021

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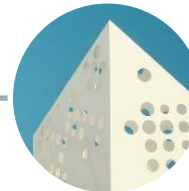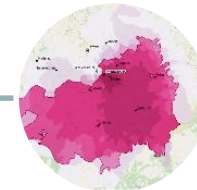
What does the model do?

Forecasts demand for new local stations

Individual station(s)

New line

Abstraction analysis

Catchment visualisation

A national trip end model with probability-based catchments

catchment · other predictor variables

$$\ln \hat{V}_i = \alpha + \beta \left(\ln \sum_{z}^{Z} Pr_{zi} P_z w_{zi} \right) + \gamma \ln F_i + \delta \ln J_{it} + \epsilon \ln Pk_i + \zeta Te_i + \eta El_i + \theta B_i$$

V   - annual trips

Pr   - probability of station being chosen
P   - population
w   - decay function
Z   - postcodes with station *i* in choice set
z   - postcode

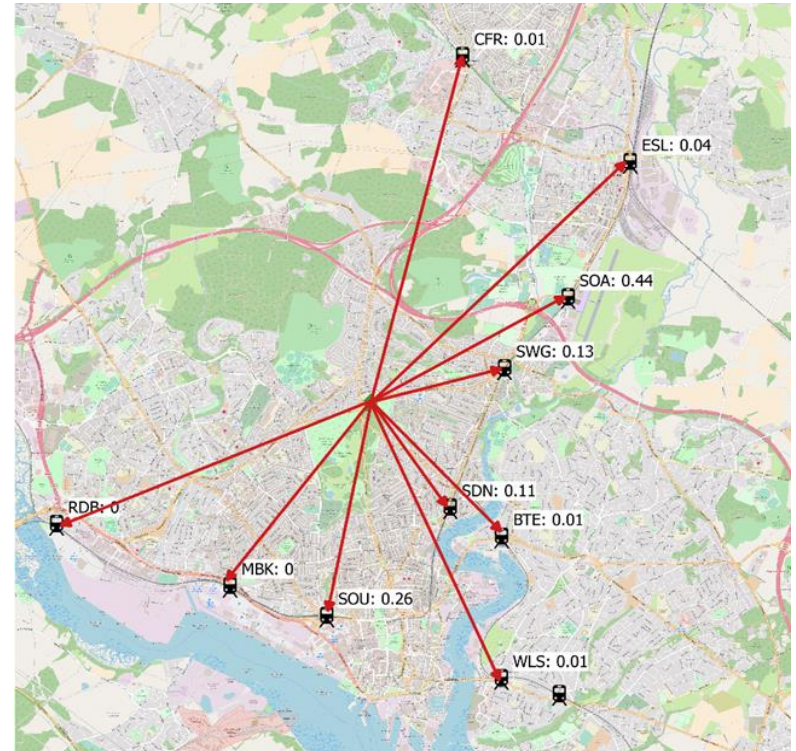*F*   - service frequency
J   - jobs (within approx. 0.5 mile)
Pk   - parking spaces
B   - travelcard boundary (y/n)
Te   - terminus station (y/n)
El   - served by electric trains (y/n)

CFR: 0.01
ESL: 0.04
SOA: 0.44
SWG: 0.13
RDB: 0
SDN: 0.11
BTE: 0.01
MBK: 0
SOU: 0.26
WLS: 0.01

Utilises open source tools and data

Identify all postcodes within 60 minutes of proposed station

Find the 10 nearest stations to each postcode

Calculate probabilities using station choice model
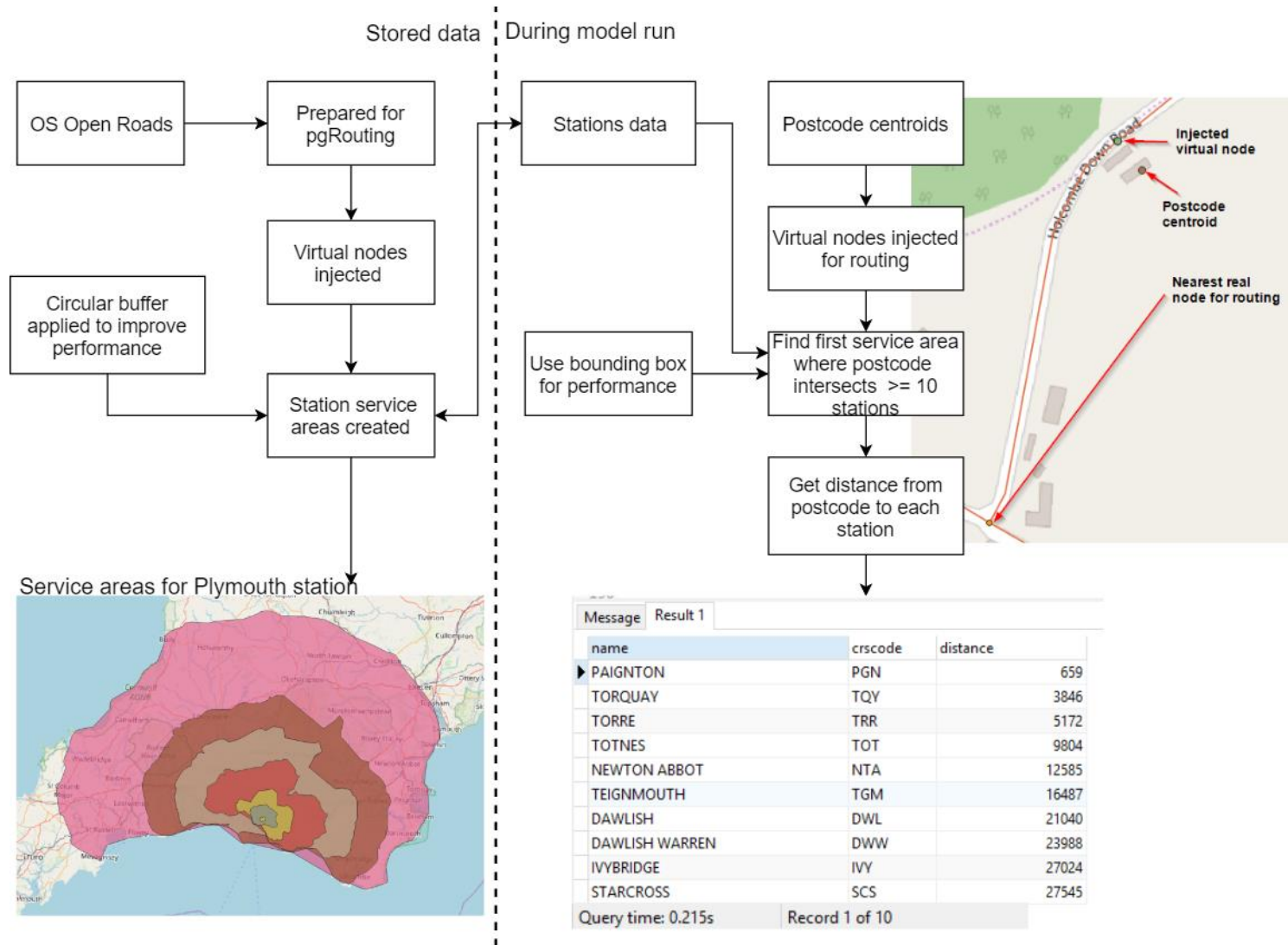
Run trip end model to generate forecast

Run abstraction analysis (if needed)
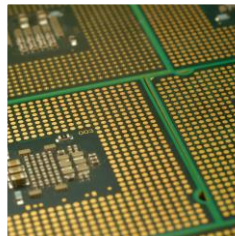
Generating choice sets – intensive compute

DAFNI - step change in model run times

Parallel processing employed in R

Each job runs in a separate container (virtualised OS)

Up to 30 cores per container

< 5 minutes for a single station forecast

Web app - job creation

Includes input verification

Web app – job management

Interactive map

Job submission

Job management

Displaying log file

Web app - visualisation
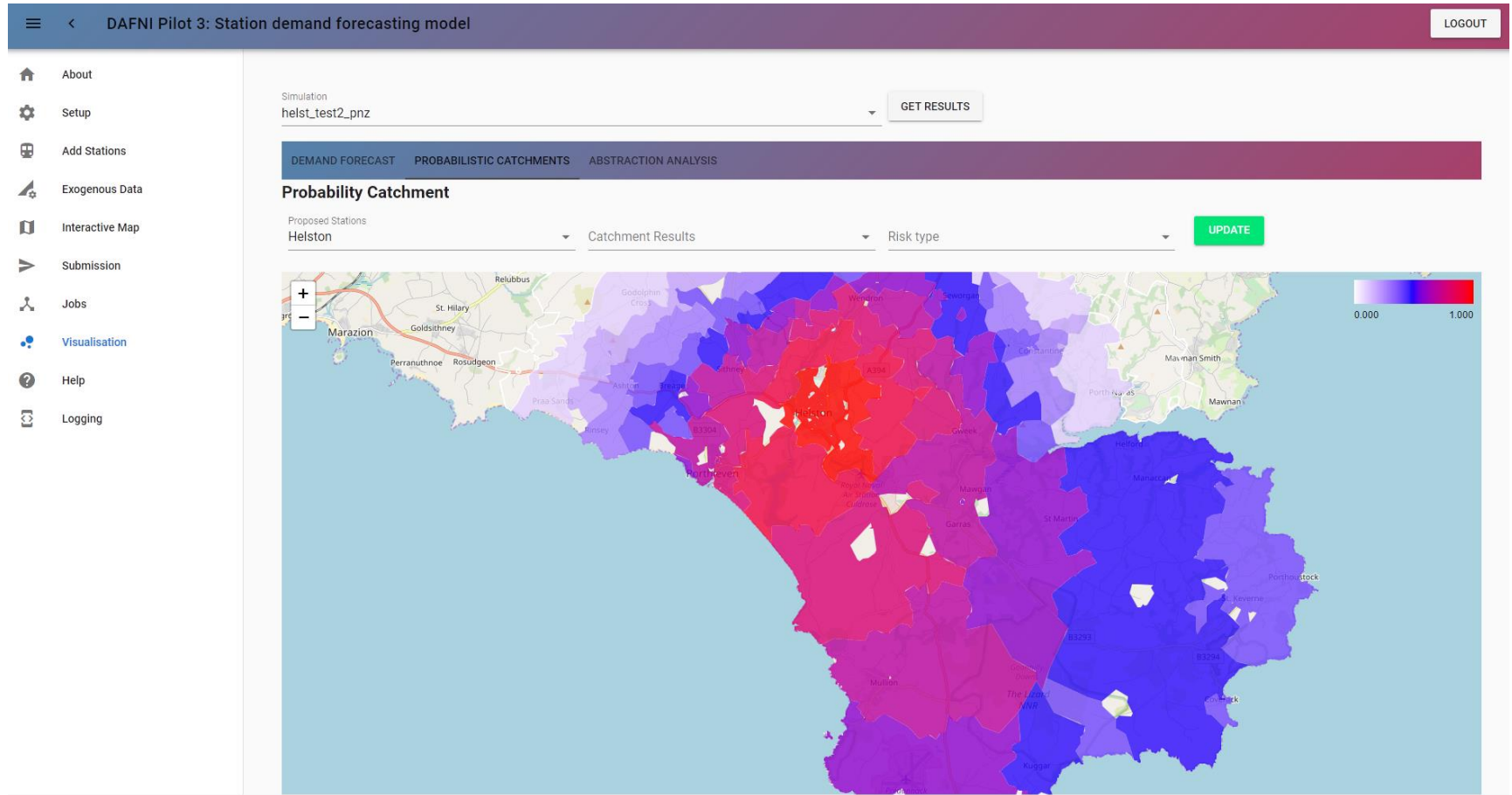
DAFNI has enabled rapid and effective sharing of the model

Not another siloed model

Accessible to students and researchers

Potential links to other DAFNI models.

Maximised knowledge exchange and research impact.

Video demonstration: https://www.youtube.com/watch?v=q0CmY5lilWg

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