



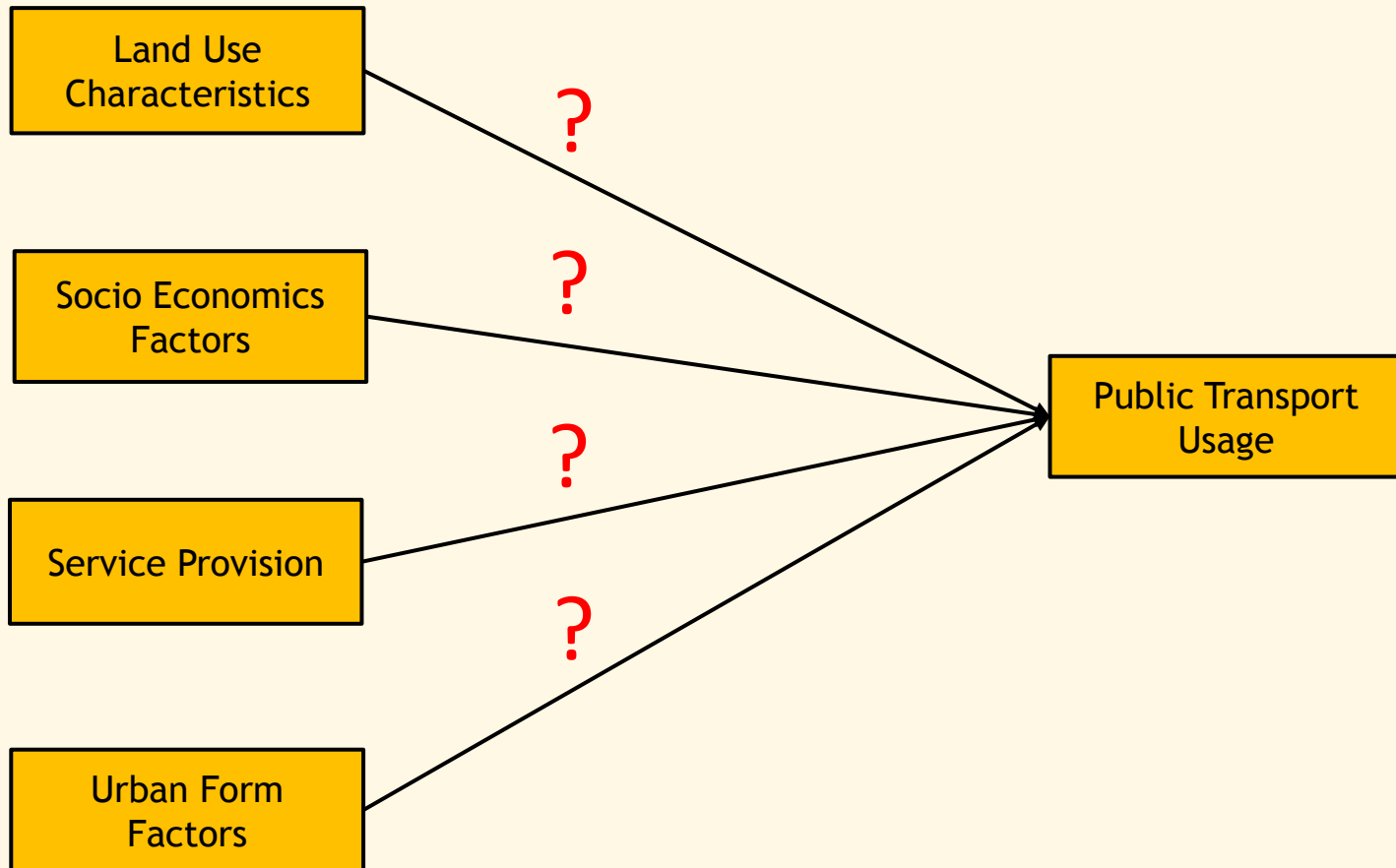
Project 4.1: Travel Behaviour Patterns

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Research Objectives

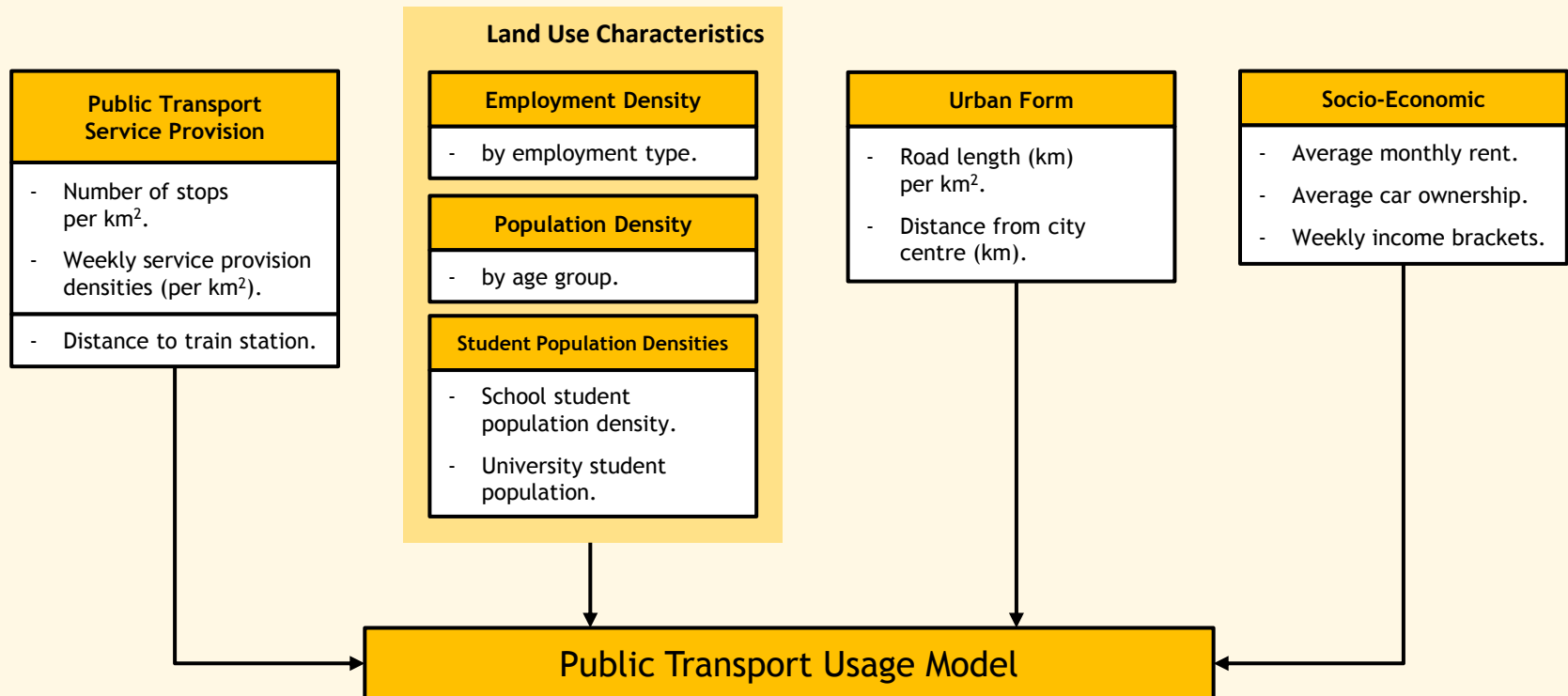
- To identify the **temporal and spatial variations** in the public transport usage patterns in Perth metropolitan suburbs in Western Australia;
- To develop a **public transport usage function** for Perth metropolitan suburbs based on the land use characteristics, socio-economic attributes, urban forms and public transport service provisions; and
- To generate a **comprehensive and rigorous regression model to predict the changes in public transport usage** based on changes in its determinants.

What is driving Public Transport in Perth?



Linked Data Approach

PT Usage model dynamically links to constituent data sources to allow rapid updating of the model (e.g. when new data available).



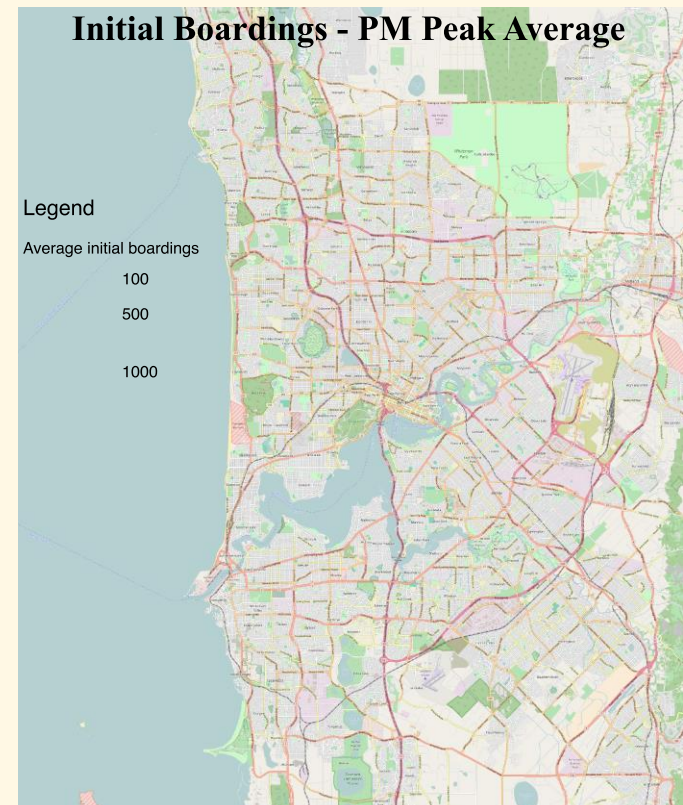
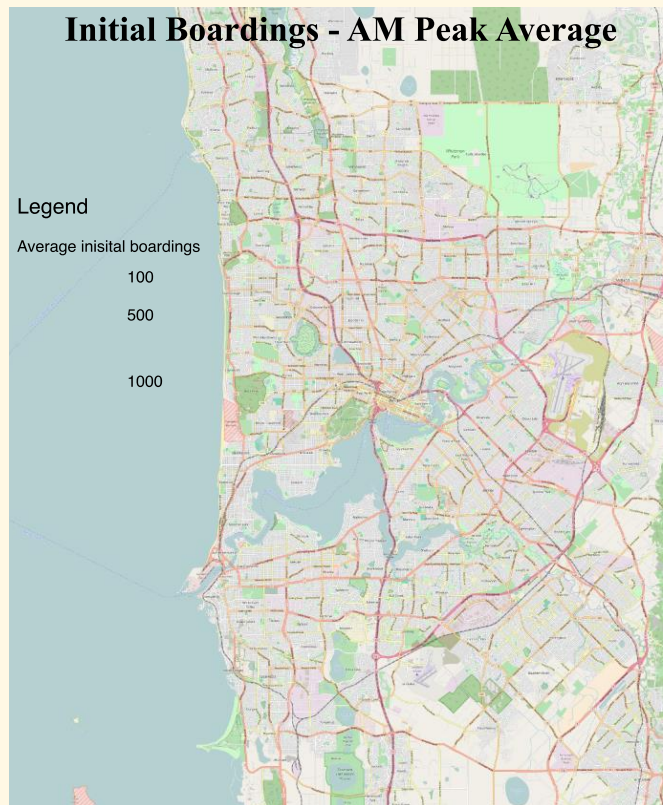
Outputs from the PT Demand Model

1. Origin-Destination matrix.
 - Methodology to generate O-D matrices from the SmartRider tag-on/tag-off data.
2. Web-based interactive dashboard.
 - Methodology to interact with the PT Demand model output and data.

	Model A		Model B		Model C		Model D		Model E		Model F	
	Only Service Provision Factors		Land Use Characteristics		Land Use Characteristics + SocioEconomic Factors		Land Use Characteristics + Service Provision Factors		Land Use Characteristics + Service Provision+ Socio Economic Factors		Land Use Characteristics + Service Provision+ Socio Economic Factors + Urban Form	
R Square	0.828		0.742		0.755		0.86		0.864		0.866	
Adjusted R Square	0.826		0.736		0.747		0.856		0.858		0.859	
ANOVA (F)	461.11		116.53		96.03		172.71		147.11		127.209	
ANOVA (Sig)			.000 ^b		.000 ^b		.000 ^b		.000 ^b		.000 ^b	
Durbin-Watson	2.008		1.586		1.614		1.99		1.941		1.9	
Coefficient			B	Sig.	B	Sig.	B	Sig.	B	Sig.	B	Sig.
(Constant)	2.730	.000	6.282	.000	5.975	.000	3.352	.000	3.108	.000	2.668	.043
Weekly Train Service Provision Density	.157	.000					.136	.000	.142	.000	.140	.000
Weekly Bus/Ferry Service Provision Density	.747	.000					.563	.000	.541	.000	.540	.000
Average Public Transport Stops Per Km2	.571	.000					.345	.004	.336	.004	.298	.014
Employment Density (Office/ Business/ Utilities/ Communication/ Residential Industry)			.226	.001	.214	.001	.116	.019	.121	.015	.104	.038
Employment Density (Shop/Other Retail/ Entertainment/ Recreation/ Culture Industry)			.230	.000	.172	.009	.103	.033	.070	.160	.074	.137
Employment Density (Storage/ Distribution/ Service Industry)			.135	.114	.133	.111	.086	.178	.086	.173	.063	.326
Employment Density (Manufacturing/ Processing/ Fabrication Industry)			-.187	.025	-.167	.041	-.189	.002	-.175	.004	-.157	.012
Employment Density (Health/ Welfare/ Community Services Industry)			.129	.044	.118	.062	.094	.048	.083	.081	.087	.066
Students and Mid-aged Dominant_Resident Population Density Factor)			1.824	.000	1.958	.000	.416	.012	.530	.002	.423	.036
University Students Population Density			.169	.004	.170	.003	.122	.005	.124	.004	.123	.005
Income Group Factor (Dominant by Below \$2000 Weekly Earner)					.804	.001			.475	.008	.485	.008
Affluence Factor					-.277	.069			-.040	.732	-.047	.684
Road Length (in m) per Km2											.087	.597
Distance from City Center											-.008	.054

Exploratory Data Analysis

Visualisation of initial boardings during AM peak and PM peak per suburb as a proportional symbol map.



Interactive Dashboard

(web-based demonstration)

Interactive Dashboard

User can choose the most suitable model and dashboard.

The screenshot displays the PATREC Modelling Portal interface. At the top, the title "PATREC Modelling Portal: Project 4.1" is shown with the subtitle "Exploring the usage of public transport and related indicators." Below this, a "Dashboards" section contains four interactive cards: "Model Exploration", "Region Exploration", "Attribute Exploration", and "Stop Exploration". Each card includes a small map visualization, a descriptive paragraph, and a corresponding "Explorer" button. A "Model Selection" dropdown menu is located at the top right, currently displaying "Travel behaviour model Base (Suburbs) - All times (CY2011)" and a "Model Summary" link. Annotations in yellow boxes with arrows point to the "Dashboards" section, the "Model Selection" dropdown, and the "Model Summary" link. A yellow line also highlights the four dashboard cards.

PATREC Modelling Portal: Project 4.1
Exploring the usage of public transport and related indicators.

Model Selection

Dashboards

Model Selection:
Travel behaviour model Base (Suburbs) - All times (CY2011)
Model Summary

Model Output

Model Exploration
Travel Behaviour: Explore the public transport usage and the Travel Behaviour model.
Model Explorer

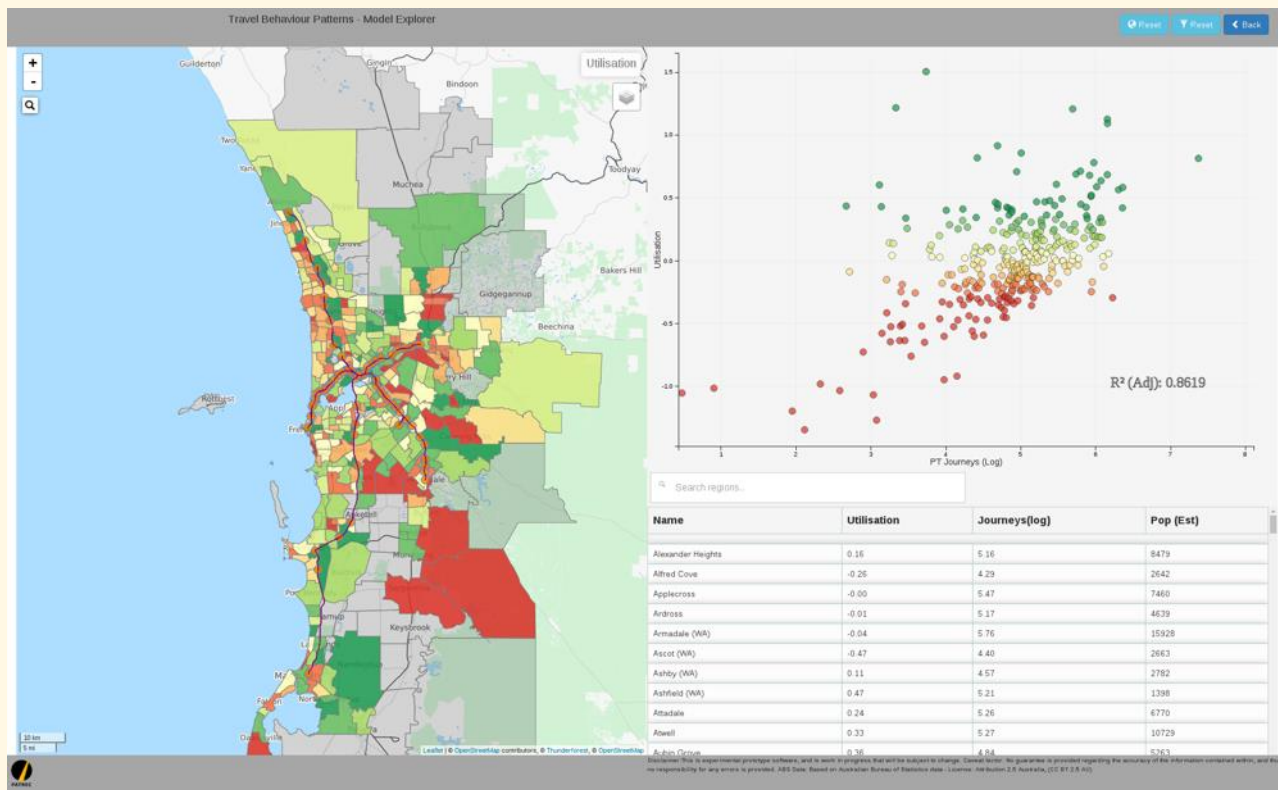
Region Exploration
Travel Behaviour: Explore the Travel Behaviour model via spatial region selection.
Region Explorer

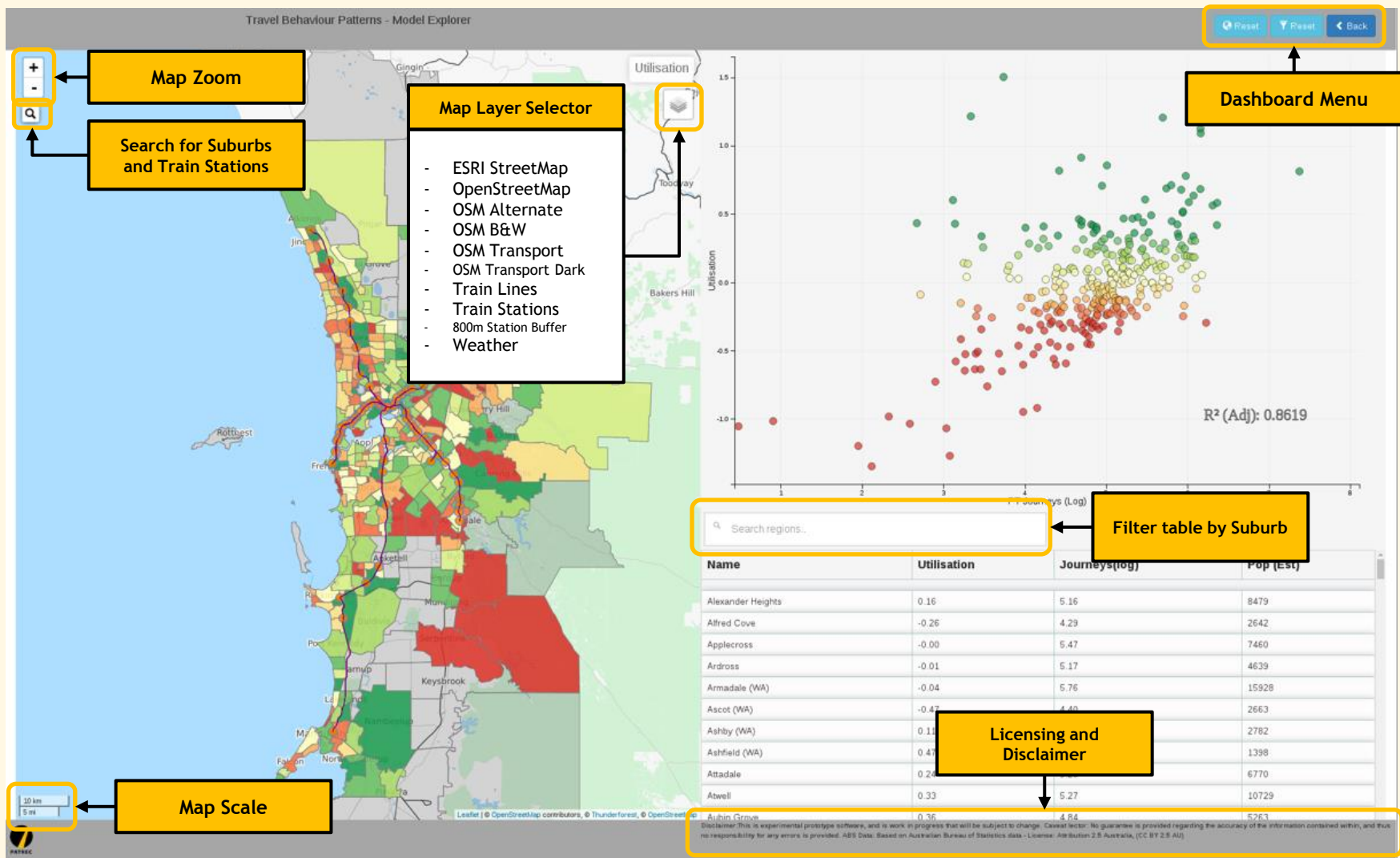
Attribute Exploration
Travel Behaviour: Explore the spatial distribution of the attributes used to derived the model.
Attribute Explorer

Stop Exploration
SmartRider Data: Explore the spatial distribution of smart rider journeys over suburbs and by stops.
Stop Explorer

Interactive Dashboard

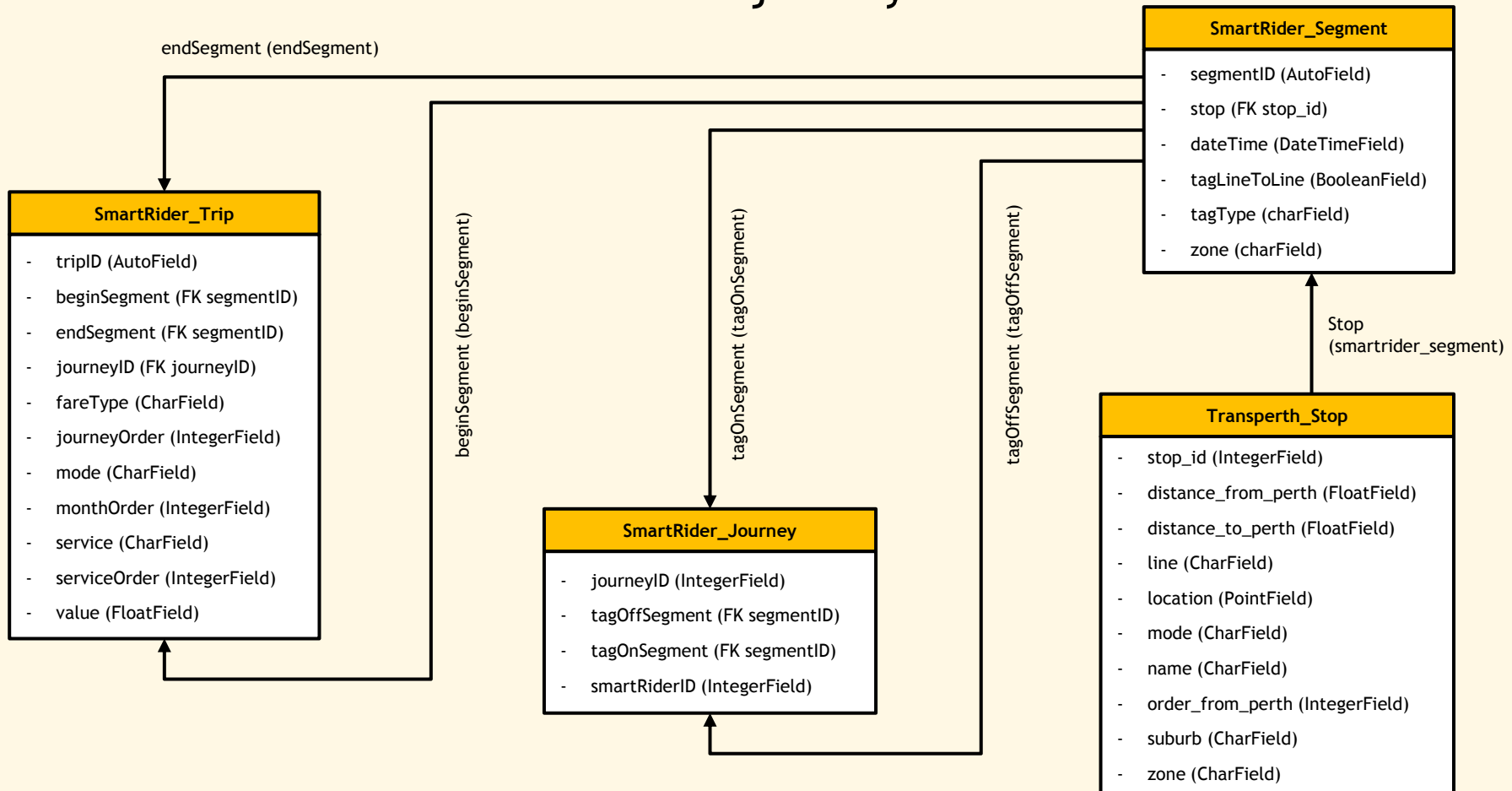
Exploration of PT Utilisation behaviour model with thematic map, scatter plot and table.





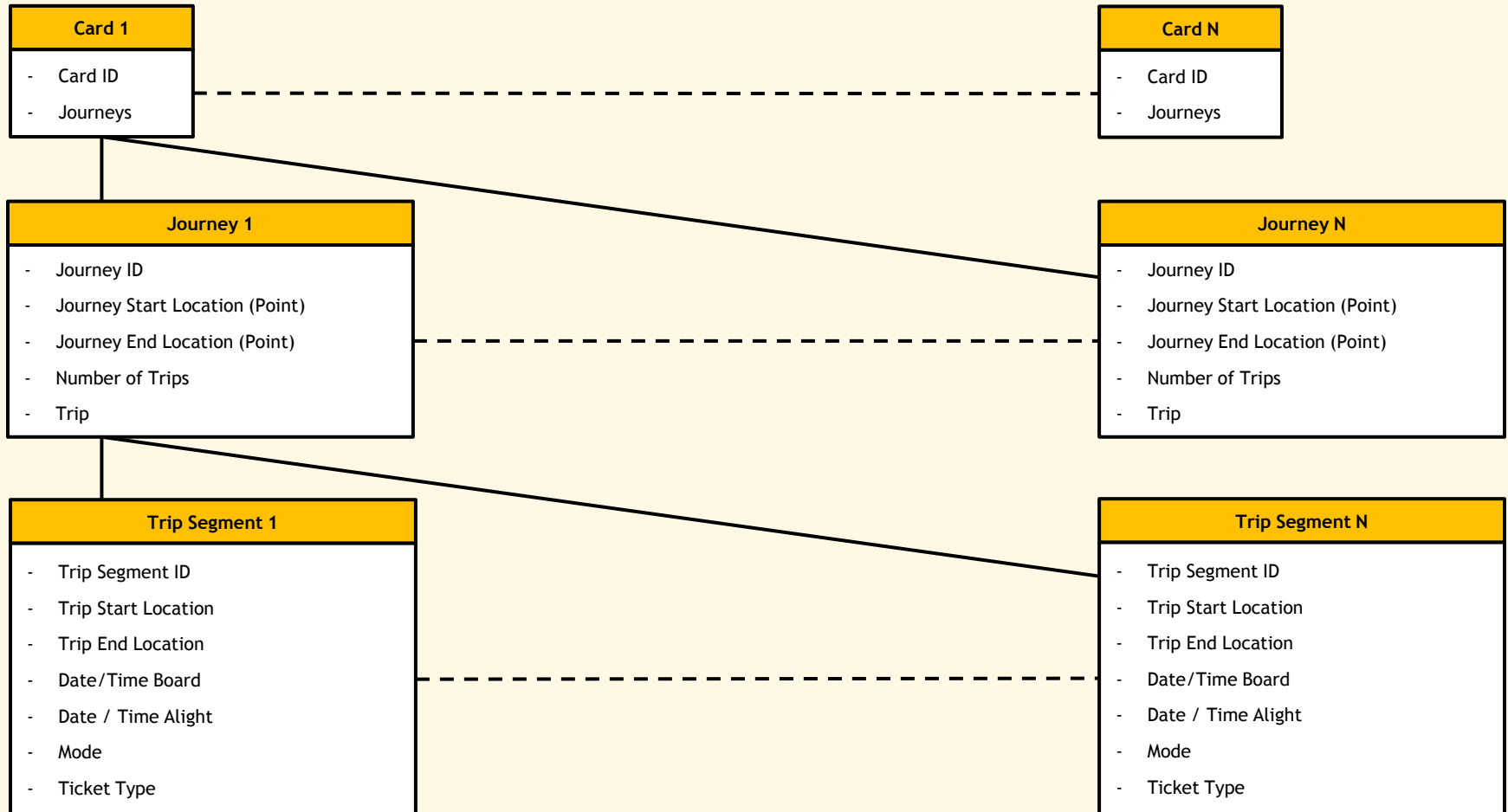
Origin-Destination Database Schema

Normalisation of database to create journeys.



Origin-Destination Document Schema

Normalisation of data to create journeys.



Future Developments

Perth			
	Factor Loading	Density in 2016	Density in 2020
Estimated Resident Population Density Age: 36-64 (Male)	0.941	419	600
Estimated Resident Population Density Age: 36-64 (Female)	0.934	259	259
Estimated Resident Population Density Age: 17-35 (Female)	0.9	379	379
Estimated Resident Population Density Age: 17-35 (Male)	0.875	509	509
Estimated Resident Population Density Age: 65 and over (Male)	0.871	90	90
Estimated Resident Population Density Age: 65 and over (Female)	0.824	59	59
Estimated Resident Population Density Age: 0-16 (Female)	0.821	72	72
Estimated Resident Population Density Age: 0-16 (Male)	0.819	66	66
Student Population Density	0.503	500	500
Public Transport Usage Density in 2016			2,792,124
Coefficient of Students and Mid-aged Dominant Resident Population Density Factor			0.423
Based on the Increase in Resident Population Density Age: 36-64 (Male)			
Expected increase in public transport usage density			2,897,076
Expected % increase in public transport usage density			4%

Any Questions?