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4.2.1 General

ID				
Use case name	Automated Travel Pattern Recognition using Mobile Network Data for Applications to Mobility as a Service			
Application domain	Other (please specify) Transport			
Deployment mode	Activity- based Modelling for New mobility Services			
Status	PoC			
Contributor	Name	Affiliation	Contact	
	Dr Patrizia Franco	Transport Systems Catapult, United Kingdom	patrizia.franco@ts.catapult.org.uk	
Scope	Detect automatically travel pattern recognition from anonymized and aggregated Mobile phone Network Data			
Objective(s)	Phase 1: Attribute trip purpose and mode of transport to multimodal door-to-door journeys from Mobile phone Network Dataset using AI and machine learning techniques (Activity based model) Phase 2: Generate daily activities for static agents in the Agent Based Model Phase 3: Optimisation of New Mobility services in integration with mass transit			
Narrative	Short description (not more than 150 words)	Activity- based modelling has the capability to exploit big data source generated by smart cities to create a digital twin of urban environments to test Mobility as a Service schemes. MND data have been used to create activities for an Agent Based Model. AI is used to automatically detect purpose and mode of transport in multimodal round trips, obtained by anonymized and aggregated MND trip-chains dataset. Data fusion techniques and SQL queries were also used to consider land use and facilities in the urban area of interest.		
	Complete description	Activity- based modelling has the capability to exploit big data source generated by smart cities to create a digital twin of urban environments to test Mobility as a Service schemes. Given the rise of location- based data and Mobile phone Network Data (MND) for transport modelling purpose, Agent based modelling has become a viable tool to explore a sustainable introduction of mobility services, exploring the integration with mass transit. AI is used in detecting purpose and mode of transport in multimodal round trips and assign purpose and mode of transport to trip- chains dataset coming from MND. The methodology has been developed for the Innovate UK funded Mobility on Demand Laboratory Environment (MODLE) project and will undergo a validation process during the Demand Modelling and Assessment through a Network Demonstrator (DeMAND) project for the Department for Transport (UK)		
Key performance indicators (KPIs)	ID	Name	Description	Reference to mentioned use case objectives
	1	Generation of Activities (land use information and time of travel)	Purpose of activities is assigned based on land use information and time of travel. Cnesus data and national/ local travel surveys will provide validation for the process	Phase 1
	2	Generation of	Agents generated will	Phase 2

		agents (travel times, speed on links)	build up in the network creating realistic conditions of congestion. Speed on links	
		Operation of service (number of users for the service)	Optimisation of route and operation time in the day. Validation provided using data collected by Mobility service operators during the operation of service	Phase 3
AI features	Task(s)	Assign purpose of each trip in the chain, assign model of transport for each trip in the chain, generate daily activity plans, generate static agents (users), generate dynamic agents (service)		
	Method(s)	Agent Based Models with Activity based approach		
	Hardware	NA		
	Terms and concepts used	Data fusion, machine learning techniques		
Challenges and issues	The use of Mobile Phone Network data is still not precise for shorter trips and internal trips which might be not detected. However, with the introduction of 5G, MND will be even more reliable and available to use in transport modelling.			
Societal concerns	The use of anonymization techniques minimise the risk of disclosing personal information when analyzing location based data and Mobile phone Network Data			

4.2.2 References

References						
No.	Type	Reference	Status	Impact on use case	Originator/ organization	Link

• Franco P, Johnston R, McCormick (2019) Demand Responsive transport: generation of activity patterns from mobile phone network data to support the operation of flexible mobility services. - Special issue of Transportation Research Part A (TRA) on developments in Mobility as a Service (MaaS) and intelligent mobility (forthcoming) https://www.sciencedirect.com/journal/transportation-research-part-a-policy-and-practice/vol/121/suppl/C

• Franco P, Johnston R, McCormick E (2018) Role of Intelligent Transport Systems applications in the uptake of mobility on demand services, United Nation "Transport and Communications Bulletin for Asia and the Pacific, 2018, No. 88 - Intelligent Transport Systems", https://www.unescap.org/sites/default/files/Ch02-Role%20of%20Intelligent%20Transport%20Systems%20%28ITS%29%20applications%20in%20the%20uptake%20of%20mobility%20on%20demand%20services_0.pdf

• Franco P, McCormick E, Johnston R (2018) Multimodal activity Modelling for supporting mobility service operations, ITS World Congress Copenhagen, 17-21 September 2018

• Franco P, McCormick E, Van Leeuwen K, Ryan Johnston, Gregor Engelmann (2017) Multi-Modal Activity-Based Models to support Flexible Demand Mobility Services. ITS World Congress 2017, Montreal 29 October- 2 November 2017. Awarded Best Paper

• Franco P, McCormick E, Van Leeuwen K (2017) Framework for modelling MaaS using ABM and real-time data from ride-sharing services. 12ve ITS Europe Congress 2017, Strasbourg, 19-22 June 2017. Proceedings