

transport databases provide information on delays at flight level, without taking into account how these delays affect connections from the airport to the passenger's final destination. This information could be a valuable input to Airport Collaborative Decision Making (A-CDM) for traffic flow and airport departure management, helping develop an extended A-CDM concept able to better account for passenger door-to-door journey, along the lines suggested by recent European research projects [21].

- Currently, air traffic forecasts typically combine flight statistics with econometric models that relate air traffic to observed variables whose correlation with the traffic values is plausible, such as demographic, macroeconomic and tourism variables. The segmentation of passengers according to their sociodemographic characteristics and trip purpose, together with airport accessibility indicators, could help develop improved traffic forecasting methodologies, thanks to larger, more detailed, cheaper and permanently updated behavioural data samples including multimodal information. The newly developed door-to-door delay indicators could also help investigate the relationship between demand and travel time reliability.

These and other related research questions will be addressed in the subsequent stages of the BigData4ATM project through different case studies.

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REFERENCES

- [1] European Commission, "Flightpath 2050. Europe's Vision for Aviation. Report of the High Level Group on Aviation Research", 2011.
- [2] A. Cook, G. Tanner, and M. Zanin, "Towards superior air transport performance metrics – imperatives", *Journal of Aerospace Operations*, vol. 2, n° 1-2, pp. 3-19, 2013.
- [3] J. L. Toole, S. Colak, B. Sturt, L. Alexandre, A. Evsukoff, and M.C. González, "The path most travelled: Travel demand estimation using Big Data resources", *Transportation Research C: Emerging Technologies*, vol. 58 part B, pp. 162-177, 2015.
- [4] M. Picornell, T. Ruiz, M. Lenormand, J. J. Ramasco, T. Dubernet, and E. Frías-Martínez, "Exploring the potential of phone call data to characterize the relationship between social network and travel behavior", *Transportation*, vol. 42, n°4, pp. 647-668, 2015.
- [5] M. Lenormand, A. Tugores, P. Colet, and J. J. Ramasco, "Tweets on the Road", *PLoS ONE* 9(8): e105407. doi:10.1371/journal.pone.0105407, 2014.
- [6] S. Sobolevsky, I. Sitjo, R. Tachet Des Combes, B. Hawelka, J. Murillo Arias, and C. Ratti, "Money on the move: Big Data of bank card transactions as the new proxy for human mobility patterns and regional delineation. The case of residents and foreign visitors in Spain", *IEEE International Congress on Big Data*, 2014.
- [7] H. Samiul, C. M. Schneider, S. V. Ukkusuri, and M.C. González, "Spatiotemporal patterns of human mobility", *Journal of Statistical Physics*, vol. 151, n° 1-2, pp. 304-318, 2013.
- [8] M. Lenormand, M. Picornell, O.G. Cantú-Ros, A. Tugores, T. Louail, R. Herranz, M. Barthelemy, E. Frías-Martínez, and J.J. Ramasco, "Cross-checking different sources of mobility information", *PLoS One* 9, no. 8, 2014.
- [9] SESAR, "Definition Phase D3: The ATM target concept", 2007.
- [10] EUROCONTROL, "Challenges of Air Transport 2030: Survey of Experts Views", 2009.
- [11] EUROCONTROL, "Synthesis of strategic and socio-economic studies at EUROCONTROL 2003-2010", 2010.
- [12] BigData4ATM Consortium, "Big Data Analytics for Socioeconomic and Behavioural Research in ATM", 2016.
- [13] L. Alexander, S. Jiang, M. Murga, and M.C. González, "Origin-destination trips by purpose and time of day inferred from mobile phone data", *Transportation Research Part C: Emerging Technologies* vol. 58 pp. 240-250, 2015.
- [14] M. Picornell and L. Willumsen, "Transport Models and Big Data Fusion: Lessons from Experience", *Proceedings of the European Transport Conference*, 2016.
- [15] H. Wang, F. Calabrese, G. Di Lorenzo, and C. Ratti, "Transportation mode inference from anonymized and aggregated mobile phone call detail records", *Intelligent Transportation Systems, Funchal*, 2010.
- [16] J. Doyle, P. Hung, D. Kelly, S. McLoone and R. Farrell, "Utilising mobile phone billing records for travel mode discovery", *22nd IET Irish signals and Systems Conference*, Dublin, 2011.
- [17] T. Hollecsek, L. Yu, J. Kang Lee, O. Senn, C. Ratti, and P. Jaillet, "Detecting weak public transport connections from cellphone and public transport data", *Proceedings of the 2014 International Conference on Big Data Science and Computing*, 2014.
- [18] Barcelona City Council Statistics, available online at: <http://www.bcn.cat/estadistica/angles/dades/economia/transport>
- [19] J. C. Martín, C. Román, J. C. García-Parlomaes and J. Gutiérrez, "Spatial analysis of the competitiveness of the high-speed train and air transport: the role of access to terminals in the Madrid-Barcelona corridor", *Transportation Research Part A: Policy and Practice*, vol. 69, pp. 392-408, 2014.
- [20] Spanish Ministry of Public Works and Transport Traffic Statistics:: http://www.fomento.gob.es/MFOM/LANG_CASTELLANO/DIRECCIONES_GENERALES/CARRETERAS/TRAFFICO_VELOCIDADES/
- [21] I. Laplace, A. Marzuoli, and E. Feron, "META-CDM: Multimodal, Efficient Transportation in Airports and Collaborative Decision Making", *Airports in Urban Networks*, 2014.