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# Presence Analytics: Discovering Meaningful Patterns about Human Presence Using Mobile Data Traces

## Research Aims

We investigate how aggregated mobile data traces, provide an invaluable opportunity to understand the presence and movement of people within work, study or leisure environments. We examine how such mobile traces offer the opportunity for human presence analytics in several dimensions: social, spatial, temporal and semantic. These analytics have real potential to support human mobility studies such as the optimisation of space usage strategies and monitoring attendance.

## Research Methodology

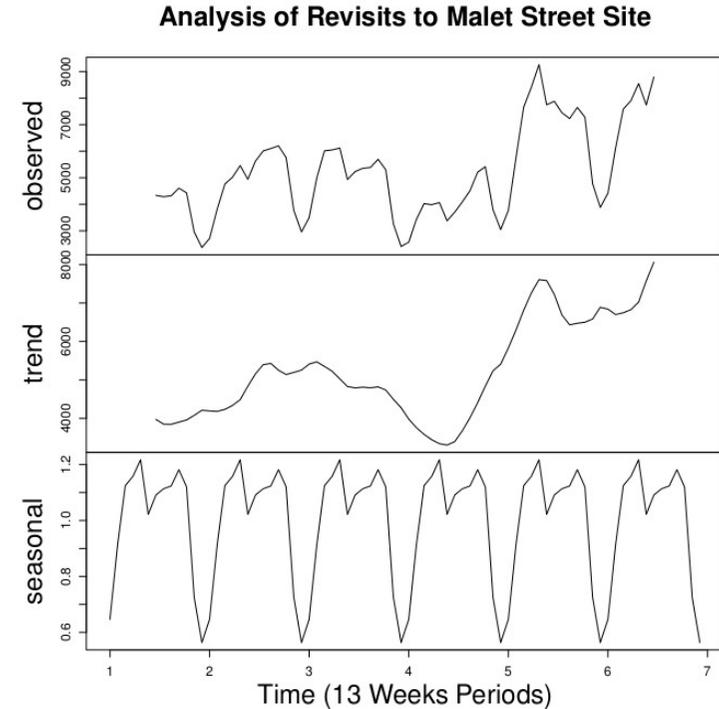
We investigate the four types of patterns, social, spatial, temporal and semantic, contained in the mobility data in a given environment, giving an insight into how people presence shapes the dynamic structure of such an environment. We utilise a combination of data analysis methods to extract these patterns, where each group of methods target a specific type of data pattern. For example, for the extraction of the temporal patterns or revisits, we deploy time series analysis.

## Research Approach

We developed a generalised density-based algorithm for social clustering, which we successfully employed to detect regular learning activities, i.e. classes, as well as the social groups of students who attended those regular activities. We have conducted a preliminary evaluation of our methodology using Birkbeck, University of London as a case study institution. The evaluation was based on Eduroam WLAN activity traces collected at the Bloomsbury campus in central London. These traces are more recent Eduroam data in comparison to data used in previous Eduroam research, and thus the provided analytics reflect the current behavioural trends in WLAN usage in a university setting.



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**Figure 1.** Time series analysis of number of revisits to the Malet Street site. In this figure, the top plot shows the original time series in which the data is divided into 13 week periods, the second from the top plot shows the estimated trend, and the bottom plot shows the estimated seasonal constituent

## Publications

[1] ELDAW M., LEVENE M. AND ROUSSOS G., Presence analytics: Density-based social clustering for mobile users, In Proceedings of The 13th International Conference on Wireless Networks and Mobile Systems, Lisbon, Portugal, 2016.

[2] ELDAW M., LEVENE M. AND ROUSSOS G., Presence Analytics: Discovering Meaningful Patterns about Human Presence Using WLAN Digital Imprints, In Proceedings of The International Conference on Internet of Things and Cloud Computing, Cambridge, UK, ACM, 2016.