A Bayesian Additive Model for Understanding Public Transport Usage in Special Events

Public special events, like sports games, concerts and festivals are well known to create disruptions in transportation systems, often catching the operators by surprise. Although these are usually planned well in advance, their impact is difficult to predict, even when organisers and transportation operators coordinate. The problem highly increases when several events happen concurrently. To solve these problems, costly processes, heavily reliant on manual search and personal experience, are usual practice in large cities like Singapore, London or Tokyo. This paper presents a Bayesian additive model with Gaussian process components that combines smart card records from public transport with context information about events that is continuously mined from the Web. We develop an efficient approximate inference algorithm using expectation propagation, which allows us to predict the total number of public transportation trips to the special event areas, thereby contributing to a more adaptive transportation system. Furthermore, for multiple concurrent event scenarios, the proposed algorithm is able to disaggregate gross trip counts into their most likely components related to specific events and routine behavior. Using real data from Singapore, we show that the presented model outperforms the best baseline model by up to 26 percent in R-2 and also has explanatory power for its individual components.

General information
Publication status: Published
Organisations: Department of Management Engineering, Transport DTU, Transport Modelling, Singapore-MIT Alliance for Research and Technology, University of Coimbra
Contributors: Rodrigues, F., Borysov, S. S., Ribeiro, B., Pereira, F. C.
Pages: 2113-2126
Publication date: 2017
Peer-reviewed: Yes

Publication information
Journal: IEEE Transactions on Pattern Analysis and Machine Intelligence
Volume: 39
Issue number: 11
ISSN (Print): 0162-8828
Ratings:
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 12.75 SJR 2.367 SNIP 6.357
Web of Science (2017): Impact factor 9.455
Web of Science (2017): Indexed yes
Original language: English
Electronic versions:
bam_final.pdf. Embargo ended: 02/12/2018
DOIs:
10.1109/TPAMI.2016.2635136
Source: FindIt
Source-ID: 2387738711
Research output: Contribution to journal › Journal article – Annual report year: 2017 › Research › peer-review