STUDENT AWARDS

Quality in parking

OPTIMISING REVENUES OF AIRPORTS

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Optimising non-aeronautical revenues of airports: the case of Rotterdam The Hague Airport

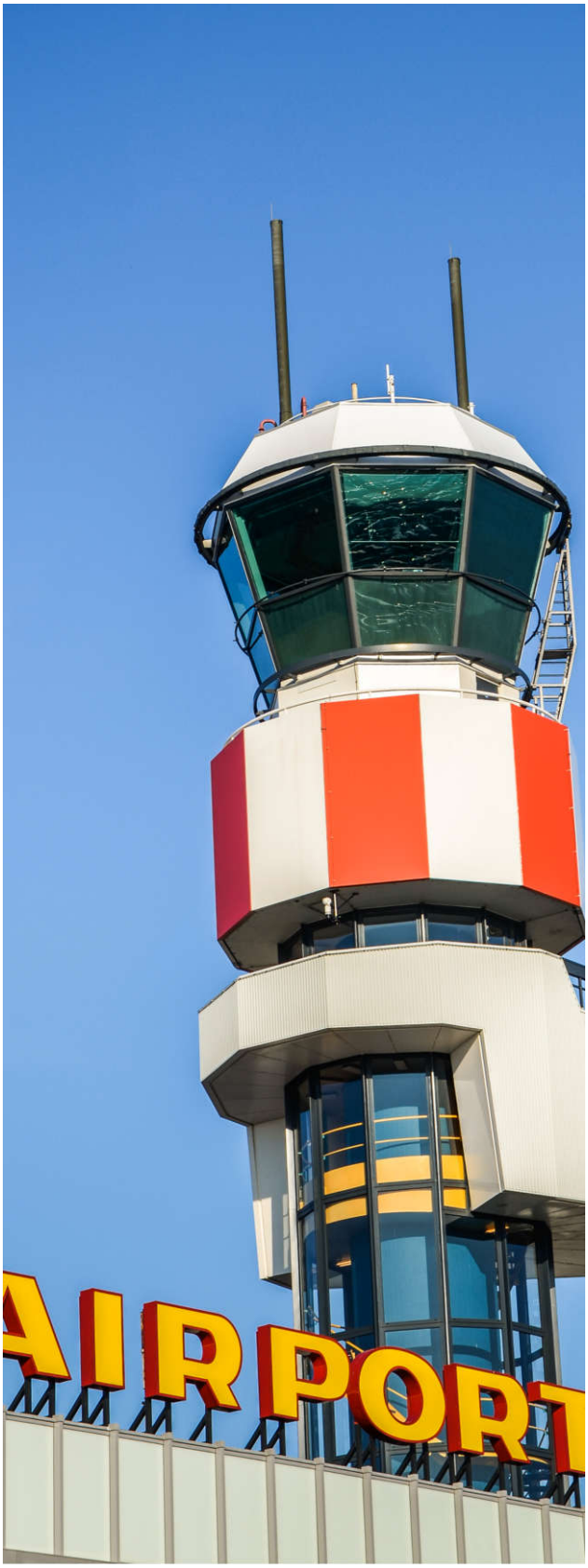
This study examines the possibilities of optimising non-aeronautical revenues of Rotterdam The Hague Airport. This is done by assessing the price elasticities for all different segments over the years 2013 -2017.

Results indicate that price adjustments can be made to increase non-aeronautical revenues.

The overall price elasticity for parking on the airport is -1.13. This elasticity coefficient lies above unit elasticity, due the busiest months of the year.

In these months, relatively more leisure travellers, which are price elastic, are travelling via the airport.

Therefore, increasing the price in the busiest months is desirable due to possible capacity problems at the airport. In all other months, an increase of the price would result in an increase of revenues, due to the relatively inelastic coefficients of these months.



PERFORMANCE PREDICTION

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Parking facility performance prediction using multi-target conformal regression

This thesis proposes a multi-target conformal regression approach for estimating the performance of new parking facility locations to be acquired by Q-Park.

Such forecasts should eliminate the need for consultancy reports prior to the development, sale or lease of new car parks: the basic parameters can be inserted into the algorithm and the artificial intelligence does the rest.

The basic data for the *machine learning model* include the capacity of the new car park, other car parks within a 1 km radius and their capacity, the presence of a train station within 500m and the numbers of offices, shops, hotels, restaurants and bars, educational institutions, industry and other buildings within 350m derived from OpenStreetMaps. Data relating to the floor space of shops, numbers of rooms in hotels and the like was not available for this research.

Data was collected for 1,037 existing Q-Park parking facilities in seven different countries. For these car parks, data including the number of hours parked, access and exit times, average length of stay, average occupancy and parking turnover per day were entered into the system. In addition, distinctions were made per country.

Various artificial intelligence techniques were applied to this database to identify which self-learning computational method best approximates the data imported. During the study, a prediction technology emerged which gave the best results. However, further research with more deep learning would be valuable.

Furthermore, additional more detailed basic data, such as shop floor area, numbers of workstations in offices, and numbers of hotel rooms, as well as results from existing car parks would make the artificial intelligence results even more reliable.

The thesis identifies the configuration of the regression model best suited for the task and compares the performance of different combinations of single and multi-target regression and conformal prediction. It also suggests the conformal method resulting in the most informative prediction regions.

Figure 1: Hourly evolution of parking occupancy for 30 regions (%). The line graph indicates the mean value of occupancy for all regions.