



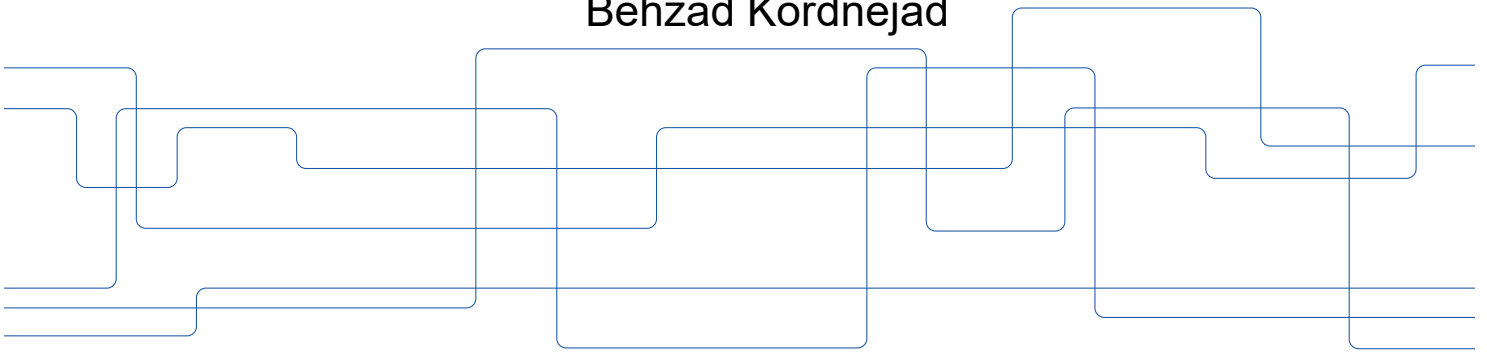
Departure Delay Analysis

Malmö and Hallsberg Yards

Niloofar Minbashi

Markus Bohlin

Behzad Kordnejad





Agenda

- Motivation
- Problem definition
- Approach
- Case study
- Data analysis
- Conclusion



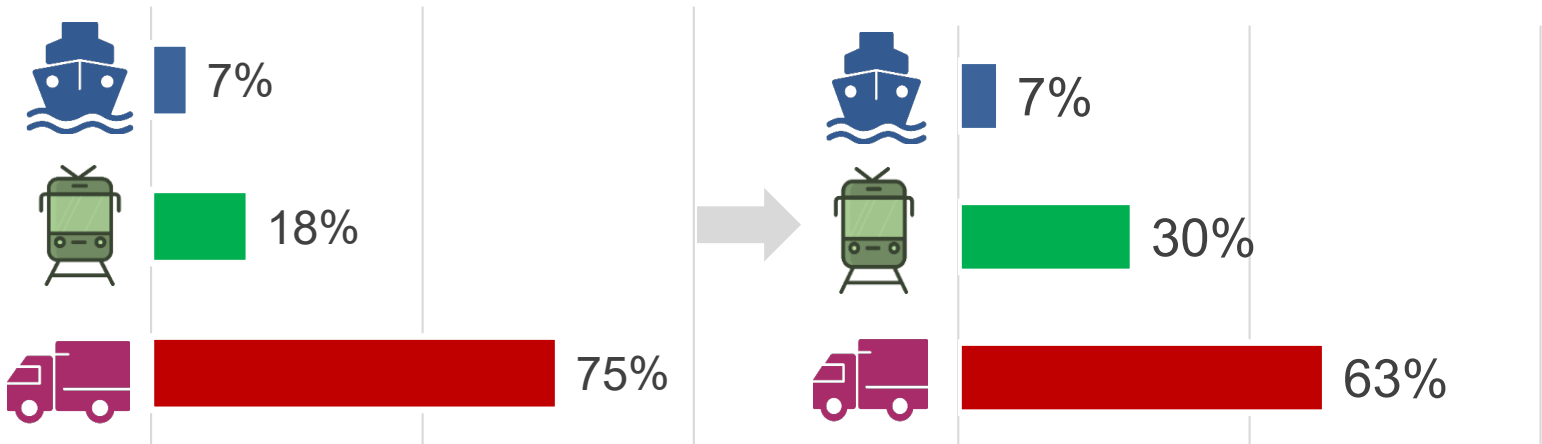


Motivation



2018

2030



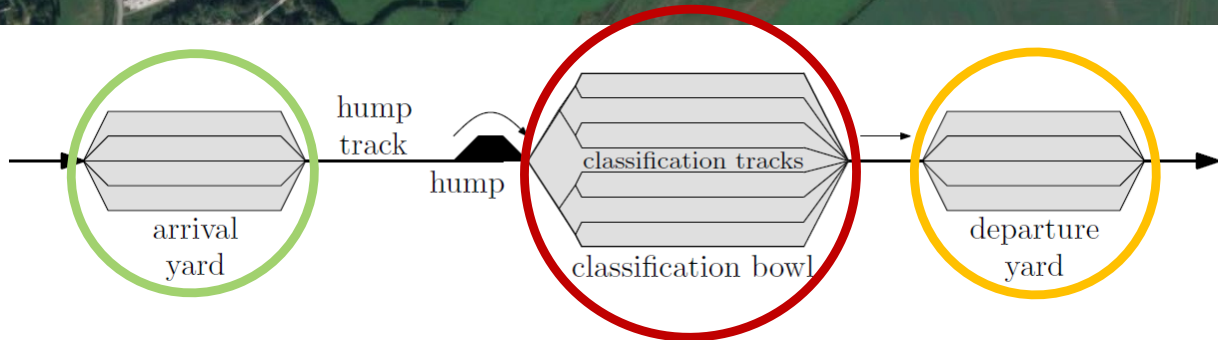
Modal share in Europe



Rail Freight Bottleneck

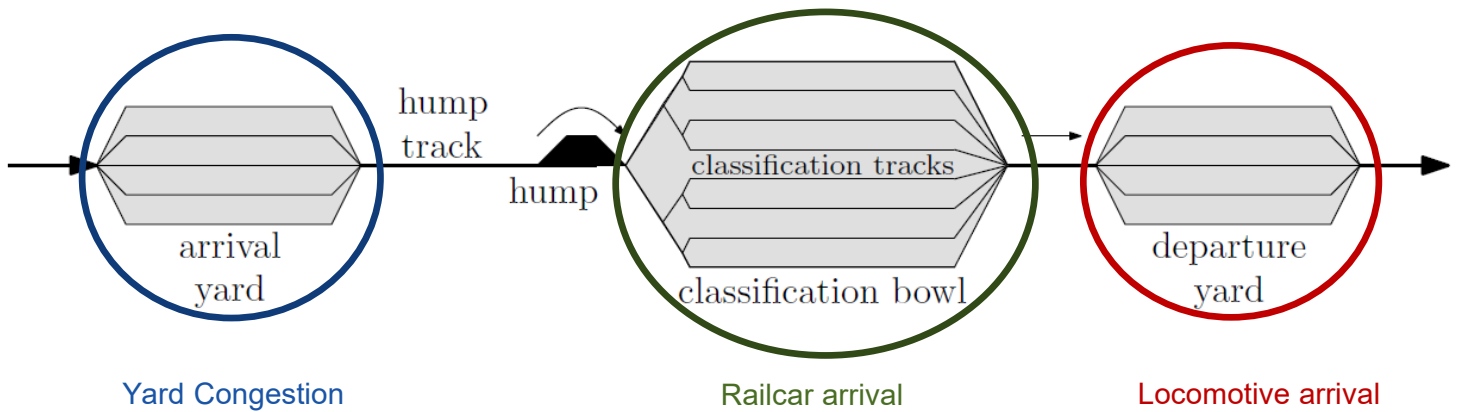


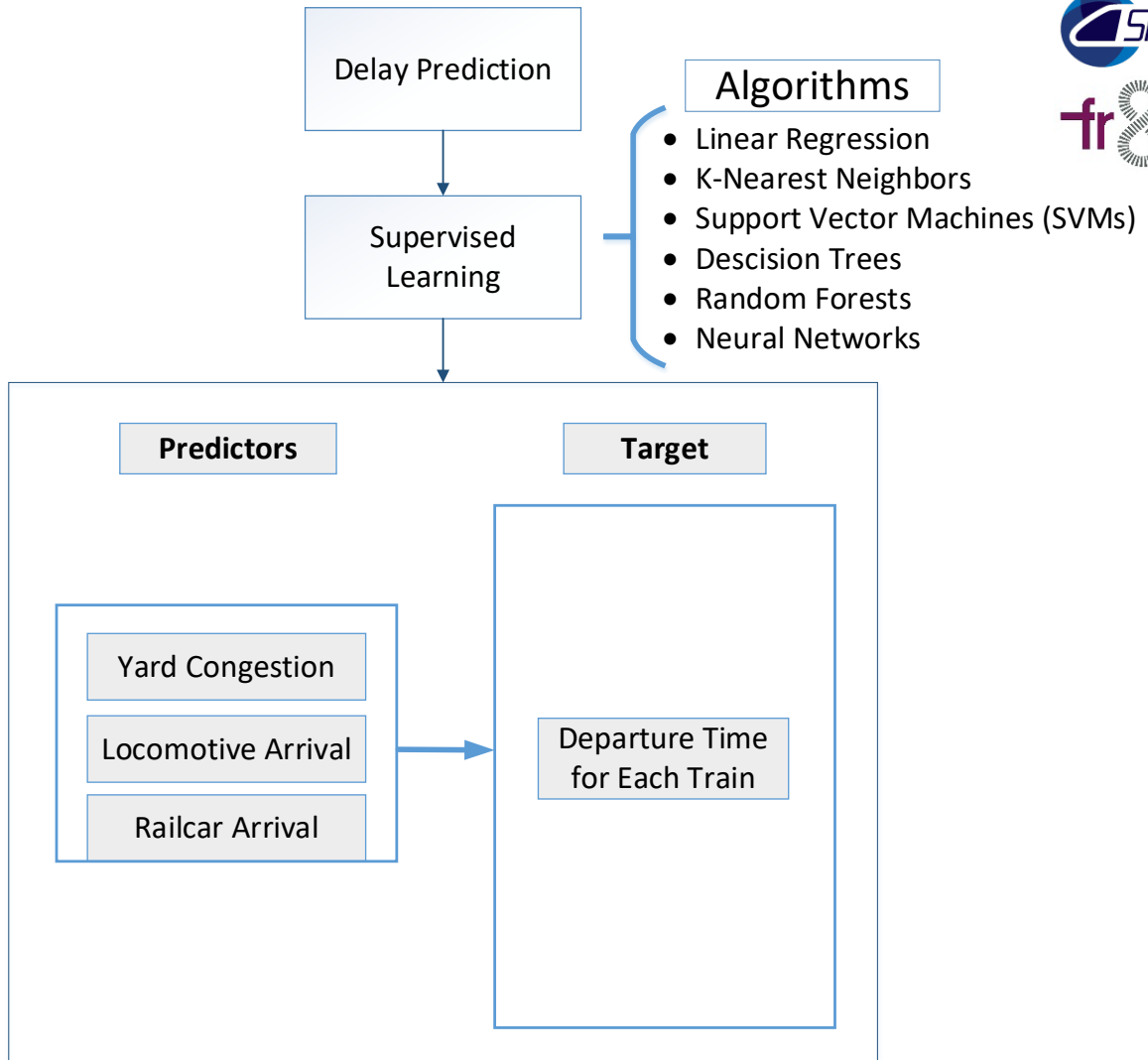
Problem Definition



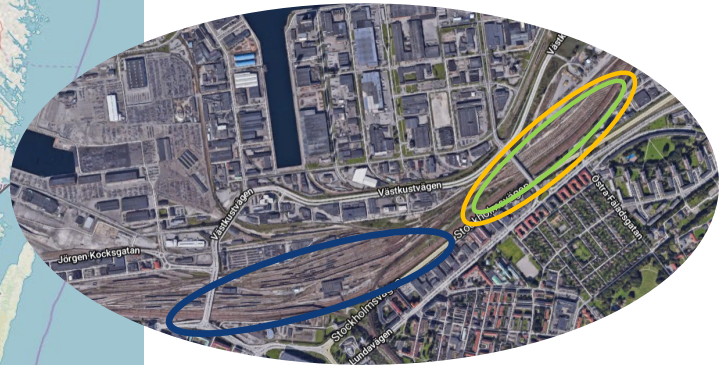
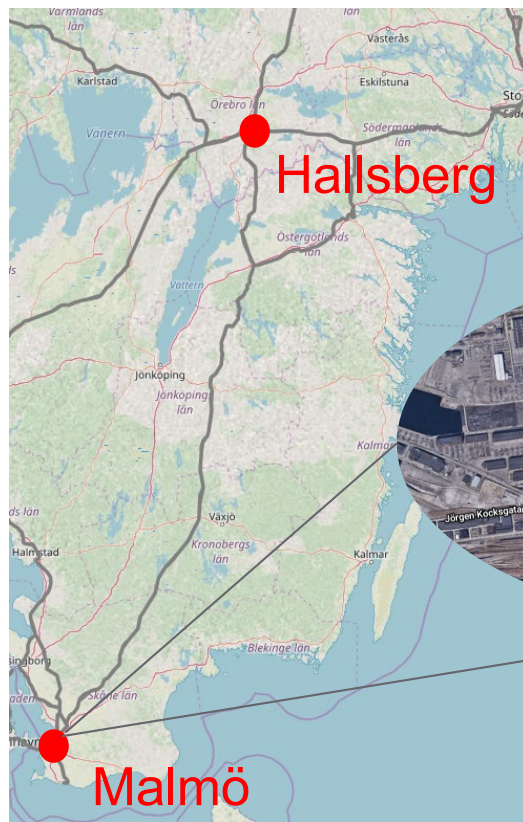
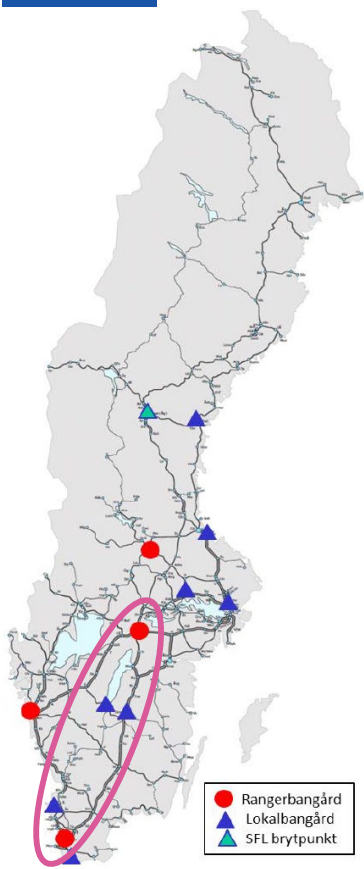
Approach: a yard delay model

$$t_b^\Delta = \gamma \#_i \{ t_b^{tt} - T_3 \leq t_i^{arr} \leq t_b^{tt} \} + \sum_i \beta_i (t_i^\Delta - T_2) + \alpha (t_a^\Delta - T_1) + \delta$$





Case study





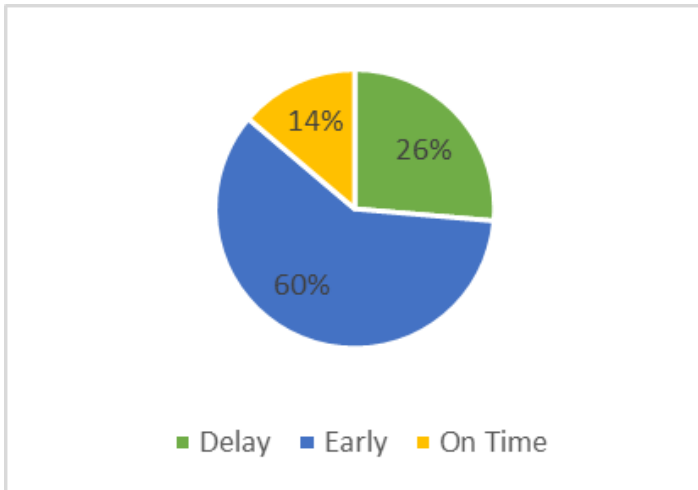
Data analysis



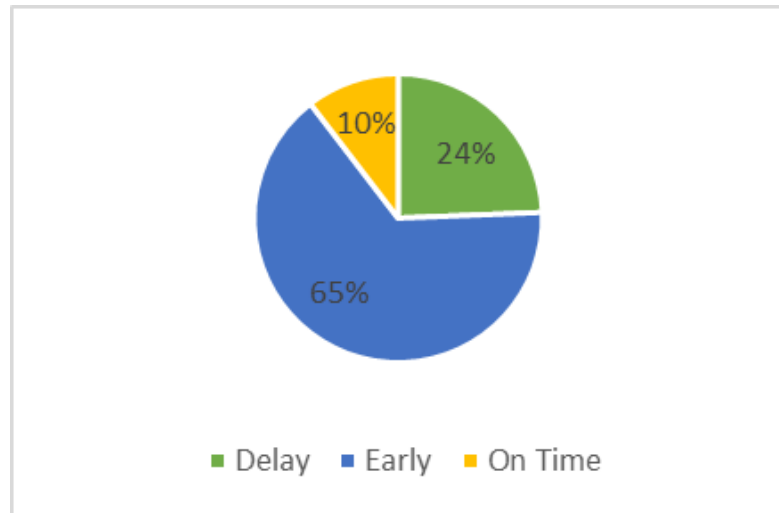
Database	LUPP
Time period	2010-12-12 to 2017-12-09
Total No. of Trains	450000
Malmö - Hallsberg	
No. of Trains	35410 Malmö to Hallsberg 16078 Hallsberg to Malmö 19332
No. of Delayed Trains	8760
Main variable	departure delay : the difference between actual departure time and scheduled departure time from the yard



Malmö - Hallsberg



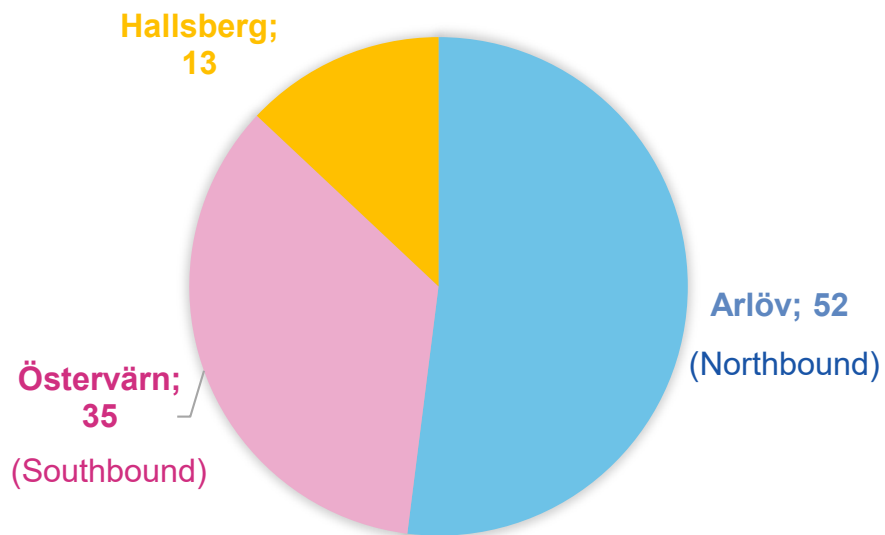
Malmö departure



Hallsberg departure



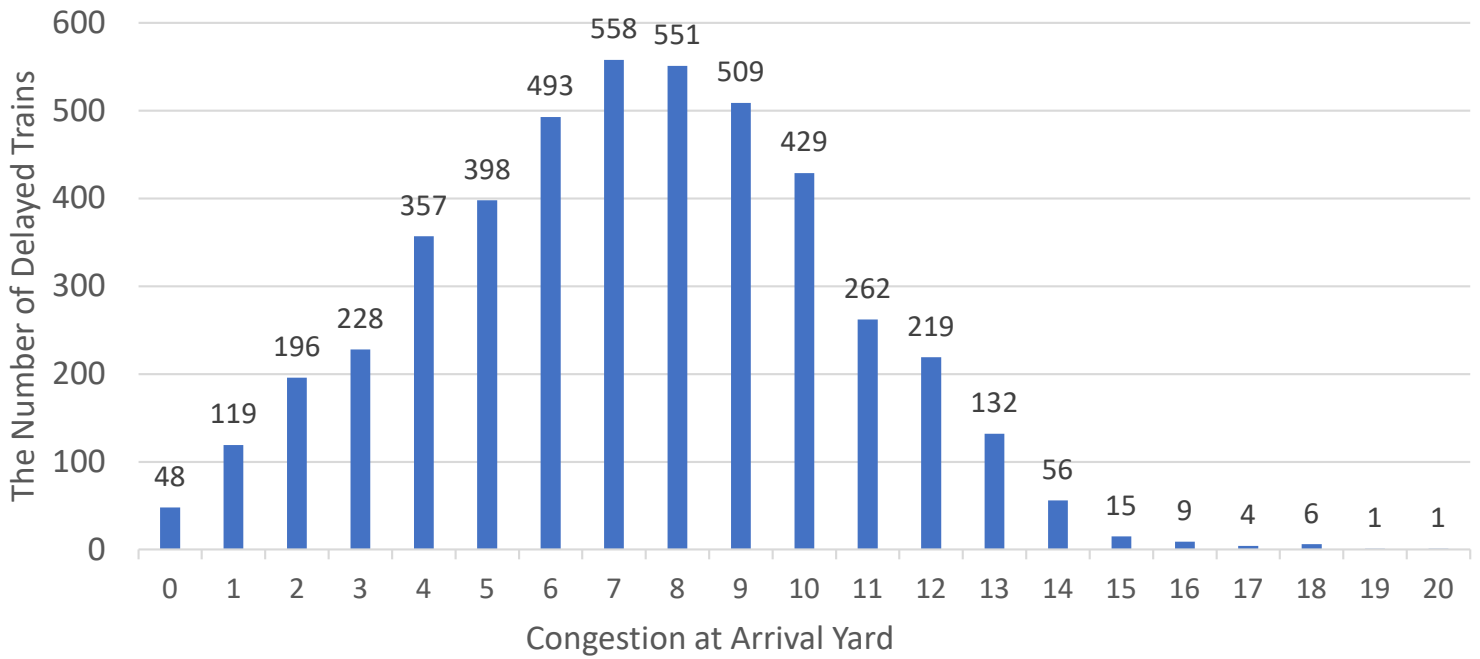
Malmö Departure



The Share of Departure from Malmö Yard



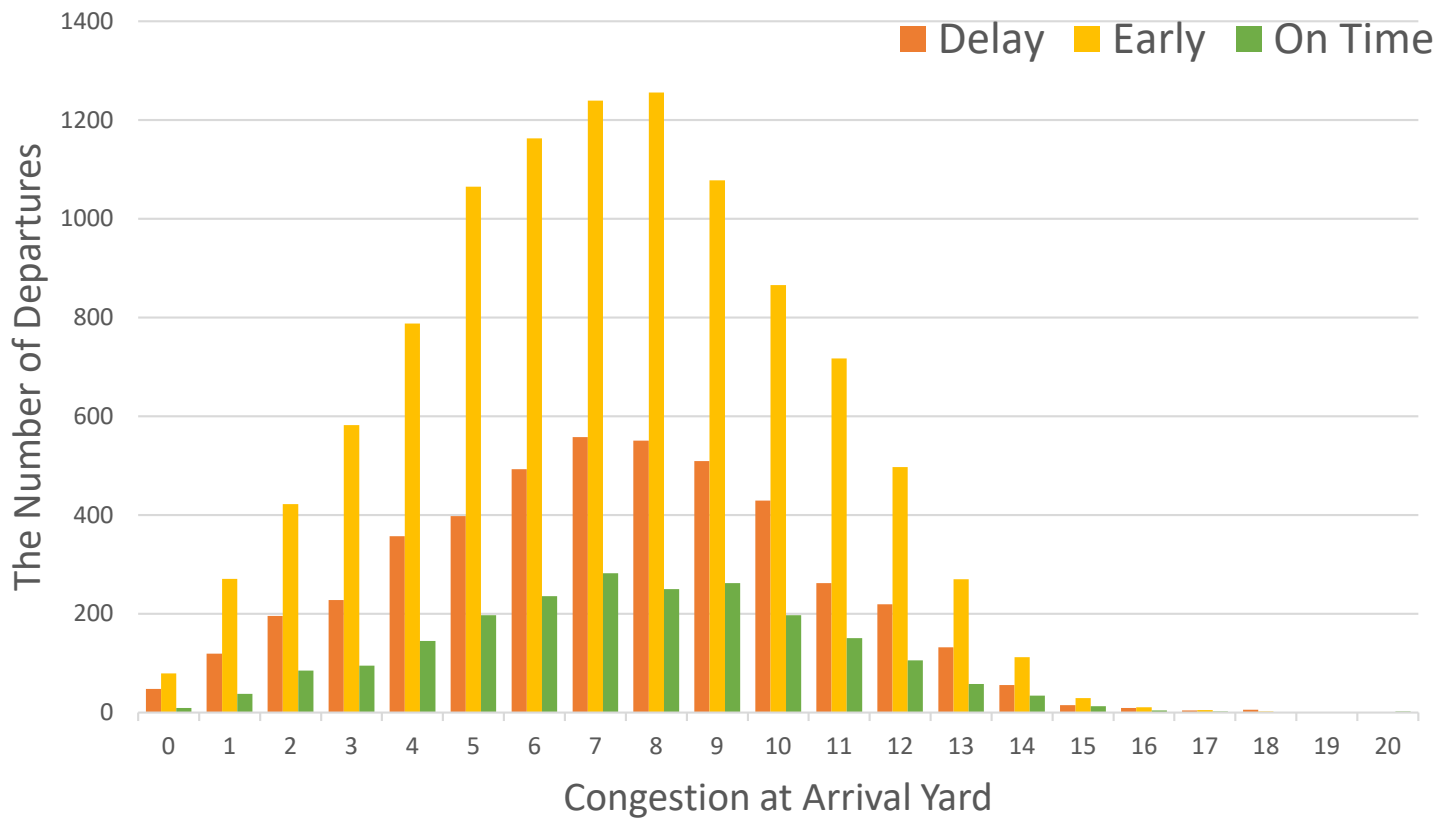
Malmö – Congestion analysis - 2017



Number of Delayed Trains: 4591

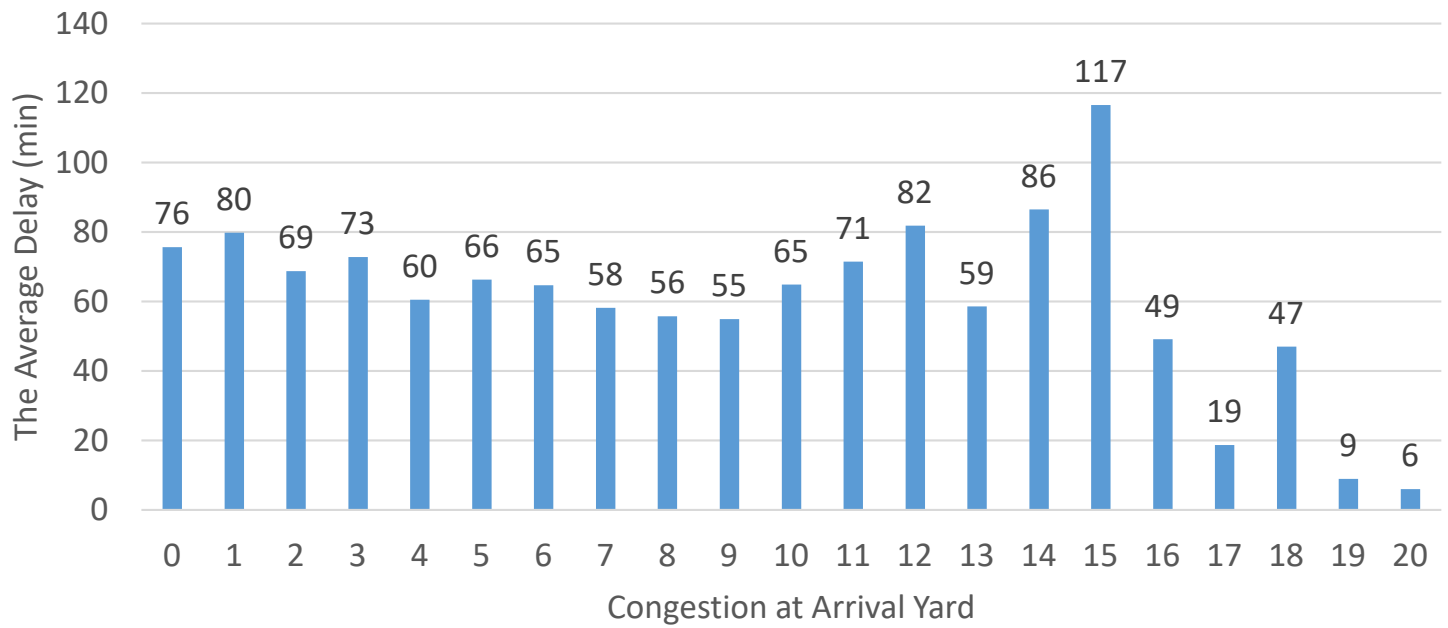
Total Number of Trains: 17209

Malmö – Congestion analysis - 2017



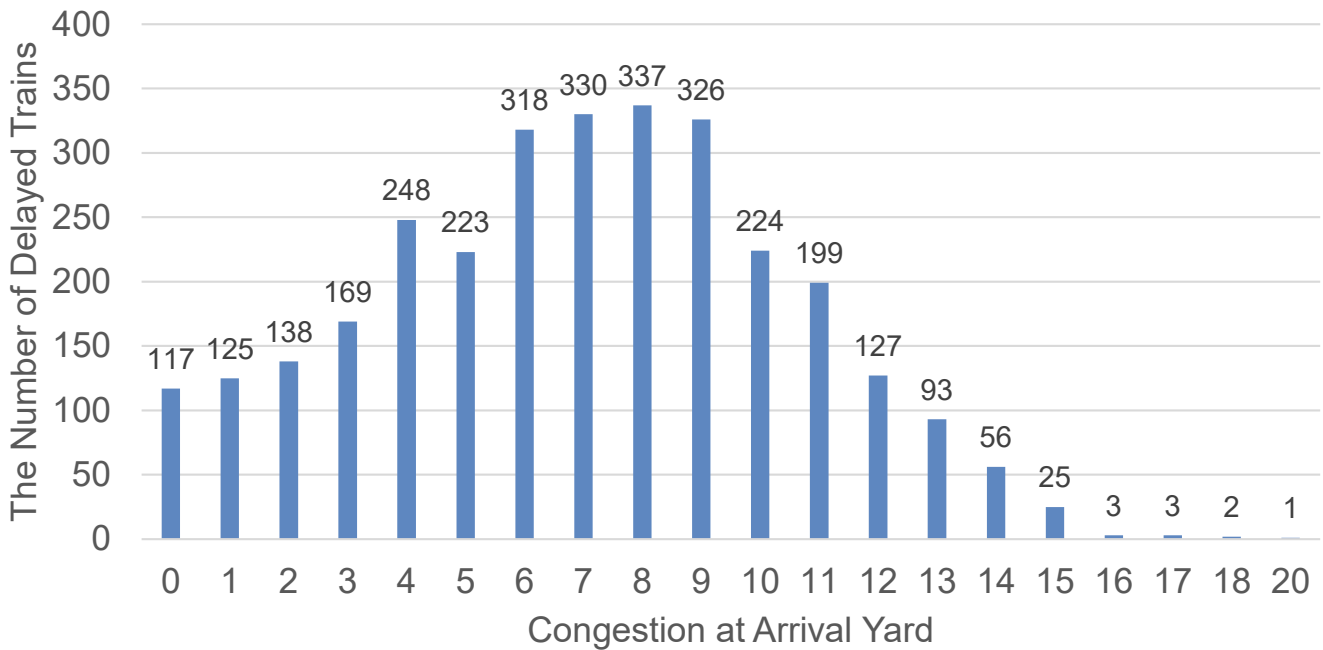


Malmö – Congestion analysis - 2017





Hallsberg – Congestion analysis - 2017

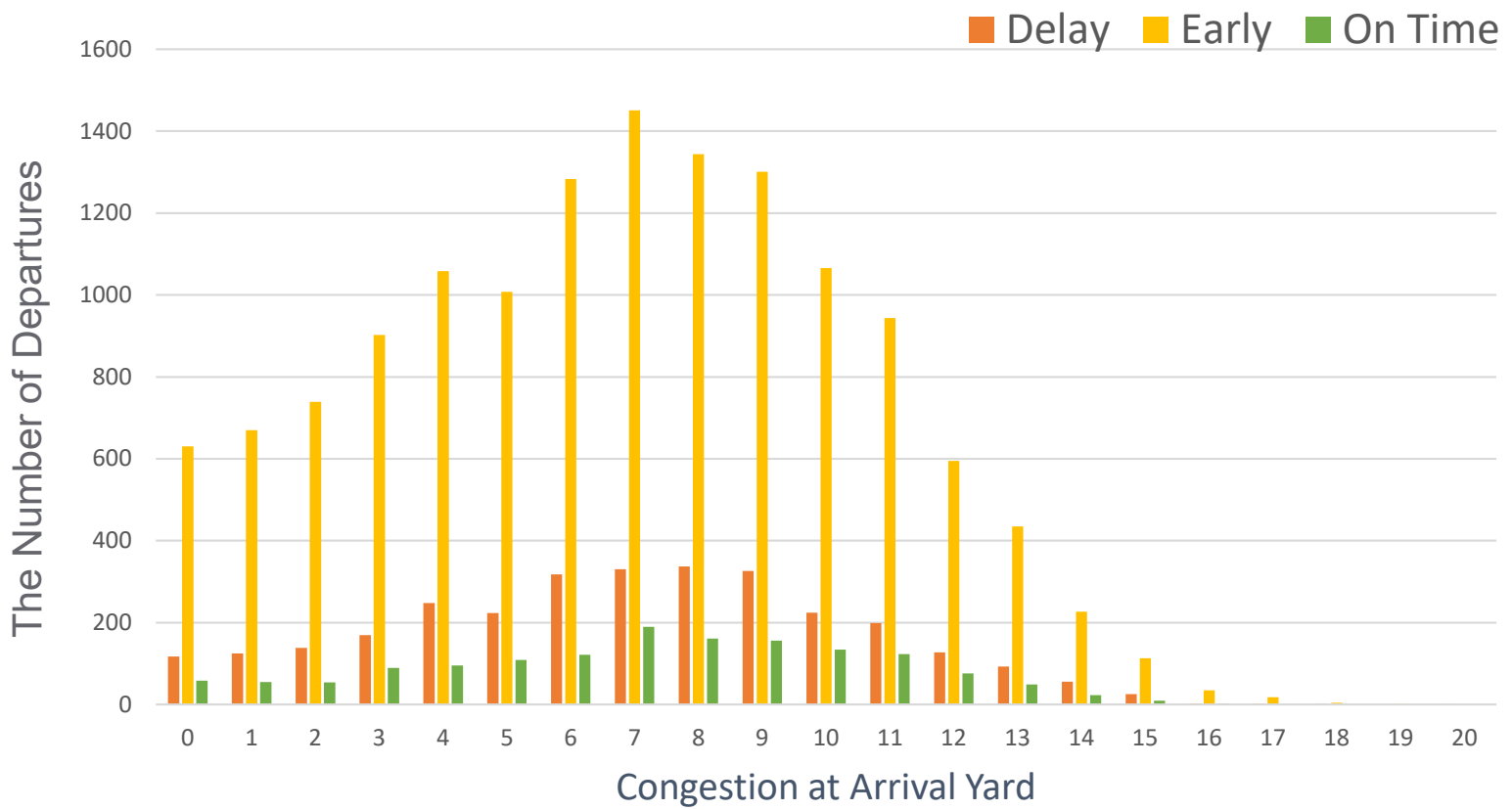


Number of Delayed Trains: 3064

Total Number of Trains: 18395

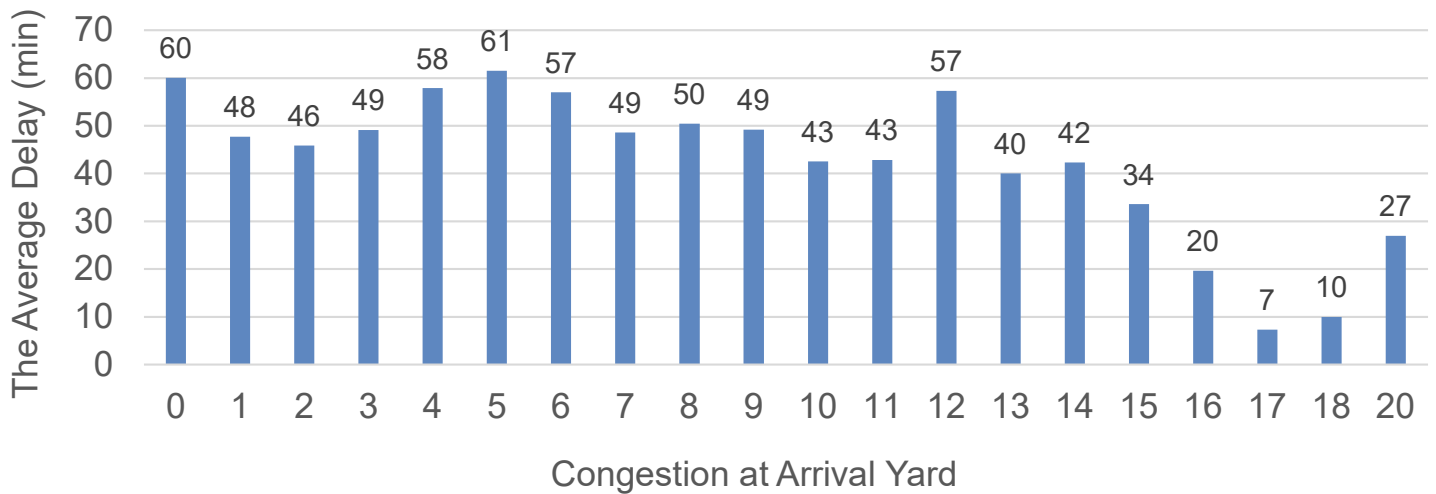


Hallsberg– Congestion analysis - 2017





Hallsberg – Congestion analysis - 2017





Conclusion



- Preliminary results doesn't show a relationship between the congestion and delay
- Congestion analysis for the whole dataset with a modified parameter
- Analysing other assumptions of the model (railcar and loco availability)

Rethinking transport

27–30 April 2020



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A Departure Delay Estimation Model for Freight Trains

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Thanks for Your Attention!



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