

Application(s) of Conformal Predictors

Ernst Ahlberg and Lars Carlsson
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Ernst Ahlberg

Clinical data science and statistics manager
Mölnlycke Health Care

Founder
Algorithma, Universal Prediction

Visiting Professor
Centre for Reliable Machine Learning

Visiting Researcher
Uppsala University

AI Lead
Stena Line

Machine Learning & AI Lead
AstraZeneca

Machine Learning Scientist
AstraZeneca

PhD Machine Learning for Pharmaceutical Development
University of Gothenburg

Lars Carlsson

Ass. Professor
Jönköping University

Partner
RTHS AB

Founder
Algorithma, Universal Prediction

Visiting Professor
Centre for Reliable Machine Learning

Head of AI
Stena Line

Strategist, Leader, Manager and Scientist
AstraZeneca

PhD Naval Architecture and Scientific Computing
Chalmers and Lawrence Livermore National Lab (UCLA)



Outline

- Introduction
- Cognitivity - levels of automation
- Application example - Setting prices
- Conclusions

Introduction

We have worked with many different applications in various businesses, here we will look at one application and go through it in more detail.

Decision-support for pharma

- Virtual testing reduces the need for synthesizing compounds by 30%
- Creating new ideas for tailored medicines
- Increased screening capacity by 10%
- Reliability and confidence in manufacturing and testing processes increased

Side effect profiles

- 30% increase in demand
- 70% reduction of FTEs
- Reduced turnaround time from two weeks to five minutes

Data, information and knowledge management Preclinical studies

- Automated integration of new data sources
- Automated ingestion of new data
- All historical data made available
- Real time updates into decision support systems

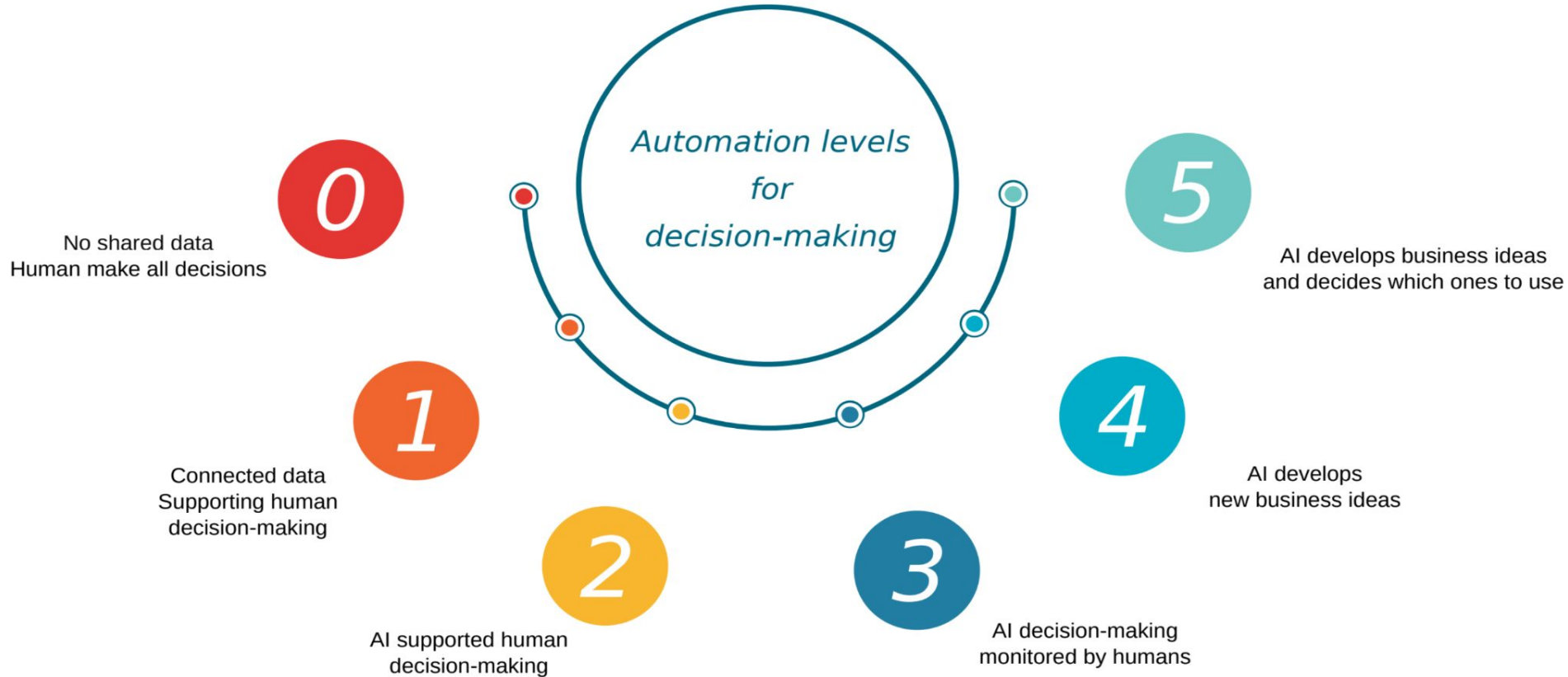
Optimization of Price, Capacity and Staffing

- 10% revenue increase on ferry tickets
- 50% reduction of manual work
- 30% revenue increase on flight seats

Fuel pilot

- Increased safety
- Up to 12% decrease in fuel

Cognitivity

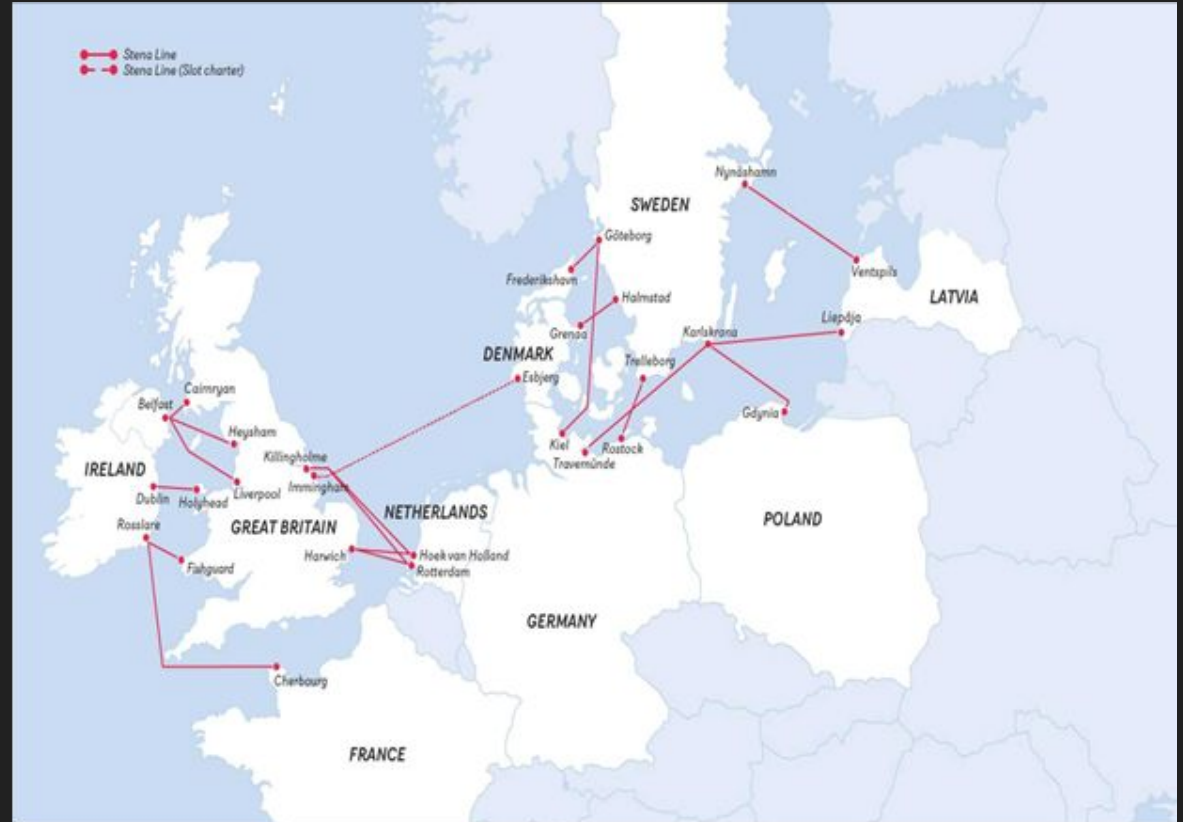


Setting prices - introduction

- Explain the problem
- Our approach
- Explain the problem we solved - business decision was to understand when automated price levels could be set and when it needed to be done manually.
- Try different approaches
- Evaluation in money and nothing else
- Next steps - prediction a price range and determine how to pick a relevant price

Setting prices for ferry tickets

- Stena Line's network
- More than 25000 trips per year
- Shared capacity
- Seasonal changes
- Regional differences
- Different types of ships
- Prices set manually
- Revenue targets based on history



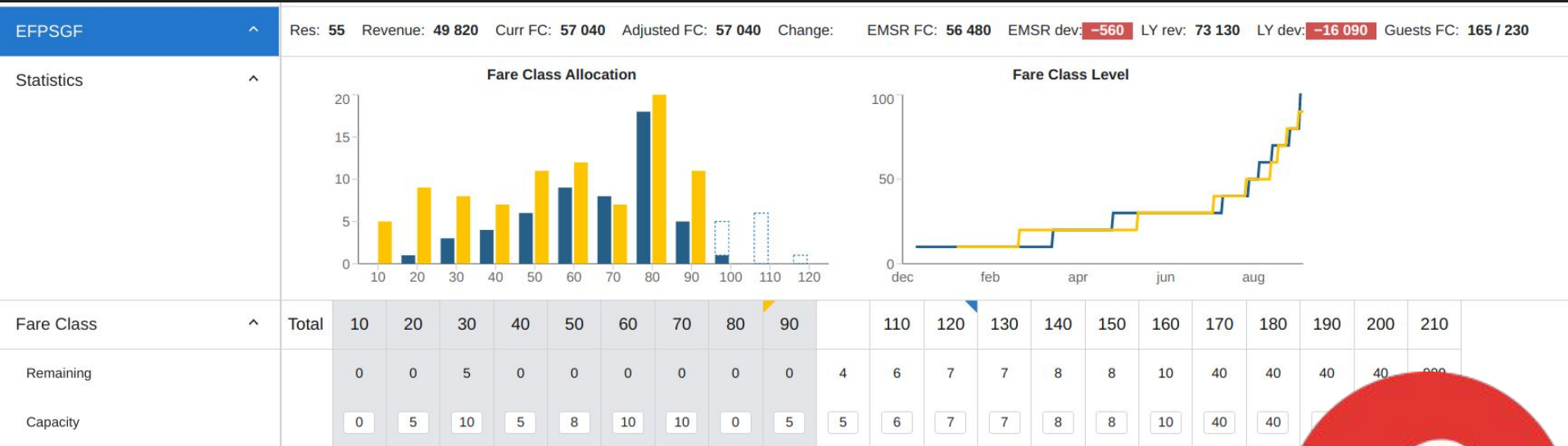
Different types of ships and capacity



Other capacity considerations and revenue streams



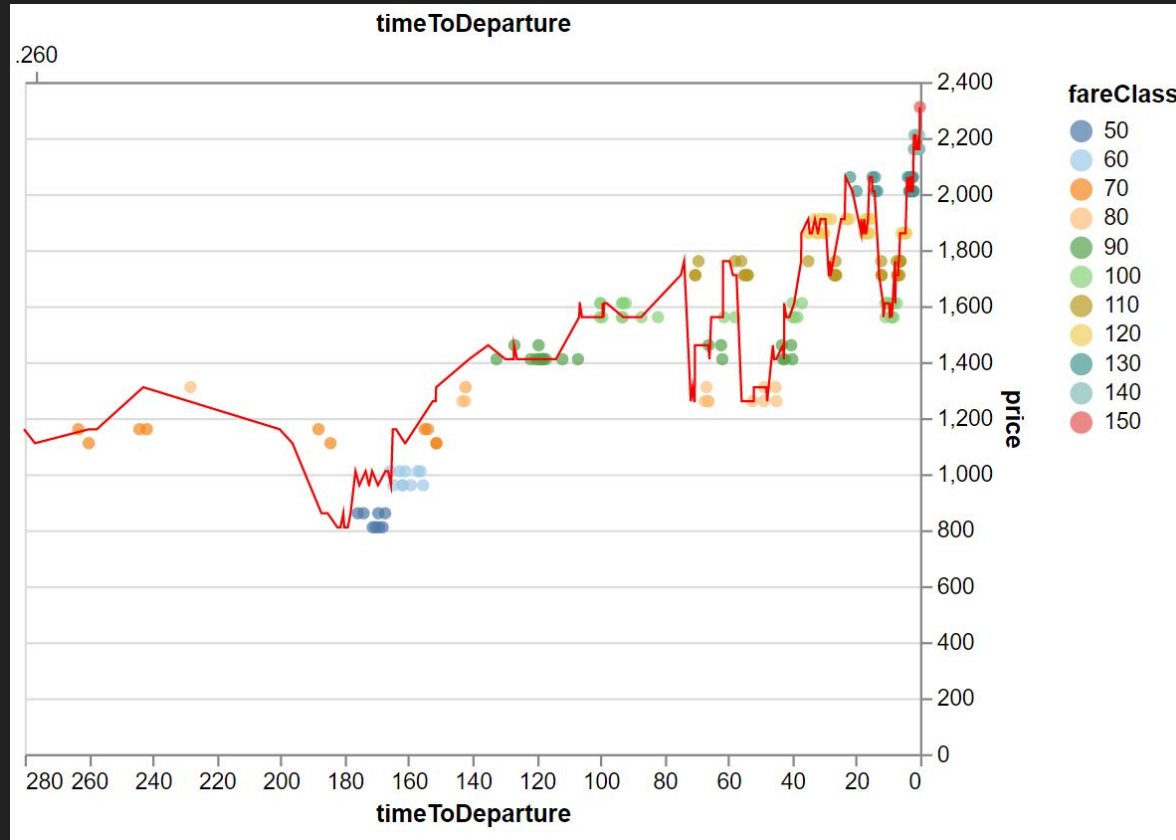
Price optimization system at the outset



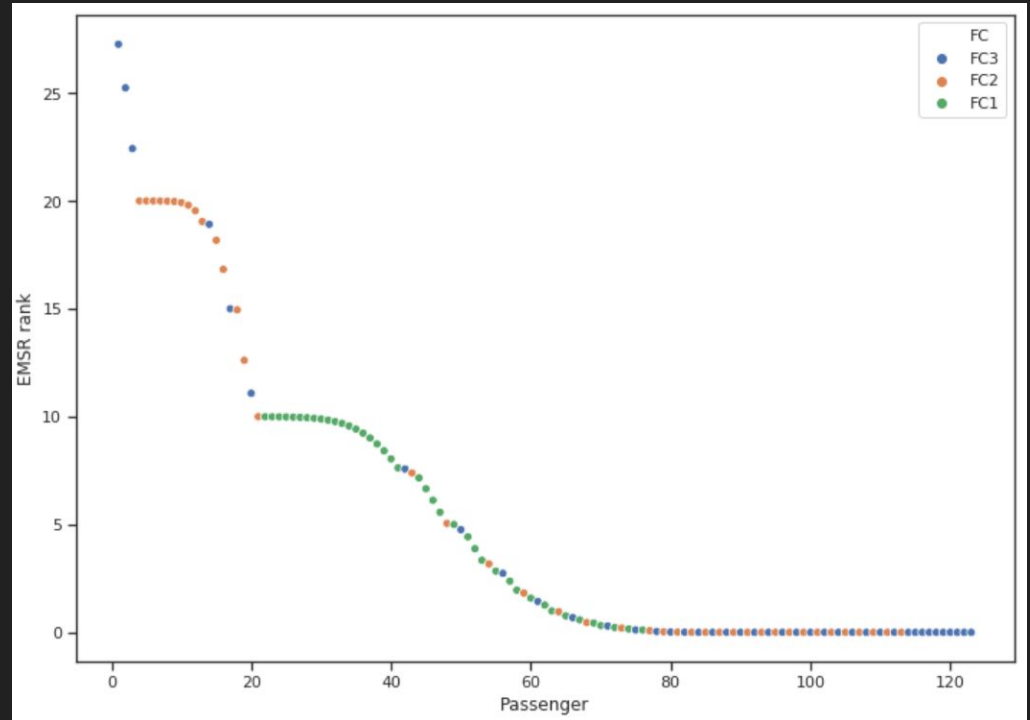
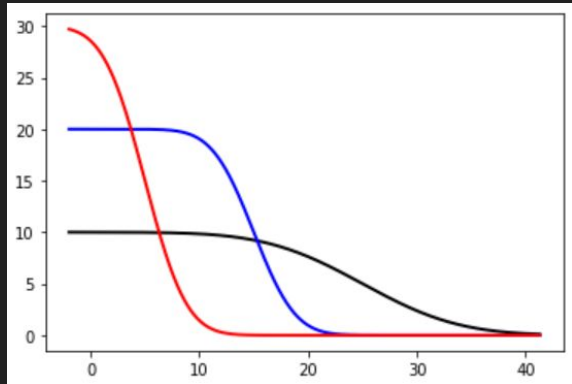
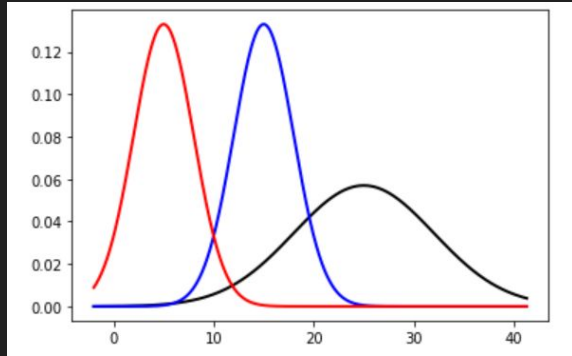
Prices loaded manually through Excel sheets!!!



Manual work with individual departures



Expected Marginal Seat Revenue (EMSR)



Clustering

Journal of Revenue and Pricing Management
<https://doi.org/10.1057/s41272-022-00371-0>

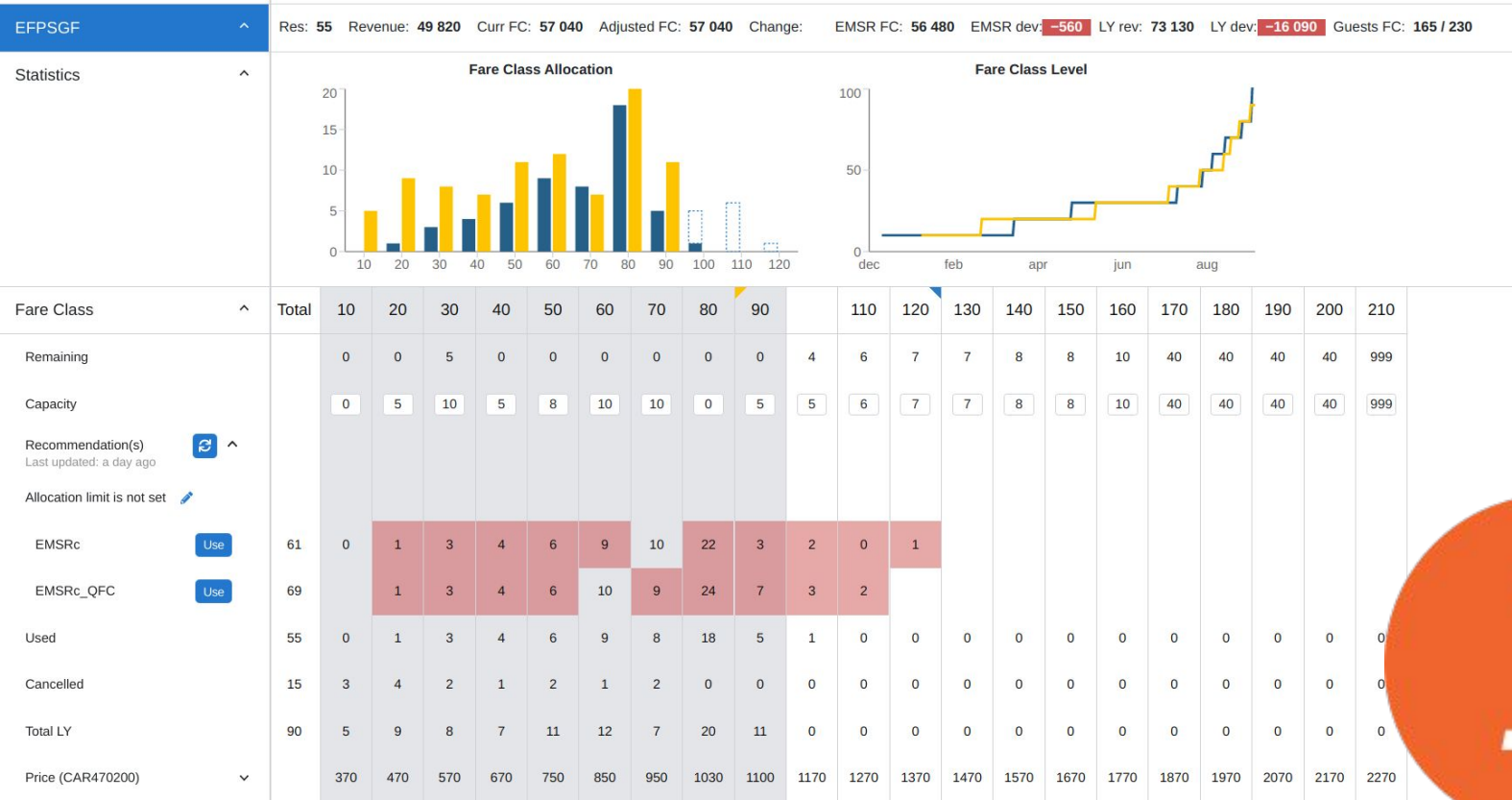
RESEARCH ARTICLE

On the selection of relevant historical demand data for revenue management applied to transportation

Ernst Ahlberg¹ · Irina Mirkina² · Alfred Olsson² · Christian Söyland² · Lars Carlsson³

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Price optimization system with EMSR optimization



Departure outcome predictions

GOFR 4 sep 2020 09:10

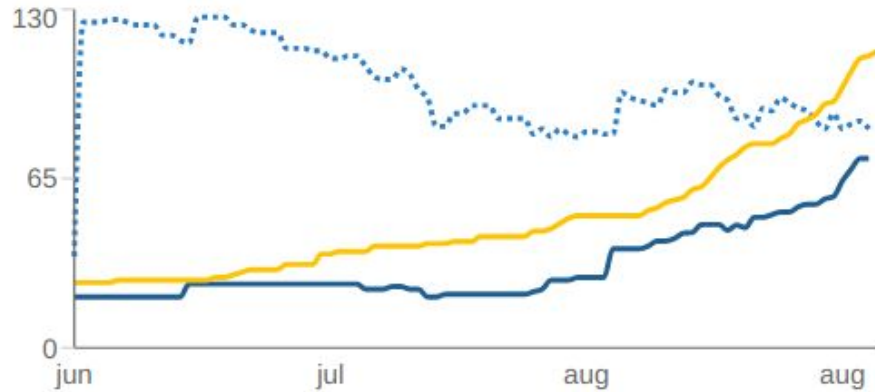


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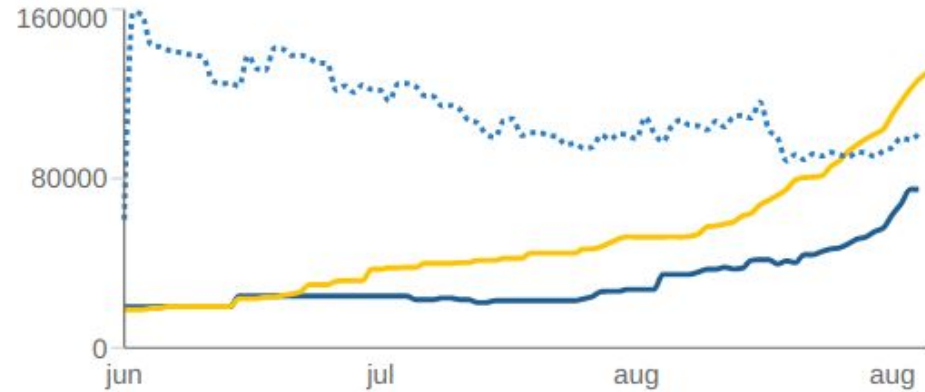
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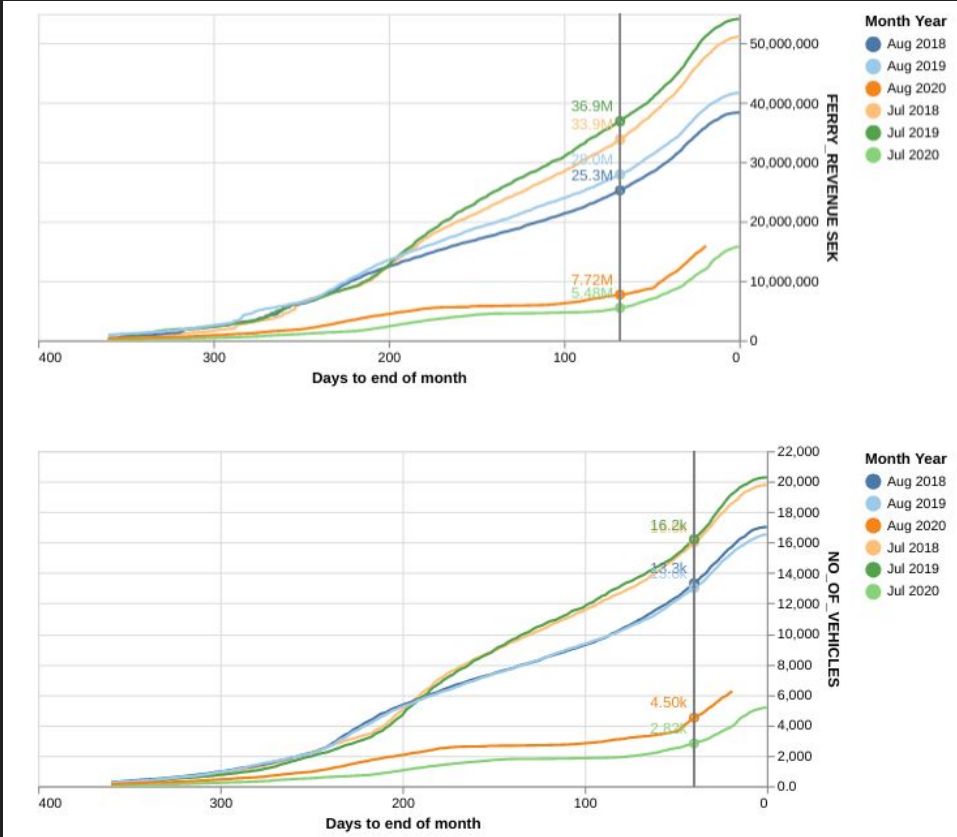
Total Travel Cars



Total Travel Revenue



Dashboard that was monitored by humans

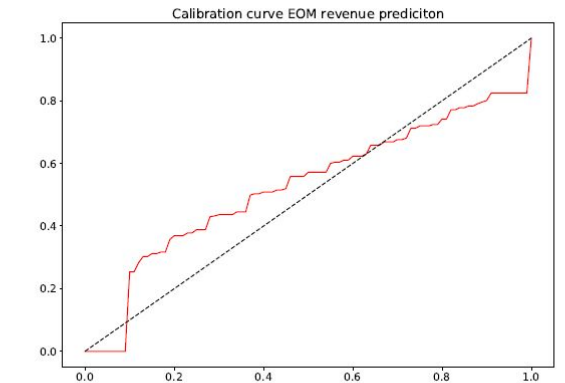
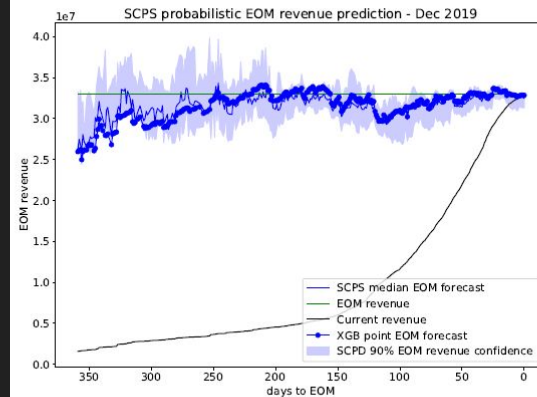
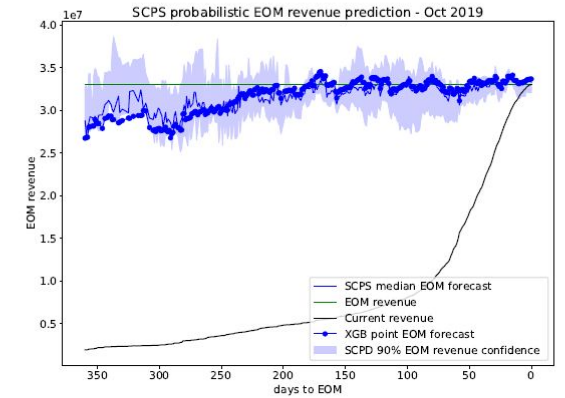
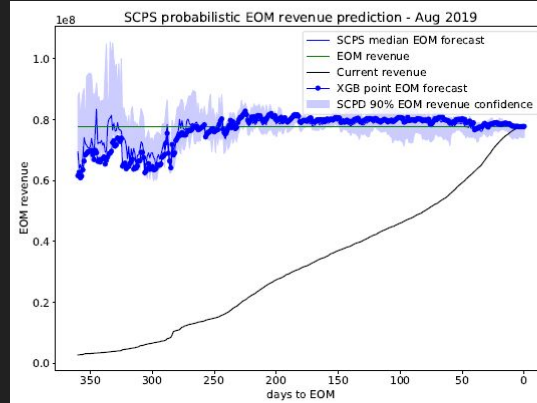


End of month revenue prediction

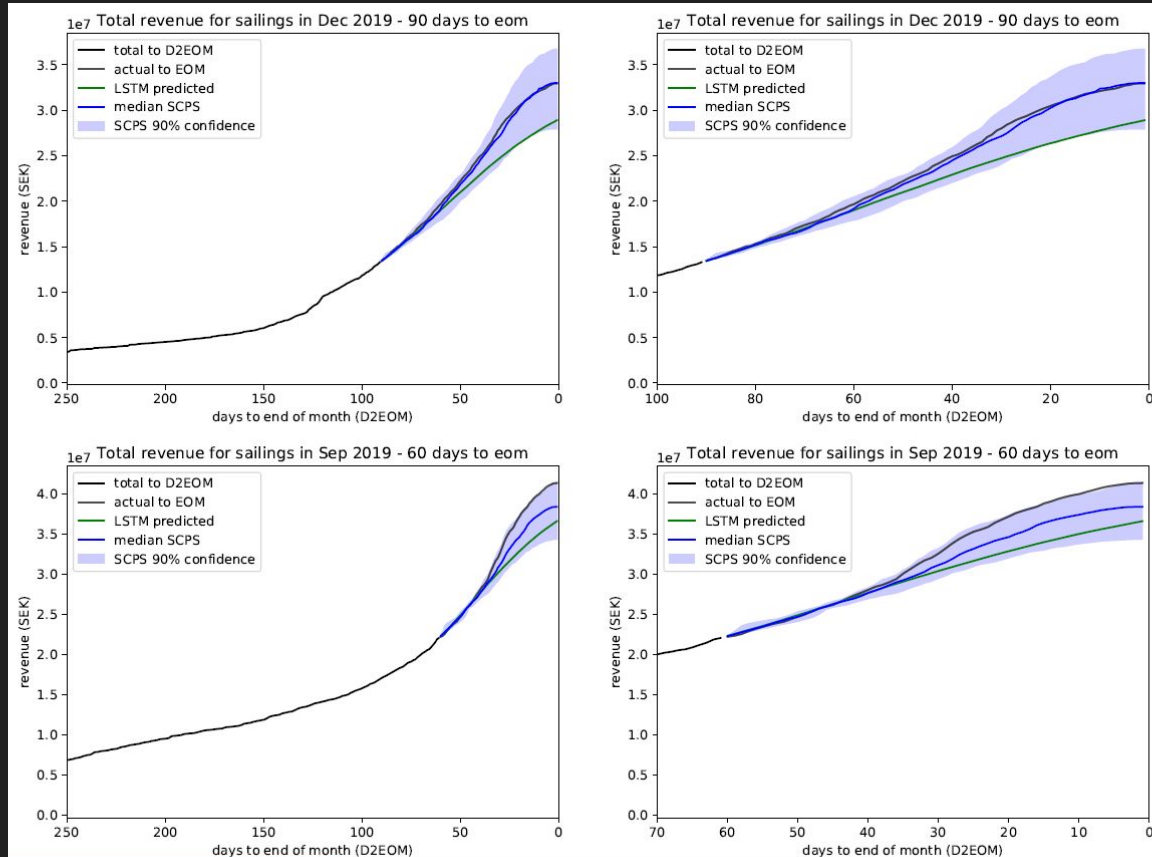
Prof Vladimir Vovk

Dr Ivan Petej

Prof Alex Gammerman



Daily time series revenue prediction

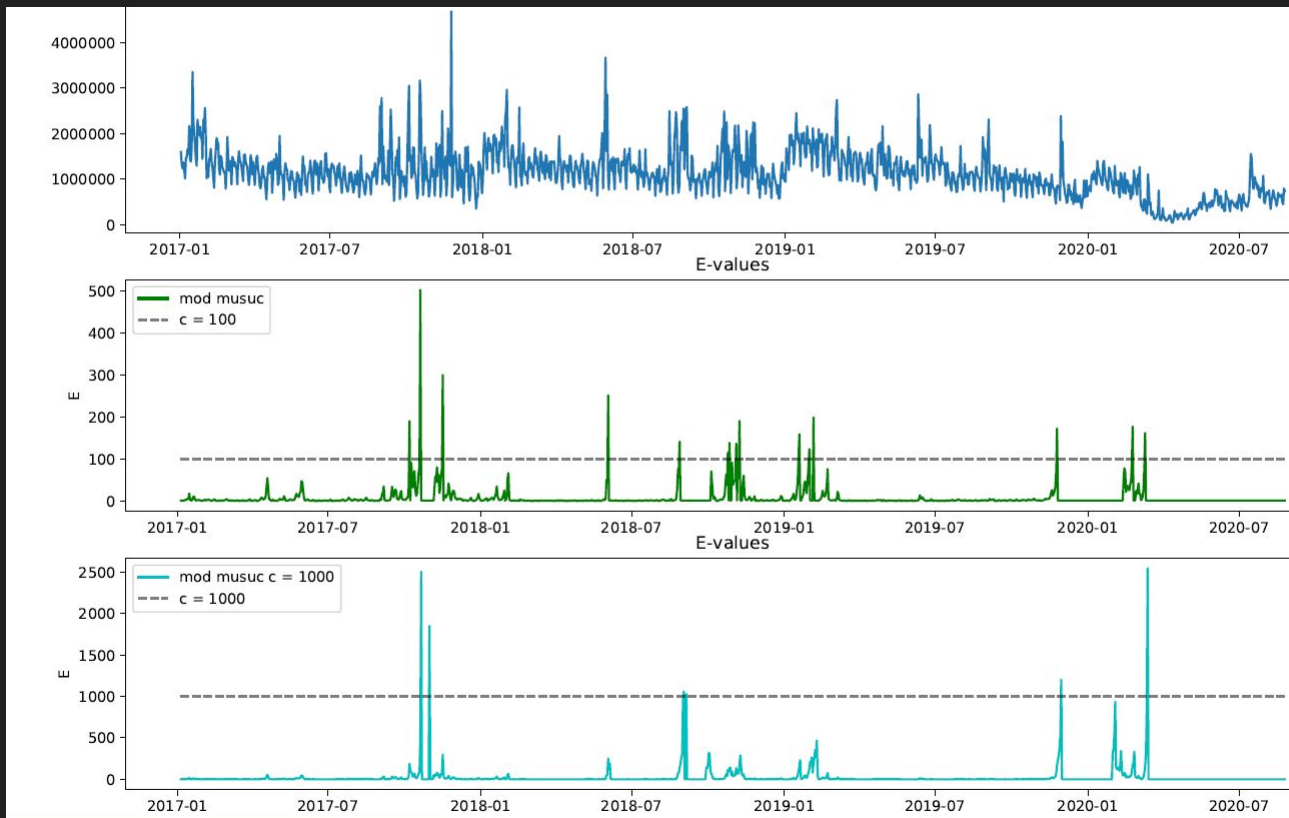


Additional identification of research problems

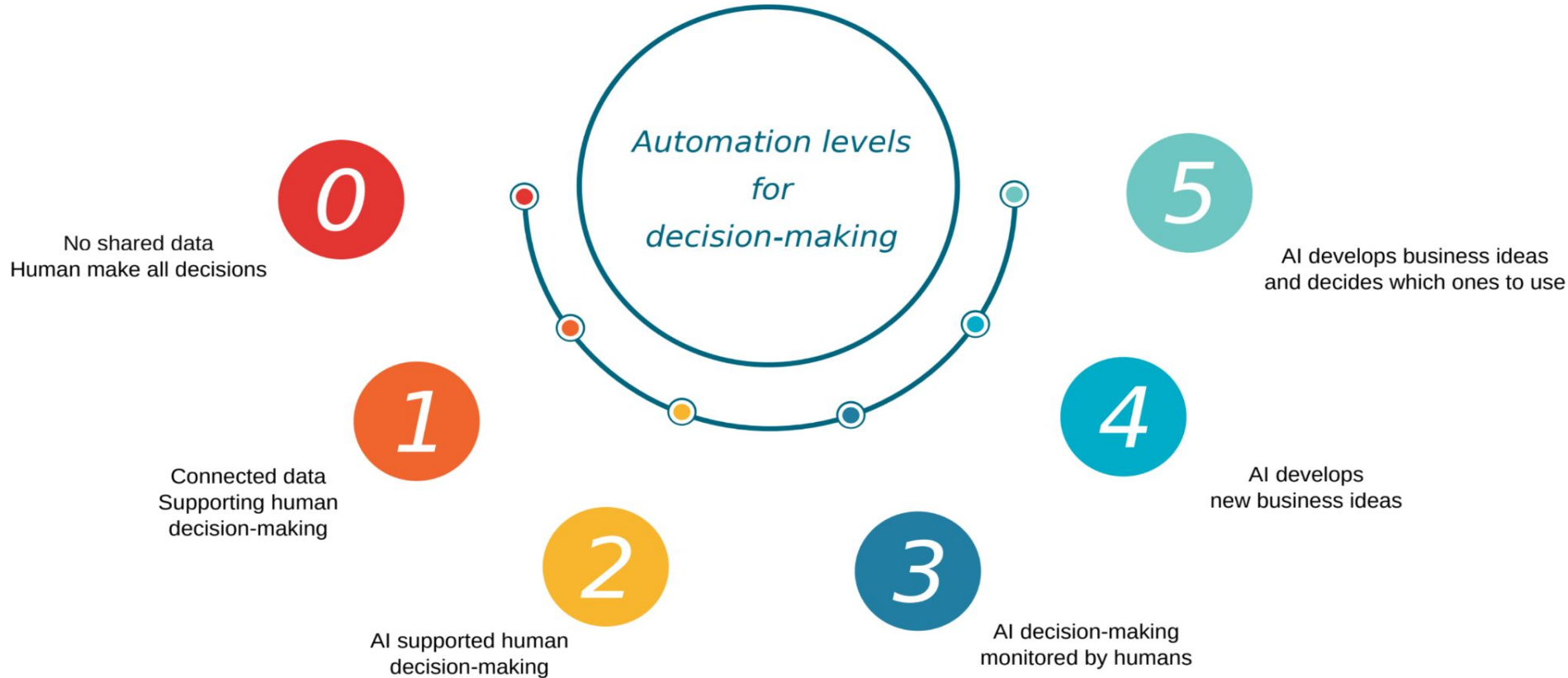
When do we have to retrain models?

- [Retrain or not retrain: Conformal test martingales for change-point detection](#) – Vladimir Vovk, Ivan Petej, Ilija Nouretdinov, Ernst Ahlberg, Lars Carlsson, Alex Gammerman
- [Evaluation of updating strategies for conformal predictive systems in the presence of extreme events](#) – Hugo Werner, Lars Carlsson, Ernst Ahlberg, Henrik Boström
- [Evaluating different approaches to calibrating conformal predictive systems](#) – Hugo Werner, Lars Carlsson, Ernst Ahlberg, Henrik Boström

Change point detection



Cognitivity



Conclusions

- Get a foot in the door, build confidence
- Identify areas of improvement
- Select a suitable “toy” problem to explore other approaches
- Team up with the best
- Get back on your feet and suggest improvements based on revenue
- Now the organization is confident in you and you can start to automate manual work and free up time for the organization to come up with new ideas on improvements

Take care!