Data-driven at sea

→ Transforming an industry with Molslinjen
→ Presenter: Lasse Janerka, Business Director - Molslinjen

→ ”Nobel Prize of Operations Research”

Molslinjen x Halfspace Edelmann Award

→ **Winner**

Achievement in Advanced Analytics, Operations Research and Management Science

Molslinjen in Numbers

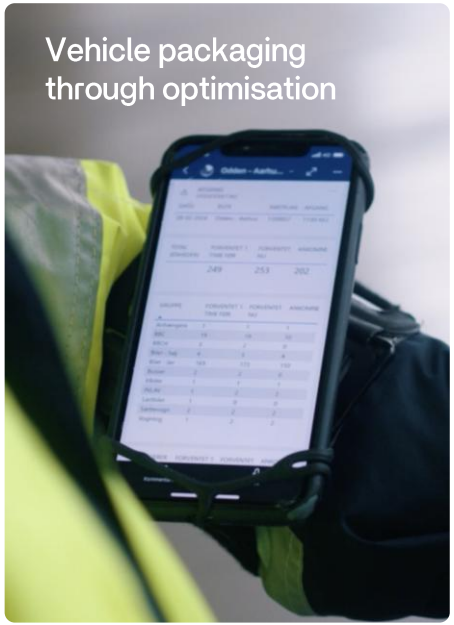
15 M	Passengers
7.8 M	Car equivalent units
18	Ferries
10	Routes

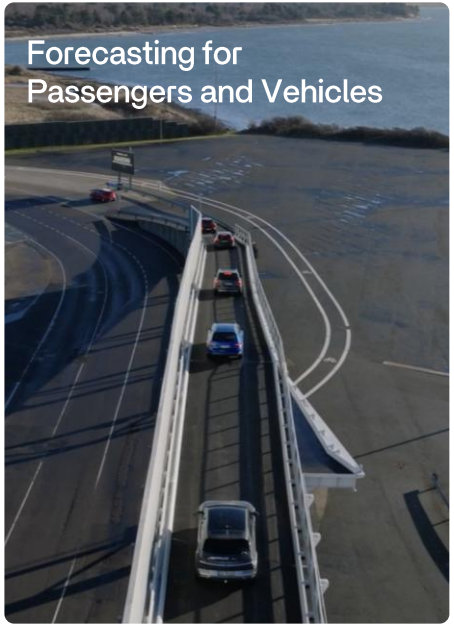
→ Challenge

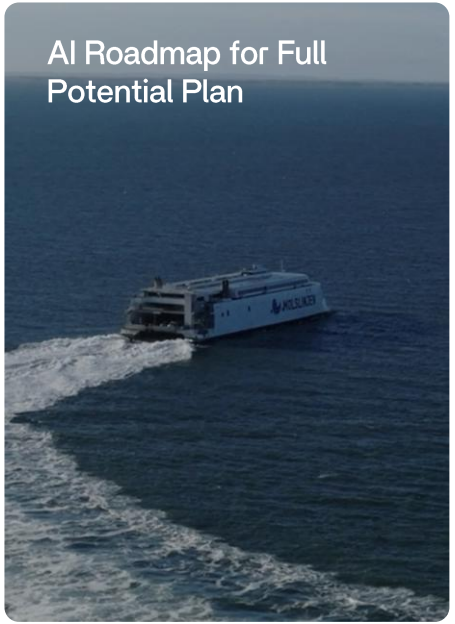
Rethinking ferry operations with data and AI

→ The plan

Think big, Start small







→ Molslinjen – Timeline

1966

Molslinjen established

2019

Forecasting and packing engine operational

→ Ability to predict demand for a specifc departure up to 1 year in advance

2020

Aquisition of Molslinjen by EQT

→ Strengthening efforts in digitalisation of operations

2022

Revenue management engine operational

→ Dynamic pricing & revenue management based on a bespoke approach

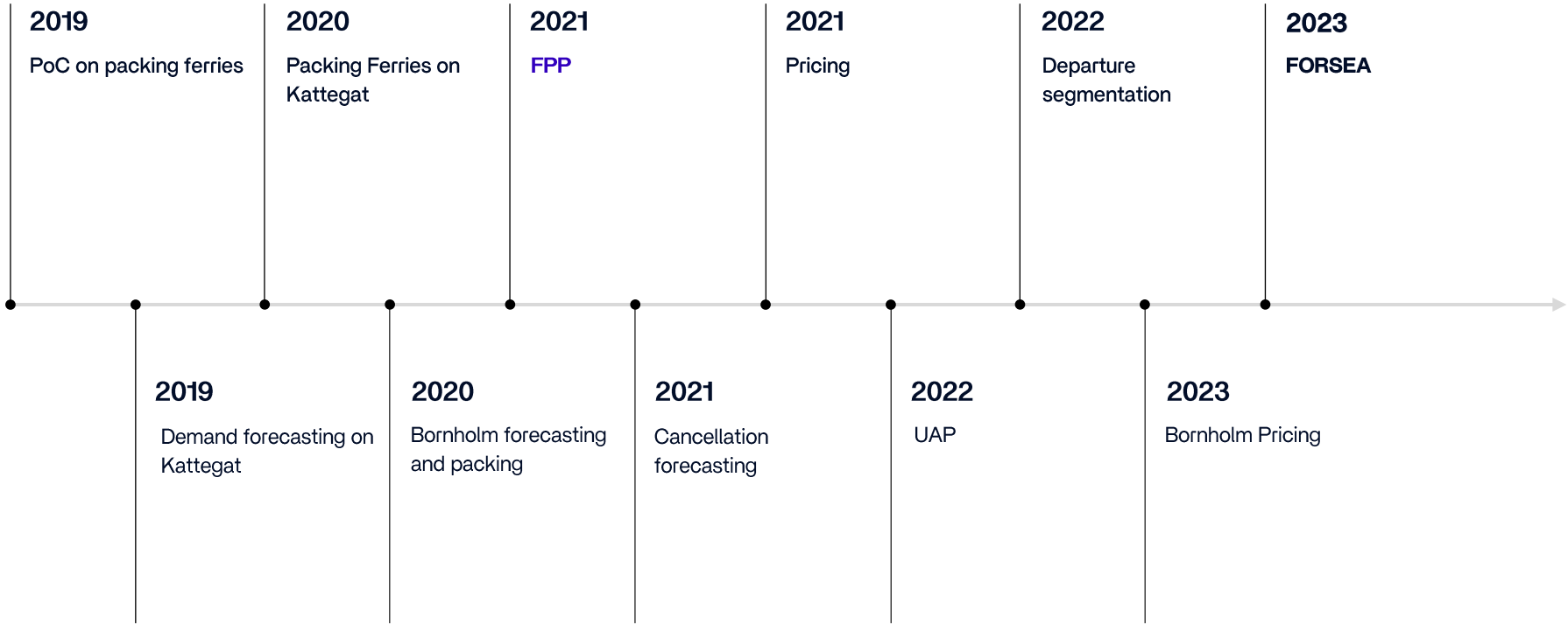
2024–

Furthering data- and AI-driven operational practice

→ Establish Molslinjen as a visionary leader in digitalising ferry operations

→ First route over Kattegat (between Jutland and Sealand)

→ Detailed Roadmap



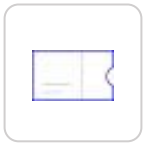
→ Vision

To use data and AI to rethink passenger ferry operations

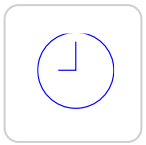
→ Molslinjen - Context

Departure Complexity

Up to **> 1000 passengers** per departure
Up to **> 330 vehicles** per departure



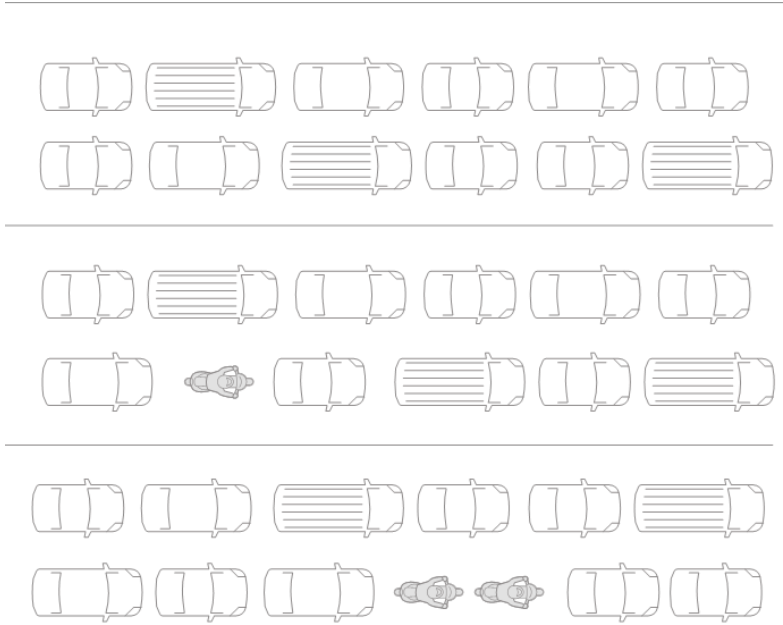
Customer classes with additional benefits
(e.g., **business customers**: no booking, late arrival, first to disembark)



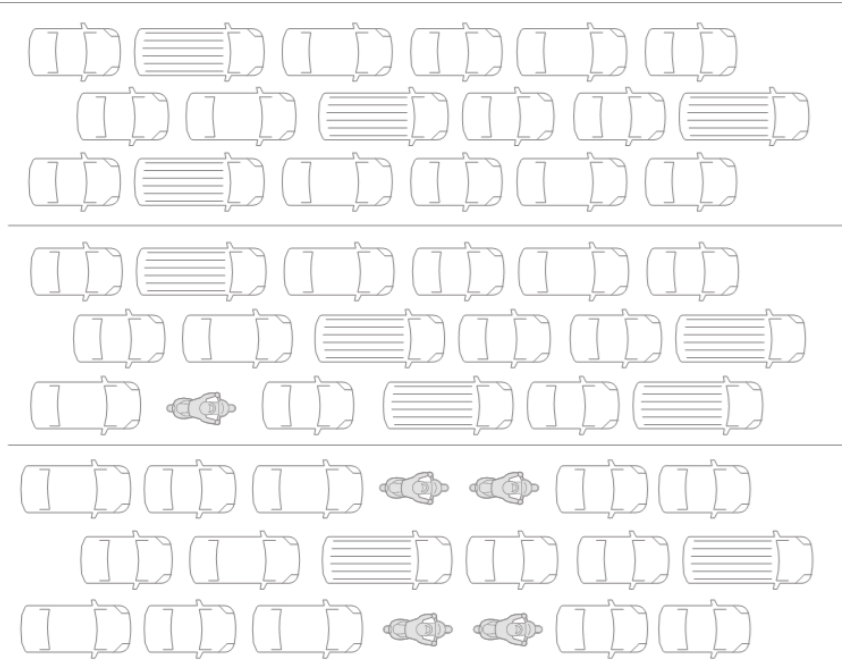
20-30 mns in-between departures

Molslinjen – Vehicle Packing Configuration

2-by-2 Vehicle Configuration



Zipper Vehicle Configuration

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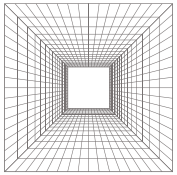
Innovative Forecasting System

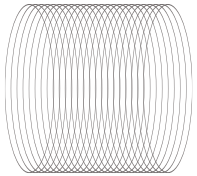
→ Forecasting

A three-step forecasting approach



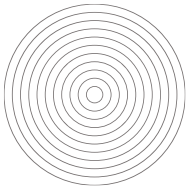
→ Initial

1-year prior to departure, based on historical data only, as well as date, time and location of departure.



→ Iterative

Forecasts are continuously updated any time new information on reservations become available.



→ Real-time

Just before the upcoming departure forecasts are continuously adjusted based on the speed and volume of vehicle arrivals, until the time of departure.

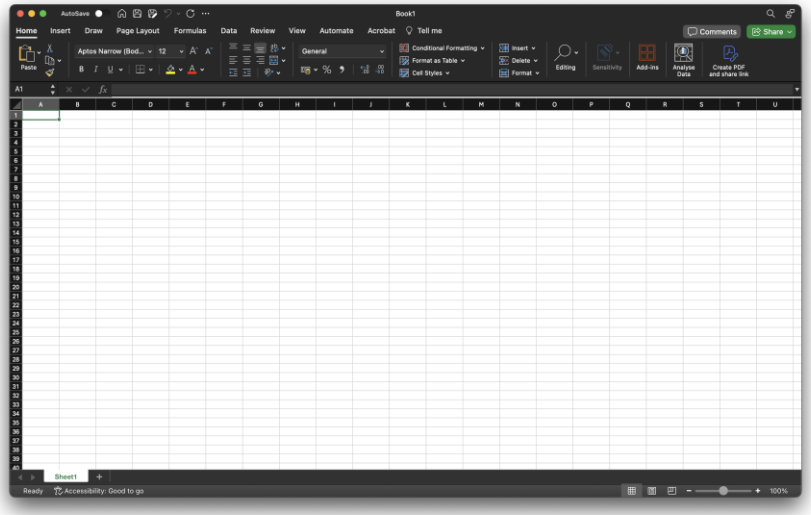
→ Forecasting

Timeline, data and decisions

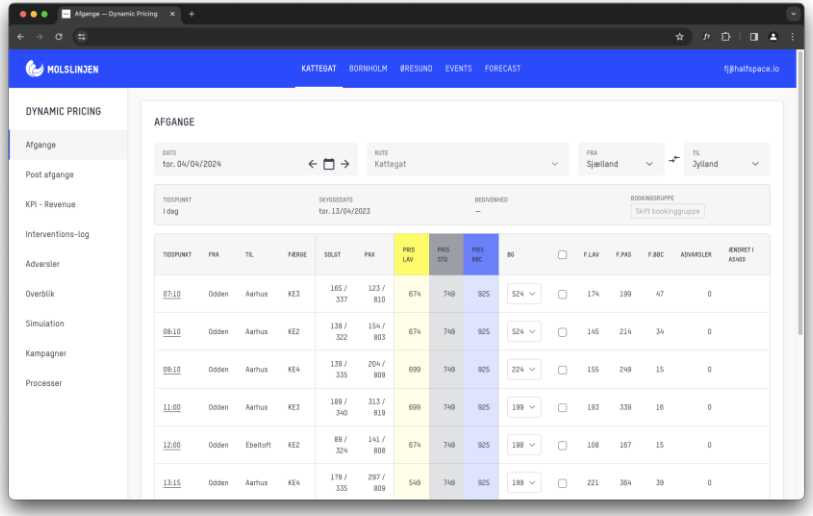
-1 Year	-1 Month	Updates	-1 Week	Updates	-1 Hour	Target
Decisions • Departure Planning	**Decisions** • Staffing • Pricing • Capacity Reservation		**Decisions** • Packing Plan • Capacity Reservation			
Features • Past demand • Calendar • Special Events	**Features** • Past demand • Calendar • Special Events • Reservations • Customer Type		**Features** • Past demand • Calendar • Special Events • Reservations • Customer Type • Check in			

→ A Forecast Engine and Integrated BI Tool

Before
→ Manual Process



After
→ AI-Powered process



Dynamic Pricing Strategy

→ Dynamic Pricing

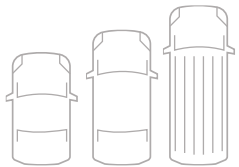
Inspired by practices in other industries

→ Dynamic Pricing

Two key technical challenges addressed

⚠ Challenge

- Remaining capacity for ticket sales **not known**
- Dependent on size of arriving cars



Intelligent Capacity Management

- Based on actual car sizes in bookings + Expected car sizes given departure

Output

Expected available tickets for sale

⚠ Challenge

- All LowFare tickets are the same
- Essential to understand price sensitivity of customers

Price-sensitive Demand Model

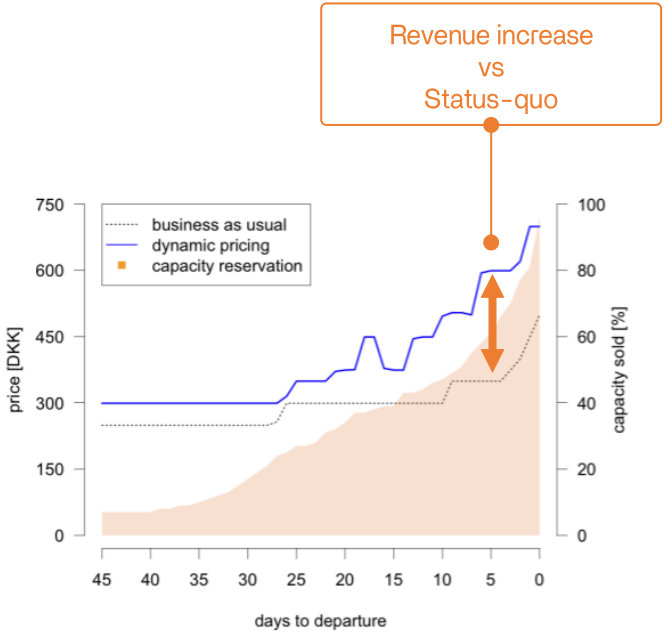
- Causal price dependence
- Bayesian Neural Network + Parametric effect of contextual variables

Output

Expected demands *given* price

→ Dynamic Pricing Outcomes

Maximizing revenue from all departures based on customer willingness-to-pay



Case in Point
Departure 3 September 2023 at 7.15PM
Jutland to Zealand

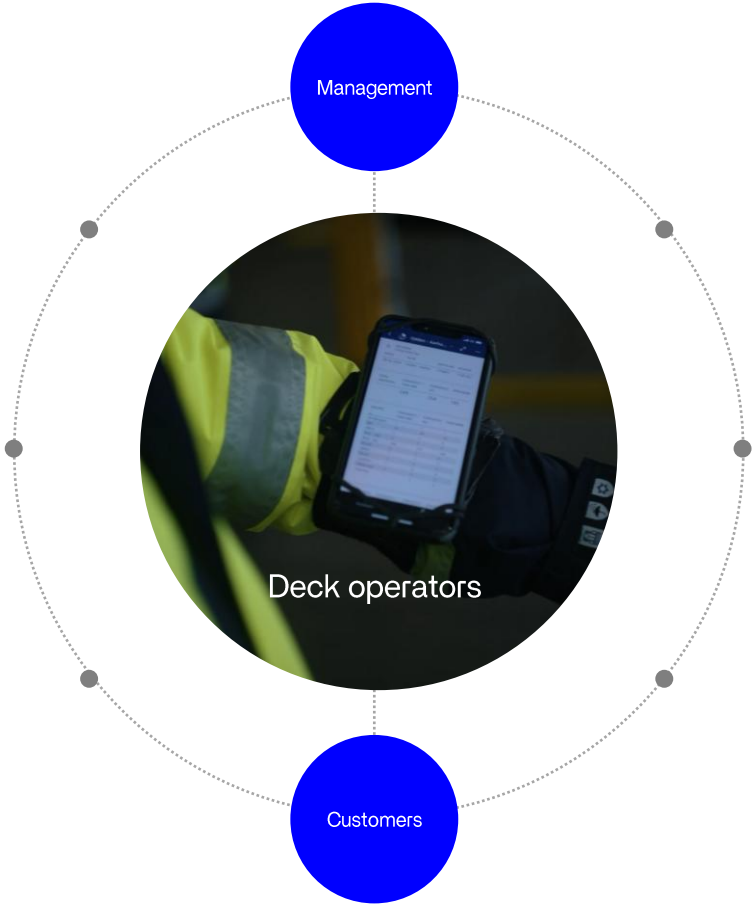
Ferry operations reimagined

Before

- Engaged in **repetitive, manual tasks**.
- **Limited focus** on strategic decision-making.
- **Stressful process** with ferry packing with limited visibility on arrivals, vehicle types, etc.
- Higher chances of **job dissatisfaction**.

→ After

- **Employees engaged** in the digitalisation process
- Shift to **strategic, engaging work**.
- Focused on **decision-making** and operational **improvements**.
- Increased **job satisfaction** and productivity.



→ Impact – Quantitative Analysis

Tremendous impact on operational, environmental and financial KPIs

$3.2 M Yearly revenue increase (up to)

Assessment is based on

- Departure delays
- Fuel consumption
- Capacity utilization
- Effective sales
- Revenue
- Etc.

→ Impact – Operational Indicators

3.5%	Decrease in the number of delayed departures
1.5 Min	Reduction in average departure delay
3%	Reduction in overall fuel consumption
6%	Increase in available capacity utilization
60%	Time reduction in planning time

→ Impact – Economic Indicators

$1.8 M	Fuel cost reduction across Molslinjen's ~8,000 yearly departures
5 K+	Increase in effective ticket sales capacity on full departures
6%	6% increase in tickets on full departures
7–15%	Increase in revenue on full departures, a 1–2% boost to the overall revenue of more than $72 mill

→ Closing

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