

# Intelligent Systems Programming

Lecture 1

Introduction to ISP



# Today's Program

- 10:00-?: Introduction to ISP
  - Who are you?
  - The research foundation of ISP
  - Intended learning objectives
  - A word about prerequisites
  - Formalities
  - ISP schedule
  - Related specializations on SDT

# The Research Foundation of ISP

- The Decision Optimization Lab
  - We conduct research on hard industrial optimization and data mining problems with high impact.
- Members



Rune Møller Jensen

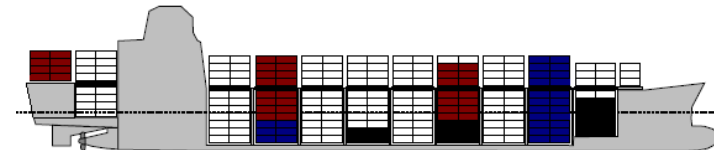
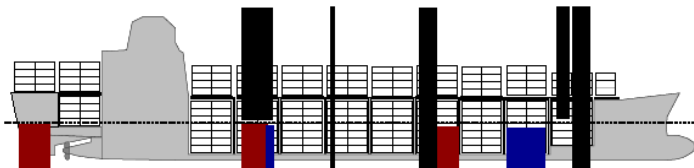
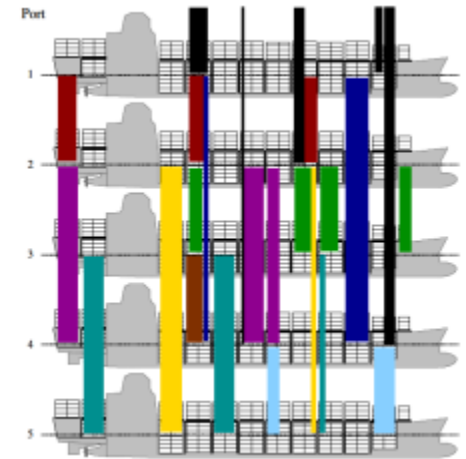
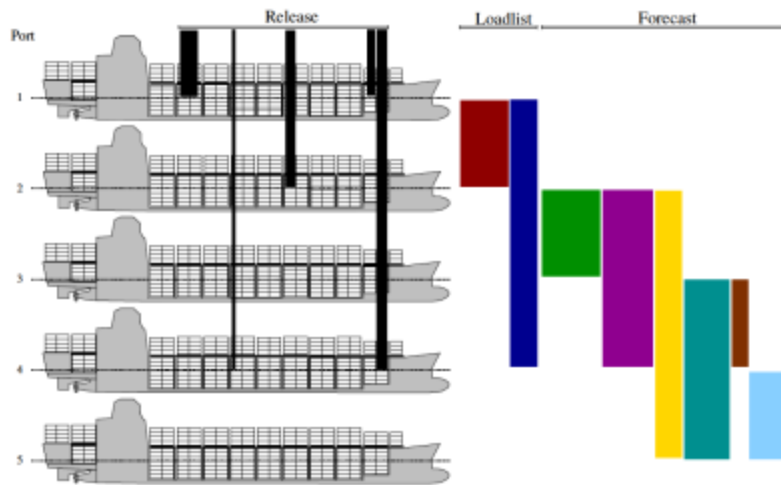


Dario Pacino (2008-)

# Stowage Planning



# Stowage Decision Support System



# Stowage Decision Support System

## Offline Onetime Setup

### 1) Setup Service

- Schedule
- Cranes: number, reach, twinlift, dual cycle, separation, height, productivity
- Port: draft, tide, max tier on departure, speed to next port, trim range, GM range, port fee, restow costs, window, ballast restrictions



### 2) Setup Optimization

- Constraint selection
- Objective selection and cost adjustments
- Compartment specific setup per port and compartment



## Online Mixed Initiative Planning

### 1) Fix decisions

- Preplace containers
- Reserve space
- Fix optimizer decisions

### 2) Change optimizer setting

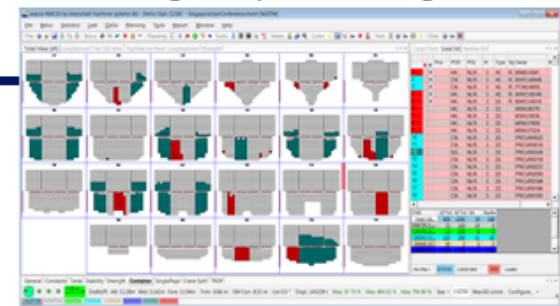
- Adjust overall restrictions and objectives
- Change cargo profit model
- Adjust restrictions and objectives at port / compartment level.

### 3) Adjust forecast

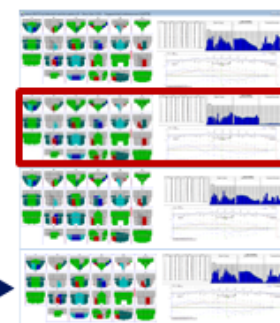
### 4) Select containers to plan

### 5) Run optimizer

### Planning and Optimizer Settings View



### Solution Pool View



### 6) Choose plan in solution pool

- Inspect KPIs
- Choose plan



# Other Examples of Intelligent Systems



# Intended Learning Outcomes

After the course, the student should be able to:

- **Identify** decision problems in work processes and IT products that can be solved by AI and optimization algorithms.
- **Apply** advanced AI and optimization modeling techniques to describe these problems formally.
- **Implement** AI and optimization software components to solve these problems efficiently.
- **Apply standard** AI and optimization models and solvers.
- **Participate in concept development** of advanced decision support systems.



# Prerequisites (do not apply to MTG)

- You must have passed
  - an elementary programming course.
  - an algorithms course
  - discrete math course

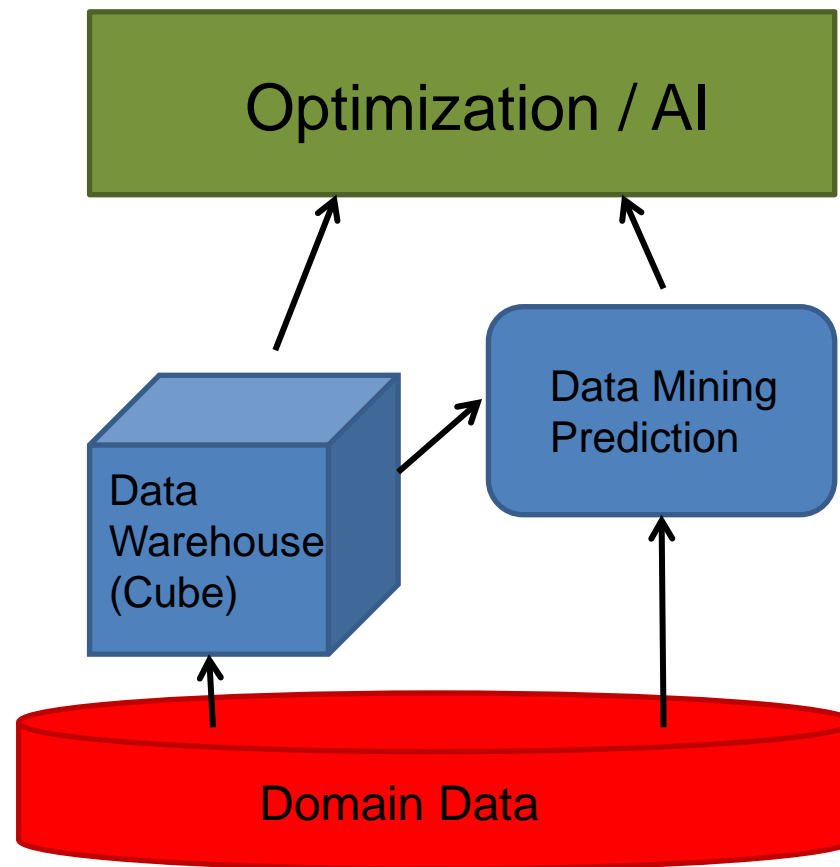
# Overview of ISP

- 74 Students signed up (85 last year)
  - SDT, MTG, BSWU, Guest
- Course Manager: **Rune Møller Jensen** (rmj) 4D13
- Teaching Assistants:
  - Jacob Brandt Jensen** (jaje)
  - Jan Piskur** (japi)
  - Morten Ugleholt Henriksen** (muhe)
- Format: 12 lectures, 10 recitations
  - 2 mandatory programming projects (out of 3 options)
  - 3 mandatory homework problems (out of 9-10 options)
- Written exam June 6

# ISP Schedule

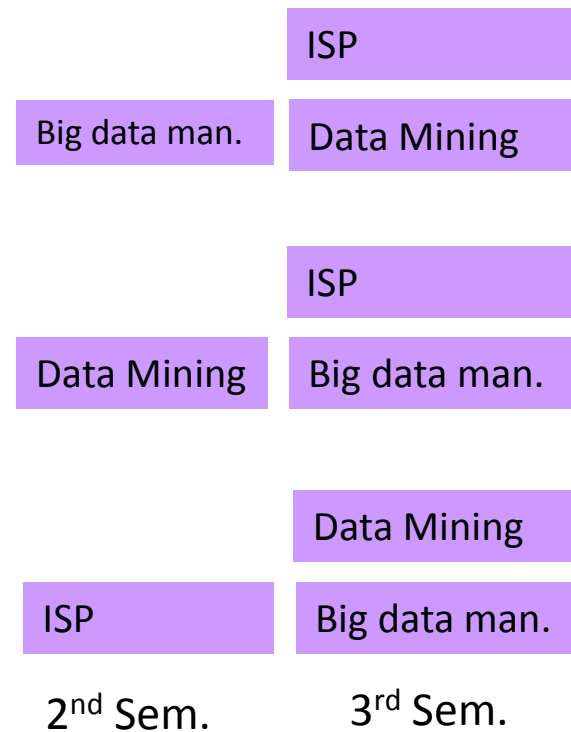


# Modern BI Architectures



# Connection to BI specialization

- Business Intelligence



# Connection to Scalable Computing

- Scalable Computing

ISP

2<sup>nd</sup> Sem.

Alg. Design

Project

3<sup>rd</sup> Sem.