BSc and MSc thesis projects at DTU Management

Fall 2025

Last update: March 24, 2025

How to apply for a BSc or MSc thesis project at DTU Management

DTU Management has four divisions, responsible for research and teaching in different areas:

- **Management Science**: If you want to write BSc or MSc thesis in the Fall 2025, keep reading: this folder is for you
- **Transportation Science**: See here
- **Technology and Business Studies**: See here and here
- **Climate and Energy Policy**: See here

We expect students to work in **groups of at least two students** for both BSc and MSc thesis projects. If you want to write a BSc thesis or an MSc thesis in the fall of 2025 in the Management Science Division or Transportation Science division, you and your thesis partner MUST start the process by completing the DTU Management - MSc/BSc thesis request form, **before 15. April 2025** at the link below:

https://forms.office.com/e/D3eCVFYuFx

The starting dates for an MSc thesis in the Fall semester 2025 are:

- Monday 4/8 2025 or Monday 25/8 2025

An MSc thesis can be 30, 32.5, or 35 ECTS points and can last for five to six months, depending on the size of the project and/or if you have coursework in parallel to the thesis. A BSc thesis can be 15, 17.5 or 20 ECTS points and is usually carried out in parallel to taking a number of courses. For further information about the rules for thesis projects, please check: Rules

In this form, you are asked to enter which faculty member you and your thesis group partner would like as your supervisor. We kindly ask you to submit **one request per thesis group**. We will get back to all applicants before 1. May 2025. As stated in the form, this does not guarantee that you will find a supervisor and a suitable topic.

You can find this project folder as a pdf file at:

https://www.man.dtu.dk/english/education/thesis-projects

Welcome

In this folder, the Division of Management Science, and some guests from the Division Transportation Science, present a wide range of exciting topics for BSc or MSc theses. Every year, we offer many different projects and update this folder at the end of each semester. The primary aim of the folder is to serve as a source of inspiration. Your main supervisor must be a faculty member in one of the two divisions; please refer to the list of faculty members mentioned in the following pages. In addition to our faculty, our PhD students and PostDocs often participate in the supervision with their fresh ideas and hands-on knowledge.

As this folder will show you, we offer a wide variety of projects. An extensive network of industrial contacts enables us to offer you projects in cooperation with many different companies. You can also choose a project that requires you to have a strong theoretical background.

Operations Research (OR)

The typical requirement for starting an MSc thesis in OR is that you have followed an advanced OR course (beyond our introductory course number 42101). The Section for Operations Research consists of more than 15 people working on different aspects of Operations Research. The department is proud to be a member of the Danish Operations Research Society – the largest OR network in Scandinavia.

Operations & Supply Chain Management (O&SCM)

We expect you to have taken at least two courses within O&SCM to qualify for your thesis with us. In most cases the student projects within O&SCM are carried out in close collaboration with a company or public institution. This often implies that the resulting thesis is kept confidential when this is deemed necessary by the external host. The Section for Operations & Supply Chain Management employs 12-15 researchers, including professors, senior researchers, PhD students, and postdocs.

Transportation Science

The Transportation Science Division studies transport behavior and systems to improve mobility while addressing key challenges: climate impact, congestion, and safety. Using statistical analyses, we assess service, network, mobility and socio-economic impacts, advancing research, advising the public sector and collaborating with transport companies. Our research covers all transport modes, focusing on green transport, electric vehicles, public transport optimization, and human behavior. With expertise in mathematical modeling, machine learning, economics, psychology, and engineering, we take an interdisciplinary approach to solving complex transport issues.

Best regards,

DTU Management

Contents

Carlos Lima Azevedo

Carlos Lima Azevedo's DTU ORBIT Profile

Research interests

My main research interests are the mathematical modeling and simulation of human behaviour, smart mobility services and the design, development and assessment of new technologies for better integrated mobility solutions.

Supervision style

Supervision meetings are held every two weeks in general. A Teams group chat for occasional / urgent communication will be created for each project. Technical work progress, task planing and (later down the road) the structure and content of the final draft is discussed in these mettings.

methodologies and expected prerequisites

Behavioural modelling, Machine Learning, Transportation modelling, Smart Mobility.

Project proposals

Title: MSc Project - AI for well being

Description: This MSc thesis proposes the development of machine learning models for predicting emotional states based on mobility, activity, and physiological data. While previous research has focused on emotion detection, this study aims to enhance emotion prediction by incorporating individual characteristics, environmental context, and temporal patterns. The project will involve detailed trajectory data of individual, bio sensors data and activity diaries already collected. Analyzing such multimodal data to evaluate different model architectures and assess their effectiveness in capturing stress responses. The findings will provide insights into the challenges of emotion prediction and guide future improvements through explainability techniques, diverse datasets, and more robust predictive models.

Title: MSc Project - Simulation and scenario analysis of green parking policies via incentives for electric vehicles

Description: Transitioning to vehicle electrification is in the essence of the current urban transportation planning agenda to tackle climate change. In Denmark, a reduction by 70% (relative to 1990) of greenhouse gases (GHG) emissions is expected until 2030, allowing Denmark to be climate neutral in 2050. While the design and expected impacts of vehicle taxation reforms that benefit the adoption of electric vehicles have been widely discussed, the effects of changes in the use of the urban space with the same goal remain unclear. This project aims to combine scenario analysis and microsimulation to assess the impact of alternative parking policies that benefit electric vehicles (e.g., parking lots exclusive for electric vehicles) in regards to GHG emissions reduction and from a perspective of accessibility, welfare, equity, and efficiency.

Title: MSc Project - Reinforcement Learning for Transportation

Description: Note: This portfolio of projects is together with Prof. Filipe Rodrigues and Ravi Seshadri, and different applications can be pursued. Reinforcement Learning (RL), in particular it's combination with Deep Learning, is currently one of the most exciting and promising research areas in AI. RL has recently shown outstanding results at solving complex sequential decision-making problems such as learning to play Go and videogames at super-human-level performance, autonomous driving and smart grid optimization. Through interaction with an environment (real or simulated), RL algorithms are able to learn optimal policies for taking actions at each time step t, such that the sum of expected future rewards is maximized (e.g. maximizing game score in the videogame example). The ability of RL algorithms to correlate actions with the delayed rewards that they lead to (e.g. amount of congestion reduction, or responsiveness increase) makes them excellent candidates for learning policies for complex transportation challenges, such as adaptive autonomous vehicle routing and re-balancing through dynamic pricing, traffic signal control for reducing congestion, etc.

Title: MSc Project - Combining Urban Simulation and AI

Description: Note: This portfolio of projects is together with Prof. Francisco Pereira. Simulation models are usually very complex and detailed tools that can represent cause-effect interactions in space and time based on rules of the domain (e.g. physics, human behavior, biology, climate). For that reason, they are still today an unavoidable tool for many large scale problems, such as transport and urban modeling, climate change, drug development. On the other hand, they are known to be extremely challenging tools to work with: they are often very slow to run, difficult to calibrate, require a tremendous amount of memory, and are hard to reuse. The goal of this theme is to apply Machine Learning methods towards the next generation of Simulation research, with automatic calibration, efficient exploration of the parameter space, and better generalizability. Significant advancements in this theme will have serious impact in real-world policy problems, such as climate adaptation and mitigation, green transition, energy policy.

Michael Barfod

Michael Barfod's DTU ORBIT Profile

Research interests

My main research focus is on quantitative and qualitative decision support making use of a wide range of impact assessment methodologies, such as multi-criteria decision analysis, cost-benefit analysis and feasibility risk assessement to build comprehensive decision support systems. My main interest lies in the green transition of the maritime industry, including green shipping corridors and port's role as energy transition hubs.

Supervision style

With me as supervisor, you can expect to have supervision meetings every second week. I am happy to discuss the thesis, its structure and content, but I do not read chapters before the thesis is handed-in. Though we will meet every two weeks, I am flexible and can give you extra supervision when (and if) needed.

Methodologies and expected prerequisites

Multi-criteria decision analysis, Cost-benefit analysis, Feasibility risk analysis, Decision support systems, and statistics.

Project proposals

Title: BSc/MSc Project - Green Shipping Corridors

Description: Green maritime corridors is a concept addressing the uncertainties associated with the substantial investments in ships, fuels, and fueling infrastructure required for kick-starting green transition in the sector through testing and demonstrating new solutions at scale. Cargo owners, vessel operators, port operators, marine fuel producers, bunkering service providers are only few of the stakeholders involved in turning a green maritime corridor into reality.

Projects will be concerned with different approaches to assess the feasibility of a potential green maritime corridor.

Title: BSc/MSc Project - Reducing Emissions in the Maritime Sector

Description: In 2023, the International Maritime Organization (IMO) set a strategy with the aim of achieving net zero GHG emissions from international shipping by or around 2050. Measures suggested in the strategy include providing power supply from renewable sources to ships and ports and developing the necessary infrastructure to support the supply of alternative low - and zero -carbon fuels. Short-term candidate measures include initiating research and development activities addressing marine propulsion, alternative low- and zero-carbon fuels, and innovative technologies to enhance ship energy efficiency further.

Projects will be concerned with different approaches to meet the overall goal of reducing emissions in the maritime sector such as: a) Examine the carbon emission reduction potential of various technical and operational energy efficiency measures for specific types of ships, b) Examine the carbon emission reduction potential of alternative fuels as both short- and long-term measures, and c) Design decision support systems to assist the maritime industry in meeting the reduction targets in the most cost-effective way.

Title: MSc Project - Decision Support using MCDA

Description: Current research deals with the difficult task of identifying the most suitable aids for decision support. Several MCDA techniques are available, but many become inappropriate when dealing with a large number of alternatives and criteria.

Outranking techniques, such as ELECTRE and PROMETHEE are examples of methods that can handle many alternatives and criteria simultaneously. The project aims to examine available outranking methods by performing a thorough literature review of pros and cons. A suitable case study can be used for testing, and the results can be benchmarked against the outcome of a conventional analysis. The outcome will be a recommendations for the techniques' applicability in decision-making.

Jens O. Brunner

Jens O. Brunner's DTU ORBIT Profile

Research interests

The focus of my research is the planning and analysis of service processes in the healthcare sector, especially in hospitals. The modeling, analysis, and optimization of practice-relevant problems using quantitative methods in the areas of business analytics and operations management is the main focus of my work. The research is carried out in close cooperation with practice, in particular with Region Zealand.

Supervision style

I adapt the supervision to the needs of the student(s). Therefore, we can individually agree on the most suitable style for your project.

Methodologies

Mathematical Modeling, Optimization, Simulation, Artificial Intelligence

General project tasks

(1) Searching and classifying relevant (scientific) literature, (2) Searching and analyzing real-world data (might be provided), (3) Formulating a (precise) problem description and a (generic) mathematical model, (4) Implementing the model in standard software and/or developing a solution algorithm (mathematical programming, simulation, machine learning), (5) Designing an experimental study, and (6) Drawing managerial insights and critically discussing the results.

HCOM
Health Care Operations Management

Project proposals

Title: MSc Project - Operating Room Planning and Scheduling

Description: At just under 40% of total expenditure, a hospital's operating rooms are the most significant cost generator and one of the largest sources of revenue. This requires efficient planning of the ORs to be performed on the strategic (case mix planning), tactical (master surgery scheduling), and operational (replanning, sequencing) levels. However, the operating rooms' capacities and those of down- and upstream or other related departments (e.g., intensive care unit, sterilization department) must be considered. In case of capacity bottlenecks in these departments, efficient patient flow might need to be improved.

Title: MSc Project - Personnel Planning and Scheduling in Healthcare

Description: The healthcare system's biggest challenge is the acute staff shortage (physicians, nurses, therapists). According to a recent study, there are only 62 applicants for every 100 unfilled jobs. The effects of demographic change will exacerbate this problem in the future. Therefore, large healthcare companies and hospitals need efficient workforce planning and scheduling. In addition, attractive and individualized roster models offer a competitive advantage over other employers. Current research on rostering and workforce planning seeks to achieve adequate staffing and appropriate workloads while allowing employees to have a as fair and appealing as possible roster. Part-time and personal preferences - such as regular days off, specific shift sequences, or individual limits on the number of night shifts - are also considered. Personnel planning can be performed on the strategic (staffing), tactical (rostering), and operational (replanning) levels.

Title: MSc Project - Optimizing Telemedicine Integration for Efficient and Equitable Healthcare Delivery in Denmark

Description: Telemedicine is transforming healthcare delivery by enhancing access to medical services, reducing hospital congestion, and improving patient outcomes. However, its integration into existing healthcare systems presents challenges such as optimal resource allocation, balancing virtual and in-person consultations, and ensuring equitable access across different regions. Effective implementation requires data-driven decision-making, optimization of service availability, and consideration of patient needs, technology constraints, and regulatory policies. This project aims to explore key operational challenges in telemedicine and develop optimization/simulation and decision-support models to improve its efficiency and accessibility.

Bissan Ghaddar

Bissan Ghaddar's DTU ORBIT Profile

Research interests

Core: Non-linear optimization, network optimization applied to energy and transport, electric vehicle routing, machine learning for optimization, last-mile optimization
Other: robust optimization, telecommunication operations optimization

Supervision style

Generally, I aim for weekly meetings, but we can adjust the schedule to better fit the project's needs as we progress.

Methodologies

Mathematical modelling, Non-linear programming, Conic Optimization, AI and Machine learning.

Project proposals

Title: BSc/MSc Project - Dynamic Route Planning for Last-Mile Delivery

Description: There has never been a time with more demand than now for e-retailing and as a consequence last-mile services. The growth in demand is also bringing significant challenges. With the abundance of options, customers are ever more demanding and expecting more control. The aim of this project is to evaluate the impact of outsourcing and postponing strategy for a dynamic multi-period vehicle routing problems with probabilistic demand information. The objective is to identify a last-mile delivery plan with a minimum total cost of service, which includes the setup and operational costs of the company's fleet of vehicles and the cost of outsourcing. The project will consist of formulating a multi-stage stochastic programming model to represent the dynamic decisions considered in the problem and developing a solution approach to solve the resulting model. Given the relevance of the problem in practice, the project will analyze different planning strategies to evaluate the impact of postponement and outsourcing decisions.

Title: MSc Project - Optimizing the Operations of NaviMerchants

Description: This project focuses on optimizing fuel consumption for ships, tackling a problem that is too large and complex for brute force methods, necessitating the use of advanced optimization techniques. While comprehensive data from the company is already available, identifying the optimal solution remains a challenge. The project aims to investigate and apply robust optimization methods to efficiently address the problem, improving fuel efficiency and promoting sustainability within maritime transportation. This project aims to model an optimization problem to compute the most cost-effective fuel option for ships, considering multiple factors. These include the cost of sailing and deviations, fuel prices, cargo intake, and loadline zones (which limit cargo based on weather conditions). Additionally, constraints such as fuel tank capacities (e.g., small ships having a maximum of 1,000 MTs and large ships up to 1,500 MTs), varying speeds, and associated fuel consumption rates must be incorporated. The model will need to balance these factors to minimize overall costs while ensuring operational efficiency and compliance with maritime regulations. Strong programming skills (python and/or Julia) and good knowledge of mathematical programming is required.

Title: MSc Project - Learning-based Methods for For Power Networks.

Description: The optimal power flow (OPF) problem is modeled as a non-linear quadratic optimization problem that is difficult to solve due to the power flow constraints. Additionally, mixed integer problems such as security-constrained OPF problems are even more difficult due to the additional binary variables. Due to the computational challenges of solving such nonconvex problems, many efforts have focused on linearizing or approximating the problem in order to solve the problem faster. However, many of these approximations can be fairly poor representations of the actual system state and still require solving an optimization problem, which can be time-consuming for large networks. The aim of this project is to learn feasible solutions of the the valve setting problem wherein machine learning and optimization work hand-in-hand to find high quality solutions. The first step is understanding the features that need to be collected for the learning phase and then designing a learning model that can exploit the problem constraints and generate high quality feasible solutions. The resulting models will be tested on several power network instances of varying sizes and evaluated in terms of prediction accuracy, operational feasibility, and solution quality. Strong programming skills (python) and knowledge of mathematical programming and machine learning is required.

Title: MSc Project - Solving SVM with Feature Selection using Semidefinite Programming.

Description: Data driven decision support systems are nowadays an integral part of many businesses. Support vector machines (SVMs) is a class of data-driven machine learning approach that deals with predictive binary classification, i.e. the assignment of class labels to unlabeled data. SVM finds a maximum margin function that separates the observations into two classes where each observation is a point in a multidimensional space of feature measurements. New unlabeled data are then assigned a class based on their geometric position relative to the classifier function. Given the vast amount of complex features that modern systems use, finding the classifier function often requires the simplification of the features space by identifying the dimensions that have the most distinguishing power. It is therefore essential to jointly optimize the feature selection and the classification in order to ensure the best performance of the decision support system. The aim of this project is to use semidefinite programming to solve SVM problems with feature selection. The problem is a quadratic problem with binary variables and is difficult to solve for practical applications. Cuts based on optimization-based bound tightening techniques will be investigated to see the impact on the solution. Strong programming skills (python) and good knowledge of mathematical programming and machine learning is required.

Title: MSc Project - Solving Mixed Integer Quadratic Optimization Problems Applied to Energy Networks

Description: Mixed integer semidefinite programs (SDP) arise in many applications including finance, energy, and water networks. In this research, the focus is on mixed integer optimal power flow problems and in particular transmission expansion planning problems that arise in power networks. The goal is to determine which transmission power lines to expand on while adhering to the forecasted demand and non-linear power flow constraints. The problem can be modeled as a nonconvex quadratic optimization problem with binary variables. Semidefinite programming provides strong relaxations for these problems and having a branch-and-bound SDP solver can provide high quality bounds in these cases. The aim of this project is to develop a mixed integer SDP algorithm targeting large-scale transmission expansion instances. The branch and bound will decide on the binary variables to branch on and at each node a SDP relaxation is solved. Additional cuts can be added to improve the quality of the relaxation. Strong programming skills (C or python) and good knowledge of mathematical programming is required.

Evelien van der Hurk

Evelien van der Hurk's DTU ORBIT Profile

Research interests

My main research area is designing exact and heuristic solution algorithms for complex problems in (public) transportation. I like to work with data, networks, and MILPS/matheuristics/metaheuristics, but occasionally also do machine learning. I also like to deal with uncertainty, e.g. in terms of robust optimization.

Supervision style

You can expect to have supervision meetings every second week. Before the meeting please send me a a short agenda with what you would like to discuss: e.g. a list of questions or 2-4 pages of written text on your thesis since last meeting. During the meeting we discuss the project, and make a plan for the coming two weeks. I love to discuss algorithms, but I assume that you can do the coding yourself.

Methodologies and expected prerequisites

Algorithms, Graphs/Networks, Metaheuristics, MIP-models, Machine Learning, Good programming skills.

Project proposals

Title: BSc/MSc Project - Network optimization

Description: The copenhagen area is planning lots of infrastructure extensions. In this project, you could do one of the following things:

- Design heuristics for network design
- Optimize location and size of vehicle sharing locations around a newly opened line, like the light rail or a BRT line
- Evaluate past network changes and the impact on passenger route choice through data analysis (a machine learning/transport project, not OR)

In the project, you will be able to work with real data from Movia on timetables, passenger forecasts, etc.

Title: BSc/MSc Project - On demand transit

Description: Currently a big question with Movia is whether they can better run traditional scheduled services, or change some to on-demand transit. This is also a largely unexplored research area: when should one offer traditional services, and when is it better to have on demand? In this project you could:

- Design metaheuristics/matheuristics for planned or dynamic on-demand transit.
- Investigate the subline-setting problem further.

Rico Krueger

Rico Krueger's DTU ORBIT Profile

Research interests

My research focusses on the development and evaluation of new models, methods and technologies at the interface of behavioural modelling, machine learning and simulation for the planning, management and improvement of human-centric and sustainable transport systems. This includes developing and employing advanced models and algorithms as well as innovative data collection methods, such as immersive virtual reality, to better understand and predict human behaviour and decision-making in transport and mobility. Key application areas of my work include travel demand forecasting, multimodal transport systems, mobility on demand, emerging technologies, sustainability, health and wellbeing.

Supervision style

With me as supervisor, you can expect to have supervision meetings every second week. I am happy to discuss the thesis, its structure and content, but I do not read chapters before the thesis is handed-in. I am happy to help you with your code during the meeting hour, but I do not debug or revise code outside of the meetings. Though we will meet every two weeks, I am flexible and can give you extra supervision when (and if) needed.

Methodologies and expected prerequisites

machine learning, statistical modelling, econometrics, travel demand modelling, virtual reality

Project proposals

Title: MSc Project - Ride-sourcing demand estimation using econometrics and machine learning

Description:

1. **Supervisor:** Rico Krueger
2. **Project group:** External collaborators may provide inputs if needed.
3. **Project background:** Ride-sourcing services like Uber, Didi and Grab have emerged as a popular transport mode in many parts of the world. Despite their worldwide presence, the effects of ride-sourcing services on transport systems are not well understood. On the one hand, ride-sourcing services offer convenient and affordable on-demand transportation with the potential to complement existing transport modes and services. On the other hand, ride-sourcing services may exacerbate transport externalities and cannibalise the demand for other transport modes and services.
4. **Project assignment:** You will implement and apply advanced methods from econometrics and machine learning to analyse the demand for ride-sourcing services at the market share-level using data extracted from API and other sources. Your tasks include:
   - Compile a dataset suitable for the analysis of ride-sourcing demand at a market share-level from APIs and other sources.
   - Conduct a descriptive analysis of the data.
   - Analyse the data using the Inverse Product Differential Logit (IPDL) model and compare the performance of the model against the BLP model.
   - Explore and assess to what extent machine learning methods such as gradient boosting can be used to enhance the performance and expressiveness of IPDL.
   - Apply the estimated model to analyse the welfare implications of ride-sourcing regulations and operational policies.
5. **Prerequisites:**
   - Knowledge of econometrics, statistical modelling and machine learning
   - Knowledge of transport demand modelling and transport economics.
   - Knowledge of Python
6. **Group size:** 2-3

Title: MSc Project - Extended Reality (XR) for Decision-Making in Human-Centric Transportation Systems

Description:

1. **Supervisor:** Rico Krueger, Lui Albæk Thomsen (postdoc)
2. **Project group:** The project may involve collaboration with PhD students and Postdocs working on immersive technology and human decision-making in transportation.
3. **Project background:** As cities shift toward human-centric transportation systems, understanding pedestrian, cyclist, and driver decision-making is key to improving safety, efficiency, and sustainability. Traditional data collection methods lack realism and fail to capture the decision-making process in dynamic environments. The IMMERSION project bridges this gap by integrating Extended Reality (XR) with decision modeling, enabling immersive experiments that simulate real-world transportation scenarios (e.g., pedestrian-autonomous vehicle interactions). This thesis explores how XR-based behavioral data (e.g., response times, gaze behavior) can enhance decision models. Students will design and analyse an XR-based experiment concept, while IMMERSION's technical team handles implementation.
4. **Project assignment:** The core research questions are:
   - How can XR-based experiments improve the validity and realism of behavioral research in transportation?
   - What insights can process data (e.g., response times, eye-tracking, physiological signals) provide in addition to traditional choice data?
   - How can decision models be optimized to leverage process data for improving predictive accuracy?
5. **Tasks & methodology:**
   - Literature Review: Investigate how decision models (e.g., discrete choice models, sequential sampling models) integrate process data in behavioral research.
   - Experimental Concept Design: Develop a concept for an XR-based decision experiment (e.g., pedestrian-autonomous vehicle interaction, wayfinding behavior). The final design must align with IMMERSION's XR capabilities.
   - Hypothesis Development: Define research hypotheses based on how process data could enhance decision modeling.
   - Data Analysis & Modeling: Work with choice and process data collected via IMMERSION's XR system. Apply statistical inference methods (e.g., Bayesian inference, latent variable models) to quantify the relationship between process data on decision-making. Evaluate different behavioral modeling approaches (e.g., machine learning, optimization techniques).
   - Policy & Industry Relevance: Analyze how findings can inform transport planning, infrastructure design, and policy recommendations.
6. **Prerequisites:** Students should ideally have experience in: Operations Research / Management Science (e.g., Decision Support, Statistical Modeling), Data Science & Optimization (Python), Behavioral Experiment Design & Analysis, Knowledge of XR / Simulation Techniques (recommended but not required)
7. **Group size:** Recommended for 2-4 students.

Jasmine Lam

Jasmine Lam's DTU ORBIT Profile

Research interests

Jasmine Lam is a full professor in the Operations and Supply Chain Management area. Jasmine is the Maritime Chair with interest in maritime, port, logistics, innovation, resilience, and sustainability. She focuses on data analytics, decision analysis, intelligent systems, policy recommendations, and interdisciplinary approaches.

Supervision style

With me as supervisor, you can expect to have supervision meetings once in every two or three weeks. The frequency can be adjusted according to the project's progress and our mutual agreement.

Methodologies and expected prerequisites

Multi-criteria decision analysis, operations research, simulation, risk analysis, machine learning, Decision support systems.

Project proposals

Title: MSc Project - Ship-shore communication in the presence of autonomous ships

Description: Supervisors Jasmine Lam and Seyed Parsa Parvasi

Maritime transportation is undergoing a transformative shift with the introduction of Maritime Autonomous Surface Ships (MASS). MASS, as a disruptive technology, has the potential to revolutionize global shipping, emphasizing the need to analyze changes to ship-shore systems for sustainability. However, MASS faces challenges in accurately predicting obstacles' movements and intentions, necessitating advanced navigation technologies and better communication strategies, including MASS-to-MASS and MASS-to-SCC (shore control centers). Safe and efficient communication can be capable by using the advent of Industry 4.0, Internet of Things (IoT), and smart logistics. The overall goal of the project is to develop a safe, secure and smart autonomous ship-shore communication approach to address complexity in ship-shore interfaces. The focus is simulation/ operations research.

This thesis topic will be scoped after discussions with the students to match the methodological background and interest of the student(s). The focus is simulation/ operations research in autonomous ship-shore communication. Prerequisites At least two, preferably more, MSc courses relevant to communication technology, operations management or logistics or transport and methodologies, e.g.: 42417 Simulation in Operations Management, 42380 Supply Chain Analytics.

Title: MSc Project - Optimization of green-fuelled autonomous ships

Description: Supervisors Jasmine Lam and Seyed Parsa Parvasi

Maritime transportation is undergoing a transformative shift with the introduction of Maritime Autonomous Surface Ships (MASS). MASS, as a disruptive technology, has the potential to revolutionize global shipping, emphasizing the need to analyze changes to establish a safe, secure and smart autonomous shipping environment. At the same time, shipping is undergoing green transition to reduce carbon emissions. New developments include adopting green and sustainable alternative marine fuels. The project aims to model for optimization of green-fuelled autonomous ships. The focus is developing an operations research model and solutions.

This thesis topic will be scoped after discussions with the student(s) to match the methodological background and interest of the student(s). The focus is developing an operations research model and solutions for green-fuelled autonomous ships. PREREQUISITES At least two, preferably more, MSc courses in operations research methodologies.

Allan Larsen

Allan Larsen's DTU ORBIT Profile

Research interests

My research falls within applying operations research methodologies such as mathematical programming (meta)-heuristics, and simulation modelling to solve and analyse complex planning problems within supply chain management, logistics and healthcare operations management. Specific research interests: Freight transport and logistics, urban freight transport, and operations within healthcare.

Most of my thesis projects are carried out in collaboration with a company and usually take departure in the student's connection to potential case companies. However, I strongly recommend reaching out to discuss the potential before deciding the topic of the thesis solely with the company.

Supervision style

I offer biweekly supervision meetings. Before the thesis project starts, I will host a kick-off workshop for all students I advise that semester, covering the formalities, structure, and content of the thesis.

I do not review entire chapters prior to submission, but I am happy to discuss parts of the thesis during our meetings. If needed and time permits, I can provide additional supervision outside of our regular meetings. I expect you to work in thesis groups of at least two students.

Methodologies and expected prerequisites

For **MSc thesis students**, I expect that you have taken multiple courses within O&SCM and/or operations research. Specifically, I expect that you have taken at least two of the following courses; 42402 Sustainable Operations and Supply Chain Management, 42417 Simulation in Operations Management, 42380 Supply Chain Analytics and 42403 Advanced Operations Management for Production and Service Systems.

For **BSc thesis students**, I expect that you have taken 42587 Introduction to Operations and Supply Chain Management (or a similar course) and also have interest (or experience) in programming in, e.g. Julia, Python, or similar, enabling you to implement an optimization method.

Project proposals

Title: Optimisation and/or simulation within supply chains and logistics (BSc/MSc)

Description: Efficient and sustainable supply chain management is critical for companies and institutions, especially amid disruptions like pandemics, geopolitical instability, and climate change. Simulation and/or optimisation modelling allow companies to assess potential impacts of changes in e.g. demand and supply and allow more efficient use of resources, implying more sustainable operations regarding economic, climate, and environmental effects.

Theses in this topic typically involve solving real-life problems with company collaboration, using simulation modeling and/or optimization methods. These projects require modeling and implementation, so familiarity with tools like AnyLogic, AnyLogistix, and programming languages such as Julia, Python, or Java is essential.

Title: Last-mile in urban freight transport (BSc/MSc)

Description: Urban freight transport is increasingly challenging due to growing cities (higher demand), citizens' expectations for low response times (higher intensity), and rising traffic congestion (lower travel speed).

This thesis will focus on last-mile logistics, the final steps in the transport chain to the destination, such as a city center or suburban mall. It involves modeling, implementing, and experimenting with vehicle routing problems under city logistics constraints. Examples include multi-echelon distribution planning, considering the design of distribution hubs, satellites, and alternative-fueled vehicles.

Title: Warehouse layout optimization: strategic placement of raw materials, components, and SKUs through simulation and optimization (MSc)

Description: Efficient warehouse layout design is crucial for minimizing operational costs, reducing handling times, and improving overall logistics efficiency. The placement of raw materials, components, and stock-keeping units (SKUs) is important for efficient workflows and mitigating inventory management challenges.

This thesis aims to utilize simulations to assess and test different scenarios and optimize those by leveraging AI, machine learning, and algorithmic approaches.

The thesis will be co-supervised in collaboration with FORCE Technology, providing students with the opportunity to work closely with industry experts.

Title: Circular supply chains in the fisheries (BSc/MSc)

Description: Supply chains in the food sector, including fisheries, face unique challenges due to perishability and the demand for sustainable solutions. Seafood supply chain starts with fish capture (or aquafarming), followed by processing, distribution, and delivery to retailers and customers.

In a recent research project, DTU Management studied processes and methods to minimize food loss and waste (FLW) thereby improving utilization of rest raw materials (RRM), ultimately aiming at increasing the circularity of the seafood supply chain.

This topics will be tailored to students' interests. However, the theses are expected to be based on an optimization approach (meta-heuristics or exact methods) or simulation modeling (discrete-event, agent-based or system dynamics).

Jesper Larsen

Jesper Larsen's DTU ORBIT Profile

Research interests

My main focus is on mathematical optimisation using MIP and LP as well as heuristic methods like metaheuristics or matheuristics. I have covered a wealth of application areas but most of my research is within transportation research.

Supervision style

In general, I aim at a meeting every second week, but along the way we can adapt the set up to the project.

Methodologies

Mathematical modelling (IP, MIP), Metaheuristics, Matheuristics, algorithm design, Transport Optimisation, Production scheduling.

Project proposals

Title: Capacity planning for Copenhagen Central Station

Description: The aim of this project is to establish an optimisation model (exact or heuristic) to generate a schedule for the rush hour at Copenhagen Central Station. All trains in the plan must be specifically routed through the Copenhagen Central station to avoid unwanted complications. The problem consists of routing regional and long distance trains at the Copenhagen central station given a specific timetable. If time permits additional constraints are: optimise buffers between trains on the same platform, ensure north- and south-bound trains on their preferred platforms etc.

Title: Patient Admission Scheduling

Description: Newly admitted patients need a free bed that satisfies both the personal preferences (single, twin room, or a ward) as well as the medical needs of the patient located in the department that is specialized in treating the clinical picture. The assignment of patients to beds is often carried out by a central admission office that individually contacts every appropriate department a few days before the effective admission of the patient. This project should devise and implement a solution approach based on mathematical programming. It is foreseen that the initial parts of the project will consist in developing mathematical models and the second part of implementing and testing the most promising model.

Title: Solar Farm Cable Layout Problem

Description: Solar energy is a renewable and sustainable energy, which gets more and more important in times where humanity aims to reduce the usage of fossil fuels. Photovoltaic modules are used to convert sun light into electricity. Often this is done in large solar farms. We model a solar farm as layered graph, where the power generated by the strings (several connected photovoltaic modules) needs to be conducted through the layers of the graph. For the connection of two vertices there are different types of cables with different capacities and costs. The problem is now to find a cable layout with minimal costs, which does not violate cable or vertex capacities. This project has a focus on developing new matheuristics or new optimal methods based on alternative decomposition techniques.

Title: Pharmaceutical Manufacturing

Description: The production of a pharmaceutical product can be a complicated process. Typically, it is synthesized in batches from quantities of raw material in such a way that the greatest quantity of the final product, having a pre-specified potency, can be manufactured. Complicating issues include the deterioration of the quality of the raw material over time, target batch sizes for the final product, and mixing restrictions on the input raw material. The aim is to devise a mathematical programming model, along with a solution method, to optimize the manufacturing process of a pharmaceutical product. Typically, the objective of the problem is to maximize the quantity of the final product produced; however, here consideration will also be given to the sensitivity of the solution to changes in input parameters. For the solution method, exact and/or heuristic methods may be developed

Richard Lusby

Richard Lusby's DTU ORBIT Profile

Research interests

My research focuses on the design and implementation of effective algorithms for solving large-scale optimization problems found in practice. Decomposition algorithms are a core theme in my research, and I have a growing interest in the use of machine learning methods to enhance conventional Operations Research methods. Application areas include public transportation, logistics, energy, and manpower planning.

Supervision style

A meeting every second week. However, this can be modified depending on how the project is progressing.

Methodologies

Mathematical modelling (IP, MIP), Decomposition algorithms, Metaheuristics, Matheuristics Multi-objective optimization

Project proposals

Title: A heuristic for the sector coupled unit commitment problem

Description: The unit commitment problem is a crucial optimization problem in the analysis of energy systems, determining the optimal schedule of the generation units to meet the demand at a minimal cost. As the energy sector transitions to renewable sources such as wind and solar, the unit commitment problem becomes increasingly complex due to the variability and uncertainty of renewable energy. The *sector-coupled* unit commitment problem considers multiple energy types, e.g., power, district heating, natural gas, hydrogen, etc. A vital part of the green transition is to couple sectors such as PtX which converts power to hydrogen, using surplus heat from, e.g. data centers to heat households as district heating, and large heat pumps to convert power to district heating. Is it possible to construct a (meta-) heuristic for the sector coupled unit commitment problem, which is both fast and finds good solutions? Although the (single sector) unit commitment problem is well studied, not much research considers the sector coupled version. Inspiration can be taken in the numerous heuristics for the (single sector) unit commitment problem, e.g. `https://link.springer.com/article/10.1007/s10479-018-3003-z` and `https://www.mdpi.com/1996-1073/15/4/1296`.

Title: A fast heuristic for the capacity expansion unit commitment problem

Description: The capacity expansion unit commitment problem extends the unit commitment problem by optimizing both the generation schedule and long-term investments in new capacity. This is vital for planning cost-effective and reliable expansions that accommodate the variable generation of renewable energy sources. It balances the trade-offs between building new infrastructure, maintaining system reliability, and minimizing emissions. Is it possible to solve the capacity expansion unit commitment problem heuristically. Many approaches can be taken such as reducing the time domain, constructing math-heuristics, using machine learning to reduce the problem space (e.g. by predicting the unit commitment cost of a given capacity expansion), etc., see e.g., `theliteraturereviewinhttps://link.springer.com/article/10.1007/s11750-019-00519-z`.

Title: Estimating optimal unit commitment values

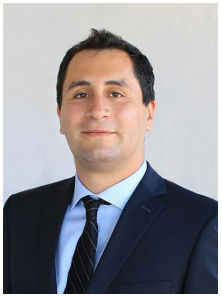
Description: The unit commitment problem is a crucial optimization problem in the analysis of energy systems, determining the optimal schedule of the generation units to meet the demand at a minimal cost. As the energy sector transitions to renewable sources such as wind and solar, the unit commitment problem becomes increasingly complex due to the variability and uncertainty of renewable energy. Is it possible to use regression or (simple?) machine learning for predicting the unit commitment solution value? Inspiration can be taken from `https://www.sciencedirect.com/science/article/pii/S0305054824001862?via%3Dihub`

Title: Dynamic Dial-A-Ride Problems with Fixed Routes

Description: Movia's Flextrafik provides transportation services tailored to elderly individuals and those with disabilities who cannot utilize standard public transportation options. Flextrafik offers door-to-door service, facilitating transportation from a passenger's residence to destinations such as hospitals for medical appointments. This service operates on a demand-responsive basis, without fixed timetables or pre-defined routes. This means that vehicle schedules adapt to transportation requests, which may be booked in advance or arise dynamically in real-time. Flextrafik aims to optimize vehicle schedules for cost efficiency while minimizing inconvenience to passengers. This project focuses on designing optimization tools to assist with the vehicle scheduling process. This project deals with a variant of the so-called *Dial-a-ride* problem (DARP) from the Operations Research literature. The DARP seeks to find a set of minimum cost vehicle routes while satisfying a given number of transportation requests (where each request is defined by a pickup location and a delivery location). This project considers a dynamic variant in which a given percentage of the requests are received in real-time and focuses on developing an on-line optimization algorithm to optimize the vehicle routes in real-time. Furthermore, the impact of combining the pure dial-a-ride aspect of the problem with a set of fixed routes (the location, frequency, and timings to be decided) must be assessed. It is expected that data from Movia will be provided.

Title: Removing redundant columns in column generation

Description: One known downside of using column generation to solve mixed integer programs is that often (many) columns that are not necessary to define any integer solution are generated. Detecting such redundant columns and preventing their generation can have a positive impact on the convergence of column generation, particularly for *time dependent decompositions*. Known approaches add classical Benders cuts in the subproblems to ensure that redundant columns are not generated. The focus of this thesis is on implementing, and investigating the performance of, such an approach on the capacitated lot-sizing problem with setup times and the temporal knapsack problem.



Joe Naoum-Sawaya

Joe Naoum-Sawaya's DTU ORBIT Profile

Research interests

Core: supply chain, logistics, transportation, network design, machine learning
Other: telecommunication networks, water networks, sharing economy

Supervision style

Typically, I schedule weekly meetings, but this can be adjusted based on the project's requirements and progress.

Methodologies

Mathematical modelling, Integer programming, Machine learning.

Project proposals

Title: BSc/MSc Project - Optimization Models for Emergency Evacuation

Description: In several emergency situations, evacuation is a necessary response to move people from danger zones to safer places, in order to reduce the threat on their lives. Many situations, such as wildfires, hurricanes, floods, as well as human-induced events, may require fast evacuation. Since evacuation is sensitive to time and the availability of limited resources (cars, roads, fuel), it is critical to optimize the evacuation process.

The aim of this project is to develop optimization models to preplan the evacuation process in designated areas. The objective is to distribute a set of limited resources (e.g. evacuation vehicles, fuel, medical resources, etc.) to an area that may need future evacuation. The main challenge that needs to be addressed in this research is the modeling of the stochastic nature of the problem due to the underlying uncertainty of emergency situations. Specifically, there can be uncertainties in the availability of (volunteers') vehicles at the time of evacuation, in the number and locations of individuals that need to be evacuated, the status of the roads, and in the locations of the safe zones. This challenge is aggravated by the fact that there may be very limited past data mainly because emergency evacuation events are relatively rare. Thus special data-driven techniques for rare events need to be developed in this project. Prerequisites: Introduction to Operations Research, Markov decision process, and coding skills in Python, C, C++, or Java.

Title: BSc/MSc Project - Container Packing Optimization

Description: Container packing deals with stacking a set of boxes of different shapes, weights, and characteristics in a shipping container to be transported by a truck or by ship. Efficiently packing the container is an important part of logistics operations that impacts costs, safety, and the overall efficiency of operations. Several practical constraints may impact the packing of the container, including the order of the arriving items, the shape of each item, the weight that each item can support, and the desired order of item removal from the container once the container arrives at the destination (or in some cases at multiple destinations).

The aim of this project is to develop an optimization model to find the optimal packing of a container given a set of items that need to be packed. The project requires the development and evaluation of different heuristic methods. Furthermore, it includes the development of a visualization platform that can easily be used to visualize the packed container and guide the operations team in following the recommended packing plan. Prerequisites: Introduction to Operations Research and strong coding skills in Python, C, C++, or Java.

Title: MSc Project - Distributed Optimization Solver

Description: One of the biggest challenges businesses face today is the uncertainty in demand forecasting and inventory management, leading to overstocking or stockouts, and financial losses. Inaccurate demand predictions result in excess inventory costs or lost sales due to insufficient stock, directly impacting a company's profitability and customer satisfaction. Traditional inventory management approaches often fail to adapt to dynamic market conditions, seasonal variations, and unexpected disruptions.

This thesis aims to tackle these challenges by exploring advanced demand forecasting models and optimized inventory management strategies by using AI/ML/algorithms.

The thesis will be co-supervised in collaboration with FORCE Technology, providing students with the opportunity to work closely with industry experts.

Title: MSc Project - Addressing uncertainty in demand forecasting and inventory management

Description: Despite the very rapid development of optimization solvers, the common architecture is to have a solver that runs on a single computer or a centralized computing resource using parallel processes. With that being said, it is well known that many computers are underutilized and highly valuable computing power is wasted without any benefit (in fact wasted computing is responsible for a significant proportion of energy and water usage).

Inspired by Distributed Ledger Technology, the aim of this project is to design a distributed optimization platform. This will necessitate the development of the underlying framework, the protocols, as well as the economics of the solution. It is not expected that the team will develop a complete solution, but to develop a proof-of-concept that validates the solution and makes the case for future developments. Prerequisites: Introduction to Operations Research and strong coding skills in Python, C, C++, or Java with ideally some experience in distributed computing.

Dario Pacino

Dario Pacino's DTU ORBIT Profile

Research interests

My main reserach focus is on the developement of mathematical models and heuristic algorithms for large scale optimization problems. I am also interested in how AI methods such as Reinforcement Learning can be applied to optimization problems. My main application area is maritime optimization, but I have worked also in health-care and generally on transport applications.

Supervision style

With me as supervisor, you can expect to have supervision meetings every second week. I am happy to discuss the thesis, its stucture and content, but I do not read chapters before the thesis is handed-in. I am happy to help you with your code during the meeting hour, but I do not debug or revise code outside of the meetings. Though we will meet every two weeks, I am flexible and can give you extra supervision when (and if) needed.

methodologies and expected prerequisites

Mathematical modelling (IP, MIP), Metaheuristics, Matheuristics, Reinforcement learning, and generally programming experience.

Project proposals

Title: BSc/MSc Project - Optimization stowage planning

Description: When a vessel arrives a port, cargo needs to be loaded. This loading process is called stowage planning. A stowage plan describes the precise position that each piece of cargo should have on the vessel. Stowage plans need to follow a strict set of rules to ensure the vessel is stable, and their position on the vessel has a large impact on the time the vessel stays at port and the emission it will generate.

Several different thesis projects can be derived from this topics, which will depend on the vessel type (RORO or container), on the level of details to include, and on the methodology to use (**Metaheuristics, Branch & Price, Mathematical modelling, Reinforcement Learning**, etc.)

Title: BSc/MSc Project - Maritime terminal optimization

Description: Terminals are the service provides for cargo handling in ports. A terminal is a candy store of optimization problems, that can fit any methodological interests that you might have. A thesis within this topic can focus on operational problems such as planning the cargo loading operations, or on tactical problems such as planning the berthing schedule of a number of collaborating terminals.

In particular I find very interesting the use of **metaheuristics** or **reinfocement learning** for the planning or cargo loads where arrival times are uncertain.

Title: MSc Project - Generic heuristic solve for binary models

Description: Heuristics and metaheuristics are notoriously hard to implement and maintain, and as a consequence most optimization experts revert to mathematical programming. Unfortunately, mathematical programming is not able to solve all problems. Research on **metaheuristics** is often limited to either specific application areas or classical problems, and little knowledge is available on model-based approaches.

In this project we aim at taking the first steps into the implementation of a general purpose heuristic solver for 0/1 Integer Programming (IP) models. Your task will be to implement and test one or more heuristic procedures for the general class of binary 0/1 integer programs.

David Pisinger

David Pisinger's DTU ORBIT Profile

Research interests

My reserach is focused on designing applicable solution methods for large scale optimization problems. The problems can be based on real-life applications, or simple problems that make it possible to develop new theory and solution methods. I work on problems in transportation problems, maritime optimization, decision making under uncertainty, energy systems, wind farm design, and knapsack problems

Supervision style

You can expect to have supervision meetings every second week. Before the meeting send me 3-5 pages you have written on your thesis since last meeting, and/or a list of questions. During the meeting we discuss the project, and make a plan for the coming two weeks. I love to discuss algorithms, but I assume that you can do the coding yourself.

methodologies and expected prerequisites

Algorithms, Graphs/Networks, Metaheuristics, MIP-models, Good programming skills.

Project proposals

Title: MSc Project - Energy production planning

Description: The Unit Commitment problem (UC) is to select which units to produce energy over the coming time horizon in order to minimize operational costs. The problem is important both on a daily scheduling basis, but also when planning future investments in new power plants, wind farms, or solar plants. In Denmark, Energinet is the main infrastructure owner, responsible for ensuring that sufficient energy is available for the industry and households. To improve efficiency, and hence meet our targets for more sustainable energy, the energy systems are becoming more coupled. This means for instance, that electricity can be used in the direct form, or transformed to heat through heat pumps. Furthermore, we may have heat storage, that save energy to future time slots. The Unit Commitment problem is difficult to solve (it is an NP-hard problem) and in order to support strategic decisions we often need to solve the problem for 10-20 years on an hourly basis. Therefore, it would be very interesting to implement fast heuristics that provide near-optimal solutions in very short time.

Title: MSc Project - Optimizing baggage handling

Description: Copenhagen airport is one of the largest airports in Scandinavia, handling more than 20 millions of passengers per year. An important part of the airport operation is to handle checked-in baggage, such that it effortlessly (for the passenger) arrives at the end destination. The baggage handling consists of several phases: Baggage drop-off, security scanning, early baggage storage, sorting, loading, unloading, baggage reclaim. Each of the phases demand some resources that can be optimized. The goal of the project is to use the existing resources in the best possible way such that more passengers can be handled without investment in new infrastructure.

Past projects have included: Check-in counter assignment, algorithms for early baggage storage, assignment of boxes in the sorting facility, optimization of belts in baggage reclaim area. The concrete project will be discussed and scoped with Copenhagen Airport.

Title: MSc Project - Offshore wind farm layout

Description: Wind farms provide renewable energy at low marginal cost, complementing and supplementing other renewable energy sources like solar energy and biogas. The offshore wind farm design problem consists of several sub-tasks: Selecting the correct wind turbine, locating turbines and sub- station(s) within the available area to maximize energy production, cable selection, and finally cable routing. Heuristics and/or mathematical models can significantly reduce the cost of energy, making the green transition easier.

Stefan Røpke

Stefan Røpke's DTU ORBIT Profile

Research interests

Core: Vehicle routing, integer programming, decomposition methods, meta-heuristics, maritime transport. Other: Collaborative game theory, stochastic programming, AI/machine learning, financial optimization, sustainability, public transport.

Supervision style

In general, I aim at a meeting every second week, but along the way we can adapt the set up to the project.

Methodologies

Mathematical modelling (IP, MIP), Metaheuristics, Matheuristics, AI/Machine learning, Branch and Price

Project proposals

Title: Solving real life vehicle routing problems

Description: Real-life vehicle routing problems typically contain more complicated constraints or objective functions compared to the standard problems studied in the literature. In this project, we will work with a company that specializes in vehicle routing software and the exact topic of the project will depend on what the company currently is working on and the interests of the student group.

Title: BSc/MSc Project - Portfolio optimization

Description: Portfolio optimization is a quantitative investment strategy that aims to construct an investment portfolio with the highest possible expected return for a given level of risk or the lowest possible risk for a given level of expected return. It's a crucial concept in finance and asset management, helping investors make informed decisions about how to allocate their assets to achieve their financial goals. A book about the subject is `https://link.springer.com/content/pdf/10.1007/978-3-319-18482-1.pdf` (you can download it when at DTU or use DTU's VPN connection).

The project should be based on an Operations Research model, but the project can include elements from finance, forecasting or machine learning as desired.

Title: MSc Project - Automatic Dantzig-Wolfe decomposition

Description: At DTU we have done research on how to automatize Dantzig-Wolfe decomposition. A goal of the research has been to develop methods that solve mixed integer programming programs using Dantzig-Wolfe decomposition and column generation without any user involvement. In the long run, such methods could be embedded into solvers like CPLEX or Gurobi and improve their performance on certain problem classes. The master thesis can look into a specific question related to automatic Dantzig-Wolfe decomposition such as:

- Detect structure that allows us to split the mathematical model into master- and sub-problems.
- Devise heuristics to solve sub-problems to speed up the convergence of the algorithm.
- Binary decision diagrams (see `https://www.andrew.cmu.edu/user/vanhoeve/papers/DD_TutORial.pdf`) have shown promise for solving certain pricing problems. A master thesis could look into whether it is possible to detect such sub-problems automatically and solve them using binary decision diagrams.

Title: BSc/MSc Project - Operations research, renewable energy sources, power-to-X, hybrid power plants, alternative fuels

Description: With this project we invite students to propose their own thesis topic within operations research, focusing on areas such as renewable energy sources, power-to-X, hybrid power plants, and alternative fuels. Your research could contribute to planning solar farm design, usage of renewable fuels in transport, scheduling fuel production, or something completely different. MSc projects could involve collaboration with Total Energies, Blue Power Partners or a company the student is in touch with.

Lara Schilling

Lara Schilling's Google Scholar Profile

Research interests

My research focuses on sustainable supply chain management, particularly emphasizing the intersection of digital technologies and their implementation in emerging markets. I examine how digital transformation can improve supply chain practices, fostering both sustainability and resilience. To explore these complex dynamics, I employ a mix of qualitative and quantitative empirical methods, including case studies, ethnography, discourse analysis, and surveys.

Supervision style

I offer supervision meetings every two weeks to discuss your thesis's structure and content. While I do not review individual chapters before final submission, I am happy to provide guidance during our meetings as needed. This process serves as a standard framework, but my mentoring style is flexible so that we can tailor the approach to meet the needs of your project best. I encourage students to work in working groups of at least two members.

Methodologies and expected prerequisites

I recommended to have completed course 42402 Sustainable Operations and Supply Chain Management.

Project proposals

Title: A case study on supply chain resilience (MSc)

Description: Global supply chains are often shaped by the complex interplay between the formal structures of multinational firms and the informal networks of traditional micro-entrepreneurs in emerging markets. Understanding these dynamics is essential for enhancing supply chain resilience. This thesis uses a case study from the dairy sector to explore how these two systems interact. The research involves collecting interview data from the Danish dairy industry and analyzing (already collected) data from the dairy sector in Pakistan to gain deeper insights into their relationship.

Title: A critical discourse analysis of circular supply chains (MSc)

Description: This research project explores the social implications of value retention options within the circular economy, moving beyond its commonly emphasized environmental benefits. It examines how value retention practices in the Global South intersect with initial value creation in the Global North, shedding light on potential inequalities and power dynamics. Focusing on the textile industry, the study employs a critical discourse analysis of circular economy narratives to uncover underlying assumptions and socio-economic consequences. The research involves conducting interviews, collecting secondary data, and applying qualitative content analysis to assess how these dynamics shape labor conditions, livelihoods, and local economies.

Thomas Stidsen

Thomas Stidsen's DTU ORBIT Profile

Research interests

Research in optimization approaches, both mathematical model formulation and specialized optimization algorithms for the models. Primary application areas are: Educational timetabling, man-power planning and multi-objective optimization.

Supervision style

With me as supervisor, you can expect to have supervision meetings every second week. I am happy to discuss the thesis, its structure and content, but I do not read chapters before the thesis is handed-in. I am happy to help you with your code during the meeting hour, but I do not debug or revise code outside of the meetings. Though we will meet every two weeks, I am flexible and can give you extra supervision when (and if) needed.

Methodologies

Mathematical modelling (LP, IP, MIP), Metaheuristics, Matheuristics, Multi-Objective methods, Benders Decomposition, Column Generation/Branch & Price

Project proposals

Title: BSc/MSc Project - Conference Planning

Description: For large conferences, scheduling the presentations into timeslots and rooms is a large complicated task which is always done under hard timepressure. In this project the EURO/IFORS conferences are considered as test cases. These are large conferences with more than 3000 participants.

Expected methods applied in the thesis work are: **Mathematical modelling, Mathheuristics, and Metaheuristics**.

Title: BSc Project - Scheduling Train Cleaning at DSB

Description: DSB wants to plan the cleaning of their trains such that the trains are clean, but the the cleaning is not excessive costly. Although the cleaning is done by an external contractor the schedule for the cleaning is made by DSB and then forwarded to the contractor. The cleanings can only be performed at designated stations on the route. The process of developing the schedules for the cleaning is currently being done manually with no or very little system support.
Expected methods applied in the thesis work are: **Mathematical modelling and Mathheuristics**.

Title: MSc Project - Integrated train driver at DSB

Description: DSB has two types of drivers. There are the classic train drivers who drive the commercial departures on the main tracks and there are the station drivers who only drive within the station on local tracks. The train drivers are allowed to drive on some tracks within a station but not necessarily all and the station drivers are not allowed to drive on any main tracks out side a station. The station drivers are normally attached to a specific station whereas the train drivers vary w.r.t. what part of the rail network they are allowed to drive. The duties of any driver are composed by task derived from the rolling stock schedule.
Expected methods applied in the thesis work are: **Mathematical modelling, Mathheuristics and Column Generation/Branch & Price**

Title: BSc Project - Exam room allocation at DTU

Description: Every semester DTU plans the written exams in a large number of rooms. Help the DTU planners to do it optimally: Given a set of written exams, a set of students, select the rooms and timeslots for the exams. Notice, the dates for the exams are given, but the time of day and room needs to be decided. Expected methods applied in the thesis work are: **Mathematical modelling and Mathheuristics**