

# Major in Systems and Operations Research

<http://sal.aalto.fi/>



Aalto-yliopisto  
Aalto-universitetet  
Aalto University

25.4.2023

# Professors

<https://sal.aalto.fi/en/personnel/>



**Fabricio Oliveira**

- Stochastic optimization
- Supply networks



**Philine Schiewe**

- Transportation planning
- Scheduling
- Logistics



**Ahti Salo**

- Decision analysis
- Risk management
- Investment science



**Kai Virtanen**

- Military operations research
- Simulation



**Risto Lahdelma**  
(50% at ENG)

- Energy systems
- Linear optimization



**Adj. prof. Afzal Siddiqui**

- Energy economics
- Equilibrium modelling



**Raimo Hämäläinen**  
(emeritus 8/2016 →)

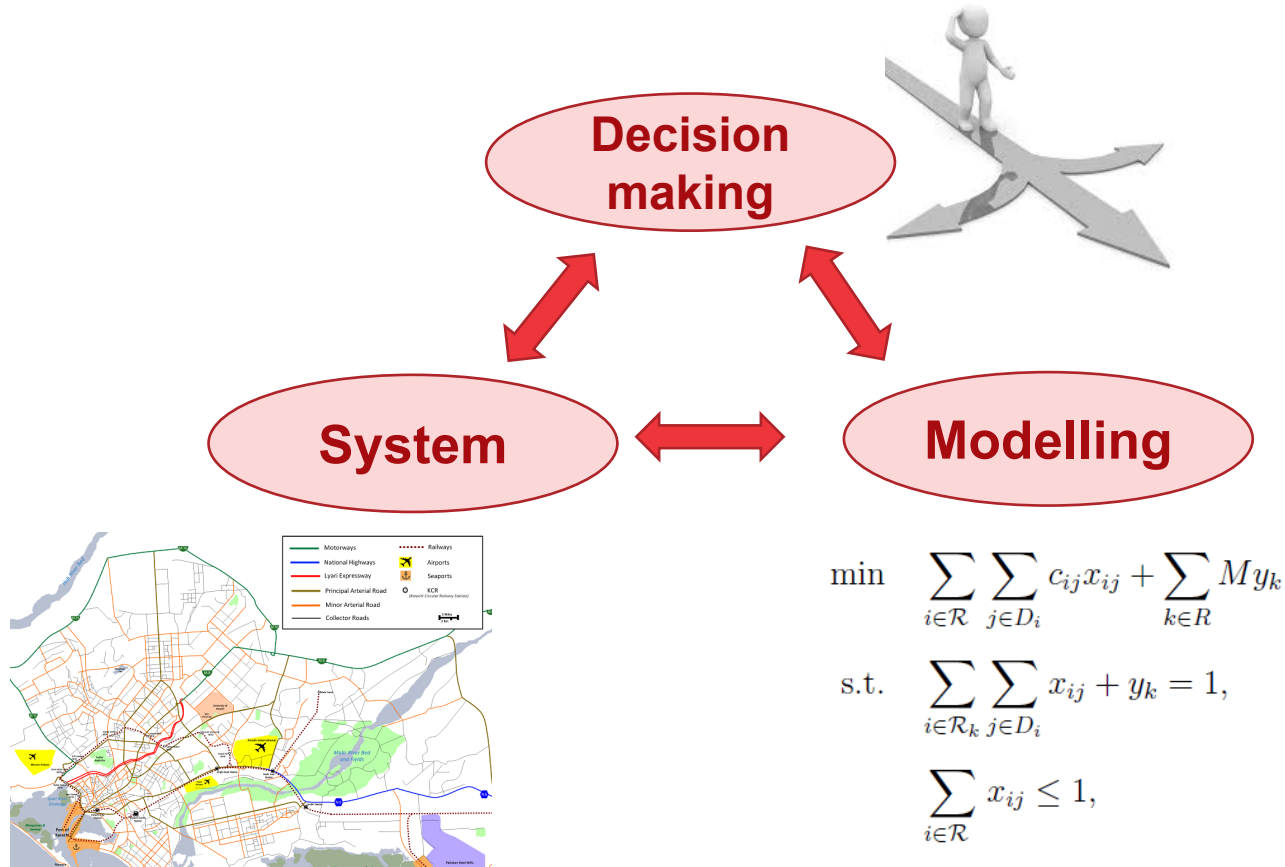
- Behavioural OR
- Systems intelligence



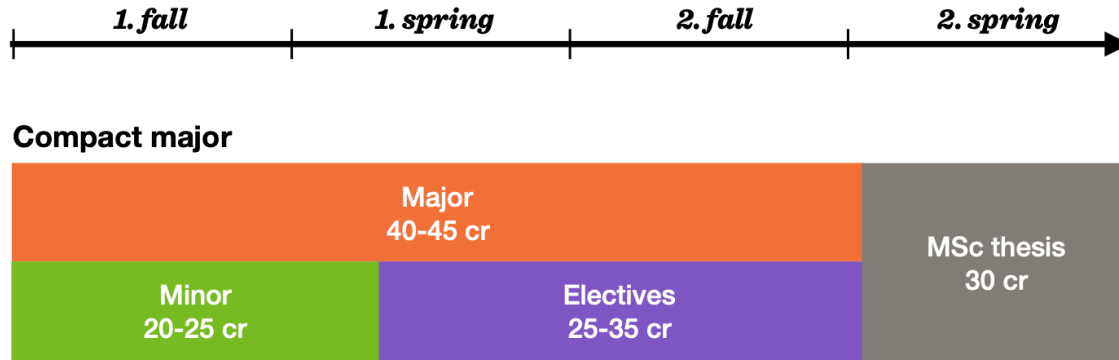
**Harri Ehtamo**  
(emeritus 3/2021 →)

- Optimization
- Game theory

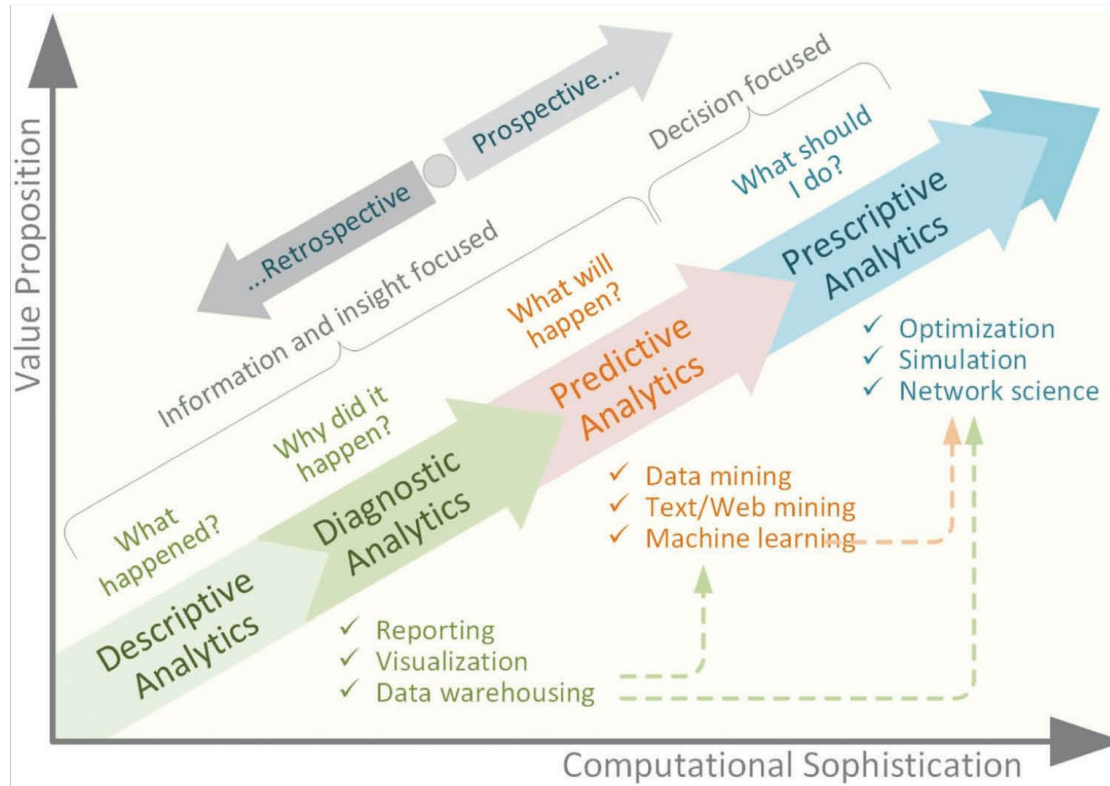
# Pillars of Operations Research



# Systems and Operations Research is a compact major



# Dimensions of analytics



# Major's courses

## Mandatory courses



## Additional MS-EXXX courses for completing 40-45 ECTS include





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I N F O R M S

Transactions on Education



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## A Seminar for Solving Client Problems in Project Teams


Ahti Salo

Systems Analysis Laboratory, Department of Mathematics and Systems Analysis, Aalto University School of Science,  
00076 Aalto, Finland, [ahti.salo@aalto.fi](mailto:ahti.salo@aalto.fi)

We describe the course “Seminar on Case Studies in Operations Research” in which teams of four or five students work on real problems posed by firms and governmental research institutions. In this course, which is taught at Aalto University School of Science, students use operations research to solve these problems and also develop teamwork, communication, and project management skills. Since 2001, the student teams have carried out more than 60 projects of which many have had significant business and societal impacts. We discuss experiences from this course and consider implementation details that have contributed to the attainment of learning objectives.

*Key words:* collaborative learning; group projects; teaching with projects; team teaching

*History:* Received: June 2011; accepted: July 2012.

 MS-E2177 - Seminar on Case Studies in Operations Research (V) D, Lecture, 13.1.2023-9.6.2023

Project topics for 2023 are proposed by:

1. [Finnish Defence Forces](#): Assessment of design options for border control
2. [UPM](#): Decision process playbook for consequential decisions
3. [SOK Group](#): Workforce scheduling of holidays
4. [S-Pankki](#): Allocation of transaction risks to loss given defaults
5. [Varma](#): Impacts of solvency requirements on optimal asset allocation
6. [Veritas](#): Changes in the investment market regimes in the post-Covid era



Previous years' project plans and reports are available under "[Deliverables from previous seminars](#)"



# Exchange and internship possibilities

- Industrial/ business MSc thesis worker positions



# Career opportunities

Our MSc alumni have *two* main career paths

- **Business/ industry/ government placements**
- **Doctoral studies towards a research career**

**An exceptional alumni network**



# Operations Research Analysts

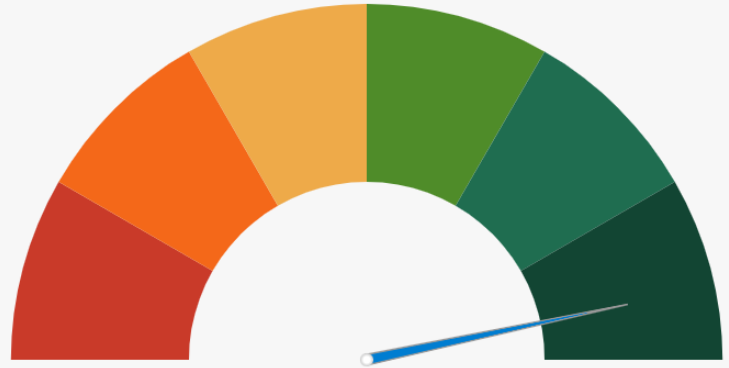
## What do they do?

Formulate and apply mathematical modeling and other optimizing methods to develop and interpret information that assists management with decisionmaking, policy formulation, or other managerial functions. May collect and analyze data and develop decision support software, services, or products. May develop and supply optimal time, cost, or logistics networks for program evaluation, review, or implementation.

### Also known as:

Advanced Analytics Associate, Analytical Strategist, Decision Analyst, Operations Research Analyst, Optimization Analyst

## Projected Growth Rate i



**Much faster than average**

Employment of Operations Research Analysts is projected to grow 25 percent from 2018 to 2028, much faster than average compared to all occupations.

# Research @ SAL

The Systems Analysis Lab  
employs researchers  
(doctoral students)

A career path for those interested  
in scientific training

*D.Sc. (Tech.)* opens doors for  
research and academic position

Summer job opportunities as  
research assistants

## Key research areas

1. Operations research in defense
2. Energy and climate change policies
3. Risk analysis of safety critical systems
4. Transportation systems and logistics
5. Environmental decision making
6. Innovation and technology strategies

# Doctoral careers



**Anna Repo**  
Natural Resources Institute  
Finland (Luke)



**Lassi Ahlvik**  
University of Helsinki



**Juuso Liesiö**  
Aalto BIZ



**Vilma Virasjoki**  
Fingrid

# inclus

Inclus erikoistuu yhteisen ymmärryksen rakentamiseen: työkalumme auttavat tunnistamaan, ymmärtämään, visualisoimaan ja hallitsemaan riskejä läpi organisaation avainprosessien. Inclusin asiantuntemus on lähtöisin rauhanvälityksestä, jossa olemme olleet rakentamassa ratkaisuja 15:llä maailman vaikeimmalla konfliktialueella. Inclusin taustalla olevia menetelmiä on kehitetty yhteistyössä Aalto yliopiston systeemianalyysin laboratorion kanssa.



DI Juha Törmänen  
Teknologiajohtaja  
Inclus

Inclusin osaamiseen ja fasilitointiin luotettiin presidentti Sauli Niinistön isännöimissä ja Risto Siilasmaan johtamissa talousryhmän Kultaranta-keskusteluissa 2020, missä arvioitiin COVID-19:ta vaikutuksia talouteen. Keskusteluun, mielipiteiden esittämiseen ja tuloksien esittämiseen käytettävä aika oli rajattua, mutta Inclus tarjosi alustan jolla saatiin kerättyä, järjestettyä ja arvioitua keskusteluissa esitetyt riskit niiden lyhyt- ja pitkävaikutteisten vaikutusten ja vakavuuden perusteella. Lisäksi arvioitiin myös riskien ratkaisuehdotuksia.

<https://www.inclus.com/>



**Dr Kimmo Soramäki**

Founder and CEO

Network Topology, System Mechanics  
and Behavioral Dynamics in Interbank  
Payment Systems

Aalto University publication series

**DOCTORAL DISSERTATIONS 75/2012**



FNA's technology enables decision makers and business analysts to easily uncover hidden connections, access and understand complex networks and create dashboards & simulations.

## Discover

Uncover hidden connections and anomalies in large, complex datasets, and then visualize and monitor them via interactive dashboards.



## Optimize

Enhance and configure systems and networks for optimal performance using proven and proprietary algorithms.



## Simulate

Deploy simulations to predict the impact of stress events within systems and networks.



<https://www.fna.fi/>



<http://euro2022espoo.com/>

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# EURO-2022

ESPOO, FINLAND  
3 - 6 JULY 2022

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<http://ada2024.aalto.fi/>

## 2024 INFORMS Advances in Decision Analysis Conference

ADA 2024 | July 10-12, 2024 | Helsinki-Espoo, Finland

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Welcome

The fifth 2024 INFORMS Advances in Decision Analysis Conference will be held July 10-12, 2024 at Aalto University, Helsinki-Espoo, Finland

