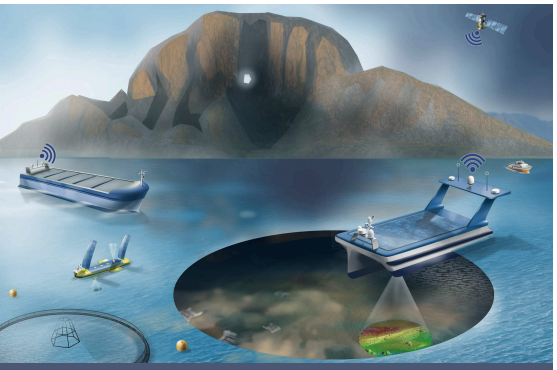
SFI · AUTOSHIP
Autonomous ships

SPRING NEWSLETTER 2025



Spring greetings from the Centre Director

SFI AutoShip has now entered its 2nd phase and the underway evaluation, conducted by the Research Council of Norway, is completed. We are very proud of our 3 researchers, Daniel, Lukas and Spencer, who submitted their dissertations this semester. We thank them for their great efforts and are excited to follow up on their future activities. We would also like to welcome our new researchers, Martin, Johannes and Mikkel, who are bringing great enthusiasm and expertise in the Centre, and wish them best of luck. With a great capacity for sea trials (MA1, Elly) and the 26 innovation leads reported by the Innovation and Commercialization Committee (ICC), we look forward to many exciting and rewarding research activities ahead!
Anastasios M. Lekkas

Publications so far in 2025

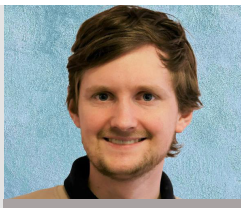
Journal papers:
11, of which 2 are co-written with industry partners
Conference papers: 3

News and partner collaboration

- Pauline Røstum Bellingmo (SINTEF Ocean) has taken over as WP5 leader after Odd Erik Mørkrid. We thank Odd Erik for all his efforts, and welcome Pauline to the WP management.
- The COLREG working group has been meeting regularly, and has recently focused on legal and computer engineering aspects of COLREG compliance, to be developed in a paper.
- Several Use Case meetings have been held to onboard new researchers and improve Use Case collaboration.
- The ICC and the Board have discussed and endorsed the updated portfolio of innovation leads.

PhD and PD status

3 new researchers were recruited: PD Martin Baerveldt, PhD Johannes Robert Skarø and PhD Mikkel Bergstrand, all in WP1. They are the final researchers to be hired in the Centre, and will work on situational awareness and mission planning, supervised by Edmund F. Brekke (Baerveldt and Skarø) and Anastasios M. Lekkas (Bergstrand).


Martin Baerveldt


Johannes R. Skarø


Mikkel Bergstrand

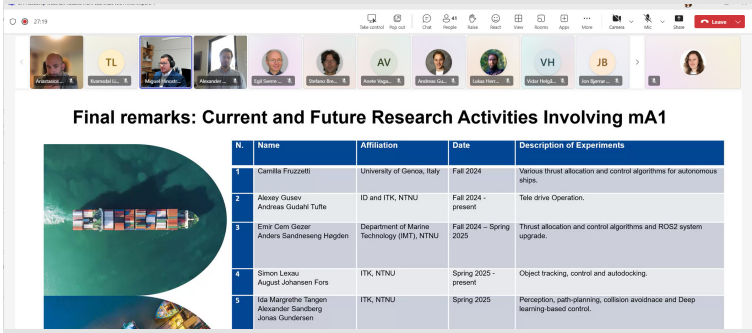
3 PhD theses were submitted and 1 PhD completed during the spring semester. Daniel Menges (WP1) defended his PhD "Digital Twin for Situational Awareness and Optimal Control of Autonomous Surface Vessels" in May. Luka Grgičević (WP3) and Spencer Dugan (WP4) have submitted and are awaiting defence.


Daniel Menges' PhD defence. Left-right: Kostas Alexis, Tom Arne Pedersen, Kari Koskinen, Daniel Menges and Adil Rasheed. Photo: Markus Lindner/NTNU

Sea trials with milliAmpere1. Left right: Anastasios M. Lekkas, Miguel Hinostroza and Alexander Sandberg. Photo: Simon Lexau/NTNU

Testing and sea trials

During the spring semester, PhD and PD researchers and MSc students have carried out sea trials with vessels including SINTEF's **Elly** and NTNU's **milliAmpere 1**, focusing on among other things radar target detection and tracking algorithms, collision avoidance, dynamic positioning, and control allocation.



Final remarks: Current and Future Research Activities Involving mA1

N.	Name	Affiliation	Date	Description of Experiments
1	Camilla Fruzzetti	University of Genoa, Italy	Fall 2024	Various thrust allocation and control algorithms for autonomous ships.
2	Alexey Gusev Andreas Gudahl Tufte	ID and ITK, NTNU	Fall 2024 - present	Tele drive Operation.
3	Emir Cem Gezer Anders Sandneseng Hegden	Department of Marine Technology (IMT), NTNU	Fall 2024 – Spring 2025	Thrust allocation and control algorithms and ROS2 system upgrade.
4	Simon Lexau August Johansen Fors	ITK, NTNU	Spring 2025 - present	Object tracking, control and autodocking.
5	Ida Margrethe Tangen Alexander Sandberg Jonas Gundersen	ITK, NTNU	Spring 2025	Perception, path-planning, collision avoidnace and Deep learning-based control.

Webinars

- **Open Crane Design System** (WP3, NTNU), March 11
- **Results from sea trials with milliAmpere1** (WP1, NTNU), June 18
- **Simulating Situational Awareness for Performance Requirements and testing Collision Avoidance Systems using Signal Temporal Logic** (WP2, NTNU and DNV), June 23

International collaboration

- SFI personnel have visited and presented the Centre at IMO in London, Ecole Centrale and INSA in Lyon, and UC Berkeley and UC Santa Cruz, and received delegations from Nordic 5 Tech and the University of Singapore in Trondheim.
- Continued collaboration and visits from PhD researchers Camilla Fruzzetti (University of Genoa) and Liz Dietrich (UC Berkeley).

Researcher workshop

On March 17, 60 participants including researchers as well as industry partners from DNV, Gard, Kongsberg Maritime, Maritime Robotics, Massterly and Torghatten, attended our researcher workshop. The aim of the event was to update and develop the innovation leads of each of the SFI researchers.

The WP3 parallel session during the researcher workshop in March. Photo: Ingeborg Guldal/NTNU

Meet our graduates:
PhDs completing or submitting their PhDs during spring 2025

Daniel Menges

What was your project about?
Autonomous ships must navigate complex environments while maintaining awareness of their surroundings and internal systems. This PhD project focused on improving situational awareness and using that knowledge for optimal control through digital twins. Reliable perception is essential for safe and efficient operation. By creating detailed virtual models of the vessel, this research enhances decision-making through smarter data integration, predictive capabilities, and advanced control techniques. It introduces adaptive methods to estimate environmental forces, proactive strategies for collision avoidance, and efficient algorithms for anomaly detection and big data processing. We developed learning-based approaches to enhance control adaptability, safety-focused strategies for robust operation, and multi-target tracking methods that fuse LiDAR and AIS data to improve situational awareness. These advancements enable autonomous vessels to operate with greater efficiency, safety, and intelligence.

What have you achieved during your PhD?
Beyond the extensive knowledge I have gained over the past three years, my PhD has resulted in seven journal papers and four conference papers, with me serving as the main author on eight of them. I have consistently targeted high-quality journals and conferences to ensure the broadest impact of my work. I have presented my research at several international conferences across different continents, as well as in multiple SFI webinars, project meetings, and discussions with industry partners. These experiences have allowed me to engage with the global research community and establish valuable academic connections. In addition, I broadened my perspective by experiencing a different research environment during my research stay at INESC TEC in Porto, where I collaborated with the Centre of Robotics and Autonomous Systems (CRAS).

What will you do next?
I am currently in the application phase, seeking a new researcher position. Driven by my passion for research and curiosity, I aim to find a role where I can apply my expertise in control, machine learning, and optimization while also expanding my knowledge into new domains.

Luka Grgičević

What was your project about?
Future maritime traffic is expected to increase in density. Centralised systems for guidance decision support are envisioned to be integrated in centres for vessel traffic services. For large number of traffic participants driven by metrics for operational efficiency and safety, multiplayer game-theoretical tools could be deployed. We investigated non-cooperative games and stable Nash equilibria solutions.

What have you achieved during your PhD?
The three-year project was filled with good ideas that are summarised in four research papers, all openly available online. A notable result is PULSE, a novel algorithm for centralised maritime traffic management utilising polymatrix games and evolutionary dynamics on graphs that outputs a series of waypoints for each vessel to follow.

Main take-aways from SFI AutoShip:
Being part of this centre for research-based innovation has been rewarding in many aspects for which I will be forever grateful. It elevated my knowledge in many disciplines and further developed the soft skills. I was privileged to collaborate with experienced and brilliant researchers and industry partners that helped in shaping my PhD project research objectives.

What will you do next?
I plan to continue my career in the private sector. Since the results are applicable to many real-world problems it will be interesting to continue the research on this methodology.

PhD and PD status

- We congratulate **Daniel Menges** on his completed PhD and **Luka Grgičević** and **Spencer Dugan** on having submitted their theses. Luka's defence is scheduled for August.
- 2 additional candidates are expected to submit in the summer.