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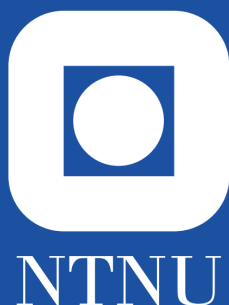
International Conference of Scandinavian Simulation Society

SIMS 2022

Trondheim, Norway, September 20-21, 2022

NTNU

SIMS Scandinavian Simulation Society

Contents

About

SIMS

SIMS is the Scandinavian Simulation Society with members from the five Nordic countries Denmark, Finland, Norway, Sweden and Iceland. The SIMS history goes back to 1959.
SIMS practical matters are taken care of by the SIMS board. It consists of two representatives from Denmark, Finland, Norway, Sweden, and Iceland.
SIMS annual meeting takes place at the annual SIMS conference or in connection to international simulation conferences arranged in the Nordic countries.

www.scansims.org

Hosting Institutions

NTNU Norwegian University of Science and Technology
OsloMet Oslo Metropolitan University
USN University of Southeast Norway
UiS University of Stavanger

Norwegian organizing committee

Ambrose Ugwu
Berthe Dongmo-Engeland
Britt Moldestad
Corinna Netzer
Debbie Koreman van den Bergh

Gaurav Mirlekar
Haoran Li
Kristian Thorsen
Lars Ivar Hatledal
Lars O. Nord

Marcin Pilarczyk
Nils-Olav Skeie
Tiina Komulainen
Vadim Engelson

KL: Keynote Lecture, IT: Invited Industry Talk, PS: Parallel Sessions, LT: Lab Tour

Monday, 19 of September

18:30–19:00	On-site registration at Trondheim Camping
19:00	Social event: Indoor mini-golf at Trondheim Camping Olav Tryggvasons gt. 5

Tuesday, 20 of September

8:30–9:00		Registration, Radisson Blu Royal Garden Hotel		
9:00–9:20		Welcome remarks		
9:20–10:00	KL	**Terese Løvås** NTNU, Trondheim	How can numerical modelling support exploring ammonia as a carbon-free fuel?	
10:10–11:10	PS	Medical Applications	CO_2 Capture I	District Heating, Cooling & Resources
11:10-11:30		Coffee break		
11:30–12:30	PS	Sustainable Fuel Production & Purification I	CO_2 Capture II	Control Engineering I
12:30–14:00		Lunch break		
14:00–14:30	IT	**Even Solbraa**, Equinor	Development and user experience for an online simulator for natural gas dehydration processes	
14:30–15:00	IT	**Adriaen Verheyleweghen**, Cybernetica	Industrial physics-based non-linear model predictive control	
15:00–15:20		Coffee break		
15:20–16:40	PS	Sustainable Fuel Production & Purification II	Electric Power	Control Engineering II Solver & Method Development
16:40		End of day 1		
16:45–17:45		SIMS General Meeting		
19:00		Conference Dinner - AiSuma, Kjøpmannsgata 57		

Wednesday, 21 of September

8:45	**Taxis are leaving at the Hotel [1]**			
9:00–10:30	LT	Lab tour at Gløshaugen Campus		
10:30–11:10	**Walk [1] Gløshaugen Campus to Radisson Blu Royal Garden Hotel**			
11:10-11:30	**Coffee break**			
11:30–12:30	PS	Oil Production	Multiphase Modelling I	Data-Driven Modelling I
12:30–14:00	**Lunch break**			
14:00–15:00	PS	Buildings	Multiphase Modelling II	Data-Driven Modelling II
15:00–15:20	**Coffee break**			
15:20–16:40	PS	Fluidized Beds	Multiphase Modelling III	Heat to Power Applications
16:40-17:00	**Best Paper Awards & Closing**			
17:00	**End of Conference**			

[1]Please contact Debbie Koreman van den Bergh if you would like to use a taxi to Gløshaugen Campus: debbie.w.koreman@ntnu.no

Conference Locations

Trondheim can be reached via the Airport **Trondheim Lufthavn, Værnes (TRD)** or via train to **Trondheim sentralstasjon**. From the airport, two convenient options are available to travel to Trondheim city center. Travel time for both options is 30 - 40 minutes:

Bus: Værnes-Ekspressen departs in front of the arrival zone. Tickets can be purchased directly on the bus or online. The bus stop "bakkegata" to Radisson Blu Royal Garden Hotel is typically announced by the driver.

Train: to **Trondheim sentralstasjon**. Follow the signs from the arrival zone to the track. Tickets can be purchased via the app **AtB Mobillett**. The Radisson Blu Royal Garden Hotel is within 10 minutes walking distance from **Trondheim sentralstasjon**.

Talks will be held at the **Radisson Blu Royal Garden Hotel**, Kjøpmannsgata 73, 7010 Trondheim, in rooms **Olav Tyggvasson I, Olav Tyggvasson II+III** and **Sverreborg**. The rooms are situated on the second floor.

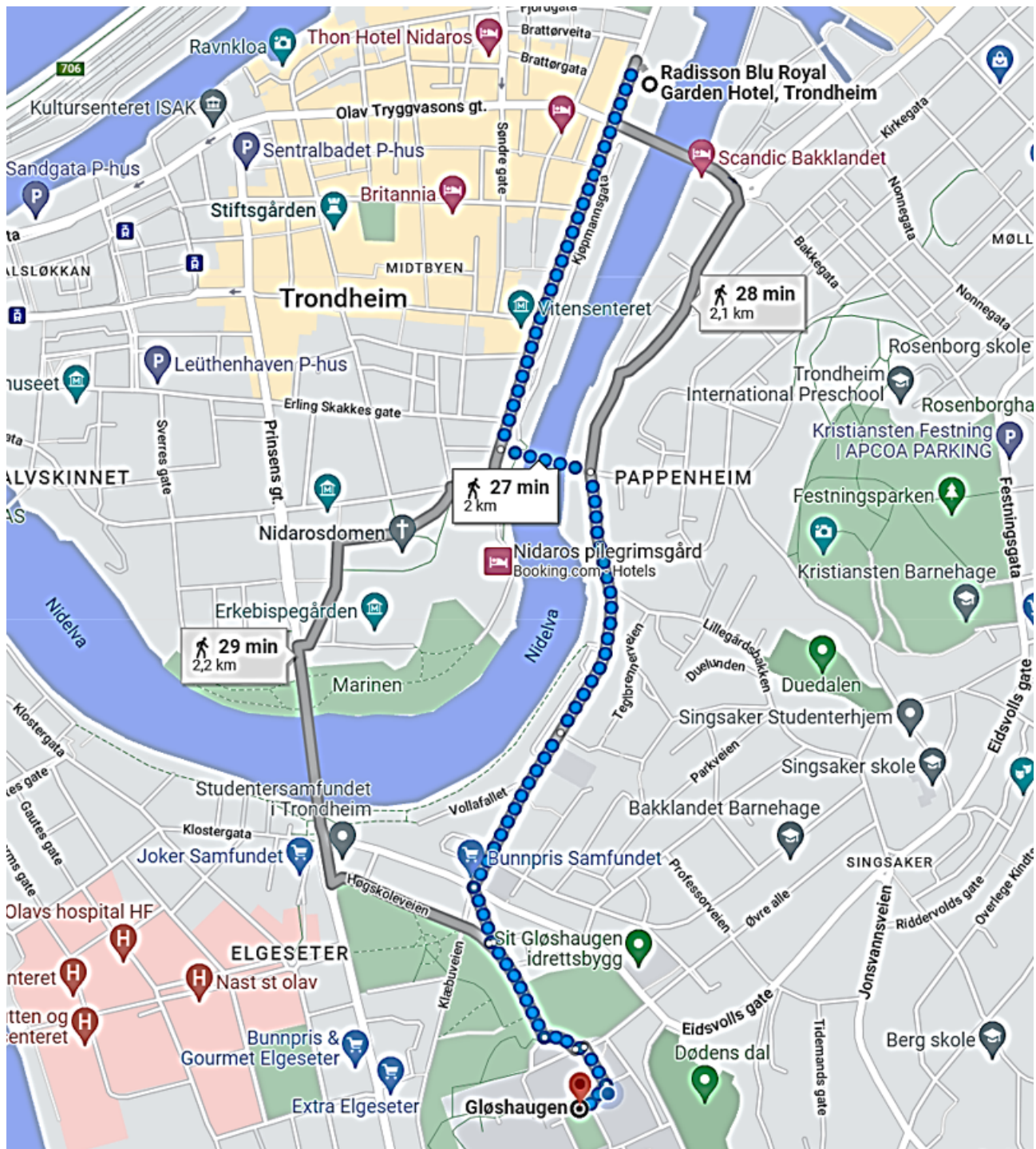The **social event** will be a fun round of Mini-golf and drinks at **Trondheim Camping**, Olav Tryggvasons gt. 5. Trondheim Camping is directly located in the city center and within 5 minute walking distance from the hotel.
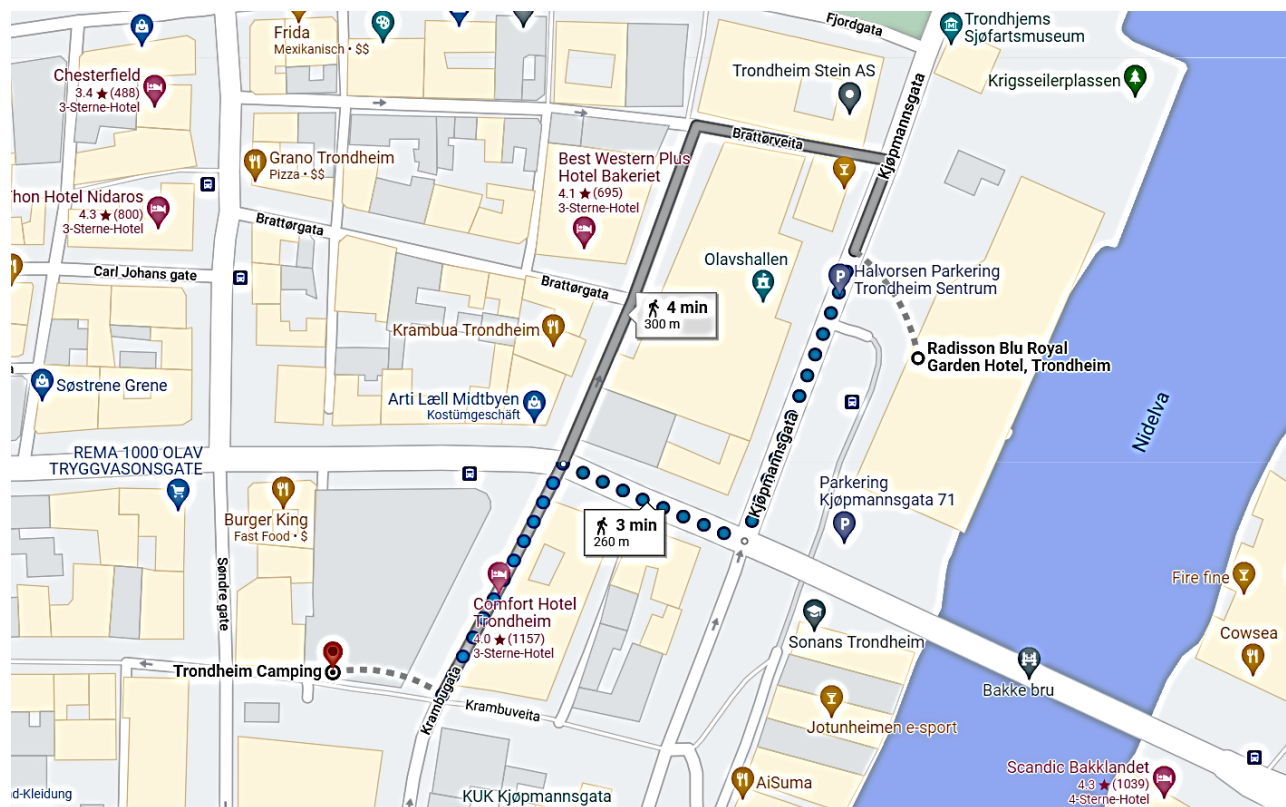
For the **conference dinner** we invite you to **AiSuma Restaurant**, Kjøpmannsgata 5, Trondheim. The restaurant is within 5 minutes' walking distance from the hotel just along the street.
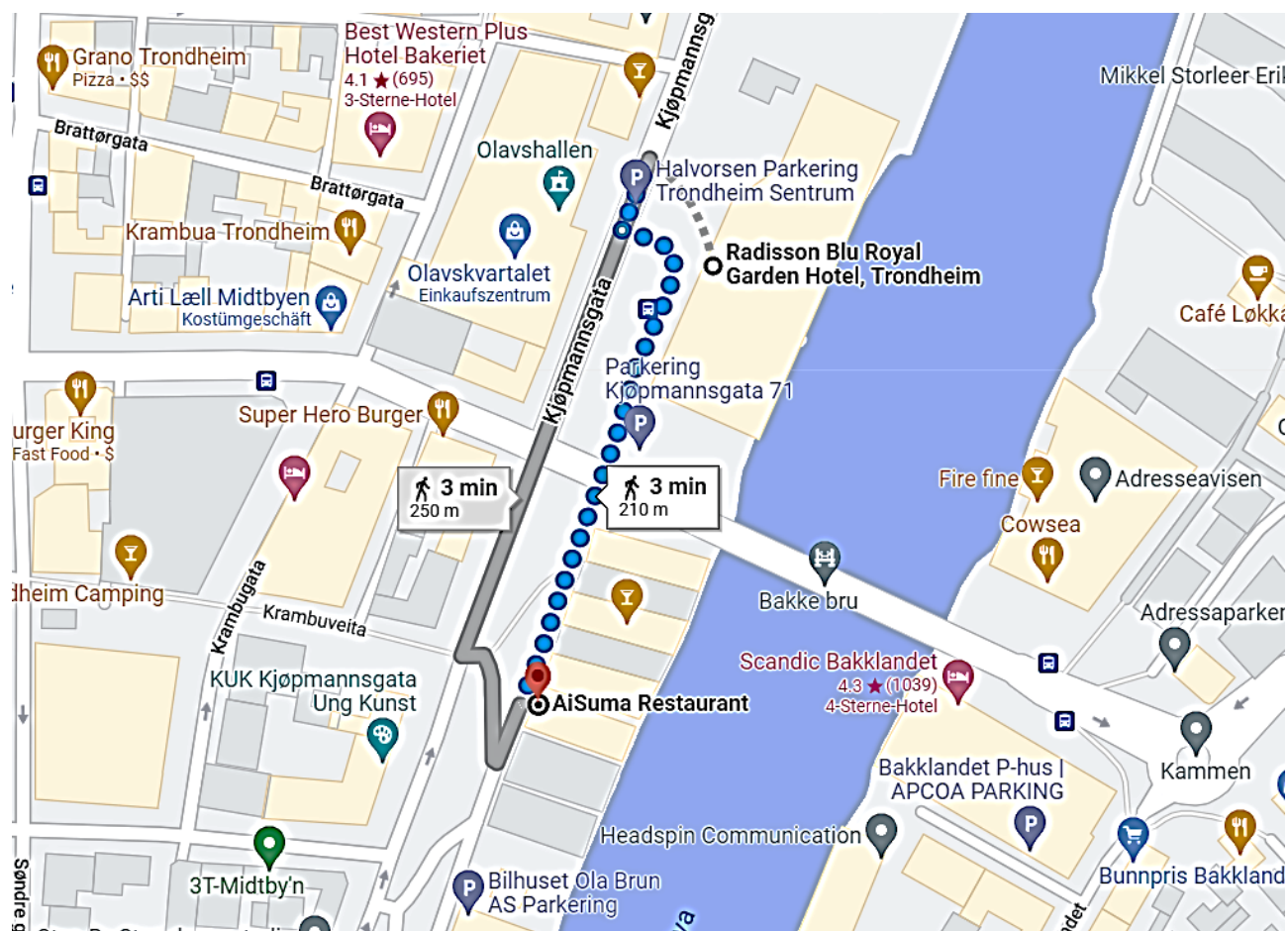
The **lab tour** will take place at **Gløshaugen (main NTNU campus)**. The meeting point is behind the main building and in front of the Varmeteknisk lab. To reach the Gløshaugen Campus we recommend taking a 30 minutes walk through the beautiful neighborhood "bakklandet" (Routes marked with 27 and 28 min).

Scientific Program

Tuesday, 20 of September

8:30–9:00		Registration, Radisson Blu Royal Garden Hotel		
9:00–9:20		**Welcome remarks** Corinna Netzer & Tiina Komulainen room: Olav Tryggvason II+III		
9:20–10:00	KL	**Terese Løvås** NTNU, Trondheim	**How can numerical modelling support exploring ammonia as a carbon-free fuel?** chair: Corinna Netzer, room: Olav Tryggvason II+III	
	PS	**District Heating, Cooling & Resources** chairs: Yiyu Ding & Tiina Komulainen room: Olav Tryggvason I	**CO_2 Capture I** chairs: Lars Erik Øi & Ruben Mocholi Montanes room: Olav Tryggvason II+III	**Medical Applications** chairs: Kristian Thorsen room: Sverresborg
10:10–10:30	PS	Simulation of different scenarios for resource utilization. Uncertainties, availability, and fair distribution of global resources *Erik Dahlquist, Stefan Hellstrand and Madeleine Martinsen*	Offshore CO2 Capture from gas turbine with low investment optimized using Aspen HYSYS *Lars Øi, Fatemeh Fazli and Rajan Thapa*	Simulation of Flow in the Human Upper Airways Modeled as a Piping System Using the Hydraulic Diameter *Thor Gudmund Weisz, Bernhard Müller and Reidar Kristoffersen*

10:30–10:50	PS	A fast and effective method for modelling and optimizing district heating systems in the Modelica language *Haoran Li, Juan Hou and Natasa Nord*	Reducing the CO2 Emissions of a Gas Cracker by Reforming Fuel Gas *Emmy Kristine Lindeløff Rustad, Lars Erik Øi and Klaus Joachim Jens*	Analysis of human respiratory droplets in indoor environment: A numerical study *Ole Martinius Harket Norbeck, Oda Martine Sundsdal, Suresh Kumar Nambully and Arnab Chaudhuri*
10:50–11:10	PS	Temporal Fusion Transformer for thermal load prediction in district heating and cooling networks *Fabian Behrens, Stefan Leiprecht, Jonas Brantl and Matthias Finkenrath*	Process Simulation and Automated Cost Optimization of CO2 Capture Using Aspen HYSYS *Lars Øi, Pouya Rahmani, Sumudu Karunarathne and Solomon Aromada*	Uncertainty quantification and sensitivity analysis during the development and validation of numerical artery models *Friederike Schäfer, Jacob Sturdy, Mateusz Mesek, Aleksander Sinek, Ryszard Białecki, Ziemowit Ostrowski, Bartłomiej Melka, Marcin Nowak and Leif Rune Hellevik*
11:10-11:30	Coffee break			
	PS	**Sustainable Fuel Production & Purification I** chairs: Marianne Eikeland & Lasse Borg Anderson room: Olav Tryggvason I	**CO$_2$ Capture II** chairs: Lars Erik Øi & Ruben Mocholi Montanes room: Olav Tryggvason II+III	**Control Engineering I** chairs: Gaurav Mirlekar & Tiina Komulainen room: Sverresborg
11:30–11:50	PS	Anaerobic Co-Digestion of Products from Biosolids Pyrolysis – Implementation in ADM1 *Gudny Øyre Flatabø and Wenche Hennie Bergland*	Mathematical Models for Physicochemical Properties of Different Amine-based Solvents in Post combustion CO2 Capture *Sumudu Karunarathne, Jeanette Larsen and Lars Erik Øi*	An improved delay and state observer for SISO LTI systems with known delay lower bound *Jonas Ingebretsen and Damiano Rotondo*

Tuesday, 20 of September

11:50–12:10	PS	Dynamic modeling of diafiltration system for a biorefinery application *Markku Ohenoja, Pekka Uusitalo, Hanna Valkama, Buddhika Rathnayake, Riitta L. Keiski and Mika Ruusunen*	Process simulation of CO2 absorption data fitted to performance efficiency at TCM Mongstad *Lars Øi, Njål Sæter, Neda Razi and Sumudu Karunarathne*	Optimal operation of grid-connected hydropower plants through voltage control methods *Emil Ghieh Melfald and Thomas Øyvang*
12:10–12:30	PS	Effect of temperatures on anaerobic granulated biofilm modelling *Anissa Sukma Safitri and Roald Kommedal*	Density and viscosity correlations of aqueous solvents for amine-based CO2 capture *Sumudu Karunarathne, John Ikechukwu Okoro, Saroj Neupane and Lars Erik Øi*	Control strategies preventing wastewater overflow in Oslo *M. Halid Seyhan and Tiina Komulainen*
12:30–14:00	**Lunch break**			
		Invited Industry Talks chair: Ambrose Ugwu, room: Olav Tryggvason II+III		
14:00–14:30	IT	**Even Solbraa**, Equinor	Development and user experience for an online simulator for natural gas dehydration processes	
14:30–15:00	IT	**Adriaen Verheyleweghen**, Cybernetica	Industrial physics-based non-linear model predictive control	
15:00–15:20	**Coffee break**			

		Sustainable Fuel Production & Purification II chairs: Lasse Borg Anderson & Michal T. Lewandowski room: Olav Tryggvason I	Electric Power chairs: Lars O. Nord & Mohammad Ali Motamed room: Olav Tryggvason II+III	Control Engineering II Solver & Method Development chairs: Gaurav Mirlekar & Tiina Komulainen room: Sverresborg
	PS			
15:20–15:40	PS	Simulation of the Effect of Local Electric Potential and Substrate Concentration on CO2 Reduction via Microbial Electrosynthesis *Vafa Ahmadi and Carlos Dinamarca*	LSTM-based PSS Design for Modern Power Systems *Khaled Aleikish and Thomas Øyvang*	Application of Autonomous Inflow Control Valve for Enhanced Bitumen Recovery by Steam Assisted Gravity Drainage *Soheila Taghavi Hosnaroudi, Farzan Farsi Madan, Ramesh Timsina and Britt M. E. Moldestad*
15:40–16:00	PS	Aspen Hysys simulation of the methanol synthesis based on gas from biomass gasification *Morten A. Fossen, Johann Halvorsrød, Thomas Narvestad, Sander Tjemsland, Ramesh Timsina and Marianne Eikeland*	Himalayan Run-Off River Power Generation Modelling for Power Security in Evolving Weather Conditions *Swaechchha Dahal, Thomas Øyvang, Gunne John Hegglid, Shailendra Kumar Jha and Bhupendra Bimal Chhetri*	Developing Voltage Droop/Compensation Controller for a Hydro Power Controller in Modelica *Luxshan Manoranjan and Dietmar Winkler*
16:00–16:20	PS	A Comparative Model - Analysis on Sulphide Bio-oxidation with Different Electron Acceptors *Vibeke B. Karlsen, Carlos Dinamarca and Gamunu Samarakoon*	Part load performance of PEM fuel cell and electrolyser stacks in hybrid energy system for offshore application *Marcin Pilarczyk, Luca Riboldi and Lars Nord*	Integrating energy in the conceptual design stage to optimize building form *Niloofar Zaker Vafaee, Melika Sandani, Tahmineh Akbarinejad, Matteo Tagnocchetti, Bunji Izumi and Luca Finocchiaro*

Tuesday, 20 of September

16:20–16:40	PS	Steam reforming of methane over a nickel-based catalyst *Rakhi, Vivien Günther, Jana Richter and Fabian Mauss*	A Ray Tracer for optimizing solar concentrating systems: The case of discretized Compound Parabolic Concentrator *Casiana Lwiwa and Ole Nydal*	Comparison and Application of Multi-Rate Methods for Real-Time Simulations of Production Systems *Lars Klingel, Valentin Kamm and Alexander Verl*
16:40	**End of day 1**			
16:45–17:45	**SIMS General Meeting - room: Sverresborg**			
19:00	**Conference Dinner - AiSuma, Kjøpmannsgata 57**			

Wednesday, 21 of September

8:45		Taxis are leaving at the Hotel [2]		
	LT	**Lab Tour 1**		**Lab Tour 2**
9:00–10:30	LT	CO2 Heat Pump Space Heating System Laboratory District Heating Consumer Substation Laboratory Battery Laboratory Heat-to-Power Laboratory Phase Change Material (PCM) Laboratory		ZEB Laboratory (Zero Emission Building)
10:30–11:10		**Walk [2] Gløshaugen Campus to Radisson Blu Royal Garden Hotel**		
11:10-11:30		**Coffee break**		
	PS	**Oil Production** chairs: Britt Moldestatt & Zhe Ban room: Olav Tryggvason I	**Multiphase Modelling I** chairs: Corinna Netzer & Rakhi room: Olav Tryggvason II+III	**Data-Driven Modelling I** chairs: Valentin Formont & Candy Deck room: Sverresborg
11:30–11:50	PS	Enhanced oil recovery using CO2 injection and inflow control devices *Stian Juvet Sørensen, Joachim Rød Knarrum, Lars Lia, Ole-Christian Kristoffersen Sannes, Ramesh Timsina, Haavard Aakre and Britt Margrethe Emilie Moldestad*	Modeling of the two-phase flow during depressurization of liquified CO2 in a pipe *Osama M. Ibrahim, Prasanna Welahettige, Knut Vågsæther and Bernt Lie*	Checking data informativity as the first step in data-driven modeling – case study *Amir Farzin, Kateryna Rabchuk, Bernt Lie and Nils-Olav Skeie*

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[2]Please contact Debbie Koreman van den Bergh if you would like to use a taxi to Gløshaugen Campus:
debbie.w.koreman@ntnu.no

Wednesday, 21 of September

11:50–12:10	PS	Modeling and analysis of secondary oil recovery with water flooding from a heterogeneous reservoir through advanced wells. *Onkar Bhujange, Ali Moradi, Britt Moldestad and Amaranath Kumara*	Modelling of liquid injection of ammonia in a GDI injector using RANS simulation *Jessica Gaucherand, Corinna Netzer, Michal Lewandowski and Terese Løvås*	Oil Production Forecasting with Uncertainty Description Using Data Driven Proxy Model *Javad Tavakolifaradonbe, Ali Moradi and Britt Margrethe Emilie Moldestad*
12:10–12:30	PS	Parameter and State Estimation for an Oil Production Model using Julia *Zhe Ban, Carlos Pfeiffer and Bernt Lie*	Development of central-upwind-WENO scheme for two-phase 1-D drift-flux model in pipe flow *Prasanna Welahettige, Chiristian Berg and Bernt Lie*	Assessment of data-driven approaches for dynamic modelling of sub-critical coal-fired boiler *Valentin Formont, Vidar Skjervold and Lars Nord*
12:30–14:00	**Lunch break**			
	PS	**Buildings** chairs: Haoran Li & Berthe Dongmo-Engeland room: Olav Tryggvason I	**Multiphase Modelling II** chairs: Ning Guo & Rakhi room: Olav Tryggvason II+III	**Data-Driven Modelling II** chairs: Valentin Formont & Candy Deck room: Sverresborg
14:00–14:20	PS	Simulation-Based Life Cycle Assessment for Office Building Façade: A Case Study of the Leadenhall Building in London *Tahmineh Akbarinejad Khameneh, Zahir Barahmand and Gamunu Samarakoon*	CFD Simulations of Flow Jetting Impact and High Erosion Region in a Production Choke and its Downstream Spool *Nikhil Bagalkot, Arvind Keprate, Eric Stephen, Kristian Ringstad, Jon Ramstad and Agastian Perinpasivam*	Machine Learning for Predictive Maintenance of pumps at "Den Magiske Fabrikken" *Martin Holm, Ozgur Yalcin, Håkon Viumdal and Carlos Pfeiffer*

Time				
14:20–14:40	PS	Unsteady flow analysis of hinged and sliding door openings *Fredrik Kihlberg, Øystein Formo Hermansen and Arnab Chaudhuri*	Spray drop size characterization in an external-mixing bluff-body atomizer based on acoustics and Multivariate Analysis *Raghav Sikka, Maths Halstensen and Joachim Lundberg*	Comparison of machine learning approaches for spectroscopy applications *Ioanna Aslanidou and Jerol Soibam*
14:40-15:00	PS	Experimental PDE solver in Julia – comparison of flux limiting schemes *Amir Farzin, Zahir Barahmand and Bernt Lie*	Evaluation of Complex Spray Behaviors of Sprinkler Spray Using FDS *Joachim Lundberg and Rajath Ramachandran*	Machine learning techniques for modeling chemical absorption in CO_2 capture process *Huilan Zheng, Gaurav Mirlekar and Lars Nord*
15:00–15:20		**Coffee break**		
	PS	**Fluidized Beds** chairs: Vidar T. Skjervold & Rajan Kumar Thapa room: Olav Tryggvason I	**Multiphase Modelling III** chairs: Ning Guo & Corinna Netzer room: Olav Tryggvason II+III	**Heat to Power Applications** chairs: Luca Riboldi & Ambrose Ugwu room: Sverresborg
15:20–15:40	PS	Eulerian-Lagrangian simulation of air-steam biomass gasification in a bubbling fluidized bed gasifier *Nastaran A. Samani and Marianne S. Eikeland*	Modelling interfacial properties and physical features of phases at thermodynamically equilibrium using Phasepy as a framework based Phyton *Javad Tavakolifaradonbe, Sumudu Karunarathne and Knut Vågsæther*	Development of a simulation tool for design and off-design performance assessment of offshore combined heat and power cycles *Mohammad Ali Motamed and Lars O. Nord*

Wednesday, 21 of September

15:40–16:00	PS	Study of gasification behavior for a biorefinery lignin waste in a fluidized bed gasification reactor *Saugata Ghosh, Ramesh Timsina and Britt M E Moldestad*	Simulation of adsorption and desorption of VOC on activated carbon *Sviatoslav Eroshkin, Even Solbraa and Eivind Johannesen*	Design optimization of small-scale ORC waste heat-to-power cycles for fluctuating heat source and sink *Donghoi Kim, Rubén M. Montañés, Luca Riboldi, Lars O. Nord, Jan Spale and Vaclav Novotny*
16:00–16:20	PS	Simulation and optimization of screw feeder in a bubbling fluidized bed gasification reactor *Trym Fehn Vaa, Oddvin Vaa, Rajan Jaiswal, Mladen Jecmenica and Rajan K Thapa*	Modelling particle degradation and intermediate dynamics in a dispersed activated sludge microcosm *Kristin T. Ravndal and Roald Kommedal*	Numerical modelling of fin side heat transfer and pressure loss for compact heat recovery steam generators *Johan Espelund, Geir Skaugen and Ole Meyer*
16:20–16:40	PS	Influence on the fluidization pattern of a freely bubbling fluidized bed with different modes of air supply *Rajan Jaiswal, Britt M. E. Moldestad, Marianne S. Eikeland and Rajan Kumar Thapa*	Mesh Sensitivity Analysis of an Entrained Flow Biomass Gasifier: A CPFD Study *Ramesh Timsina and Zahir Barahmand*	Method for mean-line design and performance prediction of one-stage axial turbines *Lasse Borg Anderson, Lars O. Nord and Roberto Agromayor*
16:40-17:00	**Best Paper Awards & Closing** Lars O. Nord room: Olav Tryggvason II+III			
17:00	**End of Conference**			