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Saeed Salehi

Associate Professor of Fluid Mechanics at Linköping University

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2 Appointments

Associate Professor
2025 – present

Linköping University
Appointed at the Division of Applied Thermodynamics and Fluid Mechanics, Department of Management and Engineering. My research focuses on combining data-driven methods and artificial intelligence with Computational Fluid Dynamics (CFD) to develop efficient and reliable methods for simulation, model reduction, control, and uncertainty quantification of fluid flows.

Researcher
2023 – 2025

Employed by Chalmers Industriteknik (CIT), conducting research on the application of artificial intelligence and machine learning in computational fluid dynamics. More information about my role at CIT can be found at chalmersindustriteknik.se/en/coworkers/saeed-salehi.
I am currently, hired by Chalmers University of Technology for a project on "Artificial Intelligence in Fluid Dynamics for Improving the Lifetime of Hydraulic Turbines".

Postdoc
2019 – 2023

Chalmers University of Technology
Project: New operating procedures of hydropower for a sustainable energy system During my postdoctoral position, my research focused on developing advanced numerical methods in OpenFOAM to simulate the transient operations of hydraulic turbines. I also expanded my expertise in data-driven and machine-learning approaches, particularly in the field of reduced-order modeling, such as Proper Orthogonal Decomposition (POD) and Dynamic Mode Decomposition (DMD). The research resulted in several publications in high-impact, peer-reviewed journals and an open-source software package for simulating hydraulic turbine transients, which is being utilized by Vattenfall, a leading energy company in Sweden.

3 Education

PhD. University of Tehran, Mechanical Engineering, Hydraulic Machinery
2012 – 2018 Thesis: Uncertainty quantification of turbulent flows in hydraulic machinery
Supervisors: Prof. Mehrdad Raisee, Prof. Michel Cervantes, Prof. Ahmad Nourbakhsh
The thesis investigates the impact of operational and geometrical uncertainties on the performance of hydraulic machinery, extending uncertainty quantification (UQ) to this critical field using polynomial chaos expansion (PCE). To address the high computational costs of traditional UQ methods, I developed efficient techniques such as compressed sensing and multifidelity ℓ_1 minimization, validated through both analytical and CFD problems. Real-world case studies demonstrate that combined operational and geometrical uncertainties significantly influence the flow and performance of hydraulic pumps. This work advances UQ methods, contributing to more robust and reliable hydraulic machinery design.

MSc. University of Tehran, Mechanical Engineering, Energy Conversion
2010 – 2012 Thesis: Computation of steady and pulsating turbulent flow through a straight asymmetric diffuser with moderate adverse pressure gradient
Supervisors: Prof. Mehrdad Raisee, Prof. Michel Cervantes

BSc. University of Tehran, Mechanical Engineering
2006 – 2010 Thesis: Large eddy simulation of stall development around airfoils

4 Publications lists

4.1 Peer-reviewed journal papers

The list of publications is presented in reverse chronological order. Contributor Roles Taxonomy (CRediT) of all peer-reviewed journal papers are summarized in Table 1.

[1] Mohammad Sheikholeslami, **Saeed Salehi**, Wengang Mao, Arash Eslamdoost, and Håkan Nilsson. "Physics-informed neural networks with hard and soft boundary conditions for linear free surface waves". *Physics of Fluids* 37.8 (2025), p. 087158. ISSN: 1070-6631. DOI: 10.1063/5.0277421.

[2] Jonathan Fahlbeck, Håkan Nilsson, Mohammad Hossein Arabnejad, and **Saeed Salehi**. "Performance characteristics of a contra-rotating pump-turbine in turbine and pump modes under cavitating flow conditions". *Renewable Energy* (2024). DOI: 10.1016/j.renene.2024.121605.

[3] **Saeed Salehi**. "An efficient intrusive deep reinforcement learning framework for OpenFOAM". *Meccanica* (2024). DOI: 10.1007/s11012-024-01830-1.

[4] Faiz Azhar Masoodi, **Saeed Salehi**, and Rahul Goyal. "Reorganization of flow field due to load rejection driven self-mitigation of high load vortex breakdown in a Francis turbine". *Physics of Fluids* 36.9 (2024), p. 094110. ISSN: 1070-6631. DOI: 10.1063/5.0222739.

[5] **Saeed Salehi** and Håkan Nilsson. "Modal analysis of vortex rope using dynamic mode decomposition". *Physics of Fluids* 36.2 (2024), p. 024122. ISSN: 1070-6631. DOI: 10.1063/5.0186871.

[6] Faiz Azhar Masoodi, **Saeed Salehi**, and Rahul Goyal. "Formation and evolution of vortex breakdown consequent to post design flow increase in a Francis turbine". *Physics of Fluids* 36.2 (2024), p. 025116. ISSN: 1070-6631. DOI: 10.1063/5.0187104.

[7] **Saeed Salehi** and Håkan Nilsson. "A semi-implicit slip algorithm for mesh deformation in complex geometries, implemented in OpenFOAM". *Computer Physics Communications* 287 (2023), p. 108703. ISSN: 0010-4655. DOI: 10.1016/j.cpc.2023.108703.

[8] Jonathan Fahlbeck, Håkan Nilsson, and **Saeed Salehi**. "Surrogate based optimisation of a pump mode startup sequence for a contra-rotating pump-turbine using a genetic algorithm and computational fluid dynamics". *Journal of Energy Storage* 62 (2023), p. 106902. ISSN: 2352-152X. DOI: 10.1016/j.est.2023.106902.

[9] **Saeed Salehi** and Håkan Nilsson. "Effects of uncertainties in positioning of PIV plane on validation of CFD results of a high-head Francis turbine model". *Renewable Energy* 193 (2022), pp. 57–75. ISSN: 0960-1481. DOI: 10.1016/j.renene.2022.04.018.

[10] **Saeed Salehi** and Håkan Nilsson. "Flow-induced pulsations in Francis turbines during startup - A consequence of an intermittent energy system". *Renewable Energy* (2022). ISSN: 0960-1481. DOI: 10.1016/j.renene.2022.01.111.

[11] Jonathan Fahlbeck, Håkan Nilsson, and **Saeed Salehi**. "A head loss pressure boundary condition for hydraulic systems". *OpenFOAM Journal* 2 (2022), pp. 1–12. DOI: 10.51560/ofj.v2.69.

[12] **Saeed Salehi**, Håkan Nilsson, Eric Lillberg, and Nicolas Edh. "An in-depth numerical analysis of transient flow field in a Francis turbine during shutdown". *Renewable Energy* 179 (2021), pp. 2322–2347. ISSN: 0960-1481. DOI: 10.1016/j.renene.2021.07.107.

[13] **Saeed Salehi** and Håkan Nilsson. "OpenFOAM for Francis turbine transients". *OpenFOAM Journal* 1 (2021), pp. 47–61. DOI: 10.51560/ofj.v1.26.

[14] Jonathan Fahlbeck, Håkan Nilsson, and **Saeed Salehi**. "Flow Characteristics of Preliminary Shutdown and Startup Sequences for a Model Counter-Rotating Pump-Turbine". *Energies* 14.12 (2021). ISSN: 1996-1073. DOI: 10.3390/en14123593.

[15] Mohamad Sadeq Karimi, Mehrdad Raisee, **Saeed Salehi**, Patrick Hendrick, and Ahmad Nourbakhsh. "Robust optimization of the NASA C3X gas turbine vane under uncertain operational conditions". *International Journal of Heat and Mass Transfer* 164 (2021), p. 120537. ISSN: 0017-9310. DOI: 10.1016/j.ijheatmasstransfer.2020.120537.

[16] Akbar Mohammadi Ahmar, **Saeed Salehi**, and Mehrdad Raisee. "Uncertainty quantification of the turbulent flow field and heat transfer of film cooling (in Persian)". *Journal of Solid and Fluid Mechanics* 10.2 (2020), pp. 177–192.

[17] Mohamad Sadeq Karimi, **Saeed Salehi**, Mehrdad Raisee, Patrick Hendrick, and Ahmad Nourbakhsh. "Probabilistic CFD computations of gas turbine vane under uncertain operational conditions". *Applied Thermal Engineering* 148 (2019), pp. 754–767. ISSN: 1359-4311. DOI: 10.1016/j.applthermaleng.2018.11.072.

[18] **Saeed Salehi**, Mehrdad Raisee, Michel J. Cervantes, and Ahmad Nourbakhsh. "On the flow field and performance of a centrifugal pump under operational and geometrical uncertainties". *Applied Mathematical Modelling* 61 (2018), pp. 540–560. DOI: 10.1016/j.apm.2018.05.008.

[19] **Saeed Salehi**, Mehrdad Raisee, Michel J. Cervantes, and Ahmad Nourbakhsh. "An efficient multifidelity ℓ_1-minimization method for sparse polynomial chaos". *Computer Methods in Applied Mechanics and Engineering* 334 (2018), pp. 183–207. DOI: 10.1016/j.cma.2018.01.055.

[20] Ali Salehpour, **Saeed Salehi**, Samaneh Salehpour, and Mehdi Ashjaee. "Thermal and hydrodynamic performances of MHD ferrofluid flow inside a porous channel". *Experimental Thermal and Fluid Science* 90 (2018), pp. 1–13. DOI: 10.1016/j.expthermflusci.2017.08.032.

[21] **Saeed Salehi**, Mehrdad Raisee, Michel J. Cervantes, and Ahmad Nourbakhsh. "Efficient uncertainty quantification of stochastic CFD problems using sparse polynomial chaos and compressed sensing". *Computers & Fluids* 154 (2017), pp. 296–321. DOI: 10.1016/j.compfluid.2017.06.016.

[22] **Saeed Salehi**, Mehrdad Raisee, Michel J. Cervantes, and Ahmad Nourbakhsh. "The Effects of Inflow Uncertainties on the Characteristics of Developing Turbulent Flow in Rectangular Pipe and Asymmetric Diffuser". *Journal of Fluids Engineering* 139.4 (2017), p. 041402. DOI: 10.1115/1.4035302.

[23] **Saeed Salehi**, Mehrdad Raisee, and Michel J. Cervantes. "Computation of Developing Turbulent Flow Through a Straight Asymmetric Diffuser With Moderate Adverse Pressure Gradient". *Journal of Applied Fluid Mechanics* 10.4 (2017), pp. 1029–1043. DOI: 10.18869/acadpub.jafm.73.241.26311.

[24] **Saeed Salehi** and Mehrdad Raisee. "Application of Gram-Schmidt orthogonalization method in uncertainty quantification of computational fluid dynamics problems with arbitrary probability distribution functions (In Persian)". *Modares Mechanical Engineering* 15.12 (2015), pp. 1–8.

[25] Behrouz Takabi and **Saeed Salehi**. "Augmentation of the Heat Transfer Performance of a Sinusoidal Corrugated Enclosure by Employing Hybrid Nanofluid". *Advances in Mechanical Engineering* 6 (2014), p. 147059. DOI: 10.1155/2014/147059.

Table 1: Contributor Roles Taxonomy (CRediT) of the peer-reviewed journal papers. The reference numbers correspond to those listed in the previous section (Peer-reviewed Journal Papers).

Article	Author Position	Conceptualization	Formal analysis	Funding acquisition	Investigation	Methodology	Project administration	Software	Resources	Supervision	Validation	Visualization	Writing – original draft	Writing – review & editing
Sheikholeslami et al. [1]	Second	✓	✓	✓	✓	✓	✓		✓	✓				✓
Fahlbeck et al. [2]	Last	✓	✓			✓		✓		✓				✓
Salehi [3]†	Single	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
Masoodi et al. [4]	Second	✓				✓		✓						✓
Salehi and Nilsson [5]	First	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
Masoodi et al. [6]	Second	✓						✓						✓
Salehi and Nilsson [7]	First	✓	✓*		✓	✓		✓	✓*		✓*	✓*	✓*	✓
Fahlbeck et al. [8]	Last	✓	✓							✓				✓
Salehi and Nilsson [9]	First	✓	✓*		✓	✓		✓	✓*		✓*	✓*	✓*	✓
Salehi and Nilsson [10]	First	✓	✓*		✓	✓		✓	✓*		✓*	✓*	✓*	✓
Fahlbeck et al. [11]	Last	✓								✓				✓
Salehi et al. [12]	First	✓	✓*		✓	✓		✓	✓*		✓*	✓*	✓*	✓
Salehi and Nilsson [13]	First	✓	✓*		✓	✓		✓			✓*	✓	✓	✓
Fahlbeck et al. [14]	Last		✓					✓		✓				✓
Karimi et al. [15]	Third										✓			✓
Ahmar et al. [16]‡	Third	✓								✓				✓
Karimi et al. [17]‡	Second	✓						✓			✓			✓
Salehi et al. [18]‡	First	✓	✓		✓	✓		✓			✓	✓	✓	✓
Salehi et al. [19]‡	First	✓	✓		✓	✓		✓			✓	✓	✓	✓
Salehpour et al. [20]‡	Second		✓								✓	✓		✓
Salehi et al. [21]‡	First	✓	✓		✓	✓		✓			✓	✓	✓	✓
Salehi et al. [22]‡	First	✓	✓		✓	✓		✓			✓	✓	✓	✓
Salehi et al. [23]‡	First	✓	✓		✓	✓		✓			✓	✓	✓	✓
Salehi and Raisee [24]‡	First	✓	✓		✓	✓		✓			✓	✓	✓	✓
Takabi and **Salehi** [25]‡	Last	✓	✓		✓	✓		✓			✓	✓	✓	✓

* Contributions not explicitly stated in the original published records. These roles were inadvertently omitted from the CRediT summary accompanying the article and not assigned to any authors. For instance, I wrote the original draft and performed the visualization and validation tasks for all my first-authored articles, but these contributions are not attributed to any authors in the published CRediT records.

† Single-author article. A CRediT summary is not included in the published record, but all roles listed are solely attributed to the author.

‡ Articles without published CRediT summaries. At the time of publication, CRediT contributions were not collected by the respective journals. The roles listed here are based on my detailed recollection of the research tasks performed and discussions with co-authors.

4.2 Book chapters

[1] **Saeed Salehi**, Mehrdad Raisee, Michel Cervantes, and Ahmad Nourbakhsh. "Development of an Efficient Multifidelity Non-Intrusive Uncertainty Quantification Method". *Evolutionary and Deterministic Methods for Design Optimization and Control With Applications to Industrial and Societal Problems*. Ed. by Esther Andrés-Pérez, Leo M. González, Jacques Periaux, Nicolas Gauger, Domenico Quagliarella, and Kyriakos Giannakoglou. Springer International Publishing, 2019. DOI: 10.1007/978-3-319-89890-2.

4.3 Conference proceedings

[1] Martina Nobilo, **Saeed Salehi**, and Håkan Nilsson. "On the flow-induced pulsating forces during load reduction of a Kaplan turbine model". *9th IAHR Meeting of the WorkGroup on Cavitation and Dynamic Problems in Hydraulic Machinery and Systems*. 2024.

[2] Jonathan Fahlbeck, Håkan Nilsson, and **Saeed Salehi**. "On the pump mode shutdown sequence for a model contra-rotating pump-turbine". *9th IAHR Meeting of the WorkGroup on Cavitation and Dynamic Problems in Hydraulic Machinery and Systems*. 2024.

[3] **Saeed Salehi** and Håkan Nilsson. "Dynamic Mode Decomposition of Rotating Vortex Rope Instability". *9th IAHR Meeting of the WorkGroup on Cavitation and Dynamic Problems in Hydraulic Machinery and Systems*. 2024.

[4] Martina Nobilo, Saeed Salehi, and Håkan Nilsson. "Effects of load reduction on forces and moments on the runner blades of a Kaplan turbine model". Vol. 1411. 1. IOP Publishing, 2024, p. 012001. DOI: 10.1088/1755-1315/1411/1/012001.

[5] J Fahlbeck, H Nilsson, and S Salehi. "Analysis of mode-switching of a contra-rotating pump-turbine based on load gradient limiting shutdown and startup sequences". Vol. 1411. 1. IOP Publishing, 2024, p. 012049. DOI: 10.1088/1755-1315/1411/1/012049.

[6] Mohammad Sheikholeslami, **Saeed Salehi**, Wengang Mao, Arash Eslamdoost, and Håkan Nilsson. "Physics-Informed Neural Networks for Modeling Linear Waves". Vol. Volume 9: Philip Liu Honoring Symposium on Water Wave Mechanics and Hydrodynamics; Blue Economy Symposium. International Conference on Offshore Mechanics and Arctic Engineering. 2024, V009T12A002. DOI: 10.1115/OMAE2024-125048.

[7] Jonathan Fahlbeck, Håkan Nilsson, and **Saeed Salehi**. "Evaluation of startup time for a model contra-rotating pump-turbine in pump-mode". Vol. 1079. 1. IOP Publishing, 2022, p. 012034. DOI: 10.1088/1755-1315/1079/1/012034.

[8] **Saeed Salehi**, Håkan Nilsson, Eric Lillberg, and Nicolas Edh. "Development of a novel numerical framework in OpenFOAM to simulate Kaplan turbine transients". Vol. 774. 1. IOP Publishing, 2021, p. 012058. DOI: 10.1088/1755-1315/774/1/012058.

[9] **Saeed Salehi**, Håkan Nilsson, Eric Lillberg, and Nicolas Edh. "Numerical Simulation of Hydraulic Turbine During Transient Operation Using OpenFOAM". Vol. 774. 1. IOP Publishing, 2021, p. 012060. DOI: 10.1088/1755-1315/774/1/012060.

[10] Jonathan Fahlbeck, Håkan Nilsson, **Saeed Salehi**, Mehrdad Zangeneh, and Melvin Joseph. "Numerical analysis of an initial design of a counter-rotating pump-turbine". Vol. 774. 1. IOP Publishing, 2021, p. 012066. DOI: 10.1088/1755-1315/774/1/012066.

[11] Mohamad Sadeq Karimi, **Saeed Salehi**, Mehrdad Raisee, and Ahmad Nourbakhsh. "Conjugate Heat Transfer Simulation of a Cooled Turbine Vane under Uncertain Operational Condition". *International Conference on Evolutionary and Deterministic Methods for Design Optimization and Control with Applications to Industrial and Societal Problems, Madrid, Spain*. 2017.

[12] **Saeed Salehi**, Mehrdad Raisee, Michel Cervantes, and Ahmad Nourbakhsh. "Development of an Efficient Multifidelity Non-Intrusive Uncertainty Quantification Method". *International Conference on Evolutionary and Deterministic Methods for Design Optimization and Control with Applications to Industrial and Societal Problems, Madrid, Spain*. 2017.

[13] **Saeed Salehi**, Mehrdad Raisee, and Ahmad Nourbakhsh. "Effects of Geometrical and Operational Uncertainties on the Performance of Hydraulic Machinery". *The 14th Asian International Conference on Fluid Machinery, Zhenjiang, China*. 2017.

[14] Vahid Etemadeasl, **Saeed Salehi**, Mehrdad Raisee, and Ahmad Nourbakhsh. "Numerical Investigation of Turbulent Flow in Francis-99 Turbine Using Various Turbulence Models". *The 14th Asian International Conference on Fluid Machinery, Zhenjiang, China*. 2017.

[15] Ehsan Akbari, **Saeed Salehi**, and M. Karami. "Numerical and Experimental Investigation of the Effect of Heat Exchanger Shape on Performance of an Industrial Heater (In Persian)". *21st Annual International Conference on Mechanical Engineering (ISME), Tehran, Iran*. 2013.

[16] Behrouz Takabi, **Saeed Salehi**, and Mohammad Hassan Rahimyan. "Studying the effects of employing hybrid nanofluid on heat transfer performance of a wavy cavity". *21st Annual International Conference on Mechanical Engineering (ISME), Tehran, Iran*. 2013.

4.4 Conference presentations

[1] **Saeed Salehi**. "CFD with OpenSource Software: a case study of project-based learning in an international PhD course". 2024.

[2] **Saeed Salehi**. "Towards practical applications of deep reinforcement learning in CFD". 2024.

[3] **Saeed Salehi**. "Implementation of deep reinforcement learning in OpenFOAM for active flow control". 2023.

[4] **Saeed Salehi**. "Deep reinforcement learning for active flow control". 2023.

[5] **Saeed Salehi**. "Evolution of flow features during transient operation of a Kaplan turbine". 2022.

[6] **Saeed Salehi**. "Numerical simulation of hydraulic turbine during transient operation using OpenFOAM". 2020.

[7] **Saeed Salehi**. "Quantification of epistemic uncertainties in the $k-\varepsilon$ model coefficients". 2019.

5 Research Grants

- Artificial intelligence for enhanced hydraulic turbine lifetime

  Funding agency: Swedish Hydropower Centre (SVC)
  Time period: from 2023-01 to 2027-06 (four and half years)
  Amount: 7 411 000 SEK (around 655 000 Euros)
  Role: Co-PI (PI: Prof. Håkan Nilsson)
  Description: This is the successful grant that I received for my current position as a researcher at Chalmers Industriteknik and Chalmers University of Technology. I developed the idea for the project and had the leading role in writing the grant application. A requirement for the call is also that the university provides 39.5% in-kind to the project. Therefore, the grant also includes funding for a PhD student (as in-kind) that we recently hired and the total budget sums up to 12 498 000 SEK.

- Hydropower operation and lifetime analysis

  Funding agency: Swedish Hydropower Centre (SVC)
  Time period: from 2023-03 to 2027-08 (four and half years)
  Amount: 5 266 000 SEK (around 465 000 Euros)
  Role: Co-PI (PI: Prof. Håkan Nilsson)
  Description: The funding for this successful grant application was used to hire a PhD student (Martina) whom I am co-supervising. I had a major role in developing the application as it can be considered a continuation of my postdoc project.

- Multi-Fidelity Physics-Informed Neural Network to Solve Partial Differential Equations

  Funding agency: Chalmers University of Technology (internal call, in competition)
  Time period: from 2023-01 to 2027-06 (four and half years)
  Amount: 5 517 000 SEK (around 487 000 Euros)
  Role: Co-PI (A collaborative application, i.e., no PI or main applicant)
  Description: This is the funding that we received for a cross-divisional PhD student in the Department of Mechanics and Maritime Sciences of Chalmers University of Technology. I played a pivotal role in formulating the concept and preparing the grant proposal application. Subsequently, the department approved our proposal, leading to the recruitment of a PhD student (Mohammad), whom I am co-supervising.

6 Supervision Experience

I am supervising or have supervised the following students. Further details about their projects can be found in the pedagogical portfolio.

- **Jonathan Fahlbeck**, PhD student, Chalmers University of Technology, June 2020 – September 2024
  Project: Flow in contra-rotating pump-turbines at stationary, transient, and cavitating conditions (ALPHEUS project – European Union's Horizon 2020 program)
  Role: Co-supervisor (Main supervisor: Prof. Håkan Nilsson), introducing advanced surrogate modeling, optimization, reduced order modeling, and modal analysis techniques to the project

- **Martina Nobilo**, PhD student, Chalmers University of Technology, Feb. 2023 – present
  Project: CFD for hydropower lifetime analysis
  Role: Co-supervisor (Main supervisor: Prof. Håkan Nilsson), methodology and software; the project is, in part, the continuation of my postdoc project.

- **Mohammad Sheikholeslami**, PhD student, Chalmers University of Technology, Jan. 2023 – present
  Project: Multi-Fidelity Physics-Informed Neural Network to solve partial differential equations
  Role: Co-supervisor (Main supervisor: Prof. Wengang Mao), conceptualization, developing the project idea, and writing the proposal

- **Hari Abaram**, Master thesis student, Chalmers University of Technology, Jan. 2022 – Jun. 2022
  Project: Systematic evaluation of different approaches for modeling inhaled particle deposition in the lung
  Role: Academic co-supervisor (the project also had a supervisor from industry), methodology and software

- **Hari Abaram, Amith Basavapatna Shesh**, Project course in MSc program, Chalmers University of Technology, July. 2021 – Dec. 2021
  Project: Efficient Dynamic Mode Decomposition on Moving Mesh
  Role: Main supervisor, conceptualization and detailed definition of the project

7 Teaching Experience

This summary outlines my primary teaching experiences in academia, showcasing my contributions to undergraduate and graduate education. For comprehensive information about my academic teaching, as well as my broader teaching experiences beyond academia, please refer to my pedagogical portfolio.

- **Introduction to turbomachinery**

  Role: Main teacher and examiner
  Place: University of Science and Culture, Iran
  Level: Bachelor
  Year: 2018 – 2019
  Credits: 7.5 ECTS (converted)
  Sessions: 32 sessions (48 hours total)
  No. of passed students per year: 20

- **Introduction to fluid dynamics in water turbines**

  Role: Main teacher and examiner
  Place: SVC research school at KTH Royal Institute of Technology
  Level: PhD
  Year: 2022
  Credits: 2.0 ECTS
  Sessions: 10 sessions (18 hours total)
  No. of passed students per year: 5

- **CFD with OpenSource Software**

  Role: Lecturer, Teaching assistant
  Place: Chalmers University of Technology
  Level: PhD
  Year: 2020 –
  Credits: 7.5 ECTS
  Sessions: Flipped classroom format
  No. of passed students per year: 7 – 13

- **Basic Usage of OpenFOAM**

  Role: Lecturer, Teaching assistant
  Place: Chalmers University of Technology
  Level: PhD
  Year: 2021 –
  Credits: 2.0 ECTS
  Sessions: Flipped classroom format
  No. of passed students per year: 17 – 30

- **Turbomachinery Lab.**

  Role: Teaching assistant
  Place: University of Tehran, Iran
  Level: Bachelor
  Year: 2015 – 2017
  Credits: 2.5 ECTS (converted)
  Sessions: 8 sessions (12 hours total)
  No. of passed students per year: 20

- **Turbulent flows**

  Role: Teaching assistant
  Place: University of Tehran, Iran
  Level: Master
  Year: 2015 – 2017
  Credits: 7.5 ECTS (converted)
  Sessions: 8 sessions (12 hours total)
  No. of passed students per year: 30

- **Introduction to heat transfer I**

  Role: Teaching assistant
  Place: University of Tehran, Iran
  Level: Bachelor
  Year: 2017
  Credits: 7.5 ECTS (converted)
  Sessions: 16 sessions (24 hours total)
  No. of passed students per year: 30

- **Introduction to fluid mechanics II**

  Role: Teaching assistant
  Place: University of Tehran, Iran
  Level: Bachelor
  Year: 2013 – 2015
  Credits: 7.5 ECTS (converted)
  Sessions: 16 sessions (24 hours total)
  No. of passed students per year: 35

8 Pedagogical courses

In October 2023, I was awarded the “Diploma in Teaching and Learning in Higher Education" in recognition of the successful fulfillment of all program requirements, including seven courses. The Diploma is designed to meet the learning outcomes defined by the Association of Swedish Higher Education Institutions (SUHF). The program is equivalent to 15 ECTS credits or 10 weeks of full-time study. It concludes with conducting a final pedagogical project related to the teaching activities. More information about my final project is provided in my pedagogical portfolio.

Additionally, to further refine my abilities in the realm of supervision, I completed the “Supervising Research Students" course (3.0 ECTS) which is not included in the teaching diploma program. The following table presents a summary of my pedagogical training.

For more details, please see my pedagogical portfolio.

Overview of the completed courses related to pedagogical development

No.	Course name	Course code	Credits	Year
1	University teaching and learning	CLS925	2.5 ECTS	2021
2	Diversity and inclusion for learning in higher education	CLS930	2.0 ECTS	2023
3	Supervising writing processes	CLS910	2.5 ECTS	2023
4	Theoretical perspectives on learning	CLS900	2.5 ECTS	2023
5	Enhancing learning through writing	CLS941	4.5 ECTS	2023
6	Minor independent study in teaching and learning	CLS946	0.5 ETCS	2023
7	Reflections on teaching and learning in higher education	CLS920	0.5 ETCS	2023
8	Supervising research students	CLS905	3.0 ECTS	2022
	Total		**18.0 ECTS**	

9 Academic Citizenship

9.1 Board memberships

- I am an active member of the OpenFOAM Turbomachinery Technical Committee, which is a part of the OpenFOAM Governance. We strive to further develop the modeling capabilities of OpenFOAM for Turbomachinery applications. My contribution to this committee is mainly focused on hydropower applications.
- In Jan. 2024, I was appointed as the external reviewer and a member of the examination board for the PhD thesis “Numerical Modeling of High Aspect Ratio Fibers in Fluid Flows” at The public University of Tarragona in Spain.

9.2 Reviewer for journals

I am an active reviewer for several peer-reviewed journals. Some of these review records can be found in my public ORCID record: 0000-0002-2037-8284. Needless to say, not all review efforts are tracked and recorded by ORCID. The journals include:

- Physics of Fluids (*AIP*)
- AIAA Journal (*AIAA*)
- Computers and Fluids (*Elsevier*)
- Applied Mathematical Modeling (*Elsevier*)
- Journal of Fluids Engineering (*ASME*)
- Biomechanics and Modeling in Mechanobiology (*Springer*)

- OpenFOAM Journal
- Science Progress (*Sage*)
- Fluids (*MDPI*)
- Energies (*MDPI*)
- Algorithms (*MDPI*)
- Processes (*MDPI*)
- Applied Fluid Mechanics (*IUT*)

10 Invited Speaker

- Swedish Society for Industrial Flow and Heat Transfer (2024), Finspång, Sweden

  Title: Artificial intelligence and data-driven algorithms for flow feature extraction and control
- Dutch OpenFOAM User group meetings July 2023

  Title: Deep Reinforcement Learning in CFD, Implementation in OpenFOAM
- OpenFOAM Student Workshop at Delft University of Technology

  Invited to help the PhD students with their questions, January 2023

11 Utilization of My Research

- During my postdoc, I developed the required numerical methods to study transients in hydraulic turbines and published the framework as an open-source package (`semiImplicitSlip`). The Research and Development department of Vattenfall, a leading energy production company in Europe, is now using my development to study the transient operation of their hydropower systems.
- I also have other open-source GitHub projects aimed at making my research beneficial for both the academic and industrial communities. For more information, please refer to my GitHub at github.com/salehisaeed.

12 Other

12.1 Other professional experiences

2015 – 2018	**Senior Researcher** Coordinated research activities within a team, focusing on simulations and analyses Project: Shape optimization of internal cooling passages of the MGT70 gas turbine blade MAPFAN Research Institute, University of Tehran Under supervision of Prof. M. Raisee, Funded by MAPNA Co.
2010 – 2011	**Research Assistant** Project: Simulation, design, and fabrication of artificial lung Research Center for New Technologies in Life Science Engineering, University of Tehran, Funded by University of Tehran

2010 – 2010	**Research Assistant** Project: Experimental study on the effects of cavitation in Francis turbine on the structural vibrations Mechanical Engineering Department, University of Tehran Under supervision of Prof. M. J. Mahjoob, Funded by University of Tehran
2009 – 2010	**Research Assistant** Project: Experimental investigation of Francis turbine operation and extraction of Hill chart University of Tehran Under supervision of Prof. S. Derakhshan, Funded by University of Tehran

12.2 Open-source software

- `TensorforceFoam`: A TensorFlow-based intrusive Deep Reinforcement Learning (DRL) framework for OpenFOAM. The Tensorforce package is utilized for the DRL computations. The term intrusive refers to the direct integration of the DRL agent within the CFD environment. Such integration eliminates the need for any external information exchange during DRL episodes. The framework is parallelized using the message passing interface (MPI) for Python (mpi4py) to manage parallel environments for computationally intensive CFD cases through distributed computing.
- `semiImplicitSlip`: A mesh motion library in OpenFOAM that implements a robust semi-implicit algorithm for slipping the mesh points on curved surfaces. The algorithm includes two steps, namely, an explicit step based on the general slip condition and an implicit step based on the Dirichlet condition. It employs the Laplacian smoothing equations to spread the mesh deformation into the domain. Additionally, a solid-body rotation may be added on top of the deformed mesh, which could be useful for modelling the runner region in transient operation of Kaplan turbines which contains simultaneous mesh deformation and solid-body rotation of the mesh.
- `Francis-99 transients`: Open-source case and code for CFD simulation of the transient operation of a Francis turbine in OpenFOAM.

12.3 Applications for computing resources

I have been heavily involved in the development of the following successful applications for computing resources through the National Academic Infrastructure for Supercomputing in Sweden (NAISS, formerly called SNIC). I also had a contributing role in acquiring multiple storage allocations through the same resources which are not listed here for brevity.

- Large compute project

  Time period: from 2023-07-01 to 2024-06-30
  Role: Co-PI
  Allocation: 600×1000 core-h/month

- Large compute project

  Time period: from 2023-01-01 to 2023-06-30
  Role: Co-PI
  Allocation: 600×1000 core-h/month

- Large compute project

  Time period: from 2022-01-01 to 2023-01-01
  Role: Co-PI

Allocation: 600 × 1000 core-h/month

- Large compute project

  Time period: from 2021-07-01 to 2022-01-01
  Role: Co-PI
  Allocation: 500 × 1000 core-h/month

12.4 Computer Skills

Programming	C++	●●●●●	Python	●●●●●
	MATLAB	●●●●●	Fortran	●●●○○
	LaTeX	●●●●●		
CFD	OpenFOAM	●●●●●	Fluent	●●●●●
	CFX	●●●●●	Numeca	●●●○○
	TurboGrid	●●●●●	ICEM-CFD	●●●●●
	Ansys Mesh	●●●●○		
Post-Processing	ParaView	●●●●●	Tecplot	●●●●●
	CFD-Post	●●●●●		
Design	SolidWorks	●●●●○	AutoCAD	●●●●○
	SpaceClaim	●●●●○	CFTurbo	●●●●●
General	Linux	●●●●●	Microsoft Office	●●●●●