# Taraneh Sayadi

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## Education

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| 2021 | Habilitation (HDR), "Towards Efficient and Robust Multi-fidelity Optimisation of Unsteady Complex Flows", Sorbonne Université, France |
| 2012 | Ph.D., Mechanical Engineering, Stanford University, Stanford, CA, USA, Advisor: Parviz Moin |
| 2007 | M.Sc., Fluid Mechanics, Technical University of Munich (TUM), Germany |
| 2005 | B.Sc., Mechanical Engineering, Sharif University of Technology, Tehran, Iran |

## Current positions and affiliations

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|---|---|
| Since 2018 | Chargée de Recherche (Research Scientist) CNRS – Sorbonne Université, France |
| Since 2017 | Research group leader, Institute of Combustion Technologies (ITV), RWTH-Aachen University, Germany |

## Profesional experience

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| 2017 – 2018 | Post-doctoral fellow, Institut des Sciences du Calcul et des Données (ISCD), Sorbonne Université, France |
| 2015 – 2018 | Adjunct assistant professor, Department of Aerospace Engineering, University of Illinois Urbana-Champaign, IL, USA |
| 2015 – 2016 | Post-doctoral fellow, Institute of Combustion Technologies (ITV), RWTH-Aachen University, Germany |
| 2013 – 2014 | Research Associate, Applied Mathematics, Imperial College London, London, UK |
| 2012 | Post-doctoral Fellow, LadHyX-École Polytechnique, France |

## Honors and awards

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| 2012 | Milton Van Dyke Award In the Gallery of Fluid Motion |
| 2010 | Fellow of the American Physical Society, Division of Fluid Dynamics |
| 2007 | Franklin P. and Caroline M. Johnson Graduate Fellowship |

## Supervision and advising

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| Since 2013 | 6 Masters students |
| Since 2015 | 8 PhD students |

## Organization of scientific meetings

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| Since 2017 | Co-organizer of the ERCOFTAC Montestigliano Workshop - A Workshop Series in Fluid Dynamics for young researchers, Montestigliano, Italy, annually |
| 2023 | Co-organiser of EuroMech colloquium on Data-driven Fluid Mechanics, Italy |

**List of ten relevant publications:**

- C. Scherding, G. Rigas, D. Sipp, P.J. Schmid, & **T. Sayadi**. "Data-driven framework for input/output lookup tables reduction – with application to hypersonic flows in chemical non-equilibrium". arXive : 10.48550/ARXIV.2210.04269 (under review in Phys Rev. Fluids), 2022.
- T. Fullana, V. Le Chenadec, & **T. Sayadi**. "Adjoint-based optimization of two-dimensional Stefan problems". J Comp. Phys. , 2022.
- S. Costanzo, **T. Sayadi**, M. Fosas de Pando, P.J. Schmid, & P. Frey. "Parallel-in-time adjoint-based optimization - application to unsteady incompressible flows". J Comp. Physics, 471:111664, hal-03852515v1, 2022.
- A. Hassan, M. Sabry, V. Le Chenadec, & **T. Sayadi**. "Uncertainty quantification of kinetic models using adjoint-driven active subspace algorithms". Proceed. Combust. Inst., hal-03852538v1, 2022.
- S. Kneer, **T. Sayadi**, D. Sipp, P. Schmid, G. Rigas. "Symmetry-Aware Autoencoders: s-PCA and s-nlPCA", arXiv:2111.02893 [physics.flu-dyn], 2021.
- **T. Sayadi** and P.J. Schmid, "Frequency response analysis of a (non)reactive jet in crossflow", *J Fluid Mech.*, Vol. 922, hal-03284082v1, 2021.
- A. Hassan, **T. Sayadi**, V. Le Chenadec, and A. Attili, "Sensitivity analysis of an unsteady char particle combustion", *Fuel*, Vol. 287, 2021.
- A. Hassan, **T. Sayadi**, M. Schiemann, V. Scherer, "Adjoint-based sensitivity analysis of char combustion surface kinetic reactions", *Fuel*, Vol. 287, 2021.
- A. Hassan, **T. Sayadi**, V. Le Chenadec, H. Pitsch, and A. Attili, "Adjoint-Based Sensitivity Analysis of Steady Char Burnout", *Combust. Theo. Modelling*, hal-03011351v1, 2020.
- A. Fikl, V. Le Chenadec, **T. Sayadi**, "Control and Optimization of Interfacial Flows Using Adjoint-Based Techniques", *Fluids*, Vol. 5(3):156, hal-03011370v1, 2020.

**(d) Ph.D. students**

01/10/2018 Serena Costanzo, *Sorbonne Université*,
**Title** : "Model reduction and optimisations of complex flows",
**co-director of the thesis** : Prof. Pascal Frey,
**Financed by** : ISCD,
**defence is scheduled for** : 22/06/2022

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01/10/2019 Tomas Fullana, *Sorbonne Université*,
**Title** : "Adjoint-based optimisation of interfacial flows",
**co-director of the thesis** : Prof. Bruno Despres,
**Financed by** : ISCD

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01/10/2020 Clément Scherding, *Sorbonne Université*,
**Title** : "Model design and high-fidelity simulations of hypersonic flows",
**Financed by** : ICL-CNRS joint PhD program (PI of the project : Taraneh Sayadi)

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01/10/2021 Alejandro Quiros, *Sorbonne Université*,
**Title** : "Optimisation of multiphase flows",
**Financed by** : ED SMAER

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01/10/2021 Avicene Samir Chaarane, *Sorbonne Université*,
**Title** : "Data assimilation of elastic objects in flow using deep learning algorithms",
**Director of the thesis**: Prof. Jean-Camille Chassaing,
**Financed by** : ED SMAER

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01/10/2018 Ahmed Hassan, *(ITV), RWTH-Aachen University*,
**Title** : "Sensitivity analysis and Uncertainty Quantification of solid fuel combustion",
**Financed by** : OxyFlame DFG funding

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01/10/2018 Athanasios Margaritis, *Imperial College London*,
**Title** : "Sensitivity analysis of hypersonic flows",
**Director of the thesis**: Prof. Peter Schmid,
**Financed by** : AFOSR (Co-PI: Taraneh Sayadi)

**Courses**

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| Since 2018 | Introduction to hydrodynamic instability (MU4MEM02, Master SDI), Sorbonne Université, France, CM: 7H & TD/TP: 7H |
| Since 2019 | Numerical Methods for linear systems (MU4MEF01, Master SDI), Sorbonne Université, France, CM: 7H & TD/TP: 7H |
| Since 2020 | Numerical Methods for nonlinear systems (MU4MEF08, Master SDI), Sorbonne Université, France, CM: 7H & TD/TP: 7H |
| 2020 | Optimisation algorithms (MU5MEF21, Master SDI), Sorbonne Université, France, CM: 15H |
| $2018-2019$ | Dynamical system analysis (MAP551), École Polytechnique, France, TD/TP: 18H |
| $2016-2017$ | Turbulent flows, RWTH-Aachen university, Germany, CM: 18H |

**Conference Papers**

- A. Fikl, V. Le Chenadec, **T. Sayadi**, and P.J. Schmid, "A Comprehensive Study of Adjoint-Based Optimization of Non-Linear Systems with Application to Burgers Equation", *AIAA J.*, 2016.
- F. Cadieux, G. Castiglioni, J. A. Domaradzki, **T. Sayadi**, S. Bose, M. Grilli, S. Hickel, "LES of separated flows at moderate Reynolds numbers appropriate for turbine blades and unmanned aero vehicles", In proceedings of 8th International Symposium on Turbulence and Shear Flow Phenomena (TSFP8), Poitiers, France.

**Book Chapters**

- **T. Sayadi**, P.J. Schmid, C.W. Hamman and A. Lozano-Duran, "Toward a dynamic model for the near-wall region based on reduced representations", Proceedings of the 2016 summer program, Center for Turbulence Research, Stanford University, pp. 325-334
- P. Sashittal, **T. Sayadi**, P J. Schmid, I. Jang and L. Magri, "Adjoint-based sensitivity analysis for a reacting jet in crossflow", Proceedings of the 2016 summer program, Center for Turbulence Research, Stanford University, pp. 325-334
- **T. Sayadi** and P.J. Schmid, "Reduced-order model for near-wall dynamics with implications to wall-models", Proceedings of the 2014 summer program, Center for Turbulence Research, Stanford University, pp. 325-334
- **T. Sayadi**, C.W. Hamman and P.J. Schmid"Parallel QR algorithm for data-driven decompositions", Proceedings of the 2014 summer program, Center for Turbulence Research, Stanford University, pp. 335-343
- **T. Sayadi**, J.W. Nichols, P.J. Schmid and P. Moin, "Dynamic mode decomposition of H- and K-type transitions", Annual Research Briefs 2013, Center for Turbulence Research, Stanford University,
- F. Cadieux, J.A. Domaradzki, **T. Sayadi**, S. Bose and F. Duchaine, "DNS and LES of Separated Flows at Moderate Reynolds numbers", Proceedings of the 2012 summer program, Center for Turbulence Research, Stanford University, pp. 77-86
- **T. Sayadi**, J.W. Nichols, P.J. Schmid and M. R. Jovanovic, "Dynamic mode decomposition of H-type transition to turbulence", Proceedings of the 2012 summer program, Center for Turbulence Research, Stanford University, pp. 5-14
- **T. Sayadi**, and P. Moin, "Predicting natural transition using large eddy simulation", Annual Research Briefs 2011, Center for Turbulence Research, Stanford University, pp. 97-108
- **T. Sayadi**, C.W. Hamman and P. Moin, "Direct numerical simulation of H-type and K-type transition to turbulence", Annual Research Briefs 2011, Center for Turbulence Research, Stanford University, pp. 109-122
- **T. Sayadi**, and P. Moin, "A comparative study of subgrid scale models for the prediction of transition in turbulent boundary layers", Annual Research Briefs 2010, Center for Turbulence Research, Stanford University, pp. 237-247
- J.H. Watmuff, D.A. Cook, **T. Sayadi**, and X. Wu, "Fundamental physical processes associated with bypass transition", Proceedings of the 2010 summer program, Center for Turbulence Research, Stanford University, pp. 97-106

**Peer-reviewed Technical Reports**

- V. Statnikov, **T. Sayadi**, M. Meinke, W. Schröder and P.J. Schmid, "Dynamic mode decomposition of supersonic and transonic wakes of generic space launcher configurations" , Annual Report 2013 of the Sonderforschungsbereich/Transregio (TRR40), Technische Universität München.

**Conferences**

- A. Margaritis, **T. Sayadi**, O. Marxen and P. Schmid, "Linear Analysis of $n$-Periodic Fluid Systems: An Application to Wake Synchronization", SciTech AIAA 2021
- S. Costanzo, **T. Sayadi**, M. Fosas de Pando, P. Schmid, and P. Frey, "A time parallelised adjoint-based optimisation strategy, appleid to compressible flows", WCCM-ECCOMAS 2020
- T. Fullana, **T. Sayadi**, V. Le Chenadec, S. Zaleski, and B. Despres "Adjoint-based optimisation of interfacial flows in the sharp interface limit", WCCM-ECCOMAS 2020
- A. Hassan, **T. Sayadi**, V. Le Chenadec, and H. Pitsch "Adjoint-based sensitivity analysis of unsteady single coal particle combustion", WCCM-ECCOMAS 2020
- S. Costanzo, **T. Sayadi**, M. Fosas de Pando, P. Schmid, and P. Frey, "A study of state-of-the-art model reduction techniques applied to flow simulations with moving immersed boundaries", Division of Fluid Dynamics Meeting 2019, The American Physical Society (APS)
- A. Margaritis, **T. Sayadi**, O. Marxen, and P. Schmid, "Sensitivity of hypersonic boundary layers to n-periodic surface roughness-element arrays and finite-rate chemistry", Division of Fluid Dynamics Meeting 2019, The American Physical Society (APS)
- A. Margaritis, **T. Sayadi**, O. Marxen, and P. Schmid, "Sensitivity of reacting hypersonic boundary layers to $n$-periodic surface roughness", IUTAM-transition, 2019
- **T. Sayadi**, S. Zaleski, S. Popinet, V. Le Chenadec, and S. Vincent. "A Convergence Study of the One-Fluid Formulation in a Phase Inversion Application at Moderate Reynolds and Weber Numbers", Turbulence Interface, 2018.
- **T. Sayadi**, P. Sashittal, and P. Schmid. "Effect of combustion on the frequency response of jets in crossflow", ERCOFTAC SIG 33 Workshop, 2017.
- P. Sashittal, **T. Sayadi** , P. Schmid, I. Jang, and L. Magri. "Adjoint-based sensitivity analysis of a reacting jet in crossflow", Division of Fluid Dynamics Meeting 2016, The American Physical Society (APS)
- **T. Sayadi** and P. J. Schmid, "Optimization of dynamic roughness elements for reducing drag in a laminar boundary layer", Division of Fluid Dynamics Meeting 2015, The American Physical Society (APS)
- S. Murthy, **T. Sayadi**, V. Le Chenadec and P. J. Schmid, "Model and analysis of thermo-acoustic instabilities in N-periodic systems", Division of Fluid Dynamics Meeting 2015, The American Physical Society (APS)
- **T. Sayadi**, P. J. Schmid, F. Richecoeur and D. Durox, "Parametrized mode decomposition for bifurcation analysis applied to a thermo-acoustically oscillating flame", Division of Fluid Dynamics Meeting 2014, The American Physical Society (APS)
- P. J. Schmid and **T. Sayadi**, "Reduced-order model for near-wall dynamics with implications to wall-models", Division of Fluid Dynamics Meeting 2014, The American Physical Society (APS)
- **T. Sayadi**, V. Le Chenadec, P. J. Schmid, F. Richecoeur and M. Massot, "Time-domain analysis of thermo-acoustic instabilities in a ducted flame", *Proceedings of the Combustion Institute*, 2014
- **T. Sayadi**, V. Le Chenadec, P. J. Schmid, F. Richecoeur and M. Massot, "Thermo-acoustic instabilities in the Rijke tube: design of a dedicated solver and resulting stability analysis", Division of Fluid Dynamics Meeting 2013, The American Physical Society (APS)
- V. Statnikov, **T. Sayadi**, M. Meinke, W. Schröder and P. Schmid, "Dynamic mode decomposition of supersonic and transonic wakes of generic space launcher configurations", Division of Fluid Dynamics Meeting 2013, The American Physical Society (APS)
- F. Cadieux, J. A. Domaradzki, **T. Sayadi**, S. Bose and F. Duchaine, "DNS and LES of Separated Flows at Moderate Reynolds numbers", Division of Fluid Dynamics Meeting 2012, The American Physical Society (APS)

- B. Pierce, P. Moin and **T. Sayadi**, “Application of vortex identification schemes to DNS data of transitional boundary layer", Division of Fluid Dynamics Meeting 2012, The American Physical Society (APS)
- **T. Sayadi**, J. Nichols, P. Schmid and P. Moin, “Dynamic mode decomposition of H-type transition to turbulence", Division of Fluid Dynamics Meeting 2012, The American Physical Society (APS)
- C. Hamman, **T. Sayadi** and P. Moin, “Onset of turbulent mean dynamics in boundary layer flow", Division of Fluid Dynamics Meeting 2012, The American Physical Society (APS)
- **T. Sayadi** , C. W. Hamman and P. Moin, “Direct numerical simulation of K-type and H-type transitions to turbulence in a low Mach number flat plate boundary layer", Division of Fluid Dynamics Meeting 2011, The American Physical Society (APS)
- **T. Sayadi** and P. Moin, “Comparing the performance of dynamic subgrid scale (SGS) models in the transition process", Thermal and Fluid Sciences Affiliates and Sponsor Conference (TFSA 2011), Stanford University
- **T. Sayadi** and P. Moin, “A Comparative Study of Subgrid Scale Models for Prediction of Transition in Turbulent Boundary Layers", Division of Fluid Dynamics Meeting 2010, The American Physical Society (APS)
- **T. Sayadi** and P. Moin, “Studying the performance of the dynamic subgrid scale (SGS) model in the transition process", Thermal and Fluid Sciences Affiliates and Sponsor Conference (TFSA 2010), Stanford University
- **T. Sayadi** and P. Moin, “Large Eddy Simulation of Transitional Boundary Layer", Division of Fluid Dynamics Meeting 2009, The American Physical Society (APS)
- **T. Sayadi** and P. Moin, “Modeling transition of a compressible flow over a flat plate using large eddy simulation", Thermal and Fluid Sciences Affiliates and Sponsor Conference (TFSA 2009), Stanford University