Curriculum vitae of Stefania Cherubini

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Born the 03/06/1983 in Bari
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Current position

November 2023 - Now : **Full Professor** in Fluid Machinery at the Department of Mechanics, Mathematics and Management, Politecnico di Bari, Italy.

Past academic position

March 2016 - November 2023 : **Associate Professor** in Fluid Machinery at the Department of Mechanics, Mathematics and Management, Politecnico di Bari, Italy.

September 2012 - February 2016 : **Maître de Conférences** (Assistant/associate professor) at the DynFluid laboratory of Arts et Métiers ParisTech.

Scientific qualification

- ***Year 2021***: Italian Scientific Qualification for Full Professor (I fascia) in Machinery and Systems for Energy and the Environment (Area 09/C1, 'Macchine e Sistemi per l'Energia e l'Ambiente')
- ***Year 2012***: Italian Scientific Qualification for Associate Professor (II fascia) in Machinery and Systems for Energy and the Environment (Area 09/C1, 'Macchine e Sistemi per l'Energia e l'Ambiente')
- ***Year 2011***: French Scientific Qualification for Maître de Conférences (Assistant Professor), section 60 - Mechanics

Education

- ***June 2010 - 3 September 2012***: **Post-doctoral position** (*Assegnista di ricerca*) at DIMEG, Politechnical University of Bari. Research project: *'Non-linear analysis of the stability of boundary layer flows on a flat plates*'.
- ***January 2007 - June 2010***: **PhD** in *Mechanics*, at the University *Arts et Métiers ParisTech*, Paris, on the 4th of June 2010, with honors (*Très honorable*) and nomination from the examination bard for the PhD thesis prize *Prix Bézier*. Advisors: Prof. Alain Lerat, Dr. Robinet. Opponents: Prof. J.-M. Chomaz, Prof. U. Ehrenstein.
- ***January 2007 - March 2010***: **PhD** in Machinery Engineering, at the Politechnical University of Bari, on the 12th of march 2010. Advisors: Prof. Napolitano, Prof. De Palma. Opponent: Prof. A. Bottaro.
- ***September 2004 - July 2006***: **Master Degree** in Mechanical Engineering, at the Politechnical University of Bari, specialization *Machinery and Energetics*, on the 26th July 2006, in the first available session of the Academic year. Note: 110/110 with honors. Advisors: Prof. Napolitano, Prof. De Palma.
- ***September 2005 - June 2006***: **Research Master Degreee** (Master recherche) in *Energy, Fluids, Aerodynamics*, specialization *Aerodynamics, aeroacustics*, at the Arts et Métiers University (ENSAM) of Paris, on the 29th of june 2006. Note: '*Très bien*' (very good) and honorable mention '*major*' (highest class final note). Relatore: Dr. Robinet.
- ***September 2001 - July 2004***: **Bachelor Degree** in Mechanical Engineering, at the Politechnical University of Bari, on the 29th of july 2004. Note: 110/110 with honors. Advisors: Prof. Napolitano, Prof. De Palma.

OTHER POSITIONS OBTAINED

- **Institut Mécanique des Fluides de Tolouse (IMFT), june 2012**: Obtained a permanent position as *Maître de Conférences* (assistant/associate Professor) at the Institut of Fluid Mechanics in Tolouse (IMFT).

AWARDS

- **September 2015: AIMETA Junior Prize 2015** for the Fluid Mechanics, awarded by the Italian Association of Theoretical and Applied Mechanics (AIMETA), with the following motivation: *'The results obtained by Stefania Cherubini have an outstanding theoretical and applied importance, and can have a significant role for the development of flow control techniques.'*
- **October 2010: Finalist for the Da Vinci Award**, awarded from ERCOFTAC (European Research Community on Flow, Turbulence and Combustion), *'in recognition of the outstanding quality of his PhD studies'*.
- **June 2010: Nominated for the thesis award Bézier** from the Ph.D. examination board, at Arts et Métiers ParisTech, Paris.

AFFILIATION TO SCIENTIFIC ORGANISATIONS AND ACADEMIES

- **January 2021 - now: Member of the International Energy Agency IEA Wind TCP cooperating Task 47**: Aerodynamics. The aim is to cooperate in the field of aerodynamic measurements on MW scale wind turbines, also including simulations giving insights into the relevant aerodynamic problems for large-scale wind turbines.
- **October 2021 - now: Member of the Apulian Science Academy** (Accademia Pugliese delle Scienze) whose aim is to spread the knowledge in several fields of the scientific research.
- **January 2017 - now: Member of the AIMSEA**, the Italian Association for Fluid Machinery and Systems for Energy and Environment.

FUNDED RESEARCH GRANTS

- **October 2015: Principal Investigator of the research project DETAIL** (DElaying TrAnsition mImicking Lotus leaves), founded by the French National Agency of Research (ANR, Agence Nationale des Recherches), within the program for Young Researchers (Jeuns Chercheurs et Jeunes Chercheuses).
- **September 2019: Coordinator of the research unit** for the research project "LUBRISMOOTH: : Innovative materials and techniques for the reduction of ship resistance", founded by the Italian Ministery of Research (MUR), within the program PRIN (Research projects of national importance).
- **September 2023: Principal Investigator of the research project DWTURB**: Diffuser augmented Wind Turbines for URban Environments, founded by the Italian Ministery of Research (MUR), within the program PRIN 2022 (Research projects of national importance).
- **November 2023: Coordinator of the research unit** for the research project "SLIPS: Slippery surfaces for drag reduction", founded by the Italian Ministery of Research (MUR), within the program PRIN PNRR 2022 (Research projects of national importance).

ADVISING AND TUTORING

- **Main advisor of ten Ph.D. students** at Politecnico di Bari: Giovanni DE CILLIS (2018-2021), Enza PARENTE (2018-2021), Antoine JOUIN (2020-2023), Alessandro GIANNOTTA (2021-2024), Claudio BERNARDI (2021-2025), Nicola CIOLA (2021-2025), Donato VARIALE (2021-2026), Felice MANGANELLI (2022-2026), Fabio SPAGNOLETTA (2023-ongoing), Carmine PETRAROTA (2025-ongoing), Giacomo Luca MONGELLI (2025-ongoing).
- **Co-advisor of three Ph.D. students** at Arts et Métiers ParisTech: Mirko FARANO (2014-2017), Michele Alessandro BUCCI (2014-2017), Francesco PICELLA (2025-2019)

RESEARCH COOPERATION WITH INTERNATIONAL RESEARCH GROUPS

- **University of Cambridge**, Cambridge, UK, with Prof. Juniper since 2021 and has led by now to 2 joint journal article published in the international journal "Combustion and flames". The subject of this cooperation is the data assimilation of a flame models through experimental data and adjoint methods.
- **University of Texas at Dallas**, Dallas, USA: the scientific cooperation with Prof. Leonardi is active since 2020 and has already led to 10 joint journal articles and several conference proceedings about the dynamics of the wake past a wind turbine.
- **Arts et Métiers ParisTech**, Paris, France, DynFluid laboratory: after more than 3 years of teaching and research as a Maître de Conférences in this institution, I maintained a rich scientific cooperation with the research group in "Flow instability", led by Prof. Robinet. This cooperation has led to the joint advising of 5 Ph.D. students between Politecnico di Bari and this French institution, and several joint journal papers about instability, transition and turbulence of bounded shear flows.
- **University of Stuttgard**, Stuttgard, Germany: the scientific cooperation with Prof. Rist and his research group has been active in 2017-2019 and has led to 1 joint journal article about the influence of a roughness element on the flow in a boundary layer.
- **ECPS, École Polytechnique Fédérale de Lausanne**, Lausanne, Switzerland: the scientific cooperation with Prof. Schneider and his research group has been active in 2018-2029 and has led to 1 joint journal article on the computation of heteroclinic orbits using adjoint methods.
- **University of Paris-Saclay**, Saclay, France: the scientific cooperation with Dr. Semeraro has been active since 2021 and has led to the joint advising of 1 PhD student, and 5 joint journal articles about data-assimilation and reduced-order models in unsteady flows. Since 2023, I have started a cooperation with Dr. Duguet, which has led to 1 joint journal paper about laminar-turbulent patterns in channel flow.
- **University of Genova**, Genova, Italia, DICAT: after a visiting at the University of Genova with Prof. Alessandro Bottaro in 2008, the scientific cooperation with this research group continued until 2015, with the publication of several joint journal papers about adjoint optimisation in fluid flows.
- **University of New Mexico**, Albuquerque, NM, USA, ME Department: visiting scholar at the University of New Mexico, with Prof. Peter Vorobieff, in 2008.

EDITORIAL AND REFERRAL ACTIVITIES

- **Associate editor** of the international journal "Theoretical and Computational Fluid Dynamics", from 2022.
- **Panel member** for the UK National Fellowships in Fluid Dynamics (NFFDy) in the UK Fluids Network of the Engineering and Physical Sciences Research Council (october/november 2022).
- **Committee member** for several PhD Thesis defense in Europe:
  - Jean-Christophe. Loiseau, Arts et Métiers ParisTech, 26th May 2014
  - Iman Lasghari, KTH Stocholm, 18th December 2015
  - Chloé Mimeau, Université de Grenoble, 7th July 2015
  - Lukasz Klotz, Université Sorbonne Paris Cité, France, 1st June 2017
  - Lorenzo Russo, University of Naples, Italy, 20th May 2020
  - Andrea Palumbo, University of Naples, Italy, 20th May 2020
  - Pierluigi Morra, KTH, Sweden, 4th june 2020
  - Luca De Vincentiis, KTH, Sweden, 15th June 2021
  - Yuxin Jiao, Imperial College London, UK, 17th December 2021
  - Laura Victoria Rolandi, Université de Toulouse ISAE-Supaéro, Toulouse, France 13rd december 2021

- Diogo Ferreira Sabino, ONERA, France, 7th June 2022
- Giulia Zoppini, Delft University of Technology, Holland, 7th September 2023
- Thales Coelho Leite Fava, KTH, Sweden, 23rd October 2023
- Simon Lecler, ONERA Meudon, France 16th July 2024
- Romain Peron, ONERA Meudon, France 18h Decembre 2025
- Laura Prudenzano, ONERA Meudon, France 16th April 2026

◇ **Committee member** for the French HDR ("Habilitation à Diriger les Recherches") qualification of Dr. Chloé Mimeau, CNAM Paris, France.

◇ **Reviewer** for several international journals, among which the Journal of Fluid Mechanics, Physical Review E, Physical Review Fluids, Physical Review Letters, International Journal of Heat and Fluid Flow, Wind Energy Science, Energies etc

CONFERENCE ORGANISATION AND TALKS

◇ **Organiser** of the following conferences, symposiums and sessions:

- ◇ **EUROMECH Colloquium** "Coherent structures and instabilities in transitional and turbulent wall-bounded flows " in Bari on 16th-18th September 2025
- ◇ **IEA WIND TCP Executive Committee** held in Bari on 21th-24th May 2024
- ◇ **Mini Symposium** "Flows on micro- or nano- structured surfaces" at the Micro and Nano Flow Conference to be held in Padova on 18th-20th September 2023
- ◇ **EUROMECH Colloquium** "Three-dimensional instability mechanisms in transitional and turbulent flows" held in Bari on 18th-20th September 2017
- ◇ **ATI conference** session organiser held in Lecce on 6th-8th September 2017

◇ **Speaker** at more than 20 international and national conferences.

◇ **Chairperson** of several conference sessions, among which BIFD, SDEWES, ATI conference, ERCOFTAC SIG33 Workshop, EFMC

◇ **Invited plenary talks at the following conferences:**

- ◇ **Keynote plenary talk at the BIFD26** (Bifurcation and Instability in Fluid Dynamics Conference), L'Aquila, Italy, 6h-10th July 2026
- ◇ **Keynote plenary talk at the EFDC2** (2nd European Fluid Dynamics Conference), Dublin, Ireland, 25th-29th August 2025
- ◇ **Invited plenary talk at the Isaac Newton Institute TURW04** workshop "Wall-bounded turbulence: beyond current boundaries" held in Cambridge, UK, in April 2022
- ◇ **Invited plenary talk at the 9th IUTAM** (International Union of Theoretical and Applied Mechanics) Symposium on laminar-turbulent transition held in London, UK, September 2019
- ◇ **Invited talk to the AIMETA conference**, Genova (Italy), for the AIMETA Junior Award 2015 for the Fluid Mechanics, title: "Does non-linearity matter for transition to turbulence in shear flows?", September 2015

◇ **Invited seminars** at University of Cambridge, Imperial College London, and University of Southampton in UK, KTH in Sweden, Orsay University, ENSTA, Ecole Polytechnique, ENSAM, University of Marseille, University of Toulouse in France

BIBLIOMETRICAL INDICATORS

◇ **International journal publications:** 62

◇ **International conference proceedings and book chapters:** 18

◇ **H-index**: 26 (Scholar), 21 (Scopus)

◇ **Total number of citations**: 1876 (Scholar), 1368 (Scopus)

◇ **Most cited paper**: 165 citations (Scholar), 127 citations (Scopus)

- **59.5% of documents in top 25% journals** according to Scopus
- **Top-Cited Paper in Wind Energy** 2021/22, for the paper *POD-based analysis of a wind turbine wake under the influence of tower and nacelle* Wind Energy 24 (6), 609-633 (2021)

PUBLICATIONS ON INTERNATIONAL JOURNALS

- N Ciola, S Cherubini, A Bottaro Can wall roughness delay cross-flow transition and reduce turbulent skin friction in a rotating disk flow? Chinese Journal of Aeronautics, 104188 (2026)
- C Testa, C Bernardi, F Porcacchia, P De Palma, S Cherubini Wind turbine aeroacoustics driven by dynamic mode decomposition-based aerodynamics Renewable Energy 260, 125076 (2026)
- C Bernardi, S Cherubini, F Manganelli, G Della Posta, S Leonardi, P De Palma Large Eddy Simulation of the IEA 15-MW Wind Turbine Using a Two-Way Coupled Fluid-Structure Interaction Model Wind Energy Science 11 (7) (2026)
- N Ciola, Y Duguet, JC Robinet, P De Palma, S Cherubini Large-scale streak instabilities of transitional channel flow Journal of Fluid Mechanics 1025, A45 (2025)
- A Giannotta, M Yoko, S Cherubini, P De Palma, MP Juniper Bayesian inference of physics-based models of acoustically-forced laminar premixed conical flames Combustion and Flame 274, 114011 (2025)
- F Manganelli, C Bernardi, S Leonardi, S Cherubini, P De Palma Assessing the Effect of Coriolis Acceleration on the Coherent Structures in the Wake of a Wind Turbine Using Dynamic Mode Decomposition Journal of Fluids Engineering 147 (3), 031104 (2025)
- M Quattromini, MA Bucci, S Cherubini, O Semeraro Active learning of data-assimilation closures using graph neural networks: M. Quattromini et al. Theoretical and Computational Fluid Dynamics 39 (1), 17 (2025)
- M Quattromini, MA Bucci, S Cherubini, O Semeraro Mean flow data assimilation using physics-constrained graph neural networks Data-Centric Engineering 6, e48 (2025)
- F Manganelli, C Bernardi, A Giannotta, S Leonardi, S Cherubini, P De Palma The effect of Coriolis force on the coherent structures in the wake of a 5MW wind turbine Energy Conversion and Management: X 25, 100830 (2025)
- N Ciola, P De Palma, JC Robinet, S Cherubini Large-scale coherent structures in turbulent channel flow: a detuned instability of wall streaks Journal of Fluid Mechanics 997, A18 (2024)
- A Jouin, JC Robinet, S Cherubini Stability of the flow over superhydrophobic micro roughnesses: the influence of the interface International Journal of Thermofluids 23, 100707 (2024)
- A Jouin, JC Robinet, S Cherubini Modal and nonmodal stability of the laminar flow in a channel with longitudinal riblets Physical Review Fluids 9 (7), 073903 (2024)
- A Jouin, N Ciola, S Cherubini, JC Robinet Detuned secondary instabilities in three-dimensional boundary-layer flow Physical Review Fluids 9 (4), 043901 (2024)
- A Jouin, S Cherubini, JC Robinet Turbulent transition in a channel with superhydrophobic walls: anisotropic slip and shear misalignment effects Journal of Fluid Mechanics 980, A49 (2024)
- D Variale, E Parente, JC Robinet, S Cherubini Modal and nonmodal stability analysis of turbulent stratified channel flows Physical Review Fluids 9 (1), 013904 (2024)
- A Giannotta, S Cherubini, P De Palma, MP Juniper The effect of flame curvature and flame base movement on the frequency response of a conical Bunsen flame Combustion and Flame 259, 113179 (2024)
- C Bernardi, F Porcacchia, C Testa, P De Palma, S Leonardi, S Cherubini NREL-5MW wind turbine noise prediction by FWH-LES International Journal of Turbomachinery, Propulsion and Power 8 (4), 54 (2023)

- N Ciola, P De Palma, JC Robinet, S Cherubini Nonlinear optimal perturbation of turbulent channel flow as a precursor of extreme events Journal of Fluid Mechanics 970, A6 (2023)
- C Bernardi, G Della Posta, P De Palma, S Leonardi, F Bernardoni, S Cherubini The effect of the tower's modeling on the aero-elastic response of the NREL 5 MW wind turbine Journal of Physics: Conference Series 2505 (1), 012037 (2023)
- A Giannotta, S Cherubini, P De Palma The effect of hydrogen enrichment on thermoacoustic instabilities in laminar conical premixed methane/air flames International Journal of Hydrogen Energy (2023)
- G De Cillis, O Semeraro, S Leonardi, P De Palma, S. Cherubini *Dynamic-mode-decomposition of the wake of the NREL-5MW wind turbine impinged by a laminar inflow* Renewable Energy 199, 1-10 (2022)
- A Giannotta, S Cherubini, P De Palma *Minimal energy thresholds for triggering in the Rijke tube: The effect of the time delay*, Journal of Fluid Mechanics 938,A23 (2022)
- G De Cillis, S Cherubini, O Semeraro, S Leonardi, P De Palma, *The influence of incoming turbulence on the dynamic modes of an NREL-5MW wind turbine wake* Renewable Energy 183, 601-616 (2022)
- G De Cillis, S Cherubini, O Semeraro, S Leonardi, P De Palma, *Stability and optimal forcing analysis of a wind turbine wake: Comparison with POD* Renewable Energy 181, 765-785 (2022)
- E Parente, JC Robinet, P De Palma, S Cherubini *Minimal energy thresholds for sustained turbulent bands in channel flow* Journal of Fluid Mechanics 942 (2022)
- E Parente, M Farano, JC Robinet, P De Palma, S Cherubini *Continuing invariant solutions towards the turbulent flow* Philosophical Transactions of the Royal Society A 380 (2226), 20210031 (2022)
- E Parente, JC Robinet, P De Palma, S Cherubini *Linear and nonlinear optimal growth mechanisms for generating turbulent bands* Journal of Fluid Mechanics 938 (2022)
- S Cherubini, G De Cillis, O Semeraro, S Leonardi, P De Palma, *Data Driven Modal Decomposition of the Wake behind an NREL-5MW Wind Turbine* International Journal of Turbomachinery, Propulsion and Power 6 (4), 44 (2021)
- MA Bucci, S Cherubini, JC Loiseau, JC Robinet, *Influence of freestream turbulence on the flow over a wall roughness* Physical Review Fluids 6 (6), 063903 (2021)
- G De Cillis, S Cherubini, O Semeraro, S Leonardi, P De Palma, *POD-based analysis of a wind turbine wake under the influence of tower and nacelle* Wind Energy 24 (6), 609-633 (2021) **TOP-CITED PAPER in WIND ENERGY between the 1st January 2021 and the 15the December 2022**
- S Cherubini, F Picella, JC Robinet, *Variational Nonlinear Optimization in Fluid Dynamics: The Case of a Channel Flow with Superhydrophobic Walls* Mathematics 9 (1), 53 (2021)
- E Parente, JC Robinet, P De Palma, S Cherubini, *Modal and nonmodal stability of a stably stratified boundary layer flow* Physical Review Fluids 5 (11), 113901 (2020)
- F Picella, JC Robinet, S Cherubini, *On the influence of the modelling of superhydrophobic surfaces on laminar–turbulent transition* Journal of Fluid Mechanics 901 (2020)
- G De Cillis, S Cherubini, O Semeraro, S Leonardi, P De Palma, *POD analysis of the recovery process in wind turbine wakes* Journal of Physics: Conference Series 1618 (6), 062016 (2020)
- S Cherubini, F Picella, JC Robinet, *Variational Nonlinear Optimization in Fluid Dynamics: The Case of a Channel Flow with Superhydrophobic Walls* Mathematics 9 (1), 1-24 (2020)
- F Picella, JC Robinet, S Cherubini, *Laminar–turbulent transition in channel flow with superhydrophobic surfaces modelled as a partial slip wall* Journal of Fluid Mechanics 881, 462-497 (2019)

- H Wedin, S Cherubini, *Saddle-node bifurcations of traveling waves in the asymptotic suction boundary layer flow* Physical Review Fluids 4 (10), 104401 (2019)
- F Picella, MA Bucci, S Cherubini, JC Robinet, *A synthetic forcing to trigger laminar-turbulent transition in parallel wall bounded flows via receptivity* Journal of Computational Physics 393, 92-116 (2019)
- M Farano, S Cherubini, JC Robinet, P De Palma, TM Schneider, *Computing heteroclinic orbits using adjoint-based methods* Journal of Fluid Mechanics 858 (2019)
- JC Loiseau, MA Bucci, S Cherubini, JC Robinet, *Time-stepping and Krylov methods for large-scale instability problems* Computational Modelling of Bifurcations and Instabilities in Fluid Dynamics (2019)
- M Farano, S Cherubini, P De Palma, JC Robinet, *Nonlinear optimal large-scale structures in turbulent channel flow* European Journal of Mechanics-B/Fluids 72, 74-86 (2018)
- M Farano, C Mancini, P De Palma, JC Robinet, S Cherubini, *3D global hydrodynamic stability analysis of a diffusion flame* Fluid Dynamics Research 50 (5), 051401 (2018)
- F Picella, JC Loiseau, F Lusseyran, JC Robinet, S Cherubini, L Pastur, *Successive bifurcations in a fully three-dimensional open cavity flow* Journal of Fluid Mechanics 844, 855-877 (2018)
- MA Bucci, DK Puckert, C Andriano, JC Loiseau, S Cherubini, JC Robinet, U Rist, *Roughness-induced transition by quasi-resonance of a varicose global mode* Journal of Fluid Mechanics 836, 167-191 (2018)
- M Farano, S Cherubini, JC Robinet, P De Palma, *Optimal bursts in turbulent channel flow* Journal of Fluid Mechanics 817, 35-60 (2017)
- H Wedin, S Cherubini, *Permeability models affecting nonlinear stability in the asymptotic suction boundary layer: the Forchheimer versus the Darcy model* Fluid Dynamics Research 48 (6), 061411 (2016)
- M Farano, S Cherubini, JC Robinet, P De Palma, *Subcritical transition scenarios via linear and nonlinear localized optimal perturbations in plane poiseuille flow* Fluid Dynamics Research 48 (6), 061409 (2016)
- JO Pralits, A Bottaro, S Cherubini, *Weakly nonlinear optimal perturbations* Journal of Fluid Mechanics 785, 135-151 (2015).
- S. Cherubini, P. De Palma, *Minimal-energy perturbations rapidly approaching the edge state in a Couette flow* Journal of Fluid Mechanics, Vol. 764, 572-598 (2015).
- S. Cherubini, P. De Palma, J. C. Robinet, *Nonlinear optimals in the asymptotic suction boundary layer: Transition thresholds and symmetry breaking* Physics of Fluids vol. 27 (3), 1.4916017, (2015).
- M. Farano, S. Cherubini, J. C. Robinet, P. De Palma, *Hairpin-like optimal perturbations in plane Poiseuille flow*, Journal of Fluid Mechanics, Rapids, Vol. 775 (2015).
- H. Wedin, S. Cherubini, A. Bottaro, *Effect of plate permeability on nonlinear stability of the asymptotic suction boundary layer* Physical Review E - Statistical, Nonlinear, and Soft Matter Physics Vol. 92 (1), 013022 (2015)
- S. Cherubini, J. Ch. Robinet, P. De Palma *Numerical study of the effect of freestream turbulence on by-pass transition in a boundary layer* Energy Procedia Vol. 45, pp. 578-587 (2014).
- S. Cherubini, P. De Palma, *Minimal perturbations approaching the edge of chaos in a Couette flow* Fluid Dynamics Research Vol. 46 (4), 041403 (2014).
- J.C. Loiseau, J.C. Robinet, S. Cherubini, E. Leriche, *Investigation of the roughness-induced transition: global stability analyses and direct numerical simulations* Journal of Fluid Mechanics, Vol. 760, 175-211 (2014).

- S. Cherubini, P. De Palma, *Nonlinear optimal perturbations in a Couette flow: bursting and transition* Journal of Fluid Mechanics, Vol. 716, pp 251-279 (2013).
- S. Cherubini, M. De Tullio, P. De Palma, G. Pascazio *Transient growth in the flow past a three-dimensional smooth roughness element* Journal of Fluid Mechanics, Vol. 724, pp. 642-670 (2013).
- S. Cherubini, M. De Tullio, P. De Palma, G. Pascazio *Optimal perturbations in boundary layer flows over rough surfaces* Journal of Fluid Engineering, 135 (12), 4025028 (2013).
- S. Cherubini, J. Ch. Robinet, P. De Palma *Nonlinear control of unsteady finite-amplitude perturbations in the Blasius boundary-layer flow* Journal of Fluid Mechanics, Vol. 737, pp. 440-465 (2013).
- S. Cherubini, P. De Palma, J.-C. Robinet, A. Bottaro, *A purely nonlinear route to transition approaching the edge of chaos in a boundary layer* Fluid Dynamics Research, Vol. 44 (3) , 031404 (2012).
- S. Cherubini, P. De Palma, J.-C. Robinet, A. Bottaro, *Edge states in a boundary-layer flow*, Physics of Fluids, 23 (5), 051705 (2011).
- S. Cherubini, P. De Palma, J.-C. Robinet, A. Bottaro, *The minimal seed of turbulent transition in the boundary layer*, Journal of Fluid Mechanics, Vol. 689 , pp. 221-253 (2011).
- S. Cherubini, J.-Ch. Robinet, P. De Palma *The effects of non-normality and non-linearity of the Navier-Stokes operator on the dynamics of a large laminar separation bubble*, Physics of Fluids, Vol. 22 (1), pp. 014102-15 (2010).
- S. Cherubini, J.-Ch. Robinet, A. Bottaro, P. De Palma *Optimal wave packets in a boundary layer and initial phases of a turbulent spot*, Journal of Fluid Mechanics Vol. 656, pp. 231-259 (2010).
- S. Cherubini, J.-C. Robinet, P. De Palma, F. Alizard, *The onset of three-dimensional centrifugal global modes and their non-linear development in a recirculating flow over a flat surface*, Physics of Fluids, Vol. 22, pp. 114102-18 (2010).
- S. Cherubini, P. De Palma, J.-C. Robinet, A. Bottaro, *Rapid path to transition via nonlinear localized optimal perturbations in a boundary-layer flow*, Physical Review E, Vol. 82, pp. 066302-5 (2010).
- F. Alizard, S. Cherubini, J.-Ch. Robinet *Sensitivity and optimal forcing response in separated boundary layer flows*, Physics of Fluids, Vol. 21 (6), pp. 064108-13, (2009).

PUBLICATIONS ON INTERNATIONAL CONFERENCE PROCEEDINGS

- F Manganelli, S Leonardi, S Cherubini, P De Palma Investigating the performance and wake flow of diffuser-augmented wind turbine using Large Eddy Simulations Journal of Physics: Conference Series 3224 (9), 092014 (2026)
- F Spagnoletta, F Manganelli, P De Palma, S Leonardi, S Cherubini Impact of wave phase speed on coherent structures in the wake of offshore wind turbines Journal of Physics: Conference Series 3224 (3), 032043 (2026)
- C Bernardi, G Della Posta, S Leonardi, S Cherubini, P De Palma The aeroelastic response of the IEA 15-MW wind turbine's blades impinged by a turbulent inflow 16 th European Conference on Turbomachinery Fluid dynamics & Thermodynamics (2025)
- A Giannotta, M Yoko, S Cherubini, P De Palmo, M Juniper Bayesian data assimilation of acoustically forced laminar premixed conical flames Symposium on Thermoacoustics in Combustion, 11–14 September 2023, Zurch ... (2023)
- F Manganelli, C Bernardi, S Leonardi, S Cherubini, P De Palma *Assessing the Effect of Coriolis Acceleration on the Coherent Structures in the Wake of a Wind Turbine Using DMD* Turbo Expo: Power for Land, Sea, and Air 88094, V013T37A005, (2024)
- C Bernardi, F Manganelli, S Leonardi, S Cherubini, P De Palma *Assessing the effect of turbine size on the coherent structures in the wake using DMD* Journal of Physics: Conference Series 2767 (9), 092019 (2024)

- C Bernardi, G Della Posta, P De Palma, S Leonardi, F Bernardoni, S Cherubini *The effect of the tower's modeling on the aero-elastic response of the NREL 5 MW wind turbine* Journal of Physics: Conference Series 2505 (1), 012037 (2023)
- C Bernardi, F Porcacchia, C Testa, P De Palma, S Leonardi, S Cherubini *Wind Turbine Aeroacoustics by Large-eddy Simulation-Acoustic Analogy Approach* 15 th European Conference on Turbomachinery Fluid dynamics & Thermodynamics (2023)
- S Cherubini, G De Cillis, O Semeraro, S Leonardi, P De Palma, *How incoming turbulence affects wake recovery of an NREL-5MW wind turbine* Journal of Physics: Conference Series 2385 (1), 012139 (2022)
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PH.D. THESIS

Linear and non-linear global instability of attached and separated boundary-layer flows, PhD Thesis, 2010.

RESEARCH INTERESTS

Instability, laminar-turbulent transition and turbulence in shear flows

A research subject I follow up from my PhD thesis up to now is the study of instability, laminar-turbulent transition and turbulence in shear flows. Despite many efforts in the last century, the very nature of turbulence and transition to turbulence continues to elude the fluid mechanics community, but it is now clear that several routes to turbulence may exist in a given flow. My work from 2010 until now has aimed at determining the most effective routes to transition to turbulence as well as the coherent structures and mechanisms maintaining the turbulent flow in shear flows such as the boundary layer or the channel flow. In particular, my research group has been the first to compute nonlinear optimal perturbations in several shear flows in laminar and turbulent conditions, along with the determination of the minimal thresholds for transition and the "edge state" separating the basins of attraction of the laminar and the turbulent flow. This research subject has led to several very

well cited journal publications from 2010 until now, in international journals such as the *Journal of Fluid Mechanics*.
Secondly, I have also made pioneering contributions by extending global instability analysis to increasingly realistic flow configurations. I have been among the first researchers to apply these techniques to flows over wall roughness elements and later to turbulent flows, demonstrating how global instability theory can explain the emergence of large-scale coherent structures and their interaction with smaller turbulent motions. This research subject has led to several very well cited journal publications from 2014 until now, in international journals such as the *Journal of Fluid Mechanics*. I recently extended the application of these techniques also to compressible flows, carrying out studies of global instabilities in over-expanded nozzles and diffusion flames. These advances considerably broadened the scope of stability theory and established powerful new tools that are now widely used in the study of complex turbulent flows.
Moreover, concerning shear flows, I have worked on some ways of reducing the drag due to the skin friction between the molecules of the fluid and the solid surface over which it flows. This resistance to motion can be reduced by using active or passive control. Concerning the active control, I have deviced a nonlinear optimal strategy based on blowing and suction to delay transition in a boundary layer flow, consequently keeping the drag to the (much lower) laminar value. Concerning the passive control, one can reduce the drag by decreasing the gradient of velocity between the surface and the flow itself, which can be achieved by using particular surfaces or coatings, able to assure shear-free or slip wall conditions. One example of this kind of surfaces is given by superhydrophobic (SH) surfaces, characterized by a nanostructure composed by a hierarchical structure of microroughnesses that trap the air underneath them, reducing the surface of contact with the water droplets and the wetting of the surface. From 2015 until now, in the framework of two research projects founded by the French ANR (National research agency) and the MIUR (Italian ministry of research), I have focused on the transition-delay properties of such surfaces, and on their numerical modeling, leading to several journal papers published in different journals such as the *Journal of Fluid Mechanics*. Moreover, I have also studied the effect of porous surfaces on transition and bifurcations of shear flows, in the framework of a cooperation with prof Bottaro from University of Genova.

Instability analysis and adjoint methods
The linear and nonlinear stability of an equilibrium solution of a nonlinear system is usually a straightforward problem for dynamical systems of finite order. However, carrying out such analyses in infinite order systems such as three-dimensional fluid flows has a huge (often prohibitive) computational cost due to the inversion of very large Jacobian matrices. For this reason, the stability of fluid flows has been studied first using a "local" approach, where the fate of perturbations at each streamwise position was analyzed by extending to infinity the velocity profile at the selected streamwise station. The international research group on stability of fluid flows in which I have been working from 2009 (Prof. Robinet, Dr. Loiseau, Prof. Rist, Prof. Lusseyran etc) has been one of the first to carry out stability analyses using "global" approaches, for which the streamwise, normal, and sometimes even the transverse flow directions are considered as eigendirections. These analyses have been carried out by using timestepping approaches that avoid the inversion of the Jacobian matrix, and have been applied for the first time by this research group to several complex flows, such as flows over roughness elements, flows over superhydrophobic surfaces, diffusion flames etc. I have also made pioneering contributions by applying these techniques to turbulent flows, demonstrating how global instability theory can explain the emergence of large-scale coherent structures and their interaction with smaller turbulent motions. This research subject has led to several very well cited journal publications from 2014 until now, in international journals such as the *Journal of Fluid Mechanics*. I recently extended the application of these techniques also to compressible flows, carrying out studies of global instabilities in over-expanded nozzles and diffusion flames. These advances considerably broadened the scope of stability theory and established powerful new tools that are now widely used in the

study of complex turbulent flows.
Moreover, with the same international research group, I have tackled nonnormal and nonlinear stability problems using adjoint methods. The adjoint formulation is useful when one seeks for a few outputs of a system with many possible inputs, leading to many advantages in stability theory and optimization, in which a single objective function is maximized with respect to a large number of input variables. Using this framework, the sensitivity of some global quantity to the input data of a complex problem (such as for instance the Navier-Stokes equations) can be simultaneously computed by adjoint algorithms having approximately the same computation time as a single run of the NS simulation, being considerably faster than a linearization approach in which one would have to numerically solve a separate linearized problem for the increment in each input variable. Througout my research work I have thus used adjoint methods in a vast range of configurations, ranging from boundary layer flows, to flame models. In all cases, adjoint fields were used to provide sensitivity derivatives, linking the concept of receptivity for convective-type instabilities (in the case of both modal and nonmodal amplification), allowing to compute optimal quantities by means of variational approaches, and yielding important information on the location and intensity of the wave maker, with immediate implications for flow control. This framework is very broad and can be applied to many problems relevant to fluid dynamics. By now, I am working at applying similar approaches to notable eingineering problems, such as the modal and nonmodal stability of combustion flames (cooperation with Prof. Juniper in Cambridge University, UK) and the stability of a turbine's wake (cooperation with Prof. Leonardi, University of Texas at Dallas, USA), and data assimilation in unsteady flows (cooperation with Dr. Semeraro of University of Paris-Saclay, France).

Wind turbine flows
The prediction and control of wind turbine dynamics and operations, as well as their wake dynamics and its impact on the downstream turbines, is a leading challenge for the design of wind farms. Since accurate aerodynamic measurements on MW scale wind turbines are extremely difficul, high-fidelity simulations are necessary to give insight into the relevant aerodynamic problems for large-scale wind turbines.
The research I carried out on this subject in the last 4 years has aimed at obtaining databases using high-fidelity large-eddy simulations, which have been exploited and analysed to identify the main mechanisms governing the wake dynamics. In particular, we have studied the main wake features and their effect on the environment by applying modal decompositions on the numerical databases, for developing dynamically accurate Reduced-Order-Models (ROM). Notably, a small set of Proper Orthogonal Decomposition (POD) or Dynamic Mode Decomposition (DMD) modes can describe several relevant aspects of the wake dynamics. Using these decompositions my research group has shown that the tower and the nacelle have a strong influence on wake recovery, and that the turbulence impacting on the turbine affects strongly the wavelengths and spatial structure of the coherent structures developing in the wake. On these topics we have published 5 articles on journals such as *Wind Energy* and *Renewable Energy* and several conference proceedings from 2020 to now. Moreover, in the frame of a very recent cooperation with the Institute of Marine Engineering of CNR - Rome (Dr. Testa and Dr. Greco), we are currently aiming at using these decompositions for determining the aeroacoustic impact of such coherent structures. The results of this cooperation have been published in 2 international journal papers.
Moreover, the design of innovative turbines has shown a clear trend towards increasing the rotor diameter up to more than 200 meters to capture a larger fraction of wind energy, inducing concerns about the effects of these long and slender blades' flexibility on the wind turbine power production and load. For this reason, our current research is attempting at taking into account the blades' aeroelasticity by means of models capable of capturing different spatial and temporal scales involved in the problem. In cooperation with Prof. Leonardi at University of Texas at Dalls and with Prof. Bernardini at La Sapienza, Rome, we have integrated Fluid-Structure Interaction (FSI) models based on a two-way coupling aeroelastic approach in our high-fidelity computations. These simulations taking into ac-

count FSI are currently been analysed to establish the effect of the aeroelastic coupling on the turbine's performance. The results of this cooperation have led to several journal papers and conference proceedings.
Finally, we are currently extending these investigations on off-shore wind turbines, which are experiencing a monotonic expansion during the last decades. In particular we are currently investigating, by means of large-eddy simulations, the wake dynamics under atmospheric turbulence and moving sea surface. Preliminary results of this work have been presented at the *TORQUE Conference 2026*, and a draft journal paper is been prepared. Determining the effect of the waves on the power production and performance of off-shore wind turbines we will be able to evaluate their advantages and disadvantages against the onshore counterparts.

Thermoacoustic instability and combustion
A rather new research topic I started to work on is the modeling of thermoacoustic instability and flame dynamics by means of data assimilation and adjoint methods. The final aim of this research topic is to be able to assimilate data about flame dynamics and instabilities into simple physics-based model.
At first, we have focused our efforts on the study of *triggering*, which is the process by which a linearly stable thermoacoustic system can reach self-sustained oscillations. This nonlinear phenomenon is activated only for sufficiently large amplitudes of perturbations to the equilibrium state. Using a nonlinear variational optimization method coupled with energy bisection, the minimal energy thresholds for triggering in a Rijke tube have been investigated. In particular, we have shown that, for sufficiently large time delays, the nonlinearity linked to the delayed flow velocity bears a strong potential for energy growth, leading to transient amplifications of the energy two orders of magnitude larger than those reported in previous studies. This study has led to a journal publication in the *Journal of Fluid Mechanics*.
Then, the research group has worked at developing a novel, general model for the tracking of a premixed flame sheet. This model, based on a Lagrangian formulation of the interface motion, has been by now applied to a conical Bunsen flame in which flame-base oscillations and flame stretch effects are also considered. This flame model has been designed to be differentiable so that it can be used for rapid data assimilation using Laplace's method. The model and the related results have been discussed in a journal paper submitted in *Combustion and flames*. In the frame of a cooperation with Prof. Juniper at Cambridge, UK, we are currently working at the assimilation of experimental data on the previously discussed flame model, by using Bayesian inference together with adjoint methods, that accelerate data assimilation and allow uncertainties to be propagated through the model.

TEACHING

- ***Dinamica e Controllo delle Macchine*** (Dynamics and Control in Machines 30H), Politecnico di Bari, during the academic year 2025/2026.
- ***Macchine a Fluido II*** (Fluid Machinery II, 60H), Politecnico di Bari, during the academic years 2020/2021 to 2023/2026.
- ***Sistemi Propulsivi*** (Propulsive Systems, 60H), Politecnico di Bari, during the academic years 2016/2017 to 2023/2026.
- ***Macchine a Fluido I*** (Fluid Machinery I, 60H), Politecnico di Bari, during the academic years 2016/2017 - 2017/2018 and 2018/2019.
- ***Thermique à flamme*** (Thermodynamics for Power Plants, 45H) FIP training, Energetic engineering '*Génie energétique*' at the Arts et Métiers ParisTech University, Paris, during the academic years 2012/2013 - 2013/2014 and 2014/2015.
- ***Physique non linéaire et chaos*** (Non-linear dynamics and chaos, 30H) MFFA -AA Master, specialization Fluid Mechanics, fundamentals and applications - Aerodynamics, aeroacustics at the University Arts et Métiers ParisTech, Paris, in the academic year 2014/2015.
- ***Mathematics for engineers*** (30H), International Master *Mechanical, Energy and Industrial Engineering*, University Arts et Métiers ParisTech, Paris, academic years 2012/2013, 2013/2014 and 2014/2015.

- ◇ ***Numerical Methods*** (12H), International Master *Mechanical, Energy and Industrial Engineering*, University Arts et Métiers ParisTech, Paris, academic years 2012/2013, 2013/2014 and 2014/2015.
- ◇ ***Hydraulics*** (18H), International Master *Mechanical, Energy and Industrial Engineering*, University Arts et Métiers ParisTech, Paris, academic years, 2013/2014 and 2014/2015.
- ◇ ***Aerodynamics*** (18H), International Master *Mechanical, Energy and Industrial Engineering*, University Arts et Métiers ParisTech, Paris, academic years 2013/2014 and 2014/2015.
- ◇ **Doctoral course of *Dinamica dei sistemi*** (Dynamical systems, 24H) at the Polytechnical University of Bari, academic year 2011/2012.

INSTITUTIONAL APPOINTMENTS

- ◇ **Erasmus Coordinator** for the Department of Mechanics, Mathematics and Management of Politecnico di Bari from 2017 until the end of 2018.
- ◇ **Coordinator of the Double Degree program** between the Department of Mechanics, Mathematics and Management of Politecnico di Bari with Arts et Métiers ParisTech (Paris, France), involving three different Master Degrees, from 2017.
- ◇ **Member of the Quality Examination Board** of the Master Degree in Mechanical Engineering of the Department of Mechanics, Mathematics and Management of Politecnico di Bari, from 2021.
- ◇ **Member of the Research Commitee** of the Department of Mechanics, Mathematics and Management of Politecnico di Bari, from 2022.
- ◇ **Member of the Regional Observatory on Hydrogen** from august 2022, nominated as Expert of the CURC (Regional Universities Coordination Commitee).
- ◇ **Delegate of Department for the Internationalization** from october 2024, nominated from the Director of the Department of Mechaniics, Mathematics and Management of the Polytechnical University of Bari.
- ◇ **Delegate of the Polytechnical University of Bari for Orientation** of the Polytechnical University of Bari from november 2025.

LANGUAGES

- ◇ **Italian** Mother tongue.
- ◇ **English** Excellent, fluent and technical, certified by the "TOEFL" test, mark 630 /667 (paper-based test).
- ◇ **French** Excellent, fluent and technical.
- ◇ **Portugues** Good.

Bari, 1 October 2026

Stefania Cherubini

