Alessandro Bongarzone

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Born August 20, 1994, in Narni (TR), Italy

Education

Doctoral School of Mechanical Engineering — Jun 2019 – Current
École Polytechnique Fédérale de Lausanne (EPFL) — Lausanne, Switzerland
Estimated completion date: Sep 2023
Provisional dissertation title: *Self-sustained dynamics and forced resonant oscillations in flows: cross-junction jets and sloshing liquids*
Supervisor: Prof. François Gallaire

Master's Degree in Aerospace Engineering — Sep 2016 – Apr 2019
University of Pisa — Pisa, Italy
Thesis title: *Sloshing waves and Faraday instability: contact line behaviour and static meniscus*
Supervisor: Prof. Simone Camarri
Final Mark: 110/110 cum laude

- Research Internship at École Polytechnique Fédérale de Lausanne (EPFL) — Sep. 2018 - Mar. 2019
  Seven months project on *Sloshing wave dynamics and Faraday instability* — Lausanne, Switzerland
  at Laboratory of Fluid Mechanics and Instabilities (LFMI).
  Tutored by Prof. François Gallaire

Bachelor's Degree in Aerospace Engineering — Sep 2013 – Oct 2016
University of Pisa — Pisa, Italy
Thesis title: *Flow through a constant area duct with friction: Fanno flow*
Supervisor: Prof. Maria Vittoria Salvetti
Final Mark: 108/110

Scientific High School Diploma — Sep 2008 – Jul 2013
I.I.S.S. Gandhi of Narni — Narni, Italy
Final Mark: 86/100

Licenses and certificates

Deep Learning Specializations (Coursera) — Feb 2022
https://www.coursera.org/account/accomplishments/specialization/certificate/WXQVWVW AF325 — online

- Sequence Models
- Convolutional Neural Networks
- Improving Deep Neural Networks: Hyperparameter Tuning, Regularization and Optimization
- Structuring Machine Learning Projects
- Neural Networks and Deep Learning

Machine Learning (Coursera) — Jan 2022
https://www.coursera.org/account/accomplishments/certificate/8CDGUXB5BKTS — online

European Computer Driving Licence (ECDL), AICA — March 2010
issued by I.I.S.S. Gandhi of Narni (AAD-01). SKILLS CARD: IT-2245990 — Narni, Italy

Additional schools and trainings

Python for Data Science and Machine Learning (Learning & Development) 21-23, Sep 2022
École Polytechnique Fédérale de Lausanne (EPFL) online

Python Fundamentals (Learning & Development) 21-23, Feb 2022
École Polytechnique Fédérale de Lausanne (EPFL) online

Model Order Reduction Summer School (MORSS 2020) 7-10, Sep 2020
Organized by École Polytechnique Fédérale de Lausanne (EPFL) and Eidgenössische Technische Hochschule (ETH) online

International Summer School *Complex Motion in Fluids* 18-24, Aug 2019
Technical University of Denmark (DTU) Kysthusene Gilleleje, Denmark

Awards

Gallery of Fluid Motion Award Nov 2021
Seattle, WA, USA

V0036: "Swinging Jets", **DOI**: https://doi.org/10.1103/APS.DFD.2019.GFM.V0036
72^{th} Annual Meeting of the APS Division of Fluid Dynamics (DFD)

Scientific publications

Peer-reviewed journal articles

- Caruso Lombardi, F., Bongarzone, A., Zampogna, G. A., Gallaire, F., Camarri, S. Ledda P. G. (2023) Three dimensional instability of the von Karman vortex street past a permeable circular cylinder: two-dimensional flow and DMD-based secondary stability analysis. *Phys. Rev. Fluids*.**8, 083901 DOI**: https://doi.org/10.1103/PhysRevFluids.8.083901
- Marcotte, A., Gallaire, F. Bongarzone, A. (2023) Super-harmonically resonant swirling waves in longitudinally forced circular cylinders. *J. Fluid Mech.* **966, DOI**: https://doi.org/10.1017/jfm.2023.438
- Bongarzone, A., Viola, F., Camarri, S. Gallaire, F. 2022 Sub-harmonic parametric instability in nearly-brimful circular cylinders: a weakly nonlinear analysis. *J. Fluid Mech.* **947, DOI**: https://doi.org/10.1017/jfm.2022.600
- Bongarzone, A., Guido, M. . Gallaire F. 2022 An amplitude equation modeling the double-crest swirling in orbital shaken cylindrical containers. *J. Fluid Mech.* **943, DOI**: https://doi.org/10.1017/jfm.2022.440
- Bongarzone, A., Viola, F. Gallaire, F. 2021 Relaxation of capillary-gravity waves due to contact line nonlinearity: A projection method. *Chaos* **31** (12), 123124, **DOI**: https://doi.org/10.1063/5.0055898
- Bongarzone, A., Bertsch, A., Renaud, P. Gallaire, F. 2021 Impinging planar jets: hysteretic behaviour and origin of the self-sustained oscillations. *J. Fluid Mech.* **913, DOI**: https://doi.org/10.1017/jfm.2021.51
- Bertsch, A., Bongarzone, A., Yim, E., Renaud, P. Gallaire, F. 2020 Swinging jets. *Phys. Rev. Fluids* **5** (11), 110505, **DOI**: https://doi.org/10.1103/PhysRevFluids.5.110505
- Bertsch, A., Bongarzone, A., Duchamp, M., Renaud, P. Gallaire, F. 2020 Feedback-free microfluidic oscillator with impinging jets. *Phys. Rev. Fluids* **5** (5), 054202, **DOI**: https://doi.org/10.1103/PhysRevFluids.5.054202

Submitted papers

- Bongarzone, A., Jouron, B., Viola, F., Gallaire, F. (2023) A revised gap-averaged Floquet analysis for Faraday waves in Hele-Shaw cells. Under review in *J. Fluid Mech.* **DOI**: https://doi.org/10.48550/arXiv.2306.11501

- Marcotte, A., Gallaire, F. Bongarzone, A. (2023) Swirling against the forcing: evidence of stable counter-directed sloshing waves in orbital-shaken reservoirs. Accepted in *Phys. Rev. Fluids* **DOI**: https://doi.org/10.48550/arXiv.2302.14579

Papers under preparation

- Bongarzone, A. Gallaire, F. (2023) Stick-slip to stick transition induced by contact angle hysteresis in U-shaped tubes: a projection method. In preparation for submission to *Phys. Rev. Fluids.*

Conferences contributed

A revised gap-averaged model of Faraday waves in Hele-Shaw cells — Jun 2023
15^{th} SIG 33-ERCOFTAC Workshop — Alghero, Italy

Symmetry-breaking swirling waves in longitudinally forced cylindrical containers — Nov 2022
75^{th} Annual Meeting of the APS Division of Fluid Dynamics (DFD) — Indianapolis, IN, USA

Stick-slip to stick transition induced by contact angle hysteresis in U-shaped tubes: a projection method — Sep 2022
Athens, Greece
14^{th} European Fluid Mechanics Conference (EFMC14)

Amplitude equation model for prediction of super-harmonic double-crest wave dynamics in orbital shaken cylindrical containers — Nov 2021
Phoenix, AZ, USA
74^{th} Annual Meeting of the APS Division of Fluid Dynamics (DFD)

The role of a capillary meniscus on the Faraday instability — Aug 2021
25^{th} International Congress of Theoretical and Applied Mechanics (ICTAM) (speaker: F. Gallaire) — Milano, Italy

Impinging planar jets: hysteretic behaviour and origin of the self-sustained oscillations — Nov 2020
73^{th} Annual Meeting of the APS Division of Fluid Dynamics (DFD) (online) — Chicago, IL, USA

Nonlinear damping of sloshing motion caused by a piece-wise linear contact line model — Nov 2020
73^{th} Annual Meeting of the APS Division of Fluid Dynamics (DFD) (online) (speaker: F. Gallaire) — Chicago, IL, USA

Swinging jets (contribution V0036 to the Gallery of Fluid Motion contest) — Nov 2019
72^{th} Annual Meeting of the APS Division of Fluid Dynamics (DFD) — Seattle, WA, USA

Faraday instability: effect of the static meniscus (poster presentation) — Aug 2019
9^{th} International Summer School *Complex Motion in Fluids* — Kysthusene Gilleleje, Denmark

Informal talks and seminars

Super-harmonically resonant swirling waves in longitudinally forced cylinders — Nov 2022
At Complex Fluids Group – Princeton University – hosted by Prof. H.A. Stone — Princeton, NJ, USA
At Brun Lab – Princeton University – hosted by Prof. P.-T. Brun
At Deike Lab – Princeton University – hosted by Prof. L. Deike

Faraday waves — May 2022
At Gran Sasso Science Institute (GSSI) — L'Aquila, Italy

Teaching and students supervision

Teaching Assistant

- *Hydrodynamics* Master course in Mechanical Engineering at EPFL — Spring 2022
  35 total hours
- *Numerical Flow Simulations* Master course in Mechanical Engineering at EPFL — Fall 2020, 2021, 2022
  130 total hours (softwares used: ANSYS – Workbench, Fluent, SpaceClaim)
- *Numerical Methods in Biomechanics* Master course in Mechanical Engineering at EPFL — Spring 2020, 2021
  45 total hours (softwares used: COMSOL Multiphysics)

Master Thesis Supervisor

- Tutored one visiting student from University of Pisa at EPFL — Sep 2021 – Mar 2022
  Title of the project: *Three- dimensional instability of the von Karman vortex street past a porous cylinder*
  85 total hours
- Tutored one student at EPFL — Spring 2021
  Title of the project: *Modeling hysteresis in orbital sloshing*
  120 total hours

Semester Project Supervisor

- Tutored one Master student at EPFL — Spring 2023
  Title of the project: *Faraday waves in an annular Hele-Shaw cell*
  50 total hours
- Tutored one Master student at EPFL — Spring 2022
  Title of the project: *Capillary-gravity waves: effect of a circular corral*
  35 total hours
- Tutored one visiting Master student from École Polytechnique at EPFL — Spring 2021
  Title of the project: *Stability of fluidic oscillators*
  20 total hours
- Tutored one Master student at EPFL — Spring 2019
  Title of the project: *Effect of a variable slip-length wall-condition on the damping of two-dimensional sloshing waves*
  30 total hours

SERVICE

Journal referee for: Journal of Fluid Mechanics

SKILLS

Languages: Italian (native), English (fluent), French (intermediate)

Programming: Matlab, Simulink, Mathematica, Python (NumPy, SciPy, Matplotlib, Pandas, TensorFlow, Jupyter)

Softwares: COMSOL, Nek5000, FreeFem++, ANSYS-Fluent, Paraview

Theoretical: finite elements, spectral and pseudospectral elements, finite differences, finite volumes, linear stability and asymptotic techniques (weakly-nonlinear multiple-scales analysis), reduced order models and decomposition techniques (POD, DMD)

Document Creation: Microsoft Office Suite (Excel, Word, PowerPoint), Adobe Creative Suite (Illustrator, Photoshop), LaTex, Overleaf

Lausanne, August 9, 2023
Alessandro Bongarzone