alexandros kontogiannis

Ph.D student @ University of Cambridge

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EXPERIENCE

University of Cambridge - Ph.D student   Cambridge · 10/2019–Present

Inverse problems in fluid mechanics and digital twins for magnetic resonance velocimetry: formulation of variational Bayesian inference algorithms that combine phase-contrast magnetic resonance imaging (PC-MRI) measurements of velocity fields and a field equation (Poisson, Stokes, Navier-Stokes), to infer uncertain quantities, such as the viscosity of the fluid, the shape of the domain and the numerical boundary conditions. At the same time, a reconstructed (noiseless) solution of the velocity field is obtained as the PC-MRI signal is filtered through the model equation.
Major subjects: inverse problems in fluid mechanics & applied mathematics

Polytechnique Montréal - graduate researcher   Montreal · 09/2017–09/2019

Multiphysic aerodynamic shape optimization for subsonic/transonic flows and in-flight atmospheric icing conditions using hybrid algorithms that combine derivative-free and adjoint-based methods.
Major subjects: aerodynamics & applied mathematics

ONERA - research assistant   Toulouse · 03/2017–08/2017

Development of new integral boundary layer models and wall functions for the momentum and thermal properties of ice-roughened surfaces with application to airfoil ice accretion prediction (@ Department of Multiphysics for Energetics).
Major subjects: aerodynamics, boundary layer theory & convective heat transfer

EDUCATION

University of Patras   Patras · 2011–2017

Graduated 3rd with *highest honors* (GPA 8.67/10) from Mechanical Engineering and Aeronautics Department (BSc.+MSc.).

Major subjects: *Fluid Mechanics · Computational Fluid Dynamics · Finite Element Methods · Aerodynamics*
Thesis subject: *Viscous-Inviscid Fluid-Structure Interaction Method for the Analysis of High-Lift Morphing Airfoils*
(Thesis GPA 10/10) Professors in charge: D. Saravanos (UPAT), V. Riziotis (NTUA)

AWARDS AND GRANTS

ASME Fluids Engineering Division Graduate Student Scholar Award (FEDSM 2021 - best paper)	· 8/2021
W. D. Armstrong Graduate (Ph.D) Studentship	· 8/2019
Technical Chamber of Greece (TEE) Award for Top Graduate Students	· 12/2018
Award of Academic Excellence by the Limmat Foundation of Zurich	· 12/2017
A. Mentzelopoulos Scholarship for Post-Graduate studies in U.S.A and Canada	· 09/2017
3rd Place in ActInSpace CNES/ESA/AIRBUS Competition	· 05/2016
2nd Place for Design in Design-Build-Fly Aeronautical Competition	· 08/2015
Greek State Scholarship Foundation Award for High Student Performance (top 1%)	· 09/2012

TECHNICAL SKILLS

CODING		CAD/CAE		VISUALIZATION		OTHER
C/C++	PYTHON	CatiaV5	OpenFOAM	Inkscape	Gnuplot	LaTeX, Git
Fortran	Bash/Shell	Gmsh	SU^2	Tikz	Tecplot/Paraview	Unix/Linux, MPI, HPC

TEACHING EXPERIENCE

Engineering Tripos Part IIA, 3A1: Fluid Mechanics I (Supervision)   University of Cambridge · 2020/21

Seminar in 'Shape Optimization with Adjoints in Fluid Dynamics'   McGill University · 2018

Lecture Series in Low-Speed Aerodynamics   University of Patras · 2014

JOURNAL AND CONFERENCE PAPERS

1. A. Kontogiannis and M. P. Juniper. Physics-informed compressed sensing for PC-MRI: an inverse Navier–Stokes problem. *IEEE Transactions on Image Processing (in peer-review)*, 2022

2. A. Kontogiannis, S. V. Elgersma, A. J. Sederman, and M. P. Juniper. Joint reconstruction and segmentation of noisy velocity images as an inverse Navier–Stokes problem. *Journal of Fluid Mechanics (peer-reviewed and accepted)*, 2022

3. U. Sengupta, A. Kontogiannis, and M. P. Juniper. Simultaneous boundary shape estimation and velocity field de-noising in magnetic resonance velocimetry using physics-informed neural networks, 2021. `doi:10.48550/ARXIV.2107.07863`

4. A. Kontogiannis and M. P. Juniper. Inverse problems in magnetic resonance velocimetry: Shape, forcing and boundary condition inference. *American Society of Mechanical Engineers, Fluids Engineering Division (Publication) FEDSM*, 2, 2021. `doi:10.1115/FEDSM2021-66080`

5. A. Kontogiannis and E. Laurendeau. Adjoint state of nonlinear vortex-lattice method for aerodynamic design and control. *AIAA Journal*, 59(4):1184–1195, 2021. `doi:10.2514/1.J059796`

6. A. Kontogiannis, M. Parenteau, and E. Laurendeau. Viscous-inviscid analysis of transonic swept wings using 2.5D RANS and parametric shapes. In *AIAA Scitech 2019 Forum*. American Institute of Aeronautics and Astronautics, Jan 2019. `doi:10.2514/6.2019-2116`

7. T. Machairas, A. Kontogiannis, A. Karakalas, A. Solomou, V. Riziotis, and D. Saravanos. Robust fluid-structure interaction analysis of an adaptive airfoil using shape memory alloy actuators. *Smart Materials and Structures*, 27(10):105035, 2018. `doi:10.1088/1361-665X/aad649`

8. E. Radenac, A. Kontogiannis, C. Bayeux, and P. Villedieu. An extended rough-wall model for an integral boundary layer model intended for ice accretion calculations. In *2018 AIAA Atmospheric and Space Environments Conference*, Atlanta, Georgia, 2018. `doi:10.2514/6.2018-2858`

9. A. Kontogiannis, A. Prakash, E. Laurendeau, and F. Moens. Sensitivity of glaze ice accretion and iced aerodynamics prediction to roughness. In *26th Annual Conference of the Computational Fluid Dynamics Society of Canada*, Winnipeg, Manitoba, 2018. ResearchGate link.

10. P. Trontin, A. Kontogiannis, G. Blanchard, and P. Villedieu. Description and assessment of the new ONERA 2D icing suite IGLOO2D. In *9th AIAA Atmospheric and Space Environments Conference*, Denver, Colorado, 2017. `doi:10.2514/6.2017-3417`

11. A. Karakalas, T. Machairas, A. Kontogiannis, A. Solomou, V. Riziotis, and D. Saravanos. A robust fluid-structure interaction numerical tool for the analysis of airfoil morphing structures with shape memory alloy actuators. In *VIII ECCOMAS Thematic Conference on Smart Structures and Materials (SMART)*, Madrid, Spain, 2017

CONFERENCE PRESENTATIONS

- A. Kontogiannis and M. P. Juniper. Physics-informed compressed sensing: reconstruction of magnetic resonance velocimetry signals as an inverse Navier-Stokes problem. In *APS Division of Fluid Dynamics Meeting Abstracts*, 2021 (*video presentation*)

- A. Kontogiannis and M. P. Juniper. Joint reconstruction and segmentation of noisy flow images as an inverse Navier–Stokes problem @ UK Fluids Conference 2021 (*online presentation*)

- Paper #4 @ ASME FEDSM 2021 Fluids Engineering Division Summer Meeting (*video presentation*)

- A. Kontogiannis and M. P. Juniper. Inverse problems in magnetic resonance velocimetry: shape, velocity and boundary condition inference. In *APS Division of Fluid Dynamics Meeting Abstracts*, 2020 (*video presentation*)

- Paper #6 @ AIAA SciTech 2019 Forum, San Diego, California, January 2019 (*podium presentation*)

- Paper #9 @ 26th Annual Conference of the CFD Society of Canada, Winnipeg, Manitoba, June 2018 (*podium presentation*)

CONFERENCE SESSION CHAIRMANSHIPS

- Novel Techniques in Fluid Mechanics & Data Processing/Algorithms in Fluid Measurements @ ASME FEDSM 2022 Fluids Engineering Division Summer Meeting

ARCHIVED WORK

1. A. Kontogiannis. *Viscous-inviscid fluid-structure interaction method for the analysis of multielement morphing airfoils.* Theses, (Diploma), University of Patras, (Document in Greek), March 2017. URL: https://hal.archives-ouvertes.fr/tel-02067067

2. A. Kontogiannis. Shape Sensitivity Analysis and Optimization in Fluid Dynamics, Graduate course project (GPA: 4/4), McGill University, Montreal, April 2019. Link to document.

PATENTS

- A. Kontogiannis and M.P. Juniper. Method for improved reconstruction of magnetic resonance velocimetry data (*filed*).

AFFILIATIONS

American Physical Society (APS)	· Graduate Student Membership
Society for Industrial and Applied Mathematics (SIAM)	· Graduate Student Membership
American Institute of Aeronautics and Aerospace (AIAA)	· Student Membership

JOURNAL ARTICLE REVIEWS

Wind Energy, Wiley	· 2019

WORKSHOPS

- Physics and Artificial Intelligence, McGill University, Montreal, May 2019