

Antonio Stanziola

Biomedical Ultrasound, Computational Engineering, Simulation, Deep Learning

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Currently

I am currently a Research Fellow in Teoretical and Computational Acoustics at the Biomedical Ultrasound Group of UCL, working on novel acoustic simulation tools and on integrating machine learning models in them.

Research interests

Ultrasound image and signal processing, deep learning, numerical simulation, differentiable programming languages for machine learning and physical simulation, scientific machine learning, acoustics, medical image analysis, inverse problems and uncertainty quantification.

Education

Imperial College London, London (UK) 2014 - 2018

Ph.D in Biomedical Engineering, with a thesis titled “[Advanced Beamforming for High Frame Rate Ultrasound Vascular Imaging](#)”

Chalmers University of Technology, Gothenbourg (Sweden) 2012 - 2014

Ms.C in Biomedical Engineering, with a major in biomedical image and signal processing, awarded with a thesis titled “[Motion correction in contrast enhanced carotid ultrasound scans](#)”, which was carried during an internship at Imperial College. Final score: 4.5/5 (First class equivalent)

Università degli Studi di Pisa, Pisa (Italy) 2008 - 2012

Bs.C in Biomedical Engineering, with a major in biomechanics. Final score: 106/110

Occupation

University College London, London (UK) 2023 - present

Research Fellow in Theoretical and Computational Acoustics. Investigating novel acoustic simulations methods and their intersection with machine learning, in particular via differentiable programming languages, and working at the next version of the widely used k-Wave simulator.

TTP plc, Melbourn (UK). 2023

Consultant in Ultrasound imaging and simulation, inverse problems, medical imaging, machine learning and computer vision, working on a range of confidential project for companies in the UK and abroad.

University College London, London (UK). 2019 - 2023

Research Fellow in Deep Learning for Transcranial Ultrasound simulation. I have been focusing on accelerating ultrasound simulations using machine learning, writing a fully differentiable and extensible acoustic simulator for scientific machine learning, developing a framework in JAX for differentiable PDE solvers with arbitrary discretizations, supervising PhD and MSc students in various projects (e.g. deep learning for medical image translation and super resolution, signal processing applied to ultrasound, deep learning aided numerical simulations), teaching and outreach.

Imperial College Executive Education Programme, London (UK). 2019 - 2022

Teacher on the Computer Vision session within the Imperial College executive 1-week education program for Sberbank (4 cohorts).

Teaching assistant and co-responsible for content, style and automation of Jupyter Notebooks for the Computer Vision, Machine Learning and Computational Privacy modules.

Facilitating coordination between teaching and technical team.

Università degli Studi di Padova, Padova (Italy). 2019

Post-doctoral research placement in machine learning for contrast enhanced ultrasound and super-resolution.

Imperial College London, London (UK). 2018 - 2019
Post-doctoral research position on imaging algorithms for improving contrast enhanced ultra-fast cardiac ultrasound.

Imperial College London, London (UK). 2014 - 2016
Graduate Teaching Assistant. Modules: Signals and Systems (BSc), Image processing (MSc), Control Systems (BSc), Math 2 (BSc).

Scuola Superiore Sant'Anna (Centro Piaggio), Pisa (Italy). 2011 - 2012
Internship in electromechanical design of a bio-inspired robot. Hydrodynamic and magneto-mechanic simulations using FEM. Part of the CoCoRo project.

Awards

EPSRC UKRI Grant, founded for £584,440 2022
 Co-investigator in the winning EPSRC grant EP/W029324/1 for developing and extending the k-Wave ultrasound simulator

Bando n. 13/2019, Università degli studi di Padova (Italy) 2019
 Winner of a 1 year research scholarship.

Winner of the Plane Wave Imaging challenge, Rotterdam (Netherlands) 2016
 Winner of the challenge “Plane Wave Imaging for Ultrasound Contrast Agents” with the abstract “Temporal andspatial processing of high frame-rate contrast enhanced ultrasound data”

Best Teaching Assistant of the Year, Bioengineering Department, ICL (UK) 2015
 Elected by student vote as best teaching assistant of the year for the Bioengineering Department of the ImperialCollege London.

Recognitions

Institut d'Études Scientifiques, Cargèse 2024
Invited speaker to the European Summer School on Physical Acoustics and its Applications, to run a tutorial session on differentiable wave modelling for acoustic holograms

SIAM conference on Imaging Sciences 2024
Invited speaker at the workshop “Open Source Software Solutions for Imaging Inverse Problems”, to talk about differentiable wave simulations

Institute of Physics, University of Salford and UK Acoustic Network 2021
Invited speaker on “Machine Learning for Accelerating Acoustic Simulations”

Skills

General

Medical ultrasound signal processing, Medical imaging, Acoustic simulation, Deep learning, Inverse problems, Mathematical modelling, PDEs / ODEs, Finite Elements, Spectral methods, Image Analysis and Processing, General programming

Programming Languages

Python, MATLAB advanced
 C++, React, Javascript, Bash good
 Julia, CUDA, PHP basic
 LaTeX, HTML, (S)CSS, Git, Docker, others (advanced)

Computer Science

JAX, PyTorch, Numpy, Pandas, Django Packages
 git, bash scripting, Continuous Integration tools, Paraveiw, Slicer3D, FSL, FLIRT, Ansys, Solid Works tools
 Linux (Debian, Arch), Windows, MacOS OS
 DICOM, HDF5, Nifti, Verasonics Vantage scanner (usage and scripting) others

Selected Publications

A complete list is available at <https://scholar.google.com/citations?user=janVBUgAAAAJ>

Patents **EP (granted), US (pending)** 2023
Acoustic sub-aperture processing for ultrasound imaging, A Stanziola, MX Tang

Journals **ArXiv** 2023
Physics-Based Acoustic Holograms, A Stanziola, BT Cox, BE Treeby, MD Brown

JASA Express Letters 3 (5) 2023
A learned Born series for highly-scattering media, A Stanziola, S Arridge, BT Cox, BE Treeby

JASA Express Letters 3 (5) - (Journal Cover) 2023
Transcranial ultrasound simulation with uncertainty estimation, A Stanziola, JA Pineda-Pardo, B Treeby

Software X, 22 2023
j-Wave: An open-source differentiable wave simulator. - A Stanziola, SR Arridge, BT Cox, BE Treeby.
Software: <https://github.com/ucl-bug/jwave>

IEEE TUFFC, 69/10 2022
Classical and learned MR to pseudo-CT mappings for accurate transcranial ultrasound simulation, M Miscouridou, JA Pineda-Pardo, CJ Stagg, BE Treeby, A Stanziola

JASA, 152 (2) 2022
Benchmark problems for transcranial ultrasound simulation: Intercomparison of compressional wave models, JF Aubry, O Bates, C Boehm, KB Pauly, D Christensen, C Cueto, P Gélat, L Guasch, J Jaros, Y Jing, R Jones, N Li, P Marty, H Montanaro, E Neufeld, S Pichardo, G Pinton, A Pulkkinen, A Stanziola, A Thielscher, B Treeby, E Van't Wout

Journal of Computational Physics, 441, 110430 2021
A Helmholtz equation solver using unsupervised learning: Application to transcranial ultrasound, A Stanziola, SR Arridge, BT Cox, BE Treeby

IEEE TMI, 37 (8) 2018
ASAP: Super-contrast vasculature imaging using coherence analysis and high frame-rate contrast enhanced ultrasound, A Stanziola, CH Leow, E Bazigou, PD Weinberg, MX Tang

IEEE SPM, 33 (2) 2016
Ultrasound Imaging with Microbubbles, A Stanziola, M Toulemonde, YO Yildiz, RJ Eckersley, M Tang

Personal Certifications

PADI Advanced driving license
Car and full motorbike driving license

Languages Italian native
English fluent

Hobbies and passions

I enjoy playing the piano, scuba diving, cooking and studying macroeconomy.
In my free time I am continuously drawn on deepening my knowledge in the philosophy and science of mind, and in the study of the nature of consciousness: in this regard I am interested in analytical idealism and in scientific theories of mind and consciousness.
I am also into running