Curriculum Vitae

Personal Data

Pietro Benedusi, Ph.D.

Research fellow at Euler Institute, Università della Svizzera Italiana (USI), Lugano, Switzerland

pietro.benedusi@usi.ch

`https://pietrobe.github.io/`

Research

from 6/2020	Joint postdoc at USI and at the Locarno institute of solar research (IRSOL), working on the simulation of radiative transfer in stellar atmospheres.
4/2022 – 4/2024	Postdoc researcher at the Simula as a computational neuroscientist and HPC expert.
8/2019 – 10/2019	Research visit at Berkeley Lab
10/2015 – 5/2020	PhD student in Computational Science at USI with advisor Prof. Rolf Krause, developing new numerical schemes for massively parallel machines exploiting parallelism in time for PDEs solvers.
1/2014 – 9/2015	Student assistant at USI working on scalable algorithms for astrophysical applications.

Education

9/2013 – 9/2015	Master's degree with summa cum laude in Applied Mathematics and Computational Science at USI with thesis "A Parallel Multigrid Solver for Time-periodic Incompressible Navier-Stokes Equations" joint with ETH Zurich
9/2009 – 4/2013	Bachelor's degree in Physics at University of Pavia with thesis: "Neutrino Oscillations".

Computational tools

C/C++, MATLAB, Python, and Fortran. Good knowledge of protocols for parallel computing (MPI and OpenMP) and HPC frameworks, such as Slurm. Experience with finite element (LibMesh and Fenics), meshing tools, and numerical packages (PETSc, Trilinos).

Awards and events

2023	Lecturer at Simula Summer School in Computational Physiology.

2023	Organizing mini-symposium "High-performance computing tools for mixed dimensional problems " at SIAM CSE23, Amsterdam, Netherlands.
2022	Organizing mini-symposium "Scalable multilevel and multi-fidelity strategies for radiative transfer problems" at the International Multigrid Conference, Lugano, Switzerland.
2022	Granted a development proposal for computing resources in the Swiss super computing centre, in the context of solar simulations.
2019	Winner of the SIAM Travel Award grant to attend the CSE19 conference held in Spokane, USA.
2017	Organization of the summer school at USI: "Generalized locally Toeplitz sequences: a spectral analysis tool for discretized differential equations", Lugano, Switzerland.
2015	Winner of the grant "USIimpresa" as best student in the computer science faculty.
2013	Finalist in the programming competition "Dyalog APL Worldwide programming contest".

Conferences participations

1/2024	Speaker at DD28, KAUST, Saudi Arabia.
11/2023	Speaker at SfN, Washington, USA.
8/2023	Speaker at ICIAM, Tokyo, Japan.
7/2023	Speaker at the MICROCARD workshop, Strasbourg, France.
11/2022	Speaker at SPW10, Kyoto, Japan.
9/2022	Speaker at GIMC SIMAI YOUNG 2022, Pavia, Italy.
8/2022	Speaker at IMG2022, Lugano, Switzerland.
7/2022	Speaker at the 11th Parallel-in-Time Workshop, CIRM, France.
6/2022	Speaker at the ECCOMAS conference in Oslo, Norway.
2/2022	Speaker at the SIAM PP21 conference, held online.
9/2021	Speaker at the SIMAI 2021 conference in Parma, Italy.
8/2021	Speaker at the USNCCM16 conference and at the 10th Parallel-in-Time Workshop, both held online.
3/2021	Speaker at the SIAM CSE conference, held online.
12/2020	Speaker at the FOMICS-DADSI winter school on cardiac simulations, held online.

6/2020	Speaker at the 9th Parallel-in-Time Workshop, held online.
5/2019	Speaker at the 8th Parallel-in-Time Workshop in Bielefeld, Germany.
2/2019	Speaker at CSE19 conference in Spokane, USA.
7/2018	Speaker at DD25 conference in St John's, Canada.
4/2018	Poster at the Swiss Numerics Day, ETH, Zurich, Switzerland.
10/2017	Speaker at the 6th Parallel-in-Time Workshop, Ascona, Switzerland.
6/2017	Speaker at LSSC17 conference in Sozopol, Bulgaria.
3/2017	Speaker at the 18th Copper Mountain Conference On Multigrid Methods, Colorado.
2/2017	Speaker at DD24 conference in Svalbard, Norway.
6/2016	Speaker at MAFELAP conference, London.
6/2016	Speaker at ECCOMAS conference, Crete.
3/2016	Speaker at SIAM PP16 conference, Paris.
12/2015	Speaker at the CBC Workshop on Dynamic Adaptivity, Simula, Oslo.

Teaching and supervision

2024	Supervision of Lin Xintan master's thesis, for the degree in AI at USI.
2023	Supervision of Alessandro Gatti master's thesis, for the degree in mathematics at Trento University.
2022	Supervision of Halvor Herlyng PhD candidate in the department of Scientific Computing at Simula.
2020	Supervision of Simone Riva, PhD candidate in Computational Science at USI.
2020	Teaching assistant for Functional and Numerical Analysis at USI.
2019	Teaching assistant for Theory of Computation at USI.
2018	Teaching assistant for Fast Solvers at USI.
2018	Teaching assistant for Introduction to PDEs at USI.
2017	Teaching assistant for Linear Algebra at USI.
2017	Teaching assistant for Introduction to Computational Science at USI.

Publications

[1] G. Janett, P. Benedusi, and F. Riva, "Numerical solutions to linear transfer problems of polarized radiation-iv. efficient preconditioning in a physics-based framework," *Astronomy & Astrophysics*, vol. 682, p. A68, 2024.

[2] P. Benedusi, P. Ferrari, M. Rognes, and S. Serra-Capizzano, "Modeling excitable cells with the EMI equations: spectral analysis and iterative solution strategy," *Journal of Scientific Computing*, vol. 98, no. 3, p. 58, 2024.

[3] N. Guerreiro, G. Janett, S. Riva, P. Benedusi, and L. Belluzzi, "Modeling scattering polarization in the solar Ca I 4227 Å line with angle-dependent PRD effects and bulk velocities," *Astronomy & Astrophysics*, 2024.
Accepted, to appear.

[4] S. Riva, N. Guerreiro, G. Janett, D. Rossinelli, P. Benedusi, R. Krause, and L. Belluzzi, "Assessment of the CRD approximation for the observer's frame RIII redistribution matrix," *Astronomy & Astrophysics*, vol. 679, p. A87, 2023.

[5] P. Benedusi, S. Riva, P. Zulian, J. Štěpán, L. Belluzzi, and R. Krause, "Scalable matrix-free solver for 3D transfer of polarized radiation in stellar atmospheres," *Journal of Computational Physics*, 2023.

[6] P. Benedusi, G. Janett, S. Riva, L. Belluzzi, and R. Krause, "Numerical solutions to linear transfer problems of polarized radiation-III. Parallel preconditioned Krylov solver tailored for modeling PRD effects," *Astronomy & Astrophysics*, 2022.

[7] P. Benedusi, G. Janett, L. Belluzzi, and R. Krause, "Numerical solutions to linear transfer problems of polarized radiation-II. Krylov methods and matrix-free implementation," *Astronomy & Astrophysics*, vol. 655, p. A88, 2021.

[8] G. Janett, P. Benedusi, L. Belluzzi, and R. Krause, "Numerical solutions to linear transfer problems of polarized radiation-I. Algebraic formulation and stationary iterative methods," *Astronomy & Astrophysics*, vol. 655, p. A87, 2021.

[9] P. Benedusi, M. L. Minion, and R. Krause, "An experimental comparison of a space-time multigrid method with pfasst for a reaction-diffusion problem," *Computers & Mathematics with Applications*, vol. 99, pp. 162–170, 2021.

[10] P. Benedusi, P. Ferrari, C. Garoni, R. Krause, and S. Serra-Capizzano, "Fast parallel solver for the space-time IgA-DG discretization of the diffusion equation," *Journal of Scientific Computing*, vol. 89, no. 1, pp. 1–21, 2021.

[11] S. B. Bader, P. Benedusi, A. Quaglino, P. Zulian, and R. Krause, "Space-time multilevel Monte Carlo methods and their application to cardiac electrophysiology," *Journal of Computational Physics*, vol. 433, p. 110164, 2021.

[12] P. Benedusi, C. Garoni, R. Krause, X. Li, and S. Serra-Capizzano, "Space-time FE-DG discretization of the anisotropic diffusion equation in any dimension: the spectral symbol," *SIAM Journal on Matrix Analysis and Applications*, vol. 39, no. 3, pp. 1383–1420, 2018.

[13] A. Kreienbuehl, P. Benedusi, D. Ruprecht, and R. Krause, "Time-parallel Gravitational Collapse Simulation," *Communications in Applied Mathematics and Computational Science*, vol. 12, no. 1, pp. 109–128, 2017.

[14] L. Grasedyck, C. Löbbert, G. Wittum, A. Nägel, V. Schulz, M. Siebenborn, R. Krause, P. Benedusi, U. Küster, and B. Dick, "Space and time parallel multigrid for optimization and uncertainty quantification in PDE simulations," in *Software for Exascale Computing-SPPEXA 2013-2015*, pp. 507–523, Springer, 2016.

[15] P. Benedusi, D. Hupp, P. Arbenz, and R. Krause, "A parallel multigrid solver for time-periodic incompressible Navier–Stokes equations in 3D," in *Numerical Mathematics and Advanced Applications ENUMATH 2015*, pp. 265–273, Springer, 2016.

[16] P. Benedusi, *Parallel space-time multilevel methods with application to electrophysiology.*
PhD thesis, Università della Svizzera italiana, 2020.