Lorenzo Campoli

Personal details

Date of birth: 05/04/1986
Nationality: Italian
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Github: `https://github.com/lkampoli`
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ResearchGate: `https://www.researchgate.net/profile/Lorenzo_Campoli`
LinkedIn: `https://www.linkedin.com/in/lorenzo-campoli-325299191`

Current employment

Assistant Professor   Jun. 2020 - present
Saint Petersburg State University, Faculty of Mathematics and Mechanics (`http://gam.spbu.ru`)

- Research activity (computational fluid dynamics and machine learning code development for non-equilibrium flows in state-to-state and multi-temperature formulations)
- Teaching activity (see section below)

Previous work experience

Assistant researcher   Nov. 2018 – Apr. 2020
Saint Petersburg State University, Faculty of Mathematics and Computer Science
(`https://chebyshev.spbu.ru`)

- Numerical modelling and investigation of viscous finger phenomenon and enhanced recovery methods for flows in porous media.

Supervisors: Prof. S. Tikhomirov

PostDoc researcher   Nov. 2017 – Nov. 2020
Saint Petersburg State University, Faculty of Mathematics and Mechanics (`http://gam.spbu.ru`)

- Code developement for high speed non-equilibrium reacting flows with state-to-state approach.

Supervisors: Prof. E. Kustova

Visiting researcher   Jun. – Jul. 2015
NASA Ames, Wescoat Rd, Mountain View, CA 94043, USA (`www.nasa.gov/centers/ames/home`)

- Implement a boundary version of the shock-fitting technique onto the high-order finite differences NASA code ADPDIS3D

Supervisors: Dott. H. C. Yee, Dott. D. Kotov and Prof. B. Sjogreen

Visiting researcher   Mar. – Jun. 2015
INRIA, 200 Avenue de la Vieille Tour, 33405 Talence, France (`www.inria.fr/centre/bordeaux`)

- Coupling of a shock-fitting algorithm with the Residual Distribution (RD) INRIA code RD-RK2 for the study of unsteady two-dimensional flows on moving and deforming unstructured grids with an Arbitrary Lagrangian-Eulerian (ALE) formulation

Supervisors: Dott. M. Ricchiuto and Prof. R. Paciorri

Research assistant   May – Dec. 2013
AVIO, Corso G. Garibaldi 22, 00034, Colleferro, Italy (`www.aviogroup.com`)
- Pressure oscillations numerical simulations of P80 Vega Solid Rocket Motor (SRM)
- Aerothermodynamic numerical simulations on Vega launcher fairing

Supervisor: Dott. F. Paglia

Technical consultant   Feb. – Apr. 2013
NHAZCA, Via Cori snc, 00177, Rome, Italy (`www.nhazca.it`)
- Algorithms development and implementation for terrestrial and satellite interferometric radar applications (SAR, TinSAR, DinSAR)

Stagist   Jun. – Jul. 2004
INFN, Via E. Fermi, 00044, Frascati, Italy (`www.infn.it`)
- Homogeneity measurements of a MultiWire Proportional Chamber (MWPC)

Supervisor: Dott. M. Anelli

Teaching experience
Saint Petersburg State University, Faculty of Mathematics and Mechanics (`https://gam.spbu.ru`)

• Hypersonics	Sep. 2020 – Sep. 2022
• Machine Learning for Fluid Mechanics	Mar. 2021 – Sep. 2022
• Modern Scientific Visualization	Mar. 2021 – Jun. 2021
• Scientific Paper Writing	Mar. 2021 – Jun. 2021
• Concepts of Modern Natural Science	Mar. 2021 – Jun. 2021

Degrees
Ph.D. in Theoretical and Applied Mechanics   Nov. 2013 – Nov. 2016
Sapienza University of Rome (Dept. of Mechanics and Aeronautics)
Thesis: A shock-fitting technique for two-dimensional unsteady flows on unstructured grids
Date of the defense of the Ph.D.: 08/02/2017
Supervisor: Prof. R. Paciorri
Advisor: Prof. C. M. Casciola

Second level Master in Space Transportation Systems   Feb. 2012 – Dec. 2012
Sapienza University of Rome
https://web.uniroma1.it/mastersts
Thesis: Solid rocket motor's internal fluid dynamics: fluid-structure interaction
Date of the defense of the Master: 20/01/2013
Supervisor: Dott. F. Paglia
Advisor: Prof. F. Nasuti

Master in Space Engineering   Sept. 2008 – Feb. 2012
Sapienza University of Rome
Thesis: Modeling and simulation of base flows in subsonic regime
Date of the defense of the Master: 20/02/2012
Supervisor: Prof. R. Paciorri

Bachelor in Aerospace Engineering   Sept. 2005 – Dec. 2008
Sapienza University of Rome
Thesis: Ablative materials: types and characterization
Date of the defense of the Bachelor: 20/12/2008
Supervisor: Prof. G. Rinaldi

Technical skills
OS: Linux
Programming languages: Fortran, C/C++, Matlab, Mathematica
Parallel programming models: MPI, OpenMP, Coarray, CUDA, OpenACC
Profiling, debugging and performance analysis tools: gprof, perf, gdb, Valgrind, Vtune, Advisor, Paraver, Scalasca, Extrae, LIKWID, PAPI
Version-control software: svn, bzr, git
Scripting languages: linux shell, Perl, Python, Jupyter, Colab
Machine learning and data mining: TensorFlow, Keras, PyTorch, Pandas, Scikit-learn, Numpy
Document processors: Latex, Lyx, Office
Fluid dynamic solvers: STAR CCM+, CFD++, Comsol, Dumux, Fluent, OpenFOAM, SU2, COOLFluid, FronTier++, MRST, Overture and in-house developed codes
Mesh generators Triangle, Tetgen, Delaundo, Yams, Gmsh, GRUMMP, mmg3d
Visualization tools: Tecplot, Gnuplot, VisIt, ParaView, Matplotlib

Language skills (Europass Guidelines)
Italian (mothertongue), English proficiency (C1), upper intermediate of Russian (B2), intermediate Spanish (A2), basic French (A1).

Research outputs
L. Campoli, A. Assonitis, M. Ciallella, R. Paciorrib, A. Bonfiglioli, M. Ricchiuto. UnDiFi-2D: an Unstructured Discontinuity Fitting code for 2D grids. Computer Physics Communications, 2021, https://doi.org/10.1016/j.cpc.2021.108202

Campoli, L., Assonitis, A., Ciallella, M., Paciorri, R., Bonfiglioli, A., Ricchiuto, M. (2021). UnDiFi-2D: an Unstructured Discontinuity Fitting code for 2D grids. arXiv preprint arXiv:2105.14269.

Campoli, L., Kustova, E., Maltseva, P. (2021). Assessment of machine learning methods for state-to-state approaches. arXiv preprint arXiv:2104.01042.

Campoli, L., Kunova, O., Kustova, E., Melnik, M. (2020). Models validation and code profiling in state-to-state simulations of shock heated air flows. Acta Astronautica. https://doi.org/10.1016/j.actaastro.2020.06.008

Bakharev, F., Campoli, L., Enin, A., Matveenko, S., Petrova, Y., Tikhomirov, S., & Yakovlev, A. (2020). Numerical Investigation of Viscous Fingering Phenomenon for Raw Field Data. Transport in Porous Media, 1-22. https://doi.org/10.1007/s11242-020-01400-5

L. Campoli, G. Oblapenko, M. Mekhonoshina, E. Kustova: Numerical investigation of hypersonic non-equilibrium flow around blunt body by COOLFluiD-Kappa coupling. AIP Conference Proceedings. 31st International Symposium on Rarefied Gas Dynamics (RGD31), 23rd-27th July 2018, University

of Strathclyde, Glasgow, UK.

L. Campoli, G. P. Oblapenko and E. V. Kustova. KAPPA: Kinetic Approach to Physical Processes in Atmospheres library in C++. Computer Physics Communications, 2018, https://doi.org/10.1016/j.cpc.2018.10.016.

Campoli, L., Quemar, P., Bonfiglioli, A., & Ricchiuto, M. (2017). Shock-fitting and predictor-corrector explicit ALE Residual Distribution. In Shock Fitting (pp. 113-129). Springer, Cham.

A. Bonfiglioli, R. Paciorri, L. Campoli, Unsteady shock-fitting for unstructured grids. International Journal for Numerical Methods in Fluids, 2015.

Conferences

Campoli, L., Oblapenko, G. P., & Kustova, E. V. (2019, August). Overview and perspectives of KAPPA library. In AIP Conference Proceedings (Vol. 2132, No. 1, p. 150005). AIP Publishing LLC. https://doi.org/10.1063/1.5119645

L. Campoli, G. Oblapenko, M. Mekhonoshina, E. Kustova: Numerical investigation of hypersonic non-equilibrium flow around blunt body by COOLFluiD-Kappa coupling. 31st Int. Symposium on Rarefied Gas Dynamics (RGD31), 23rd-27th July 2018, University of Strathclyde, Glasgow, UK.

O. V. Kunova et al. On the implementation of the software library Kappa and its interface with COOLFluiD. International scientific conference on mechanics "The Eighth Polyakhovs Reading". 30th Jan - 2nd Feb. 2018, Saint Petersburg, Russia.

A. Bonfiglioli, R. Paciorri, L. Campoli, V. De Amicis, M. Onofri, Development of an unsteady Shock-fitting technique for unstructured grids. 30th International Symposium on Shock Waves (ISSW30), July 19-24, 2015, Tel-Aviv, Israel.

A. Bonfiglioli, R. Paciorri, L. Campoli, Unstructured shock-fitting calculations of transonic turbomachinery flows. Proceedings of 11th European Conference on Turbomachinery Fluid dynamics & Thermodynamics ETC11, March 23-27, 2015, Madrid, Spain.

A. Bonfiglioli, R. Paciorri, L. Campoli, (2014). An unsteady shock-fitting technique for unstructured grids. In Onate, E., Oliver, J., and Huerta, A., editors, 6th. European Congress on Computational Fluid Dynamics (ECFD VI), pages 4864–4872, Barcelona, Spain. ECCOMAS, International Center for Numerical Methods in Engineering.

M. Onofri, R. Paciorri, L. Campoli, A. Bonfiglioli, An unsteady shock-fitting technique for unstructured grids. 21st International Shock Interaction Symposium ISIS21, August 3-8, 2014, Riga, Latvia.

R. Paciorri, L. Campoli, Numerical Simulations of Flows Past the IXV Capsule. 5th International ARA Days, May 18-20, 2015, Arcachon, France.

Research funding and grants
Dog_2019: Разработка инструментов определения определения оптимальных МУН: связь МУН и механизмов воздействия, методы мониторинга

13/03/19 → 16/05/19

RSF_RG_2019 - 1: Моделирование неравновесных течений углекислого газа в современных задачах космической аэродинамики и экологии Земли: 2019 г. этап 1
6/05/19 → 31/12/19

Dog_2019: Разработка методов увеличения прогнозной способности трёхмерных цифровых геологических моделей
31/05/19 → 30/09/19

Dog_2019: Разработка инструментов определения оптимальных МУН в части модели ПАВ-полимерного и щелочно-полимерного заводнения, оценки Кохв в 5-ти точечной системе разработки, оценка оптимального размера оторочки полимера
22/10/19 → 31/12/19

Dog_2019: Разработка методов увеличения прогнозной способности трёхмерных цифровых геологических моделей
16/12/19 → 19/03/20

RSF_RG_2019 - 2: Моделирование неравновесных течений углекислого газа в современных задачах космической аэродинамики и экологии Земли: 2020 г. этап 2
1/01/20 → 31/12/20

Dog_2019: Договор пожертвования №117/19-БП
1/01/20 → 31/12/20

RSF_RG_2019 - 3: Моделирование неравновесных течений углекислого газа в современных задачах космической аэродинамики и экологии Земли: 2021 г. этап 3
1/01/21 → 31/12/21

M1_2021 - 1: Машинное обучение в задачах неравновесной аэромеханики: 2021 г. этап 1
24/08/21 → 31/12/21

Awards and honours
Certificate of participation in several PRACE Training Centre's courses.
https://training.prace-ri.eu/

Partnership of a European Group of Aeronautics and Space UniversitieS (PEGASUS), 2012.
https://www.pegasus-europe.org

About me
I do sport (running, biking and swimming) on daily basis. I love nature, trekking and alpinism and I was in boy-scout for 10 years. I play classical, electrical guitar and drum. I'm interested in reading and writing (prose and poetry), astronomy and travelling. I enjoy discovering new cultures, languages, traditions. I'm gratified in helping people.