# Samuel Lanthaler

## Personal Data

• Google Scholar • ArXiv • Orcid • Website


Citizenship: Switzerland
email: slanth@caltech.edu


## Employment

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| since 08/2022 | **Postdoc** in Computing + Mathematical Sciences at Caltech, USA |
| 11/2021 – 07/2022 | **Postdoc/Lecturer** in Mathematics at ETH Zurich, Switzerland |

## Education

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| 11/2018 – 11/2021 | **PhD in Mathematics** at ETH Zurich, Switzerland<br>Thesis: "Computation and analysis of statistical solutions of the incompressible Euler equations"<br>\| Advisor: Prof. Siddhartha Mishra |
| 08/2015 – 08/2020 | **PhD in Physics** at EPF Lausanne, Switzerland<br>Thesis: "Kinetic-MHD stability of virtually collisionless plasmas"<br>\| Advisor: Prof. Jonathan P. Graves |
| 09/2013 – 03/2015 | **Master of Science in Mathematics**, ETH Zurich |
| 09/2010 – 09/2013 | **Bachelor of Science in Mathematics**, ETH Zurich |

## Selected Publications

1. "Error estimates for deeponets: A deep learning framework in infinite dimensions", S. Lanthaler, S. Mishra, G.E. Karniadakis, *Trans Math Appl*, **6**(1), (2022), tnac001,
2. "On universal approximation and error bounds for Fourier neural operators", N. Kovachki, S. Lanthaler, S. Mishra, *JMLR*, **22**(290), (2021), 1-76
3. "Statistical solutions of the incompressible Euler equations", S. Lanthaler, S. Mishra, C. Parés-Pulido, *Math. Models Methods Appl. Sci.* (M$^3$AS), **31**(2), (2021), 223-292
4. "On the conservation of energy in two-dimensional incompressible flows", S. Lanthaler, S. Mishra, C. Parés-Pulido, *Nonlinearity*, **34**(2), (2021), 1084
5. "On the convergence of the spectral viscosity method for the two-dimensional incompressible Euler equations with rough initial data", S. Lanthaler, S. Mishra, *Found Comput Math*, **20**, (2020), 1309–1362

## Scientific presentations

- Talk in the Applied Math Seminar, UC Berkeley (2022),
- Minisymposium on "Provable Guarantees for Learning Dynamical Systems" SIAM MD22, San Diego CA (2022),
- Minisymposium on "Operator Learning in PDEs, Inverse Problems, and UQ" SIAM UQ22 (hybrid), Atlanta GA (2022),
- Minisymposium on "Recent Advances on Analysis and Numerics of Multidimensional Compressible Flows", SIAM PD22 (virtual), (2022),
- *Swiss Numerics Day 2021*, EPF Lausanne, Switzerland (2021),
- Seminar on "Physics-Informed Learning Machines for Multiscale and Multiphysics Problems" (PhILMs), *virtual*, invited by G.E. Karniadakis, Brown University (2021),
- Minisymposium on *Incompressible Fluid Mechanics*, SIAM PD19 in La Quinta, CA (2019),

- Workshop on *Interfaces and Instabilities in Fluid Dynamics* at the Hausdorff Research Institute in Mathematics in Bonn, Germany (2019),
- Invited speaker: *Theory of Fusion Plasmas*, Varenna-Lausanne intl. workshop (2018),
- *XV Intl. Conference on Hyperbolic Problems (Hyp2014)*, in Rio de Janeiro, Brazil (2014).

## Teaching experience

- **Lecturer** for "Numerical Methods for Hyperbolic PDEs" (ETH Zurich; Spring 2022)
- **Co-supervision of young researchers:** (ETH Zurich, Spring and Autumn 2021)
  - **master theses (3)** (Fabian Jin, 2021, *awarded ETH Medal*; Patrik Hadorn, 2021; Michael Prasthofer, 2021),
  - **semester theses (2)** (Fabian Jin, 2021; Patrik Hadorn, 2021).
- **Head assistant** for **Linear Algebra** (autumn semesters 2019;2020;2021);
  - Conducting and organizing examinations, **350 students**,
  - Organization of exercise classes and exercises, **8 TAs**,
- **Class-room teaching:** TA for various courses at ETH Zurich and EPF Lausanne, in both *mathematics* and *physics*, including
  - Numerical Methods for Hyperbolic PDEs (ETHZ; 2019); Mathematical Methods for Physicists (EPFL; 2017, 2018); Advanced Physics (EPFL; 2017); Computational Physics (EPFL; 2015, 2016); Numerical Mathematics (ETHZ; 2013); Differential Geometry (ETHZ; 2012)

## Recognition and Awards

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| 05/2022 | ETH Medal (ETH Zurich)<br>Awarded for outstanding doctoral thesis |
| 01/2022 – 12/2024 | GAMM Junior Fellow<br>Elected by the International Association of Applied Mathematics and Mechanics (GAMM) for outstanding work in doctoral thesis (10 junior fellows per year) |
| 01/2015 | ETH Medal (ETH Zurich)<br>Awarded for outstanding master's thesis |
| 09/2013 – 01/2015 | Excellence Scholarship and Opportunity Programme (ETH Zurich)<br>A special scholarship to cover the full study and living costs for the duration of master's degree, as well as specific supervision. |
| 12/2013 | Polya prize (ETH Zurich)<br>Awarded for best bachelor's degree in mathematics and physics. |

## Professional service

- Journal referee for Calcolo, Journal of Scientific Computing, IMA Journal of Numerical Analysis, SIAM Journal on Scientific Computing, Vietnam Journal of Mathematics, Neural Networks, Connection Science, Inverse Problems and Communications in Computational Physics.
- Organizer: Minisymposium "Theoretical foundations and algorithmic innovation in operator learning" ICIAM 2023.

## Programming Experience

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| Extended Experience: | C++, Fortran-90/03 (with MPI-parallelization), MATLAB, Python |
| Basic Knowledge: | CUDA, OpenACC, HTML |

## Languages

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| English: | Fluent (C2) | French: | Advanced (C1) |
| German: | Mothertongue | Korean: | Intermediate (B1) |