

Jonathan Viquerat

Research Engineer
PhD in applied mathematics

06200 Nice
✉ jonathan.viquerat@mines-paristech.fr
🌐 [Personal webpage](#)

Professional experience

- 2018 – Present **Research engineer, CEMEF Mines ParisTech, (Sophia Antipolis, France)**, CFL research group, Topic : Machine learning for CFD problems (MINDS project).
Reference : Elie Hachem, elie.hachem@mines-paristech.fr, +33 4 93 95 74 58
- 2015 – 2018 **Research engineer, INRIA, (Sophia Antipolis, France)**, Nachos project-team, Topic : Development of a discontinuous Galerkin solver suite for nano-optics problems.
Reference : Stéphane Lanteri, stephane.lanteri@inria.fr, +33 4 92 38 77 34
- 2012 **Master's degree internship (2nd year), INRIA, (Sophia Antipolis, France)**, Nachos project-team, Topic : Discontinuous Galerkin time-domain method for nanophotonics.
Reference : see above
- 2011 **Master's degree internship (1st year), University College, (London, UK)**, Mechanical engineering department, Topic : Assessment of transcatheter aortic valve devices by numerical simulation on commercial solver.
Reference : Gaetano Burriesci, g.burriesci@ucl.ac.uk, +44 20 7679 3922

Projects

- Minds** A project bringing together numerical computation and data sciences, including :
- ♦ A research activity organized around supervised and reinforcement learning for CFD problems,
 - ♦ The development of an agnostic coupling interface, in C++ and Python, between numerical simulation codes and machine learning libraries aimed at non-experts,
 - ♦ The co-advising of two PhD students (J. Chen, *Physically-informed machine learning for turbulent flows* - H. Ghraieb, *Deep reinforcement learning for shape optimization*),
 - ♦ A website (see <https://cfl-minds.github.io/>),
 - ♦ Regular seminars, given by experts in the field (<https://www.youtube.com/channel/UCUzBdy7ovH102TvHLtM8pZQ>).
- Diogenes** Development of a discontinuous Galerkin library in modern Fortran for nano-optics applications. This project included several tasks, such as :
- ♦ A parallel discontinuous Galerkin time-domain solver for Maxwell's equations, with an advanced mesh processing library, a mesh partitioning tool, a material processing tool for metal and semiconductor permittivity laws, and a coupling with optimization libraries,
 - ♦ The computation of a large set of real-life problems, set up in collaboration with academic and industrial partners (CNRS LPMC, Bristol University, C2N, CEA LETI, ...),
 - ♦ A website (see <https://diogenes.inria.fr/>).

Studies

- 2012 – 2015 **PhD in applied mathematics and numerical simulation, INRIA, (Sophia Antipolis, France)**, Nachos project-team, Topic : Discontinuous Galerkin time-domain method for nanophotonics.
Reference : see above
- 2009 – 2012 **Engineering degree in applied mathematics, ENSTA ParisTech (Paris, France)**.
- 2011 – 2012 **Master's degree in modelisation and numerical simulation, with distinctions, CEA (Saclay, France)**.
- 2007 – 2009 **"Classes préparatoires" in mathematics, physics and chemistry, Lycée Massena (Nice, France)**.

Publications

- Submitted J. Viquerat, J. Rabault, A. Kuhnle, H. Ghraieb, E. Hachem, *Direct shape optimization through deep reinforcement learning*, Journal of Computational Physics
- Submitted P. Garnier, J. Viquerat, J. Rabault, A. Larcher, A. Kuhnle, E. Hachem, *A review on deep reinforcement learning for fluid mechanics*, Computer and Fluids
- Submitted H. Ghraieb, J. Viquerat, A. Larcher, P. Meliga, E. Hachem, *Optimization and passive flow control using single-step deep reinforcement learning*, Physical Review Fluids
- 2020 J. Viquerat, E. Hachem, *A supervised neural network for drag prediction of arbitrary 2D shapes in low Reynolds number flows*, Computers and Fluids, vol. 210, pp. 104645
- 2019 V. Belus, J. Rabault, J. Viquerat, Z. Che, E. Hachem, U. Reglade, *Exploiting locality and translational invariance to design effective deep reinforcement learning control of the 1-dimensional unstable falling liquid film*, AIP Advances, vol. 9, pp. 125014
- 2019 J. Viquerat, N. Schmitt, C. Scheid, *Simulating 3D periodic structures at oblique incidences with discontinuous Galerkin time-domain methods : theoretical and practical considerations*, SMAI Journal of Computational Mathematics, vol. 5, pp.131 – 159
- 2019 J. Viquerat, *Efficient time-domain numerical analysis of waveguides with tailored wideband pulses*, Microwave and Optical Technology Letters, vol. 61, pp. 1534 – 1539
- 2018 J. Viquerat, *Fitting experimental dispersion data with a simulated annealing method for nano-optics applications*, Journal of Nanophotonics, vol. 12, pp. 036014
- 2018 N. Schmitt, C. Scheid, J. Viquerat, S. Lanteri, *Simulation of three-dimensional nanoscale light interaction with spatially dispersive metals using a high-order curvilinear DGTD method*, Journal of Computational Physics, vol. 373, pp. 210 – 229
- 2017 S. Lanteri, C. Scheid, J. Viquerat, *Analysis of a generalized dispersive model coupled to a DGTD method with application to nanophotonics*, SIAM Journal of Scientific Computing, vol. 39, pp. 831 – 859
- 2016 J. Viquerat, S. Lanteri, *Simulation of near-field plasmonic interactions with a local approximation order discontinuous Galerkin time-domain method*, Photonics and Nanostructures-Fundamentals and Applications, vol. 18, pp. 43 – 58
- 2016 N. Schmitt, C. Scheid, S. Lanteri, A. Moreau, J. Viquerat, *A DGTD method for the numerical modeling of the interaction of light with nanometer scale metallic structures taking into account non-local dispersion effects*, Journal of Computational Physics, vol. 316, pp. 396 – 415
- 2015 J. Viquerat, *Simulation of electromagnetic wave propagation in nano-optics with a high-order discontinuous Galerkin time-domain method*, PhD thesis (see <https://www.archives-ouvertes.fr/tel-01272010/>)
- 2015 J. Viquerat, C. Scheid, *A 3D curvilinear discontinuous Galerkin time-domain solver for nanoscale light-matter interactions*, Journal of Computational and Applied Mathematics, vol. 289, pp. 37 – 50
- 2014 R. Léger, J. Viquerat, C. Durochat, C. Scheid, S. Lanteri, *A parallel non-conforming multi-element DGTD method for the simulation of electromagnetic wave interaction with metallic nanoparticles*, Journal of Computational and Applied Mathematics, vol. 270, pp. 330 – 342
- 2013 S. Descombes, C. Durochat, S. Lanteri, L. Moya, C. Scheid, J. Viquerat, *Recent advances on a DGTD method for time-domain electromagnetics*, Photonics and Nanostructures - Fundamentals and Applications, vol. 11, issue 4, pp. 291 – 302
- 2013 S. Tzamtzis, J. Viquerat, J. Yap, M. J. Mullen, G. Burriesci, *Numerical analysis of the radial force produced by the Medtronic-CoreValve and Edwards-SAPIEN after transcatheter aortic valve implantation (TAVI)*, Medical Engineering and Physics, vol. 35, issue 1, pp. 125 – 130

Conferences

- 2018 GDR Ondes, Paris (France), *Diogenes : a DG-based software suite for nano-optics problems*
- 2014 Acomen, Ghent (Belgium), *A curvilinear discontinuous Galerkin time-domain method for nanophotonics*
- 2014 Meta, Singapore, *Discontinuous Galerkin time-domain method for nanophotonics*
- 2013 Waves, Tunis (Tunisia), *Discontinuous Galerkin Time-Domain method for nanophotonics*

2012 GDR Ondes, Troyes (France), *Méthode Galerkin discontinue en domaine temporel pour la propagation d'ondes électromagnétiques en nano-optique*

Teaching and supervising

2018 – Present **Co-advisor for PhD students in the MINDS project**, CEMEF Mines ParisTech (Sophia Antipolis, France).

2014 – 2016 **Supervisor for L3, M1 and M2 internships**, INRIA (Sophia Antipolis, France).

2010 – 2011 **Computing science teacher in "Classes préparatoires"**, Lycée Marcelin Berthelot (Saint-Maur des Fossés, France).

Skills

Programming C++, Python, Fortran

HPC MPI, OpenMP

Machine learning Keras, Tensorforce, Tensorflow

Meshes Gmsh, MeshGems

Post-treatment Paraview, Vizir, Medit

Development Git, CI, CMake, Jenkins, Emacs

Systems Linux, Mac OS, Windows

Misc. \LaTeX , HTML, CSS

Languages English (fluent)

Hobbies

Sports Climbing, alpinism, ski-touring, canyoning

Others Photography