Curriculum vitae (04/13/2021): Charles Dapogny

Personal data

- Born on 1st December 1985 in Valence (Drôme).
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- *Web* : `ljk.imag.fr/membres/Charles.Dapogny/`

Professional address:
Laboratoire Jean Kuntzmann
Université Grenoble Alpes
Bâtiment IMAG, 700 Avenue Centrale
38401 Domaine Universitaire de Saint-Martin-d'Hères
France

Personal address:
10 rue montorge
38000 Grenoble
France

Education and professional experience

- **January 2015 - .**: Junior CNRS researcher in mathematics ("Chargé de recherches", section 41). Appointed in Laboratoire Jean Kuntzmann (Grenoble, France).

- 2014**: Post-doctoral stay** under the supervision of M. Vogelius.
  Rutgers University (New Jersey, United States).

- 2010 – 2013**: Ph.D. in applied mathematics**.
  Laboratoire Jacques-Louis Lions (Université Pierre et Marie Curie).
  Title of the thesis: *Shape optimization, level set methods on unstructured meshes, and mesh evolution.*
  Thesis supervised by Grégoire Allaire and Pascal Frey, funded by the company Renault,
  refereed by Dorin Bucur, Antoine Henrot and James Sethian, and defended on 4th December 2013 in front of the jury:
  - Marc Albertelli,
  - Grégoire Allaire,
  - Jérôme Fehrenbach,
  - Pascal Frey,
  - Frédéric Hecht,
  - Antoine Henrot,
  - Antony Patera.

- 2009 – 2010 **: Second year of the Masters program "Numerical Analysis and Partial Differential Equations"**.
  Université Pierre et Marie Curie.
  Highest honours.
  Master's thesis realized under the supervision of Grégoire Allaire and Pascal Frey: *Autour de la fonction de distance signée à un contour discret.*

- 2008 – 2009**: Second year of the Masters program "Analysis, arithmetic and geometry"**.
  Université Paris Sud.
  Highest honours.
  Master's thesis realized under the supervision of Julien Duval: *Une caractérisation numérique du cône de Kähler d'une variété kählerienne compacte.*

- 2005 – 2008 **: Undergraduate studies in École Polytechnique**
  Bachelor's thesis realized under the supervision David Harari: *Autour du théorème de Bézout en*

géométrie algébrique.

- 2003 – 2005**: Classes préparatoires aux grandes écoles (CPGE) MPSI-MP*.**
  Lycée Clémenceau, Reims

Research interests

- Shape and topology optimization
- Partial differential equations
- Finite element methods
- Meshing
- Scientific computing and numerical methods

Other skills

- Programming languages: `C`, `C++`, `python`, `html`.
- Spoken languages: French (mother tongue), English (fluent), Japanese (limited proficiency, JLPT3), Spanish (conversational level).

Publications in peer-reviewed journals

All the material described below can be downloaded from my webpage:

`https://ljk.imag.fr/membres/Charles.Dapogny/publis.html`

[J34] B. Braida, J. Dalphin, C. Dapogny, P. Frey and Y. Privat, *Shape and topology optimization for Maximum Probability Domains in Quantum Chemistry*, submitted, (2020).

[J33] F. Feppon, G. Allaire, C. Dapogny and P. Jolivet, *Body-fitted topology optimization of 2D and 3D fluid-to-fluid heat exchangers*, to appear in Comput. Meths. Appl. Mech. Engrg., (2021).

[J32] C. Dapogny, *The topological ligament in shape optimization: a connection with thin tubular inhomogeneities*, submitted, (2020).

[J31] F. Feppon, G. Allaire, C. Dapogny and P. Jolivet, *Topology optimization of thermal fluid–structure systems using body-fitted meshes and parallel computing*, to appear in J. Comput. Phys., (2020).

[J30] G. Allaire, C. Dapogny and F. Jouve, *Shape and topology optimization*, to appear in Handb. Numer. Anal., (2020).

[J29] C. Dapogny, *A connection between topological ligaments in shape optimization and thin tubular inhomogeneities*, to appear in C. R. Acad. Sci. Paris, Ser. I, (2020).

[J28] C. Dapogny, N. Lebbe and E. Oudet, *Optimization of the shape of regions supporting boundary conditions*, to appear in Numer. Math., (2019).

[J27] F. Feppon, G. Allaire and C. Dapogny, *Null space gradient flows for constrained optimization with applications to shape optimization*, to appear in ESAIM: Control, Optimization and Calculus of Variations, (2019).

[J26] F. Feppon, G. Allaire and C. Dapogny, *A variational formulation for computing shape derivatives of geometric constraints along rays*, ESAIM: Mathematical Modelling and Numerical Analysis, 54, (2020),

pp. 181—228.

[J25] N. Lebbe, C. Dapogny, E. Oudet, K. Hassan and A. Gliere, *Robust shape and topology optimization of nanophotonic devices using the level set method*, J. Comput. Phys., 395, (2019), pp. 710–746.

[J24] N. Lebbe, A. Gliere, K. Hassan, C. Dapogny and E. Oudet, *Shape Optimization for the Design of Passive Mid-Infrared Photonic Components*, Optical and Quantum Electronics, 51, Article number: 166, (2019).

[J23] J. Martínez-Frutos, G. Allaire, C. Dapogny and F. Periago, *Structural optimization under internal porosity constraints using topological derivatives*, Comput. Meths. Appl. Mech. Engrg., 345, (2019), pp. 1–25.

[J22] E. Bonnetier, C. Dapogny, F. Triki and H. Zhang, *The plasmonic resonances of a bowtie antenna*, Anal. Theory Appl., 35, (2019), pp. 85–116.

[J21] F. Feppon, G. Allaire, F. Bordeu, J. Cortial and C. Dapogny, *Shape optimization of a coupled thermal fluid-structure problem in a level set mesh evolution framework*, SeMA J., 76, 3, (2019), pp. 413–458.

[J20] C. Dapogny, R. Estevez, A. Faure and G. Michailidis, *Shape and topology optimization considering anisotropic features induced by additive manufacturing processes*, Comput. Meths. Appl. Mech. Engrg., 344, (2019), pp. 626–665.

[J19] R. Chakir, C. Dapogny, C. Japhet, Y. Maday, J.-B. Montavon, O. Pantz and A. Patera, *Component Mapping Automation for Parametric Component Reduced Basis Techniques (RB-Component)*, ESAIM Proc. Surveys, 63, (2018), pp. 208–227.

[J18] G. Allaire, C. Dapogny, R. Estevez, A. Faure and G. Michailidis, *Structural optimization under overhang constraints imposed by additive manufacturing technologies*, J. Comput. Phys., 351, (2017), pp. 295–328).

[J17] C. Dapogny, P. Frey, F. Omnès and Y. Privat, *Geometrical shape optimization in Fluid Mechanics using FreeFem++*, Struct. Multidisc. Optim., 58, no. 6, (2018), pp. 2761–2788.

[J16] E. Bonnetier, C. Dapogny and F. Triki, *Homogenization of the eigenvalues of the Neumann-Poincaré operator*, Arch. Ration. Mech. Anal., 234, (2019), pp. 777–855.

[J15] S. Amstutz, C. Dapogny and A. Ferrer, *A consistent relaxation of optimal design problems for coupling shape and topological derivatives*, Numer. Math., 140 (1), (2018), pp. 35–94.

[J14] G. Allaire, C. Dapogny, A. Faure and G. Michailidis, *Shape optimization of a layer by layer mechanical constraint for additive manufacturing*, C. R. Acad. Sci. Paris, Ser. I, 355 (2017), pp. 699-717.

[J13] C. Dapogny, A. Faure, G. Michailidis, G. Allaire, A. Couvelas and R. Estevez, *Geometric constraints for shape and topology optimization in architectural design*, Comput. Mech., 59, (2017), pp. 933–965.

[J12] M. de Buhan, C. Dapogny, C. Nardoni and P. Frey, *An optimization method for elastic shape matching*, C. R. Acad. Sci. Paris, Ser. I, 354, (2016), pp. 783–787.

[J11] C. Dapogny and M.S. Vogelius, *Uniform asymptotic expansion of the voltage potential in the presence of thin inhomogeneities with arbitrary conductivity*, Chin. Ann. Math. Ser. B, 38, 1, (special issue in

the honor of H. Brezis), (2017), pp. 293–344.

[J10] G. Allaire and C. Dapogny, *A deterministic approximation method in shape optimization under random uncertainties*, SMAI-Journal of computational mathematics, 1 (2015), pp. 83–143.

[J9] M. Dambrine, C. Dapogny and H. Harbrecht *Shape optimization for quadratic functionals and states with random right-hand sides*, SIAM J. Control Optim., 53(5), (2015), pp. 3081–3103.

[J8] G. Allaire, C. Dapogny and P. Frey, *Shape optimization with a level set based mesh evolution method*, Comput. Meths. Appl. Mech. Engrg., 282, (2014), pp. 22–53.

[J7] G. Allaire and C. Dapogny, *A linearized approach to worst-case design in parametric and geometric shape optimization*, Math. Models Methods Appl. Sci., 24, (2014), pp. 2199–2257.

[J6] G. Allaire, C. Dapogny, G. Delgado and G. Michailidis, *Multi-phase structural optimization via a level set method*, ESAIM: Control, Optimization and Calculus of Variations, 20, (2014), pp.576-611.

[J5] C. Dapogny, C. Dobrzynski and P. Frey, *Three-dimensional adaptive domain remeshing, implicit domain meshing, and applications to free and moving boundary problems*, J. Comput. Phys, 262, (2014), pp. 358–378.

[J4] G. Allaire, C. Dapogny and P. Frey, *A mesh evolution algorithm based on the level set method for geometry and topology optimization*, Struct. Multidisc. Optim., 48, 4, (2013), pp.711-715.

[J3] G. Allaire, C. Dapogny and P. Frey, *Topology and geometry optimization of elastic structures by exact deformation of simplicial mesh*, C. R. Acad. Sci. Paris, Série I, 349, pp.999-1003 (2011).

[J2] C. Bui, C. Dapogny and P. Frey, *An accurate anisotropic adaptation method for solving the level set advection equation*, Int. J. Numer. Meth. Fluids, Volume 70, Issue 7, pp. 899-922 (2012).

[J1] C. Dapogny and P. Frey, *Computation of the signed distance function to a discrete contour on adapted triangulation*, Calcolo, Volume 49, Issue 3, pp. 193-219 (2012).

Proceedings with peer-review process

[A6] P.-Y. Gagnier, H. Maschner, A. Gailliègue, P. Frey, L. Norgeot, C. Dapogny, L. Revéret, F. Hecht, F. Goussard and A. Abourachid, *Automatic reconstruction of polygon triangulation for mounted skeleton point cloud*, proceedings of the BigDig 2017 conference, 24th October, 2017.

[A5] G. Allaire, C. Dapogny, R. Estevez, A. Faure and G. Michailidis, *Structural optimization under overhang constraints imposed by additive manufacturing processes: an overview of some recent results*, proceedings of the CEDYA+CMA conference, 26-30 June 2017, Cartegena, Spain.

[A4] G. Allaire, C. Dapogny, A. Faure and G. Michailidis, *A model of layer by layer mechanical constraint for additive manufacturing in shape and topology optimization*, proceedings of the 12th World Congress on Structural and Multidisciplinary Optimization, 5-9 June 2017, Braunschweig, Germany.

[A3] Th. Abballe, M. Albertelli, G. Allaire, A. Caron, Ph. Conraux, L. Dall'Olio, C. Dapogny, C. Dobrzynski, B. Jeannin, F. Jouve, D. Lachouette, Th. Le Sommer, K.Maquin, G. Michailidis, M. Siavelis, V. Srithammavanh, *RODIN project, topology optimization 2.0 ?*, Proceedings of the congress "Simulation" de la Société des Ingénieurs de l'Automobile (SIA), Montigny le Bretonneux, 18th-19th March 2015.

[A2] G. Allaire, C. Dapogny and P. Frey, *A mesh evolution algorithm based on the level set method for geometry and topology optimization* , proceedings of the 10th World Congress on Structural and Multidisciplinary Optimization, 19th-24th May 2013, Orlando, USA.

[A1] G. Allaire, C. Dapogny and P. Frey, *Shape optimization of elastic structures using a level-set based mesh evolution method*, proceedings of the Fifth International Conference on Advanced COmputational Methods in ENgineering (ACOMEN 2011), Liège, Belgium, 14-17 November 2011.

Software development

[L3] C. Dapogny, C. Dobrzynski, P. Frey and A. Froelhy, `Mmg`, *Remeshing library in two and three space dimensions*, $\approx$ 100,000 lines in `C`; GitHub link: `https://github.com/MmgTools/mmg`, and webpage of the project: `https://www.mmgtools.org`.

[L2] C. Dapogny and P. Frey, `advect`, *Solve the advection equation on a simplicial mesh in two and three space dimensions*, $\approx$ 2000 lines in `C`; `GitHub` link: `https://github.com/ISCDtoolbox/Advection`.

[L1] C. Dapogny and P. Frey, `mshdist`, *Automatic generation of the signed distance function to a discrete contour, or a level set function in two and three space dimensions*, $\approx$ 10000 lines in `C`; `GitHub` link: `https://github.com/ISCDtoolbox/Mshdist`.

Oral interventions

- 6 invitations as a plenary lecturer in international conferences.
- 25 participations to international conferences in Europe, America or Asia.
- 42 invitations to colloquia, seminars or special session talks in Europe, America or Asia.

Student supervision

Ph.D. students:

- Nicolas Lebbe (joint supervision with E. Oudet and the CEA-LETI): *Contribution in topological optimization and application to nanophotonics*, (2016–2019). Nicolas is now post-doctoral fellow at INRIA Nice-Sofia-Antipolis.
- Florian Feppon (joint supervision with G. Allaire and the company SafranTech): *Shape and topology optimization of multiphysics systems* (2017–2020). Florian is now post-doctoral fellow at ETH Zürich.

M. Sc. students:

- Samuel Lopes (joint supervision with E. Oudet), (2021).
- Carlos Brito-Pacheco (joint supervision with E. Bonnetier and R. Estevez), (2021).
- Jean Cauvin-Vila (joint supervision with E. Oudet), (2020). Jean is now Ph. D. student in CERMICS (Ecole des Ponts et Chaussées).
- Nicolas Lebbe (joint supervision with E. Oudet and the CEA-LETI), (2016).
- Marie-Marthe Groz (joint supervision with E. Bonnetier), (2015). Marie-Marthe is now CNRS researcher at IM2 Bordeaux.

Teaching experience

Online resources associated to the courses described below are available on my webpage:

`https://ljk.imag.fr/membres/Charles.Dapogny/teaching.html`

Undergraduate courses:

- Topology and differential calculus (3rd year in Université Paris VI), 2013,
- Signal processing (2nd year in the engineering school ENSIMAG), 2015-*
- Several first-year courses in the Université Grenoble-Alpes.

Graduate courses:

- *Localized plasmonic resonances and the Neumann-Poincaré operator: homogenization and bowties*, 2h mini-course: slides (≈ 100 slides) available on my webpage.
- *An introduction to shape and topology optimization*, Masters course (18h) : slides (≈ 400 slides), hands-on session subjects (≈ 35 pages) and codes available on my webpage.
- *Formes optimales, hier, aujourd´hui et demain*, popularization conference (prep. school level): slides (≈ 100 slides) available on my webpage.
- *An introduction to the level set method*, Masters course (6h) : lecture notes (≈ 35 pages) and slides (≈ 100 slides) available on my webpage.

Service to the community

- **Organization of events**
  - Organization (with E. Bonnetier, E. Oudet and B. Velichkov) of the conference PICOF (Problèmes Inverses, Contrôle, Optimisation de Formes) in 2016 in Autrans (≈ 120 participants).
  - Member of the organization committee of the conference Applied Inverse Problems (AIP), in 2019 in Grenoble (≈ 700 participants).
  - Member of the organization committee of the *Semaine Math-Informatique en Entreprise* (SEMIE) in 2017 (≈ 50 participants).
- **Contributions to the peer evaluation process**
  - Referee for multiple journals, such as Journal of Computational Physics, Computer Methods in Applied Mechanical Engineering, Numerische Mathematik, Structural and Multidisciplinary Optimization, SIAM journals (SICON, SIMA, SINUM), etc.
  - Reviewer for ANR projects (2020), ECOS projects (2020).
  - Member of the assistant professor hiring committees in Bordeaux (2018), Paris VI (2021).
- **Member** (by appointment) of the council of Laboratoire Jean Kuntzmann (2016-2020).
- **Representative of the Ph.D. students** of Laboratoire Jean Kuntzmann with respect to the administration (2016-2020).

Grants

- **ANR Shapo grant (2018–2022)**; principal investigator: J. Lamboley (≈ 450,000 euros).
- **CIFRE contract with Safran Tech.** (2017-2020) (≈ 20,000 euros).
- **Project IRS CAOS** (Conception Additive et Optimisation de Structures) (2017-2018) (≈ 15,000 euros).
- **Project AGIR HOMONIM** (Homogenization of Negative Index Materials) (2016-2017); principal investigator: E. Bonnetier (≈ 15,000 euros).
- **INSIS project "Matériaux architecturés** (2015-2016); principal investigator: R. Estevez (≈ 15,000 euros).

Honors and awards

Ph. D. award Thiessé de Rosemont Demassieux, from the Chancellerie des Universités de Paris (≈ 10,000 euros).