Curriculum vitae (11/09/2021): Charles Dapogny

Personal information

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

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Laboratoire Jean Kuntzmann
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France

Personal address:
10 rue montorge
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France

Education and professional experience

- **January 2015 - .**: **Junior CNRS researcher** in mathematics (Chargé de recherche, 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 December 4th 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 joint supervision of Grégoire Allaire and Pascal Frey: *Around the signed distance function to a discrete contour.*

- 2008 – 2009**: Second year of the Masters program "Analysis, arithmetics et geometry"**.
  Université Paris Sud.
  Highest honours.
  Master's thesis realized under the supervision of Julien Duval: *A numerical characterization of the Kähler cone of a compact Kähler manifold.*

- 2005 – 2008**: Undergraduate studies in École Polytechnique**
  Bachelor's thesis realized under the supervision of David Harari: *Around Bézout's theorem in algebraic geometry.*

- 2003 – 2005**: 'Classes préparatoires aux grandes écoles' 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), Spanish (conversational level), Japanese (average level, JLPT3 obtained in 2008).

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`

1. Journal articles

[J39] C. Dapogny , *Optimisation de formes*, to appear in La Gazette des Mathématiciens, (2022).

[J38] C. Dapogny, F. Iutzeler, A. Meda and B. Thibert , *Entropy-regularized Wasserstein distributionally robust shape and topology optimization*, submitted, (2022).

[J37] G. Balarac, F. Basile, P. Bénard, F. Bordeu, J.-B. Chapelier, L. Cirrottola, G. Caumon, C. Dapogny, P. Frey, A. Froehly, G. Ghigliotti, R. Laraufie, G. Lartigue, C. Legentil, R. Mercier, V. Moureau, C. Nardoni, S. Pertant and M. Zakari , *Tetrahedral remeshing in the context of large-scale numerical simulation and high performance computing*, to appear in Maths in Action, (2021).

[J36] S. Amstutz, C. Dapogny and A. Ferrer, *A consistent approximation of the total perimeter functional for topology optimization algorithms*, ESAIM: Control, Optimization and Calculus of Variations, 28, (2022), 18, (2021).

[J35] E. Bonnetier, C. Dapogny and M.S. Vogelius, *Small perturbations in the type of boundary conditions for an elliptic operator*, to appear in Journal de Mathématiques Pures et Appliquées, (2022).

[J34] B. Braida, J. Dalphin, C. Dapogny, P. Frey and Y. Privat, *Shape and topology optimization for Maximum Probability Domains in Quantum Chemistry*, Numer. Math., 151, (2022), pp. 1017–1064.

[J33] F. Feppon, G. Allaire, C. Dapogny and P. Jolivet, *Body-fitted topology optimization of 2D and 3D fluid-to-fluid heat exchangers*, Comput. Meths. Appl. Mech. Engrg., 376, 113638, (2021).

[J32] C. Dapogny, *The topological ligament in shape optimization: a connection with thin tubular inhomogeneities*, SMAI-Journal of computational mathematics, 7, (2021), pp. 185–266.

[J31] F. Feppon, G. Allaire, C. Dapogny and P. Jolivet, *Topology optimization of thermal fluid-structure systems using body-fitted meshes and parallel computing*, J. Comput. Phys., 417, 109574, (2020).

[J30] G. Allaire, C. Dapogny and F. Jouve, *Shape and topology optimization*, in Geometric partial differential equations, part II, A. Bonito and R. Nochetto eds., Handbook of Numerical Analysis, vol. 22, (2021), pp.1-132.

[J29] C. Dapogny, *A connection between topological ligaments in shape optimization and thin tubular inhomogeneities*, C. R. Acad. Sci. Paris, 358, no. 2, (2020), pp. 119–127.

[J28] C. Dapogny, N. Lebbe and E. Oudet, *Optimization of the shape of regions supporting boundary conditions*, Numer. Math., 146, (2020), pp. 51–104.

[J27] F. Feppon, G. Allaire and C. Dapogny, *Null space gradient flows for constrained optimization with applications to shape optimization*, ESAIM: Control, Optimization and Calculus of Variations, 26, (2020).

[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), 2, 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. Gaillièguе, 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, 18-19 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, 19-24 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*, $\approx 150,000$ 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*, ≈ 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*, ≈ 10000 lines in `C`; `GitHub` link: `https://github.com/ISCDtoolbox/Mshdist`.

Oral interventions

- 7 invitations as a plenary lecturer in international conferences.
- 32 participations to international conferences in Europe, America or Asia.
- 41 invitations to colloquia, seminars or special session talks in Europe, America or Asia.

Student supervision

Ph.D. students:

- Julien Prando (joint supervision with B. Thibert): *Distributionally robust shape and topology optimizaton*, (2022-·).
- Carlos Brito-Pacheco (joint supervision with E. Bonnetier): *Shape and topology optimization on surfaces*, (2021-·).

- 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:

- Andrea Meda (joint supervision with B. Thibert), (2022).
- 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 ($\approx$ 100 slides) available on my webpage.
- *Refresher about differential calculus*, Introductory Masters course (12h): lecture notes ($\approx$ 80 pages),
- *An introduction to shape and topology optimization*, Masters course (18h): slides ($\approx$ 400 slides), hands-on session subjects ($\approx$ 35 pages) and codes available on my webpage.
- *Formes optimales, hier, aujourd'hui et demain*, popularization conference (prep. school level): slides ($\approx$ 100 slides) available on my webpage.
- *An introduction to the level set method*, Masters course (6h): lecture notes ($\approx$ 35 pages) and slides ($\approx$ 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 ($\approx$ 120 participants).
  - Member of the organization committee of the conference Applied Inverse Problems (AIP), in 2019 in Grenoble ($\approx$ 700 participants).
  - Member of the organization committee of the Semaine Math-Informatique en Entreprise (SEMIE) in 2017 ($\approx$ 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).
- **Referee** for the Ph.D. thesis of S.C.Y Ong (Oxford University, 2019).
- **Member** of the Ph.D. defence committe of M. Ly (Inria Grenoble, 2021).
- **Member** of 4 Ph. D. monitoring committees.

Grants

- **Thomas Jefferson project (2021–2023);** principal investigators: L.-M. Imbert-Gérard and C.D ($\approx 20,000$ euros).
- **Industrial research contract** with the software editor `Ansys` ($\approx 20,000$ euros).
- **ANR Shapo grant (2018–2022);** principal investigator: J. Lamboley ($\approx 450,000$ euros).
- **CIFRE contract with Safran Tech.** (2017-2020) ($\approx 20,000$ euros).
- **Project IRS CAOS** (Conception Additive et Optimisation de Structures) (2017-2018) ($\approx 15,000$ euros).
- **Project AGIR HOMONIM** (Homogenization of Negative Index Materials) (2016-2017); principal investigator: E. Bonnetier ($\approx 15,000$ euros).
- **INSIS project "Matériaux architecturés"** (2015-2016); principal investigator: R. Estevez ($\approx 15,000$ euros).

Honors and awards

- **Prix Espoir Michelin** de l'Académie des Sciences, 2021, ($\approx 15,000$ euros).
- **Best paper award** in SeMa Journal, 2019, with G. Allaire, F. Bordeu, J. Cortial and F. Feppon ($\approx 1,500$ euros).
- **Ph. D. award** Thiessé de Rosemont Demassieux, from the Chancellerie des Universités de Paris ($\approx 10,000$ euros).