

Franz Chouly

C.V. - September 21, 2023

1 Personal data

Name: Chouly, Franz.

Nationality: french.

Date of birth: 05/04/1979.

franz.chouly@math.cnrs.fr

fchouly.perso.math.cnrs.fr

<https://orcid.org/0000-0002-9087-3301>

2 Positions

2.1 Academic positions

- **(09/2018–)** **Professor (Professeur des universités)**. Institut de Mathématiques de Bourgogne (IMB, UMR 5584 CNRS). UFR Sciences et Techniques. Université de Bourgogne, Dijon, France.
 - **(09/2023–08/2024) Disponibilité (sabbatical leave)**. Disponibilité pour convenance personnelle.
- **(09/2010–08/2018) Professor (Maître de conférences)**. Laboratoire de Mathématiques de Besançon (LMB, UMR 6623 CNRS). Institut Supérieur d'Ingénieurs de Franche-Comté (ISIFC). Université de Franche-Comté, Besançon, France.
 - **(09/2015–08/2016) Délégation CNRS (50 %)**. Laboratoire de Mathématiques de Besançon (LMB, UMR 6623 CNRS).

2.2 Other positions

- **(09/2023–) Visiting Researcher**. Centro de Investigación en Ingeniería Matemática (CI²MA). Universidad de Concepción, Chile.
Investigador asociado externo.
- **(08/13/2023–08/19/2023) Visiting Professor**. Universidad de la República de Uruguay (UDELAR), Montevideo, Uruguay.
Profesor Adjunto (Gdo. 3, 40 hs., cargo No 53016).
- **(09/2021–08/2023) Visiting Researcher**. Délégation CNRS. Centre of Mathematical Modelling (CMM, IRL 2804) and Centro de Investigación en Ingeniería Matemática (CI²MA). Universidad de Chile, Universidad de Concepción, Chile.
- **(01/2010–08/2010) Research Associate**. Department of Mathematics, Universidad Técnica Federico Santa María (UTFSM), Santiago and Valparaíso, Chile.
Investigador del Programa de Inserción de Investigadores a la Academia de Conicyt.

- **(11/2009–12/2009) Research Engineer.** Department of Structural Engineering, Pontificia Universidad Católica de Chile (PUC).
Investigador e ingeniero asociado externo (contrato de servicio).
- **(10/2007–09/2009) Research Associate.** INRIA CRI Paris-Rocquencourt, France.
Contrat de Recherche Post-Doctorale de l'INRIA. Equipe projet REO.
- **(10/2006–08/2007) Research Associate.** Department of Mathematical Engineering, Universidad de Concepción, Chile.
Contrat avec l'Université Joseph Fourier, Grenoble I (Bourse ALFA De la Commission Européenne, programme ALFA-IPECA).
Contrato de la Universidad de Concepción, como Investigador asociado al Departamento de Ingeniería Matemática.
- **(10/2005–08/2006) Teaching Assistant.** ENSIMAG Engineering School, Grenoble, France.
Attaché Temporaire d'Enseignement et de Recherche (ATER) à 50 %.

3 Education

- **(2013) “Habilitation à Diriger des Recherches”** in applied mathematics. Defended the 4th of December, 2013. Université de Franche-Comté, France.
 - Title: “Contributions to the numerical treatment of some boundary or interface conditions within the framework of the Finite Element Method.”
 - Referees : Yves Achdou, Roland Becker, Faker Ben Belgacem, Erik Burman.
 - Jury : Yves Achdou (referee), Faker Ben Belgacem (referee), Erik Burman (referee), Alexandre Ern, Alexei Lozinski, Yvon Maday (president).
- **(2002–2005) PhD** in image, computer vision and robotics. Defended the 15th of December, 2005. Grenoble INP, France.
 - Title : “Physical modelling of the upper airway for Obstructive Sleep Apnea Syndrome”.
 - Advisors: Yohan Payan, Xavier Pelorson.
 - Jury : Marie-Paule Cani (president), Christophe Chaillou (referee), Daniel Isabey (referee), Jean-Roch Paoli, Pierre-Yves Lagrée, Annemie Van Hirtum.
- **(2001–2002) MSc** in image, computer vision and robotics, Grenoble INP, France (*with honours, top of the class*).
- **(1999–2002) Engineering** in computer science and applied mathematics, ENSIMAG, Grenoble, France (*with honours*).
- **(1997–1999) “Classes préparatoires”** MPSI, PSI*, lycée Montaigne, Bordeaux, France. “Classes préparatoires” is a two year preparation in mathematics and physics for competitive entrance into french engineering schools.

4 Publications

4.1 Book

- [1] F. CHOULY, P. HILD, AND Y. RENARD, *Finite element approximation of contact and friction in elasticity*, vol. 48 of *Advances in Mechanics and Mathematics / Advances in Continuum Mechanics*, Birkhäuser, Springer, 2023. ISBN 978-3-031-31422-3. <https://doi.org/10.1007/978-3-031-31422-3>, xxi+294 pages.

4.2 Appeared/in press in refereed journals

- [2] F. CHOULY, A. VAN HIRTUM, P.-Y. LAGRÉE, X. PELORSON, AND Y. PAYAN, *Numerical and experimental study of expiratory flow in the case of major upper airway obstructions with fluid–structure interaction*, *Journal of Fluids and Structures*, 24 (2008), pp. 250–269.
- [3] ———, *Modelling the human pharyngeal airway: validation of numerical simulations using in vitro experiments*, *Medical and Biological Engineering and Computing*, 47 (2009), pp. 49–58.
- [4] G. R. BARRENECHEA AND F. CHOULY, *A finite element method for the resolution of the reduced Navier-Stokes/Prandtl equations*, *Zeitschrift für Angewandte Mathematik und Mechanik*, 89 (2009), pp. 54–68.
- [5] M. ASTORINO, F. CHOULY, AND M. A. FERNÁNDEZ, *Robin based semi-implicit coupling in fluid-structure interaction: stability analysis and numerics*, *SIAM Journal on Scientific Computing*, 31 (2009/10), pp. 4041–4065.
- [6] F. CHOULY AND P.-Y. LAGRÉE, *Comparison of computations of asymptotic flow models in a constricted channel*, *Applied Mathematical Modelling*, 36 (2012), pp. 6061–6071.
- [7] F. CHOULY AND N. HEUER, *A Nitsche-based domain decomposition method for hypersingular integral equations*, *Numerische Mathematik*, 121 (2012), pp. 705–729.
- [8] G. R. BARRENECHEA AND F. CHOULY, *A local projection stabilized method for fictitious domains*, *Applied Mathematics Letters*, 25 (2012), pp. 2071–2076.
- [9] F. CHOULY AND P. HILD, *On convergence of the penalty method for unilateral contact problems*, *Applied Numerical Mathematics*, 65 (2013), pp. 27–40.
- [10] ———, *A Nitsche-based method for unilateral contact problems: numerical analysis*, *SIAM Journal on Numerical Analysis*, 51 (2013), pp. 1295–1307.
- [11] F. CHOULY, *An adaptation of Nitsche’s method to the Tresca friction problem*, *Journal of Mathematical Analysis and Applications*, 411 (2014), pp. 329–339.
- [12] F. CHOULY, P. HILD, AND Y. RENARD, *Symmetric and non-symmetric variants of Nitsche’s method for contact problems in elasticity: theory and numerical experiments*, *Mathematics of Computation*, 84 (2015), pp. 1089–1112.
- [13] ———, *A Nitsche finite element method for dynamic contact: 1. Space semi-discretization and time-marching schemes*, *ESAIM. Mathematical Modelling and Numerical Analysis*, 49 (2015), pp. 481–502.

- [14] —, *A Nitsche finite element method for dynamic contact: 2. Stability of the schemes and numerical experiments*, ESAIM. Mathematical Modelling and Numerical Analysis, 49 (2015), pp. 503–528.
- [15] M. ASTORINO, F. CHOULY, AND A. QUARTERONI, *A time-parallel framework for coupling finite element and lattice Boltzmann methods*, Applied Mathematics Research Express. AMRX, (2016), pp. 24–67.
- [16] F. AMMAR KHODJA, F. CHOULY, AND M. DUPREZ, *Partial null controllability of parabolic linear systems*, Mathematical Control and Related Fields, 6 (2016), pp. 185–216.
- [17] R. MLIKA, Y. RENARD, AND F. CHOULY, *An unbiased Nitsche’s formulation of large deformation frictional contact and self-contact*, Computer Methods in Applied Mechanics and Engineering, 325 (2017), pp. 265–288.
- [18] M. BRUNEAU, T. MOTTET, S. MOULIN, M. KERBIRIOU, F. CHOULY, S. CHRETIEN, AND C. GUYEUX, *A clustering package for nucleotide sequences using Laplacian Eigenmaps and Gaussian Mixture Model*, Computers in Biology and Medicine, 93 (2018), pp. 66–74.
- [19] F. CHOULY, M. FABRE, P. HILD, J. POUSIN, AND Y. RENARD, *Residual-based a posteriori error estimation for contact problems approximated by Nitsche’s method*, IMA Journal of Numerical Analysis, 38 (2018), pp. 921–954.
- [20] N. HERMANT, F. CHOULY, F. SILVA, AND P. LUIZARD, *Numerical study of the vibrations of an elastic container filled with an inviscid fluid*, Zeitschrift für Angewandte Mathematik und Mechanik, 98 (2018), pp. 602–621.
- [21] F. CHOULY, R. MLIKA, AND Y. RENARD, *An unbiased Nitsche’s approximation of the frictional contact between two elastic structures*, Numerische Mathematik, 139 (2018), pp. 593–631.
- [22] Q. HU, F. CHOULY, P. HU, G. CHENG, AND S. P. A. BORDAS, *Skew-symmetric Nitsche’s formulation in isogeometric analysis: Dirichlet and symmetry conditions, patch coupling and frictionless contact*, Computer Methods in Applied Mechanics and Engineering, 341 (2018), pp. 188–220.
- [23] L. BLANK, A. CAIAZZO, F. CHOULY, A. LOZINSKI, AND J. MURA, *Analysis of a stabilized penalty-free Nitsche method for the Brinkman, Stokes and Darcy problems*, ESAIM. Mathematical Modelling and Numerical Analysis, 52 (2018), pp. 2149–2185.
- [24] F. CHOULY AND Y. RENARD, *Explicit Verlet time-integration for a Nitsche-based approximation of elastodynamic contact problems*, Advanced Modeling and Simulation in Engineering Sciences, 5 (2018), pp. 1–38.
- [25] M. DUPREZ, S. P. A. BORDAS, M. BUCKI, H. P. BUI, F. CHOULY, V. LLERAS, C. LOBOS, A. LOZINSKI, P.-Y. ROHAN, AND S. TOMAR, *Quantifying discretization errors for soft-tissue simulation in computer assisted surgery: a preliminary study*, Applied Mathematical Modelling, 77 (2020), pp. 709–723.
- [26] R. BULLE, F. CHOULY, J. S. HALE, AND A. LOZINSKI, *Removing the saturation assumption in Bank-Weiser estimator analysis in dimension three*, Applied Mathematics Letters, 107 (2020). Article 106429.

- [27] F. CHOULY, A. ERN, AND N. PIGNET, *A hybrid high-order discretization combined with Nitsche's method for contact and Tresca friction in small strain elasticity*, SIAM Journal on Scientific Computing, 42 (2020), pp. A2300–A2324.
- [28] D. SUTULA, A. ELOUNEG, M. SENSALÉ, F. CHOULY, J. CHAMBERT, A. LEJEUNE, D. BAROLI, P. HAUSEUX, S. P. A. BORDAS, AND E. JACQUET, *An open-source pipeline for design of experiments for hyperelastic models of the skin with applications to keloids*, Journal of the Mechanical Behavior of Biomedical Materials, 112 (2020). Article 103999.
- [29] K. L. CASCAVITA, F. CHOULY, AND A. ERN, *Hybrid High-Order discretizations combined with Nitsche's method for Dirichlet and Signorini boundary conditions*, IMA Journal of Numerical Analysis, 40 (2020), pp. 2189–2226.
- [30] F. CHOULY AND P. KLEIN, *Wave-heat coupling in one-dimensional unbounded domains: artificial boundary conditions and an optimized Schwarz method*, Numerical Algorithms, 90 (2022), pp. 631–668.
- [31] F. CHOULY AND P. HILD, *On a finite element approximation for the elastoplastic torsion problem*, Applied Mathematics Letters, 132 (2022). Article 108191.
- [32] F. CHOULY, P. HILD, V. LLERAS, AND Y. RENARD, *Nitsche method for contact with Coulomb friction: Existence results for the static and dynamic finite element formulations*, Journal of Computational and Applied Mathematics, 416 (2022). Paper No. 114557.
- [33] R. BULLE, J. S. HALE, A. LOZINSKI, S. P. A. BORDAS, AND F. CHOULY, *Hierarchical a posteriori error estimation of Bank-Weiser type in the FEniCS Project*, Computers & Mathematics with Applications, 131 (2023), pp. 103–123.
- [34] R. BULLE, O. BARRERA, S. P. A. BORDAS, F. CHOULY, AND J. S. HALE, *An a posteriori error estimator for the spectral fractional power of the Laplacian*, Computer Methods in Applied Mechanics and Engineering, 407 (2023). Paper No. 115943.
- [35] F. CHOULY, T. GUSTAFSSON, AND P. HILD, *A Nitsche method for the elastoplastic torsion problem*, ESAIM. Mathematical Modelling and Numerical Analysis, 57 (2023), pp. 1731–1746.
- [36] L. BEAUDE, F. CHOULY, M. LAAZIRI, AND R. MASSON, *Mixed and Nitsche's discretizations of Coulomb frictional contact-mechanics for mixed dimensional poromechanical models*, Computer Methods in Applied Mechanics and Engineering, 413 (2023). Paper No. 116124.
- [37] R. ARAYA AND F. CHOULY, *Residual a posteriori error estimation for frictional contact with Nitsche method*, Journal of Scientific Computing, 96 (2023). Paper No. 87.

4.3 Conference proceedings (in indexed book series, with peer-review)

- [38] F. CHOULY, A. VAN HIRTUM, P.-Y. LAGRÉE, J.-R. PAOLI, X. PELORSON, AND Y. PAYAN, *Simulation of the retroglossal fluid-structure interaction during obstructive sleep apnea*, Lecture Notes in Computer Science, 4072 (2006), pp. 48–57. Proceedings of the Third International Symposium ISBMS 2006 on Biomedical Simulation. Editors: Matthias Harders and Gábor Székely.

- [39] F. CHOULY, M. FABRE, P. HILD, R. MLIKA, J. POUSIN, AND Y. RENARD, *An overview of recent results on Nitsche’s method for contact problems*, Lecture Notes in Computational Science and Engineering, 121 (2017), pp. 93–141. Proceedings of the UCL Workshop 2016 on Geometrically Unfitted Finite Element Methods and Applications. Editors: Stéphane P.A. Bordas, Erik Burman, Mats G. Larson and Maxim A. Olshanskii.
- [40] F. CHOULY, P. HILD, V. LLERAS, AND Y. RENARD, *Nitsche-based finite element method for contact with Coulomb friction*, Lecture Notes in Computational Science and Engineering, 126 (2019), pp. 839–847. Proceedings of the European Conference on Numerical Mathematics and Advanced Applications ENUMATH 2017. Editors: Florian Adrian Radu, Kundan Kumar, Inga Berre, Jan Martin Nordbotten, Iuliu Sorin Pop.
- [41] L. BEAUDE, F. CHOULY, M. LAAZIRI, AND R. MASSON, *Mixed and Nitsche’s discretizations of frictional contact-mechanics in fractured porous media*, Lecture Notes in Computer Science, (2023). Proceedings of the 14th International Conference on Large-Scale Scientific Computations. To appear.

4.4 Short notes in Comptes Rendus Mathématique

- [42] M. ASTORINO, F. CHOULY, AND M. A. FERNÁNDEZ, *An added-mass free semi-implicit coupling scheme for fluid-structure interaction*, Comptes Rendus Mathématique. Académie des Sciences. Paris, 347 (2009), pp. 99–104.
- [43] F. CHOULY AND A. LOZINSKI, *Parareal multi-model numerical zoom for parabolic multi-scale problems*, Comptes Rendus Mathématique. Académie des Sciences. Paris, 352 (2014), pp. 535–540.

4.5 Preprints of submitted papers

- [44] F. CHOULY, *A review on some discrete variational techniques for the approximation of essential boundary conditions*. hal-03741809. Submitted, Aug. 2022.
- [45] R. EFTIMIE, G. ROLIN, O. ADEBAYO, S. URCUN, F. CHOULY, AND S. P. A. BORDAS, *Modelling keloids dynamics: a brief review and new mathematical perspectives*. hal-03897527. Accepted under major modifications in Bulletin of Mathematical Biology, June 2023.
- [46] H. HUANG, N. PIGNET, G. DROUET, AND F. CHOULY, *HHT- α and TR-BDF2 schemes for dynamic contact problems*. hal-04021471. Accepted under major modifications in Computational Mechanics, June 2023.
- [47] R. ARAYA, A. CAIAZZO, AND F. CHOULY, *Stokes problem with slip boundary conditions using stabilized finite elements combined with Nitsche*. hal-04077986. Submitted, Apr. 2023.
- [48] H. P. BUI, M. DUPREZ, P.-Y. ROHAN, A. LEJEUNE, S. P. A. BORDAS, M. BUCKI, AND F. CHOULY, *Automatic mesh refinement for soft tissue*. hal-04208610. Submitted, Sept. 2023.

4.6 Book chapters

- [49] A. VAN HIRTUM, F. CHOULY, P.-Y. LAGRÉE, J.-R. PAOLI, Y. PAYAN, AND X. PELORSON, *When a fluid-structure interaction keeps you awake : a physical approach to Obstructive Sleep Apnea.*, in Progress in Sleep Apnea Research, R. T. Ferber, ed., Nova Science Publishers, 2007, pp. 41–76. ISBN:978-1-60021-652-7.
- [50] F. CHOULY, P. HILD, AND Y. RENARD, *Méthodes de lagrangien et de Nitsche pour l'approximation numérique des conditions de contact avec frottement*, in Modélisation numérique en mécanique fortement non linéaire (contact et rupture), J. Besson, F. Lebon, and E. Lorentz, eds., ISTE Editions (Sciences), 2023, pp. 8–52. ISBN:978-1-78948-081-8.

4.7 Conference proceedings (indexed, without peer-review)

- [51] C. MARÉCAUX, M. CHABANAS, V. LUBOZ, A. PEDRONO, F. CHOULY, P. SWIDER, Y. PAYAN, AND F. BOUTAULT, *Maxillofacial computer aided surgery: a 5 years experience and future*, in Proceedings of the First International Conference Surgetica'2002. Computer-Aided Medical Interventions: tools and applications, Sauramps Medical Editors, 2002, pp. 185–190.
- [52] A. VAN HIRTUM, F. CHOULY, A. TEULÉ, Y. PAYAN, AND X. PELORSON, *In-vitro study of pharyngeal pressure losses at the origin of obstructive sleep apnea*, in Proceedings of the 25th Annual International Conference of the IEEE Engineering In Medicine And Biology Society, IEEE, 2003, pp. 371–374.
- [53] A. VAN HIRTUM, F. CHOULY, A. TEULÉ, C. VILAIN, Y. PAYAN, AND X. PELORSON, *Obstructive sleep apnea syndrome. Part 1: In-vitro study of the fluid-structure interaction*, Archives of Physiology and Biochemistry, 111 (2003), p. 60. Actes de la conférence de la Société Française de Biomécanique (SFB), 2003.
- [54] F. CHOULY, A. VAN HIRTUM, X. PELORSON, AND Y. PAYAN, *Obstructive sleep apnea syndrome. Part 2: computer simulation of the fluid-structure interaction*, Archives of Physiology and Biochemistry, 111 (2003), p. 54. Actes de la conférence de la Société Française de Biomécanique (SFB), 2003.
- [55] M. CHABANAS, C. MARÉCAUX, F. CHOULY, F. BOUTAULT, AND Y. PAYAN, *Evaluating soft tissue simulation in maxillofacial surgery using pre and post-operative CT scan*, in Proceedings of the 18th International Conference on Computer Assisted Radiology and Surgery, CARS 2004. International Congress Series (ICS), vol. 1268, Elsevier, 2004, pp. 419–424.
- [56] F. CHOULY, A. VAN HIRTUM, P.-Y. LAGRÉE, X. PELORSON, AND Y. PAYAN, *Reproduction of hypopnea phenomenon using a physical and numerical model*, in Proceedings of the 6th International Symposium on Computer Methods in Biomechanics & Biomedical Engineering, CMBBE 2004, J. Middleton, N. Shrive, and M. Jones, eds., FIRST Numerics Ltd, ISBN 0-9549670-0-3 (CD ROM, 6 pages), 2004.
- [57] F. CHOULY, Y. PAYAN, AND J.-R. PAOLI, *Simulation de l'interaction entre air inspiré et tissus pharyngés pour l'aide au planning en chirurgie maxillo-faciale*, Revue de Stomatologie et de Chirurgie Maxillo-Faciale, 106 (2005), pp. 1S11–1S12. Actes du 41e Congrès Français et 2e Congrès International Francophone de Stomatologie et Chirurgie Maxillo-Faciale, 2005.

- [58] F. CHOULY, A. VAN HIRTUM, P.-Y. LAGRÉE, X. PELORSON, AND Y. PAYAN, *Fluid-structure interaction in Obstructive Sleep Apnea: validation of numerical simulations using in-vitro measurements*, Journal of Biomechanics, 39 (Suppl. 1) (2006), p. S441. Proceedings of the 5th World Congress of Biomechanics, 2006.
- [59] F. CHOULY AND M.-A. FERNÁNDEZ, *An enhanced Parareal algorithm for partitioned parabolic-hyperbolic coupling*, in International Conference on Numerical Analysis and Applied Mathematics ICNAAM 2009, vol. 1168 of AIP Conference Proceedings, AIP, 2009, pp. 1517–1520.

4.8 Software and/or data

- [60] M. DUPREZ, S. P. A. BORDAS, M. BUCKI, H. P. BUI, F. CHOULY, V. LLERAS, C. LOBOS, A. LOZINSKI, P.-Y. ROHAN, AND S. TOMAR, *Quantifying discretization errors for soft-tissue simulation in computer assisted surgery: a preliminary study*, (2019). figshare repository. DOI:10.6084/m9.figshare.8128178.v1.
- [61] N. MARIE, A. LEJEUNE, F. CHOULY, J. CHAMBERT, AND E. JACQUET, *DWR error estimator for the biomechanics of the skin with a keloid scar*, (2022). figshare repository. DOI:10.6084/m9.figshare.19372280.v1.
- [62] R. ARAYA AND F. CHOULY, *Residual estimator for frictional contact with Nitsche method*, (2023). figshare repository. DOI:10.6084/m9.figshare.22555573.v1.
- [63] R. ARAYA, A. CAIAZZO, AND F. CHOULY, *Nitsche method for Stokes with slip boundary conditions in FEniCS*, (2023). figshare repository. DOI:10.6084/m9.figshare.22779443.v1.
- [64] R. ARAYA AND F. CHOULY, *Nitsche with a Lagrange Finite Element Method*, (2023). figshare repository. DOI:10.6084/m9.figshare.24082137.v1.
- [65] M. DUPREZ, A. LEJEUNE, F. CHOULY, S. P. A. BORDAS, AND H. P. BUI, *DWR hyperelastic soft tissue*, (2023). figshare repository. DOI:10.6084/m9.figshare.22548634.v1.

4.9 Other documents

- [66] F. CHOULY, *Modélisation physique des voies aériennes supérieures pour le Syndrome d’Apnées Obstructives du Sommeil*, PhD Thesis, Institut National Polytechnique de Grenoble, Dec. 2005. HAL/TEL reference: tel-00012061.
- [67] ———, *Contribution au traitement des conditions limites et d’interface dans le cadre de la Méthode des Éléments Finis*, Habilitation à Diriger des Recherches, Université de Franche-Comté, Dec. 2013. HAL/TEL reference: tel-00981356.
- [68] N. HERMANT, F. SILVA, F. CHOULY, AND X. PELORSON, *Modèle éléments finis d’un pli vocal artificiel avec couplage hydro-élastique*, in CFA 2014 - 12ème Congrès Français d’Acoustique, Poitiers, France, Apr. 2014, pp. 1821–1827. hal-01016791.

- [69] F. CHOULY, P. HILD, AND Y. RENARD, *A Nitsche finite element method for dynamic contact*, in 11th World Congress on Computational Mechanics (WCCM XI), Barcelona, Spain, July 2014, p. a1255. hal-01061496.
- [70] N. HERMANT, X. PELORSON, P. LUIZARD, F. CHOULY, AND F. SILVA, *Hydro-elastic finite element model of a vocal fold replica*, in ICSV 2015 - 22nd International Congress on Sound and Vibration, Florence, Italy, July 2015. hal-01181630.
- [71] F. E. HERAVI, M. A. NAZARI, F. CHOULY, P. PERRIER, AND Y. PAYAN, *Computational fluid dynamics in the upper airway: comparison between different models and experimental data for a simplified geometry with major obstruction*. Research report. hal-01383256, 2016.
- [72] F. CHOULY, *Sur la prise en compte de quelques conditions aux limites avec la méthode des éléments finis*. Lecture notes (in french). Master Mathématiques Approfondies, Université Bourgogne Franche-Comté, 70 pages. cel-01564693, 2017.
- [73] G. R. BARRENECHEA, F. CHOULY, AND C. GONZALEZ, *A stabilised finite element method for a time-dependent problem solved using a fictitious domain method*. Research report. hal-01596106, 2017.
- [74] R. MLIKA, Y. RENARD, AND F. CHOULY, *Approximation non biaisée par une méthode de type Nitsche pour le contact en petites et grandes déformations*, in 13e Colloque National en Calcul des Structures, Giens, France, May 2017, Université Paris-Saclay. hal-01926869.
- [75] M. SENSALÉ, J. CHAMBERT, F. CHOULY, A. LEJEUNE, S. JOLY, E. K. REKIK, G. ROLIN, T. LIHOREAU, B. CHATELAIN, P. SANDOZ, S. P. A. BORDAS, AND E. JACQUET, *Experimental and numerical assessment of the mechanics of keloid-skin composites undergoing large deformations*, in EUROMECH Colloquium 595, Biomechanics and computer assisted surgery meets medical reality, Villeneuve d’Ascq, France, Aug. 2017. hal-01503619.
- [76] Q. HU, F. CHOULY, A. ZILIAN, G. CHENG, AND S. P. A. BORDAS, *Generalized local B-bar method for locking phenomenon in Reissner-Mindlin shell and skew-symmetric Nitsche method for boundary conditions imposing and patch coupling in IGA*, in 7th GACM Colloquium on Computational Mechanics for Young Scientists from Academia and Industry, Stuttgart, Germany, Oct. 2017. hal-01654498.
- [77] D. SUTULA, A. ELOUNEG, M. SENSALÉ, F. CHOULY, J. CHAMBERT, A. LEJEUNE, D. BAROLI, P. HAUSEUX, S. P. A. BORDAS, AND E. JACQUET, *Parameter identification problem in bimaternal human skin and sensitivity analysis: uncertainties in biomechanics of skin*, in Congrès Français de Mécanique, Brest, France, Aug. 2019. hal-02376994.
- [78] A. ELOUNEG, D. SUTULA, M. SENSALÉ, F. CHOULY, J. CHAMBERT, A. LEJEUNE, D. BAROLI, P. HAUSEUX, S. P. A. BORDAS, AND E. JACQUET, *Mechanical parameters identification of keloid and surrounding healthy skin using Digital Image Correlation measurements in vivo*, in Congrès Français de Mécanique, Brest, France, Aug. 2019. hal-02376993.
- [79] F. CHOULY, J. LOUBANI, A. LOZINSKI, B. MÉJRI, K. MERITO, S. PASSOS, AND A. PINEDA, *Computing bi-tangents for transmission belts*. Research report (Semaine d’Etude Maths Entreprises, SEME, May 2019, Besançon). hal-02429962, 2020.

- [80] A. ELOUNEG, D. SUTULA, A. LEJEUNE, J. CHAMBERT, F. CHOULY, S. P. A. BORDAS, AND E. JACQUET, *Inverse identification of bi-material soft tissue parameters*, in 14th World Congress on Computational Mechanics (WCCM) ECCOMAS 2020, Paris, France, Jan. 2021. hal-03549361.
- [81] F. CHOULY, *An introductory course to some numerical approximation methods for ordinary and partial differential equations*. Lecture notes. International Master in Mathematical Physics, Université de Bourgogne, 44 pages. hal-03212748, 2021.
- [82] F. CHOULY, X. DUPUIS, AND K. VUILLEMOT, *Analyse numérique MIGS 1re Année*. Lecture notes (in french). Master Mathématiques pour l’Industrie, alGorithmique, Statistique (MIGS), Université de Bourgogne, 56 pages. hal-03277223, 2021.
- [83] A. ELOUNEG, A. BERTIN, N. MARIE, Q. LUCOT, D. SUTULA, F. CHOULY, A. LEJEUNE, G. ROLIN, T. LIHOREAU, B. CHATELAIN, S. P. A. BORDAS, E. JACQUET, AND J. CHAMBERT, *In vivo mechanical characterization and tissue-scale modelling of keloid and surrounding healthy skin*, in 26th Congress of the European Society of Biomechanics (ESB 2021), Milan, Italy, jul 2021, p. 506. Available at <https://publiweb.femto-st.fr/tntnet/entries/18464/documents/author/data>.
- [84] M. BLAISE, F. CHOULY, AND P.-Y. ROHAN, *A few remarks about the computer implementation and the verification of some hyperelastic constitutive laws and an illustration with the mechanical response of an artery*. Research report. hal-03637834, 2022.
- [85] H. HUANG, F. CHOULY, G. DROUET, AND N. PIGNET, *Schémas HHT-alpha et prédicteurs-correcteurs pour le contact dynamique avec méthode de Nitsche*, in CSMA 2022 : 15ème Colloque National en Calcul des Structures, Giens, France, May 2022. hal-03683159.
- [86] F. CHOULY, *A short journey into the realm of numerical methods for contact in elastodynamics*. Lecture notes. 17 pages. hal-04204197, Sept. 2023.

5 Presentations and seminars

5.1 Invited courses

1. Workshop “Applications and New Frontiers for the Finite Element Method”. Centre de Recherches Mathématiques (CRM). Université Laval. Québec, Canada. May 2016. Organized by Jean Deteix, Miguel A. Fernández, André Fortin, André Garon and José M. Urquiza.
Course: “Nitsche’s method for unilateral contact problems” (8 hours).
2. Centro de Investigación en Ingeniería Matemática (CI²MA). Universidad de Concepción. Concepción, Chile. April to June 2022. Organized by Rodolfo Araya.
Course: “Nitsche’s method for essential boundary conditions and some variational inequalities” (8 hours).

5.2 Invited presentations in meetings

1. 5th World Congress of Biomechanics WCB 2006. Munich, Germany. July 2006.

- Invited to the session “Respiratory mechanics FSI – aerodynamics and vibrations” organized by Matthias Heil and Chris Bertram.
2. 7th International Conference on Numerical Analysis and Applied Mathematics ICNAAM 2009. Rethymno, Greece. September 2009.
Invited to the minisymposium “Recent advances on the parareal in time algorithms” organized by Yvon Maday.
 3. 3rd Chilean Workshop on Numerical Analysis of Partial Differential Equations WON-APDE 2010. Concepción, Chile. January 2010.
Invited to the minisymposium “Numerical methods in life sciences modeling” organized by Mauricio Sepúlveda.
 4. International Conference on Scientific Computation and Differential Equations SciCADE 2013. Valladolid, Spain. September 2013.
Invited to the minisymposium “Recent advances on parareal algorithms” organized by Frédéric Legoll and Yvon Maday.
 5. 12e Colloque Franco-Roumain de Mathématiques Appliquées (CFR). Lyon. Août 2014.
Invited to the Numerical Analysis Session organized by Paul Vigneaux, Claudia Negulescu and Yves Renard.
 6. Workshop on Geometrically Unfitted Finite Element Methods GUFEM 2016. London, United Kingdom. January 2016.
Invited speaker. Workshop organized by Erik Burman, Susanne Claus and Thomas Boiveau.
 7. 17th SIAM Conference on Parallel Processing for Scientific Computing SIAM PP 2016. Paris, France. April 2016.
Invited to the minisymposium “Parallel-in-time integration methods” organized by Martin Schreiber, Thobias Neckel and Daniel Ruprecht.
 8. International Conference “Emerging Trends in Applied Mathematics and Mechanics”, ETAMM 2016. Perpignan, France. May–June 2016.
Invitation to the minisymposium “Numerical analysis and computational methods in non-smooth mechanics” organized by Mikaël Barboteu.
 9. Congress of the Italian Society of Industrial and Applied Mathematics, SIMAI 2016, Milano, Italy. September 2016.
Invitation to the minisymposium “Heterogeneous domain decomposition methods” organized by Gabriele Ciamarella and Martin Gander.
 10. National conference “Le Congrès du Sommeil”, Strasbourg, France. November 2016.
Invitation to the minisymposium “Evaluation des voies aériennes supérieures dans le SAOS” organized by Olivier Gallet de Santerre and Emilie Béquignon.
 11. Workshop “Free Boundary Problems 17: Mathematical problems with subdifferential condition”, Saint-Etienne, France. June 2017.
Invited speaker. Workshop organized by Mahdi Boukrouche and Laetitia Paoli.

12. International Conference “Emerging Trends in Applied Mathematics and Mechanics”, ETAMM 2018. Krakow, Poland. June 2018.
Invitation to the minisymposium “Numerical Analysis and Computational Methods for Mechanics” organized by Mikael Barboteu and Krzysztof Bartosz.
13. Workshop “Computational Methods for Interface Problems” 2019. London, United Kingdom. January 2019.
Invited speaker. Workshop organized by Erik Burman, Stefan Frei and Cuiyu He.
14. Colloquium EUROMECH 600 “New Challenges in Finite Element Technology – From the Perspective of Mechanics and Mathematics”. Aachen, Germany. March 2019.
Invited speaker. Colloquium organized by Stephanie Reese and Peter Hansbo.
15. Workshop “Journées Numériques de Besançon” 2019. Besançon, France. June 2019.
Invited speaker. Workshop organized by Alexei Lozinski and Ulrich Razafison.

5.3 Contributed presentations to national or international conferences

International

1. 6th international conference “Computer Methods in Biomechanics & Biomedical Engineering” CMBBE 2004. Madrid, Spain. February 2004.
2. 3rd Symposium on Biomedical Simulation ISBMS 2006. Zurich, Switzerland. July 2006.
3. 4th Meeting on Numerical Analysis of Partial Differential Equations, Santiago Numerico I. Santiago, Chile. January 2009.
4. 1st international conference “Fluid and Elasticity” 2009. Carry-Le-Rouet, France. June 2009.
5. 10th European Finite Element Fair 2012. Bilbao, Spain. June 2012.
6. 3rd International Conference on Computational Contact Mechanics ICCCM 2013. Lecce, Italy. July 2013.
7. 11th World Congress on Computational Mechanics WCCM XI. Barcelona, Spain. July 2014.
8. 13th World Congress on Computational Mechanics WCCM XIII. New York City, United States. July 2018.
9. 13th European Conference on Numerical Mathematics and Advanced Applications ENUMATH 2019. Egmond aan Zee, The Netherlands. September 2019.
10. 1st Meeting “Numerical and analytical approaches for nonlinear dispersive PDEs”. Dijon, France. October 2019.

National (France)

1. 28e Congrès de la Société Française de Biomécanique (SFB). Poitiers, Septembre 2003. (*poster*)
2. 41e Congrès Français et 2e Congrès International Francophone de Stomatologie et Chirurgie Maxillo-Faciale. Marseille. Septembre 2005.
3. 20e Congrès de la Société Française de Recherche sur le Sommeil. Lyon. Novembre 2005. (*poster*)
4. 44e Congrès National d'Analyse Numérique, CANUM 2018. Cap d'Agde, Mai–Juin 2018.

National (Chile)

1. XXXV Jornada de Matemática de la Zona Sur (JMZS). Concepción, April 2023.

5.4 Seminar talks and colloquia

1. Institut de la Communication Parlée. Grenoble-INP & Université Stendhal, Grenoble, France. April 2005.
2. Departamento de Ingeniería Matemática. Universidad de Concepción, Concepción, Chile. April 2007.
3. Projet REO. INRIA CRI Paris-Rocquencourt, France. July 2008.
4. GIPSA-Lab, Département Parole-Cognition. Grenoble-INP & Université Stendhal, Grenoble, France. April 2009.
5. Departamento de Ingeniería Matemática. Universidad de Concepción, Concepción, Chile. May 2009.
6. Departamento de Ingeniería Estructural y Geotécnica. Pontificia Universidad Católica de Chile, Santiago, Chile. May 2009.
7. Laboratoire de Mathématiques de Besançon, équipe ANCS. Université de Franche-Comté, Besançon, France. May 2010.
8. Laboratoire TIMC, équipe GMCAO. Université Joseph Fourier & Grenoble-INP, Grenoble, France. January 2011.
9. Department of Mathematics and Statistics. Strathclyde University, Glasgow, United Kingdom. October 2011.
10. GIPSA-Lab, Département Parole-Cognition. Grenoble-INP & Université Stendhal, Grenoble, France. April 2012.
11. Institut de Mathématiques de Toulouse, équipe MIP. Université Paul Sabatier, Toulouse, France. June 2013.
12. Laboratoire Jean Kuntzmann, équipes EDP-MOISE. Université Joseph Fourier & Grenoble-INP, Grenoble, France. November 2013.

13. Laboratoire de Mathématiques, Informatique et Applications. Université de Haute Alsace, Mulhouse, France. January 2014.
14. Institut de Mathématiques de Toulouse, équipe MIP. Université Paul Sabatier, Toulouse, France. February 2014.
15. Laboratoire de Mathématiques et de leurs Applications de Pau. Université de Pau et des Pays de l'Adour, Pau, France. June 2014.
16. Institut de Recherche Mathématique Avancée. Université de Strasbourg, Strasbourg, France. June 2014.
17. Laboratoire de Mathématiques. Université Blaise Pascal. Clermont-Ferrand, France. February 2015.
18. Institut Camille Jordan. Lyon, France. March 2015.
19. Institut Elie Cartan. Université de Lorraine. Nancy, France. March 2015.
20. Unité de Mathématiques Pures et Appliquées. Ecole Normale Supérieure de Lyon. Lyon, France. November 2015.
21. Laboratoire Jean Alexandre Dieudonné. Université de Nice Sophia Antipolis. Nice, France. January 2016.
22. Mathematics Institute of Computational Science and Engineering (MATHICSE). Ecole Polytechnique Fédérale de Lausanne. Lausanne, Switzerland. April 2016.
23. Laboratoire Amiénois de Mathématique Fondamentale et Appliquée. Université de Picardie Jules Verne. Amiens, France. April 2017.
24. Institut de Mathématiques de Bourgogne, Université de Bourgogne. Dijon, France. October 2017.
25. Laboratoire de Mathématiques Appliquées à Paris 5. Université Paris 5. Paris, France. December 2017.
26. LEGATO Team. Université du Luxembourg, Esch sur Alzette, Luxembourg. January 2018.
27. SERENA Team. INRIA Paris, Paris, France. February 2018.
28. Institut de Mathématiques de Marseille. Aix-Marseille Université, Marseille, France. March 2018.
29. Institut de Recherche Mathématique Avancée. Université de Strasbourg, Strasbourg, France. April 2018.
30. Institute of Applied Mechanics. Technische Universität Braunschweig, Germany. April 2018.
31. Laboratory for Modeling and Scientific Computing MOX. Politecnico di Milano, Italy. November 2018.

32. Institut de Mathématiques de Bourgogne, Université de Bourgogne. Dijon, France. January 2019.
33. Département de Mécanique Appliquée (DMA), FEMTO-ST. Université de Franche-Comté. Besançon, France. March 2019.
34. Département Automatique et Systèmes Micro-Mécatroniques (AS2M), FEMTO-ST. Université de Franche-Comté. Besançon, France. May 2019.
35. Centre de Recherches Mathématiques (CRM). Université Laval. Québec, Canada. June 2021 (virtual talk).
36. Department of Applied Mathematics and Physics (DMFA). Universidad Católica de la Santísima Concepción (UCSC), Concepción, Chile. June 2023.
37. Seminar of PDEs, Centre of Mathematics. Universidad de la República de Uruguay (UDELAR), Montevideo, Uruguay. August 2023.

5.5 Other communications

1. “Journée des Thésards en Mathématiques Appliquées”, Laboratoire de Modélisation et Calcul. Université Joseph Fourier & Grenoble-INP, Grenoble, France. April 2003.
2. Scientific talk for the venue of AERES evaluation committee at the Laboratoire de Mathématiques de Besançon. Université de Franche-Comté, Besançon, France. January 2011.
3. “Journée de Séminaires Croisés LMB/FEMTO”. Laboratoire de Mathématiques de Besançon. Université de Franche Comté, Besançon, France. December 2012.
4. “10 ans du Projet REO”. INRIA Paris-Rocquencourt. Paris, France. June 2015.
5. Colloque CNRS “INterFaces Interdisciplinaires NumérIque et ThéorIque - INFINITI”. Institut Henri Poincaré. Paris, France. November 2017.
6. “Journée Mathématiques-Entreprises. Inauguration du noeud MSO Bourgogne-Franche-Comté”. Institut de Mathématiques de Bourgogne. Université de Bourgogne, Dijon, France. November 2017.
7. “Colloque INterFaces Interdisciplinaires NumérIque et ThéorIque - INFINITI”. Institut Henri Poincaré. Paris, France. November 2018 (*poster*).
8. “Journée scientifique de l’Institut de Mathématiques de Bourgogne”. Institut de Mathématiques de Bourgogne. Université de Bourgogne, Dijon, France. Avril 2019.
9. “Séminaire valorisation AMIES/INSMI & MSO”. Paris 05, France. November 2021 (*virtual talk*).

6 Research activities

6.1 Supervision

Prizes for supervision: I received the **PES** (“**Prime d’Excellence Scientifique**”) in 2013–2016, and then the **PEDR** (“**Prime d’Encadrement Doctoral et de Recherche**”) 2 times

(2017–2020 and 2021–2024) (french grants/prizes for research activities and supervision of PhD students).

6.1.1 Post-doctoral supervision

1. **(12/2017–08/2018)** Huu Phuoc Bui. “Goal oriented *a posteriori* error estimation for hyperelastic contractile models applied to clinical biomechanics”. Grant from the french agency “Agence pour les Mathématiques en Interaction avec les Entreprises et la Société” (AMIES), in partnership with Marek Bucki (industrial partner from the french start-up TexiSense).

Huu Phuoc Bui is researcher-engineer at ANSYS France, Lyon, since September 2018.

6.1.2 Doctoral dissertations

1. **(04/2021–03/2024)** Hao Huang. “Numerical methods for non-regular elastodynamics”. Industrial (“CIFRE”) grant co-funded by EDF R&D.

Co-advisors at EDF: Guillaume Drouet, Nicolas Pignet.

2. **(10/2017–03/2022)** Raphaël Bulle. “A posteriori error estimation for finite element approximations of fractional Laplacian problems and applications to poro-elasticity”. Grant from the University of Luxembourg. Co-tutelle between the University of Luxembourg and Université Bourgogne Franche-Comté. CET: Stéphane Bordas, Franz Chouly, Jack Hale, Alexei Lozinski.

Raphaël Bulle is in postdoctoral position at the CRM (Québec, Canada) since April 2022.

3. **(02/2015–01/2018)** Rabii Mlika. “Nitsche method for frictional contact and self-contact: mathematical and numerical study”. Co-supervised with Yves Renard. Industrial (“CIFRE”) grant co-funded by Michelin France.

Co-advisors at Michelin: Jean-François Deldon, Patrice Hauret.

Rabii Mlika is researcher-engineer at ANSYS France, Lyon, since May 2018.

4. **(09/2012–11/2015)** Michel Duprez. “Controllability of some systems of parabolic equations”. Co-supervised with Farid Ammar-Khodja. Grant from the “Région Franche-Comté”.

Michel Duprez is Chargé de Recherches at INRIA Strasbourg, since September 2020.

5. **(09/2011–10/2014)** Nicolas Hermant. “Observation, modelling and simulation of vocal folds replica. Application to pathological configurations”. Co-supervised with Xavier Pelorson and Fabrice Silva. Grant from the french government.

Nicolas Hermant has been reseach associate professor at the school of mechanical engineering of Universidad del Valle (Cali, Columbia), from January 2017 to March 2019. He is now CEO of Vercuma (Autrans-Méaudre en Vercors, France).

6.1.3 Master theses

1. **(04/2022–08/2022)** MSc thesis of Mohamed Laaziri. Co-supervised with Roland Masson (INRIA and Nice University) and Laurence Beauge (BRGM, Orléans). Subject: “Nitsche method for contact and friction in fractured porous media”.

2. **(02/2021–09/2021)** MSc thesis of Emerson Takematsu. Co-supervised with Kanty Raberonosoa (FEMTO-ST, Besançon, France). Subject: “Numerical tools for continuum robotics”.
3. **(06/2020–10/2020)** MSc thesis of Nicolas Marie. Co-supervised with Arnaud Lejeune, Jérôme Chambert and Emmanuelle Jacquet (FEMTO-ST, Besançon, France). Subject: “Goal-oriented mesh adaptation in elasticity. Application to the biomechanical analysis of a keloid scar”.
4. **(01/2018–07/2018)** MSc thesis of Yassine Mkhini. Subject: “On the mathematical analysis and finite element approximation of some boundary conditions”.
5. **(11/2016–11/2017)** MSc thesis of Aurélien Florence. Co-supervised with Pierre-Yves Rohan and Rachele Allena (Arts et Métiers ParisTech, France). Subject: “Finite element modelling of muscle fiber’s activation”.
6. **(11/2016–09/2017)** MSc thesis of Raphaël Bulle. Co-supervised with Alexei Lozinski (Laboratoire de Mathématiques de Besançon, France). Subject: “A study of the Bank and Weiser *a posteriori* estimator for finite elements of arbitrary order”.
7. **(12/2016–03/2017)** MSc thesis of Marco Sensale. Co-supervised with Jérôme Chambert and Emmanuelle Jacquet (FEMTO-ST, Besançon, France). Subject: “A biomechanical analysis of a keloid scar”.
8. **(02/2015–09/2015)** MSc thesis of Yinsong Bai. Subject: “Optimal control of elliptic problems”.
9. **(01/2015–10/2015)** MSc thesis of Stéphane Robin. Subject: “Finite element methods for unilateral contact”.
10. **(03/2014–07/2014)** MSc thesis of Rabii Mlika. Co-supervised with Yves Renard (INSA-Lyon, France) and Jean-François Deldon (Michelin France). Subject: “Robust numerical method for auto-contact in the large deformation framework”.
11. **(01/2012–06/2012)** MSc thesis of Michel Duprez. Co-supervised with Farid Ammar-Khodja (Laboratoire de Mathématiques de Besançon, France). Subject: “Control, optimization and numerics for the linear diffusion equation”.
12. **(01/2012–05/2012)** MSc thesis of Ester Baruffini. Subject: “On some mathematical aspects of the finite element method”.
13. **(11/2011–03/2012)** MSc thesis of Solenne Piart. Co-supervised with Fabrice Richard (FEMTO-ST, France). Subject: “Mechanical modelling of the vocal folds”.

6.1.4 Undergraduate theses

1. **(01/2021–05/2021)** Project, Master MIGS, 1st year, Université de Bourgogne. Ugo Bismara & Alexis Delattre. Subject: “The fast Fourier transform”.
2. **(01/2020–05/2020)** Project, Master MIGS, 1st year, Université de Bourgogne. Killian Vuillemot. Subject: “Time-parallel time-integration”.

3. **(01/2020–05/2020)** Project, Master MIGS, 1st year, Université de Bourgogne. Ronan Deshormières. Subject: “Numerical methods for the wave equation”.
4. **(10/2019–03/2020)** First and second semester projects, Master MIGS, 2nd year, Université de Bourgogne. Nicolas Marie. Subject: “Finite elements for the wave equation”.
5. **(03/2018–12/2018)** Undergraduate project in engineering, 2nd year (ISIFC). Manon Blaise. Co-supervised with Pierre-Yves Rohan (Arts&Métiers ParisTech). Subject: “Mathematical modelling of the arterial wall”.
6. **(03/2015–11/2015)** Undergraduate project in engineering. 2nd and 3rd years (ISIFC). Marine Bruneau. Co-supervised with Stéphane Chrétien (National Physics Laboratory, United Kingdom) and Christophe Guyeux (FEMTO-ST, France). Subject: “Clustering of nucleotide sequences”.
7. **(03/2015–06/2015)** Undergraduate project in engineering, 2nd year (ISIFC). Pauline Nicole. Co-supervised with Nicolas Andreff (FEMTO-ST, France). Subject: “Finite element modelling of the vocal folds for robotized micro-surgery”.
8. **(09/2011–11/2015)** 5 undergraduate projects in engineering, 2nd and 3rd years (ISIFC). Solenne Piart, Julie Buccheri, Alexis Roux, Cécile Lamy, Pauline Idesheim, Anne-Laure Baurand. Co-supervised with Fabrice Richard and Arnaud Lejeune (FEMTO-ST, France). Subject: “Mechanical modelling of the vocal folds”.
9. **(03/2011–06/2011)** Undergraduate project in engineering, 1st year (ISIFC). Maxime Lelièvre, Adèle Nowak, Divya Pathack. Subject: “Neuromuscular interactions in the human upper airway”.

6.2 Software for scientific computing

- Editorial co-director of GetFEM++ open source finite element library
(with Konstantinos Poulios ; publication director : Yves Renard).
<http://getfem.org/>

6.3 Industrial contracts

1. **(2022)** Contrat d’encadrement de thèse Electricité de France EDF No.8610–4220180496 & CNRS No.238689.
2. **(2018)** Research contract (“Contrat de Collaboration de Recherche”) CNRS No.176832 with the start-up TexiSense (Grenoble, France).

6.4 Research grants

6.4.1 As the principal investigator

1. **(2019) Project “Recherche en Réseau”. Université de Bourgogne. 3.800 euros.**
“Error controlled numerical methods for incompressible hyperelasticity and contact. Applications in computer assisted surgery.”
Funded by the Université de Bourgogne.

2. **(2018) Project “Chrysalide”. Université de Franche-Comté. 9.000 euros.**
 “Adaptive finite elements for biomechanics and computer assisted surgery.”
 Funded by the Université de Franche-Comté.
3. **(2017–2019) National project “PEPS-AMIES”. 47.000 euros.**
 “Adaptive finite elements for computer assisted surgery.”
 Funded by the french agency “Agence pour les Mathématiques en Interaction avec les Entreprises et la Société” (AMIES), in partnership with Marek Bucki (industrial partner from the french start-up TexiSense).
4. **(2017–2018) National project “Defi Infiniti”. 30.000 euros.**
 “Adaptive finite elements for computer assisted surgery.”
 Funded by the french agency “Centre National de la Recherche Scientifique” (CNRS). Multi-disciplinary project that involved one industrial partner (TexiSense) and 28 members: 12 in numerical analysis, 4 in computational mechanics, 8 in biomechanics and 4 in computer science. The members are located in France, Chile, Luxembourg, United Kingdom and Switzerland.
5. **(2015–2018) Regional project “MeNElas”. 50.000 euros.**
 “Mathematical models and numerical methods in non-linear elasticity”
 Funded by the “Région Franche-Comté”: convention no. 2015C-4991 “promotion, rayonnement et reconnaissance de la recherche d’excellence”. It involved 21 members in France, Chile, Germany and Luxembourg, and two industrial partners (Michelin France and TexiSense).

6.4.2 As a co-principal investigator

1. **(2013) BQR, Université de Franche-Comté. 8.000 euros.**
 “Domain decomposition methods with waveform relaxation. Application to multi-physics.” with Pauline Klein (Laboratoire de Mathématiques de Besançon, France).
“BQR : Bonus Qualité Recherche” are small-size projects funded by french universities.

6.4.3 As a collaborator

1. **(2023–2026) EUR EIPHI (regional) project NANA.**
130.000 euros.
 “Nouvelles approches numériques et analytiques pour des modèles mathématiques inspirés par la biologie”.
 Principal investigator: Raluca Eftimie.
2. **(2021–2024) ANR/FNR PCI project S–Keloid (ANR-21-CE45-0025-04).**
425.000 euros.
 “Comprendre les maladies chéloïdes : une approche multi-échelle in-vitro / in-vivo / in-silico vers des jumeaux numériques d’organoïdes de peau sur puce”.
 Principal investigators: Raluca Eftimie & Stéphane Bordas.

3. **(2020–) Chilean project Anillo ACT 192169.**
 “Toward understanding transient-to-precursory earthquake deformation in Chile”.
 International collaborator.
4. **(2019–2022) ISITE project “NAANoD”, Université Bourgogne Franche-Comté.**
150.000 euros.
 “Numerical and Analytical Approaches for Nonlinear Dispersive PDEs”.
 Principal investigator: Christian Klein.
5. **(2012–2014) ECOS-Sud/CONICYT project.**
 “Fluid-structure interaction in speech and its pathologies”.
 Bilateral project Chile/France.
6. **(2011) BQR, Université de Franche-Comté.** *5.500 euros.*
 “Parareal time-parallel time-integration methods for asymptotic flows in hydrology”, with
 Mihai Bostan and Ulrich Razafison (Laboratoire de Mathématiques de Besançon, France).

6.5 Organization of meetings

Workshops:

1. **(10/2019)** Co-organizer of the Workshop “Numerical and analytical approaches for non-linear dispersive PDE’s”, with Mariana Haragus and Christian Klein. Institut de Mathématiques de Bourgogne, Dijon, France.
<https://indico.math.cnrs.fr/event/5156/>
2. **(06/2015)** Co-organizer of the workshop “Besançon Week of Numerical Analysis”, with Gaspard Jankowiak, Pauline Klein and Alexei Lozinski. Laboratoire de Mathématiques de Besançon, Besançon, France. Organizer of the “Nitsche-FEM / XFEM session” within this workshop.
<http://trimestres-lmb.univ-fcomte.fr/Besancon-numerical-analysis.html>

Minisymposia for international conferences:

1. **(09/2019)** Co-organizer of the Minisymposium “Innovative methods for contact problems” for the EnuMath conference 2019, with Erik Burman and Stefan Frei. Egmond aan Zee, The Netherlands, September 30–October 4, 2019.
<https://www.enumath2019.eu/>
2. **(07/2018)** Co-organizer of the Minisymposium 311 “Stabilized and non-conforming finite element methods for variational inequalities” for the 13th World Congress on Computational Mechanics (WCCM 2018), with Patrick Hild, Vanessa Lleras and Yves Renard. New York City, July 22–27, 2018.
http://www.wccm2018.org/MS_311
3. **(05/2018)** Co-organizer of the Minisymposium “Méthodes Numériques en Mécanique du Contact” for the 44th “Congrès National d’Analyse Numérique” (CANUM 2018), with Vanessa Lleras. Cap d’Agde, May 28–June 1st, 2018.
http://smai.emath.fr/canum2018/sql_minisymposia.php

7 Service activities

7.1 External scientific expert

1. **(11/2021–07/2022)** Service contract as a Scientific expert for the University of Luxembourg. Expertise for the design of the track Industrial Mathematics within the Master of Mathematics.

7.2 Selection committes

1. **(2018)** External member of a selection committee to hire a junior researcher (“Chargé de Recherche”), INRIA Nancy Grand-Est, France.
2. **(2014)** External member of a selection committee to hire an associate professor (“Maître de conférences”), Université de Technologie de Belfort-Montbéliard (UTBM), France.

7.3 Jury in PhD defenses

As a reviewer and member of the jury:

1. **(12/2022)** Nadine Dirani (supervisors: Thierry Goudon, Laurent Monasse). Université Côte d’Azur, Nice, France.
2. **(11/2022)** Simon Clément (supervisors: Eric Blayo, Florian Lemarié). Université Grenoble Alpes, Grenoble, France.
3. **(10/2022)** Joëlle Ferzly (supervisors: Martin Vohralík, Soleiman Yousef, Ibtihel Ben Garbia). Sorbonne Université, Paris, France.
4. **(03/2022)** Ilaria Fontana (supervisors: Daniele Di Pietro, Kyrylo Kazymyrenko). Université de Montpellier, France.
5. **(12/2020)** Ghina Nassreddine (supervisors: Pascal Omnes, Toni Sayah). Sorbonne Université, Paris, France.
6. **(06/2019)** Jad Dabaghi (supervisors: Vincent Martin, Martin Vohralik). Sorbonne Université, Paris, France.

As a member of the jury:

1. **(10/2023)** Mathieu Barré (supervisors: Céline Grandmont, Philippe Moireau). Institut Polytechnique de Paris, Ecole Polytechnique, Palaiseau, France.
2. **(12/2022)** Idrissa Niakh (supervisors: Alexandre Ern, Guillaume Drouet, Virginie Ehrlicher). Sorbonne Université, Paris, France.
3. **(03/2021)** Shuangshuang Meng (supervisors: Nadhir Lebaal, Sébastien Roth). UTBM, Belfort, France.
4. **(12/2018)** Sarra Brihi (supervisors: Mohammed Louaked, Nour Seloula). Université de Caen Normandie, Caen, France.
President of the jury.
5. **(07/2015)** Mathieu Fabre (supervisors: Jérôme Pousin and Yves Renard). Institut National des Sciences Appliquées, Lyon, France.

7.4 Industrial relationships

7.4.1 AMIES/MSO local representative

From September 2018 to October 2022, I have been the local representative of the french association “Agence Maths-Entreprises” (AMIES) and of the “Modélisation Simulation Optimisation” (MSO) network at the Institut de Mathématiques de Bourgogne (Dijon, France).

7.4.2 Participation to mathematics–industry meetings

In May 2019, I took part of the SeME (“Semaine Maths-Enterprises”) organized in Besançon by Alexei Lozinski and Camelia Goga. I co-supervised a project with Alexei Lozinski, that was proposed by PSA Group. The results of our study is freely available as a preprint:

<https://hal.archives-ouvertes.fr/hal-02429962>

7.5 Other activities

7.5.1 Council

1. **(09/2017–08/2018)** Elected member of the scientific council of the Laboratoire de Mathématiques de Besançon.

7.5.2 Seminars

1. **(2011–2013)** Coordinator for weekly seminars of the Numerical Analysis team. Laboratoire de Mathématiques de Besançon, Université de Franche-Comté, France.
2. **(2003–2004)** Coordinator of weekly working groups in the CAMI team. Laboratoire TIMC, Grenoble, France.

7.6 Various expertise activities

7.6.1 Project evaluation

I did expertise for:

1. Regional project of the Région Nouvelle Aquitaine (1 project in 2021).
2. International collaboration projects *ECOS-Conicyt* (1 project in 2020).
3. Projects of the Chilean research institute *ANID/Conicyt* (4 Fondecyt projects in 2009, 2015, 2019 and 2020).
4. Projects of the Belgian *Research Foundation - Flanders (FWO)* (2 projects in 2017 and in 2018).

7.6.2 Referee

Referee for various international journals in applied and numerical mathematics, computational mechanics, mechanical and biomedical engineering.

Referee for a book chapter on model reduction (CECAM conferences, Springer MS&A, 2013).

Reviewer for *Math Reviews* since 2013.

7.7 Membership of scientific societies

Membership of the SMAI (“Société de Mathématiques Appliquées et Industrielles”, France) since 2016, and of the EMS (European Mathematical Society) since 2018.

Membership of the AMS (“American Mathematical Society”) from 2020 to 2022.

8 Teaching

8.1 Teaching responsibilities

8.1.1 Université de Bourgogne

1. (2019–2022) Responsible for the second year of Master MIGS.

Master MIGS is one of the four masters in mathematics at the Université de Bourgogne. This master aims at forming professionals for the industry and service sectors, with a strong background in applied mathematics (computer science, data analysis, numerical analysis, optimization, probability, scientific computing, statistics).

Master MIGS allows work-study contracts (“contrats professionnels d’alternance”) for students.

Master MIGS participated to the FEM (“Forum Emploi Maths”) at La Villette (Paris) (October 2019), and to the forum Studyrama in Dijon (January 2020).

8.1.2 Université de Franche-Comté (ISIFC)

Main responsibility:

1. (2011–2018) Responsible of the optional module “Cellule R&D” (with Nadège Courjal between 2015 and 2017).

The optional module “Cellule R&D” consists of small projects for initiation to research in modelling and biomedical engineering.

Other responsibilities:

1. (2018) Following former students doing a Ph.D and working in the academic sector.
2. (2017) Collaborator in BQF “BiotiCom” (responsible : Nadège Courjal). *4000 euros*.
BQF “Bonus Qualité Formation” are small projects, funded by the Université de Franche-Comté, for quality/innovative teaching. The aim of the project BiotiCom was to strengthen the link between students, research and industry, in biomedical sciences and engineering.
3. (2011–2018) Mentoring in mathematics.

4. **(2011, 2015, 2017)** Interviews for the competitive entrance to the ISIFC engineering school

8.2 Lectures and tutorials

1. **(2018–2021)** UFR Sciences et Techniques (UFR-ST), Université de Bourgogne, Dijon, France. Full professor (192 hours per year).

Lectures in numerical analysis and scientific computing at Graduate level: advanced numerical linear algebra in Master MIGS 1st Year, elliptic PDEs and finite elements in International Master MP 1st Year, and Master MIGS 2nd Year.

Lecture notes on CEL :

<https://cel.archives-ouvertes.fr/hal-03212748>

<https://cel.archives-ouvertes.fr/hal-03277223>

At Undergraduate level (licence): applied and numerical analysis, measure theory and Lebesgue integration, mathematics for economy and management, statistical tests for psychology.

Projects of mathematics and computer science.

2. **(2011–2018)** Specialized course in numerical analysis and scientific computing, Master Mathematics, 2nd Year, Université de Franche-Comté, Besançon, France.
Lecture notes on CEL : <https://cel.archives-ouvertes.fr/cel-01564693>
3. **(2010–2018)** Institut Supérieur d'Ingénieurs de Franche-Comté (ISIFC), Université de Franche-Comté, Besançon France. Associate professor (192 hours per year).
Applied mathematics, numerical methods, signal processing, probability and statistics.
Monitoring for training periods in the hospital, in laboratories and in the industry.
4. **(2002–2006)** Ecole Nationale Supérieure d'Informatique et de Mathématiques Appliquées de Grenoble (ENSIMAG), Grenoble Institute of Technology, Grenoble, France. Part-time assistant professor (64 hours per year).
Applied analysis, statistics, formal language theory, compilation, algorithmics.

9 Popularization of science

1. **(03/2023)** Interview for the french society Vocalib (consulting in professional orientation), about the interest of studying mathematics.
2. **(09/2022)** Success Story AMIES/Eu-Math-In, available at:
<https://www.agence-maths-entreprises.fr/public/pages/index.html>
Title: “TwinSight : Digital Orthopedic Twins”.
3. **(05/2018)** Interview for the journal “En Direct”, published by the “Université de Franche-Comté” (number 277, July–August 2018, article titled “Spécialité Mathématiques, option biomédical”).
http://endirect.univ-fcomte.fr/index.php?id=numero_292_13_1&art=3382

4. **(07/2012)** Interview for the journal “En Direct”, published by the “Université de Franche-Comté” (number 244, September–October 2012 titled “Mathématiques sans limites”).
5. **(05/2011)** Two talks on the topic “Henri Poincaré and the relativity theory”. Seminar “Epiphymaths” (history and philosophy of science). Université de Franche-Comté, Besançon, France.
6. **(06/2008)** Talk “Dynamical systems : from the three-body problem to biological applications”. Olympiades de mathématiques en classe de 4e, Versailles, France.
7. **(2005)** Organization of a mini-colloquium on the history and philosophy of science. Grenoble, France. Talk “Emergence and reduction” with Olivier Massin.