

# I Resume (last update : October 5, 2025)

<b>General information</b>	Théodore CHERRIÈRE		
Current position:	<b>Assistant Professor</b> (permanent), CentraleSupélec, Université Paris-Saclay, Group of Electrical Engineering Paris (GeePs)		
Contact:	✉ 11, rue Joliot Curie, 91192 Gif-sur-Yvette, France		
	@ theodore.cherriere@centralesupelec.fr		
Links:	in theodore-cherriere id 0000-0001-5421-4061 tcherrie		
<b>CNU qualification</b>	<b>Section 63</b> , n° <b>24263400894</b> , obtained on February 16, 2024		
<b>Main diplomas</b>			
2023	<b>Ph.D.</b> in Electrical Engineering (Université Paris-Saclay)		
2020	<b>M.Sc.</b> in Physics and Engineering of Energy, Université Paris-Saclay		
2020	<i>ENS Paris-Saclay diploma</i>		
2019	<i>Agrégation</i> in Electrical Engineering (rank 1 <sup>st</sup> )		
2019	<b>M.Sc.</b> Higher Education Teaching in Physics of Electrical Energy, ENS Paris-Saclay		
<b>Ph.D. Thesis</b>	<b>November 8, 2023</b> , ENS Paris-Saclay		
Defense	Electrical, Optical, Bio-Physics and Engineering (n° 575)		
Doctoral School	<b>SATIE</b> , UMR 8029 (Systèmes et Applications des Technologies de l'Information et de l'Énergie), ENS Paris-Saclay		
Laboratory	« Development of methods and software for magneto-mechanical topology optimization of rotating electrical machines »		
Title	Topology optimization, Multi-materials, Magneto-mechanics, Finite elements, Synchronous machines, Density methods, Gradient methods		
Keywords			
Supervision			
Thesis director	Sami HLIOUI	Full Professor, CY Cergy Paris Université	CNU section 63
Co-supervisor	François LOUF	Full Professor, ENS Paris-Saclay	60
Co-supervisor	Luc LAURENT	Assistant Professor, Cnam	60
Committee			
President	Grégoire ALLAIRE	Full Professor, École Polytechnique	CNU section 26
Reviewer	Frédéric MESSINE	Full Professor, Université de Toulouse	63
Reviewer	Georges BARAKAT	Full Professor, Université du Havre	63
Examiner	Zhuoxiang REN	Full Professor, Sorbonne Université	63
Examiner	Delphine SINOQUET	Research Engineer, IFPEN	26
Invited	Cédric PLASSE	CTO, Nidec-emotors	-
<b>Publications</b>			
International	6 articles in pair-reviewed international journals 8 communications in pair-reviewed international conferences		
National	4 communications in national pair-reviewed conferences		
<b>Teaching</b>			
2020 - 2023	<b>Teaching assistant</b> at Université Paris-Saclay (205h), supervision of projects and internships.		
2023	Co-organization of workshops ( <a href="#">link</a> ) and topology optimization tutorials ( <a href="#">2D transformer</a> , <a href="#">3D magnetostatics</a> )		
2022 - ...	Committee member of CentraleSupélec selective examination, co-author of an examination paper.		
2019 - 2020	Tutoring for bachelor students in physics and electronics.		
2022	Co-author of the exercise book <i>Informatique tronc commun - ITC - PSI, MP, PC</i> (publisher: Ellipses)		
2019	Co-author of the exercise book <i>Physique-chimie PSI-PSI*: Concours X, ENS, CentraleSupélec, Mines-Ponts, CCINP</i> (publisher: Ellipses)		
2016-2020	Preparatory classes oral exams in physics (lycée Hoche, Versailles)		
<b>Other activities</b>			
2025	<b>Science popularization:</b> mini-conference at the "Fête de la Science" (ENS Paris-Saclay) on the topology optimization of electrical machines.		
2024 - ...	<b>Associate member</b> of international research consortium <a href="#">CREATOR</a> (WP D02 - Topology Optimization of Electric Machine under Electro-Thermal Coupling)		
2022 - ...	<b>Reviewing</b> for IET Electric Power Application, IEEE/ASME Transactions on Mechatronics, Finite Elements in Analysis and Design, and international conferences.		

## II Detailed Curriculum Vitae

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### II.1 Education and experience

2024 - ... <b>Asst. Prof.</b>	Assistant professor at CentraleSupélec, GeePs laboratory. Research : optimization of electrical machines; Teaching : electrical engineering, finite elements, optimization.
2023 - 2024 <b>Post-doc</b>	Johann Radon Institute for Computational and Applied Mathematics of the Austrian Academy of Sciences. Group: Computational Methods for PDEs Research topic: Multi-material topology optimization of electrical machines.
2020 – 2023 <b>Ph.D.</b>	« Development of methods and software for magneto-mechanical topology optimization of rotating electrical machines » ENS Paris-Saclay, SATIE laboratory, Components and Systems for Electrical Energy (CSEE) team, Transducers and Systems for Energy (TeSE) group Doctoral School EOBE, Specific "Normalien" Doctoral Funding Thesis director: Sami HLIOUI, Co-supervisors: François LOUF, Luc LAURENT
Teaching	Assignment of 64 h/year at Université Paris-Saclay, UFR Sciences, Physics department
2019 – 2020 <b>M.Sc. PIE</b>	Physics and Engineering of Energy, Systems for Electrical Energy (first class honors) Université Paris-Saclay, CentraleSupélec, ENS Paris-Saclay
Research internships	Multiphysics and multiscale finite element modeling of magnetoelectric composite materials, GeePs, Sorbonne Université
2018 – 2019 <b>M.Sc. FeSUP</b>	Formation to Higher Education Teaching in Physics of Electrical Energy Systems (first class honors), ENS Paris-Saclay
<i>Agrégation</i>	Engineering and Industrial Sciences, major Electrical Engineering (rank 1 <sup>st</sup> )
2017 - 2018 <b>M1 E3A</b>	Electronics, Electrical Energy, Automation (André Ampère programm), Université Paris-Saclay, ENS Paris-Saclay
Teaching internship	Internship in high school final year. Development of a course and exercises on sensors.
Research internship	Characterization of a braided soft magnetic structure for transverse flux machines, Technische Universität Berlin.
2016 - 2017	SAPHIRE program (Applied Physics and Engineering Sciences for Research and Teaching), ENS Paris-Saclay
2016 - 2020 <b>ENS PS</b>	Civil servant student at École Normale Supérieure Paris-Saclay. Physics oral examiner in PCSI preparatory classes, Lycée Hoche, Versailles.
2014 - 2016 2014	Preparatory classes PCSI - PSI*, Lycée Hoche, Versailles A-level in Sciences, major in mathematics (first class honors), Lycée Hoche, Versailles
<b>Skills</b>	
<b>Languages</b>	<b>French</b> (native) <b>English</b> fluent C1: Cambridge English Advanced, 188 (A5241757, obtained on 03/21/2018) <b>German</b> intermediate A2/B1
<b>Informatics</b>	<b>Languages:</b> Matlab (expert), Python (fluent), C/C++ (notions), VHDL (notions) <b>Text processing:</b> Microsoft Office, LibreOffice, L <sup>A</sup> T <sub>E</sub> X <b>Finite element method:</b> Expert, developer of in-house 2D, 3D, nonlinear solvers, common use of open-source software (Netgen/NGSolve, GMSH/GetDP, FEMM) and occasionally commercial software (Ansys, COMSOL).
<b>Other</b>	Driving license, Hobbies: classical guitar, badminton.

## II.2 Research activities

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This section chronologically lists my research activities since joining ENS Paris-Saclay in 2016. I developed my research activity around the *modeling* and *optimization* of *unconventional electromagnetic transducers*.

### II.2.1 Research interests

My research was initiated during my various student projects and internships, where I had the opportunity to work on the modeling of a high-reliability solar machine in collaboration with the start-up Sauréa and then on a transverse flux machine at the Technical University of Berlin. Interested in the multiphysics couplings inherent in transducers, I deepened my theoretical and practical knowledge of the finite element method during my end-of-study internship at GeePs, where I worked on the multiphysics and multiscale modeling of composite magnetoelectric materials for the remote powering of micro-energy sources in a biomedical context. Eager to use my experience in numerical modeling and actuators for optimal design purposes, I naturally chose to combine them in my thesis, which focuses on developing methods and software tools for topology optimization of rotating electrical machines. I then specialized in designing actuators using **numerical optimization methods requiring no initial information on their structure**, using **multi-material and multi-physics topology optimization**.

### II.2.2 Participation in committees

1. Member of the PhD committee of Zakaria Houta (main advisor : Prof. Frédéric Messine), "Optimisation topologique et de forme pour la conception de dispositifs magnéto-mécanique en 3D" (12/04/2025)

### II.2.3 List of publications and communications

This sub-section lists all my scientific contributions to date of October 5, 2025. The complete and updated list is available on Hal ([cv.hal.science/theodore-cherriere](https://hal.science/theodore-cherriere)).

- **Articles in international peer-reviewed journals:**

1. [1] (*In revision*) Y. Li, B. Ma, **T. Cherrière**, J. Zhu, A. Lehtikainen, Q. Wan, S. Huang, G. Lei, and A. Belahcen, "Topology optimization for generating optimal free-form rotor structures in pmsms," *IEEE Transactions on Energy Conversion*, 2024
2. [2] (*In revision*) G. Allaire, **T. Cherrière**, T. Gauthey, M. Hage-Hassan, and X. Mininger, "A remark on self-adjoint problems in the optimization of non-linear models," *Journal of Optimization Theory and Applications*, 2024
3. [3] A. M. Jubartalla Ali, A. Altassan, **T. Cherrière**, P. G. Gangl, M. Gföhler, and M. Kapl, "On choosing interpolation domains and functions in topology optimization of multi-scale structures: a comparative study," *Structural and Multidisciplinary Optimization*, 2025
4. [4] **T. Cherrière**, S. Hlioui, F. Louf, and L. Laurent, "Multimaterial filtering applied to topology optimization of a permanent magnet synchronous machine," *COMPEL: The International Journal for Computation and Mathematics in Electrical and Electronic Engineering*, vol. Special issue: 17th International Workshop on Optimization and Inverse Problems in Electromagnetism, 2024
5. [5] **T. Cherrière**, S. Hlioui, L. Laurent, F. Louf, H. Ben Ahmed, and M. Gabsi, "Effects of filtering and current-angle adjustment on the multi-material topology optimization of a three-phase stator," *IEEE Transactions on Magnetics*, vol. 60, no. 3, p. 1–4, mar 2024

6. [6] —, “Multi-material topology optimization of a flux switching machine,” *Science and Technology for Energy Transition*, vol. 78, p. 41, 2023
7. [7] **T. Cherrière**, T. Vancorsellis, S. Hlioui, L. Laurent, F. Louf, H. B. Ahmed, and M. Gabsi, “A multimaterial topology optimization considering the pm nonlinearity,” *IEEE Transactions on Magnetics*, vol. 59, no. 5, p. 1–9, may 2023
8. [8] **T. Cherrière**, L. Laurent, S. Hlioui, F. Louf, P. Duysinx, C. Geuzaine, H. Ben Ahmed, M. Gabsi, and E. Fernández, “Multi-material topology optimization using wachspress interpolations for designing a 3-phase electrical machine stator,” *Structural and Multidisciplinary Optimization*, vol. 65, no. 12, nov 2022

• **International conferences with refereed proceedings:**

1. [9] A. Bach, P. Henneaux, and **T. Cherrière**, “A shape optimisation framework to design robust distance elements considering uncertainties,” in *19th IET Conference on Developments in Power System Protection (DPSP Europe 2025)*, Bilbao, Spain, April 2025
2. [10] **T. Cherrière**, S. Hlioui, L. Laurent, F. Louf, H. Ben Ahmed, and M. Gabsi, “Topology optimization of a complete reluctance machine with no initial information on its geometry,” in *2024 International Conference on Electrical Machines (ICEM)*. Torino, Italy: IEEE, Sep 2024
3. [11] **T. Cherrière**, S. Hlioui, M. Gabsi, L. Laurent, F. Louf, and H. Ben Ahmed, “Topology Optimization of Flux Switching Machine Rotors,” in *4th IEEE International Conference on Electrical Sciences and Technologies in Maghreb - CISTEM 2022*. Tunis, Tunisia: IEEE, Oct 2022
4. [12] **T. Cherrière**, S. Hlioui, L. Laurent, F. Louf, H. Ben Ahmed, and M. Gabsi, “Topology Optimization of Asymmetric PMSM Rotor,” in *2022 International Conference on Electrical Machines (ICEM)*. Valencia, Spain: IEEE, Sep 2022, pp. 469–475
5. [13] **T. Cherrière**, L. Laurent, S. Hlioui, F. Louf, H. Ben Ahmed, and M. Gabsi, “Multi-material topology optimization of a rotating electrical machine with a density-based method,” in *PAMM*. Gras, Autriche: Wiley, dec 2021
6. [14] A. Giedymin, **T. Cherrière**, F. Avcilar, U. Schafer, and F. Mazaleyrat, “Optimization of magnetic flux paths in transverse flux machines through the use of iron wire wound materials,” in *2019 IEEE 12th International Symposium on Diagnostics for Electrical Machines, Power Electronics and Drives (SDEMPED)*. Toulouse, France: IEEE, Aug 2019, pp. 23–29

• **Communications at refereed international congresses, without proceedings<sup>1</sup>:**

1. [15] N. Krenn, **T. Cherrière**, S. Schöps, and P. Gangl, “Electro-thermal topology optimization of an electric machine by the topological derivative considering drive cycles,” *COMPUMAG 2025*, Napoli, Italia, June 2025

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<sup>1</sup>Includes also conferences where contributions have been selected for publication in journals, counted under “ Articles in refereed journals ”.

2. [16] **T. Cherrière**, N. Krenn, and P. Gangl, “Topology optimization with arbitrarily many materials: density versus level-set applied to a hybrid excited rotor,” COMPUMAG 2025, Napoli, Italia, June 2025
3. [17] S. Gaydier, I. Zehavi, **T. Cherrière**, and P. Gangl, “Parametric and free-form air gap optimization of an inductor,” COMPUMAG 2025, Napoli, Italia, June 2025
4. [18] **T. Cherrière**, A. Bach, and P. Henneaux, “A shape optimization framework to design robust distance elements considering uncertainties,” in *4th Molecules and Materials for the Energy of Tomorrow International Congress (MOMENTOM 2025)*, Gif-sur-Yvette, France, April 2025
5. [19] **T. Cherrière**, “General multi-material topology optimization framework to design innovative electrical machines,” MSO-Industry Conference, Széchenyi István University, Győr, Hungary, Oct 2024
6. [20] **T. Cherrière**, “General multi-material topology optimization framework to design innovative electrical machines,” MSO-Industry Conference, Széchenyi István University, Győr, Hungary, Oct 2024
7. [21] **T. Cherrière**, “Toward topology optimization of hybrid-excited electrical machines using recursive material interpolation,” 15th International Conference on Scientific Computing in Electrical Engineering (SCEE), Darmstadt, Allemagne, Mar 2024
8. [22] **T. Cherrière**, S. Hlioui, F. Louf, and L. Laurent, “Multimaterial Filtering applied to Topology Optimization of a Permanent Magnet Synchronous Machine,” in *17th International Workshop on Optimization and Inverse Problems in Electromagnetism 2023*, Graz, Austria, Sep 2023
9. [23] **T. Cherrière**, S. Hlioui, L. Laurent, F. Louf, H. Ben Ahmed, and M. Gabsi, “Effects of Filtering and Current-angle Adjustment on the Multimaterial Topology Optimization of a 3-phase Stator,” in *COMPUMAG 2023*, Kyoto, Japan, May 2023

• **Papers presented at national conferences with refereed proceedings:**

1. [24] **T. Cherrière**, T. Gauthey, S. Gaydier, and M. Hage-Hassan, “Optimisation topologique de dispositifs magnétiques : état de l’art et implémentations,” july 2025
2. [25] **T. Cherrière**, “Optimisation topologique d’un rotor à double-excitation par une interpolation récursive,” in *Journées SEEDS / JCGE 2024*. Le Croisic, France: Jeunes Chercheurs en Génie Electrique (JCGE), Jun 2024
3. [26] **T. Cherrière**, L. Laurent, F. Louf, S. Hlioui, H. Ben Ahmed, and M. Gabsi, “Optimisation topologique magnéto-mécanique d’un rotor de machine électrique synchro-réductante,” in *16ème Colloque National en Calcul des Structures (CSMA 2024)*, Giens, France, Mai 2024
4. [27] **T. Cherrière**, T. Gauthey, S. Hlioui, and M. Hage-Hassan, “Optimisation topologique d’un rotor de MRV pour maximiser le couple moyen : un problème mal posé,” 5ème Symposium de Génie Électrique (SGE 2023), Jul 2023, poster

5. [28] **T. Cherrière**, “Optimisation topologique d’un rotor asymétrique d’une machine à aimants permanents,” in *Journées SEEDS / JCGE 2022*. Le Croisic, France: Jeunes Chercheurs en Génie Electrique (JCGE), Jun 2022  
**Audience prize of best presentation**

- **Open-source codes**

1. [29] **T. Cherrière**, T. Gauthey, S. Gaydier, and M. Hage-Hassan, “Authomas555/sge2025\_topopt: v0.0 (répertoire github),” 2025, doi : 10.5281/zenodo.15422223 (Python/NGSolve code) (Code associated with [24])
2. [30] **T. Cherrière** and S. Gaydier, “Stephlemedef/inductance-compumag: v0.1.2 (répertoire github),” 2025, doi : 10.5281/zenodo.14631426 (Python/NGSolve code) (Code associated with [17])
3. [31] F. Wurtzer and **T. Cherrière**, “fwurtzer/benchmark\_danilovskaya: v0.1 (répertoire github),” 2024, doi : 10.5281/zenodo.13370352 (Python/NGSolve code)
4. [32] **T. Cherrière**, “Hiped: Hierarchical interpolation with projection, evaluation and derivation,” 2024, doi : 10.5281/zenodo.10718117 (Matlab/Python/NGSolve code)
5. [33] **T. Cherrière** and T. Gauthey, “tcherrie/tutoriel\_optimisation\_topologique\_gdr\_seeds,” 2023, doi : 10.5281/zenodo.7907448 (Python/NGSolve code)
6. [34] **T. Cherrière** and L. Laurent, “Wachspress2d3d, v1.0.0,” 2022, doi : 10.5281/zenodo.6630215 (Matlab)

- **Keynotes and invited talks**

1. "Calcul efficace de sensibilités par la méthode de l’adjoint : application à l’optimisation d’actionneurs électromagnétiques", talk given in French to the "GT Calcul scientifique et modélisation numérique", part of "GDR Seeds", 07/07/2025 ([link](#))
2. "Pushing creativity further in electrical machine design using topology optimization", IEEE Magnetics Society Webinar, 06/11/2024 ([link to the recording](#))
3. "Topology optimization of rotating electrical machines: state of the art and applications", 5ème Conférence Internationale en Sciences et Technologies Electriques au Maghreb (CISTEM 2024) (<https://cistem2024.sciencesconf.org/resource/page/id/20>)

- **Workshop and symposia:**

1. Visit to French/German Saint-Louis Institute (ISL) and presentation on adjoint method (23/07/2025)
2. Invited presentation "adjoint variable method: practical and theoretical applications to electrical engineering", GRUCAD, Federal university of Santa-Catarina, Florianopolis, Brazil (16/07/2025)
3. Visit to the Laplace laboratory (Toulouse) and presentation on topology optimization (30/06/2025)
4. Invitation to a seminar at TU Berlin, Germany (20/09/2024).
5. Seminar talk, "On multi-material topology optimization of electrical machines", RICAM (28/05/2024)
6. Invitation to a seminar at L2EP, Lille, France (20/03/2024).
7. Presentation of my thesis work to members of the *Collaborative Research Center - TRR361/F90: CREATOR - Computational Electric Machine Laboratory* (Graz, Austria) (12/02/2024).

8. Visit to the FEMTO-ST laboratory and presentation to the AS2M (micro-robotics) department on non-linear multi-material topology optimization (19/12/2023)
9. Presentation to the SATIE team at ENS Rennes (03/10/2023)
10. Presentation given at the Laboratoire de Mécanique des Structures et des Systèmes Couplés, Cnam, Paris (13/04/2023)
11. Presentation given at the Johannes Radon Institute for Computational and Applied Mathematics, Linz, Austria. (17/01/2023)
12. Presentation to first-year SAPHIRE students, ENS Paris-Saclay (08/11/2022)
13. Presentation given to Prof. Frédéric Messine's team (Laplace laboratory, INPT, Toulouse) and Deeper Pulse (07/18/2022)
14. Presentation given during a visit by IFPEN scientists to the SATIE laboratory (17/05/2022)
15. Presentation given to doctoral students at ENSTA's Applied Mathematics Unit, Palaiseau (10/05/2022)
16. Poster presentation at the Alain Boussy Colloquium of the Physics Department of the Université Paris-Saclay (16/12/2021)

• **International stays:**

1. Federal University of Santa Catarina, Florianopolis, Brazil. July 2025 (10 days), invited by Laurent Bernard
2. RICAM, Austrian Academy of Sciences, Linz, Austria. April 2025 (2 weeks), invited by Peter Gangl
3. RICAM, Austrian Academy of Sciences, Linz, Austria. January 2023 (1 week), invited by Peter Gangl
4. Laboratoire des Techniques Aéronautiques et Spatiales (LTAS), University of Liège, Belgium. January 2022 (1 week), invited by Pierre Duysinx and Christophe Geuzaine
5. LTAS, University of Liège, Belgium. August - September 2021 (4 weeks), invited by Pierre Duysinx and Christophe Geuzaine.

## II.2.4 Reviewing

• **Journals**

1. Regular article *IEEE/ASME Transactions on Mechatronics* (ISSN: 1083-4435), 2025
2. Regular article *IEEE Transactions on Transportation Electrification* (ISSN: 2332-7782), 2025
3. Regular article *IEEE Transactions on Magnetics* (ISSN: 0018-9464), 2024
4. Regular article *IET Electric Power Applications* (ISSN: 1751-8660), 2024
5. Regular article *IEEE/ASME Transactions on Mechatronics* (ISSN: 1083-4435), 2023
6. Regular article *Finite Elements in Analysis and Design* (ISSN: 0168-874X), 2023

• **International conferences:**

1. 1 proceedings paper reviewed for *Compumag*, 2025
2. 1 proceedings paper reviewed for *Intermag*, 2024
3. 4 proceedings papers reviewed for *International Conference on Eletrical Machines*, 2024
4. 1 proceedings paper reviewed for *International Conference on Eletrical Machines*, 2022

## II.2.5 Scientific animation

- Responsible for the young researchers' seminar series "GeePs 'N Talks" organized for the PhD students in the GeePs laboratory.
- Workshops
  1. Co-organization with P. Gangl of "Advanced techniques for design optimization in engineering applications," 27–31/10/2025, RICAM, Linz, Austria. 1-week workshop on shape and topology optimization, part of RICAM special semester on Computational Methods for Electric Machines <https://www.ricam.oeaw.ac.at/specsem/specsem2025/workshop2/>.
  2. Organization of "Séminaire d'optimisation topologique appliquée aux machines électriques," 06/12/2022, ENS Paris-Saclay, Gif-sur-Yvette, <https://sites.google.com/view/topopot-machine-06-12-22/accueil>
- Tutorials
  1. Co-organization with A. El Gode and T. Gauthey of "Good coding practice and management with git," 01/10/2025, CentraleSupélec, Gif-sur-Yvette. 4-hour ADUM training course for PhD students.
  2. Co-organization with M. Hage-Hassan, T. Gauthey and A. Cesarano of "3d magnetostatics modeling & topology optimization," 9-10/11/2023, CentraleSupélec, Gif-sur-Yvette. 2-day seminar & 8-hour ADUM training course (2 points) for PhD students.
  3. Co-organization with T. Gauthey and S. Hlioui of "Topology optimization of a transformer," 10/05/2023, le Cnam, Paris. Code is freely available, see [33]

## II.3 Prizes and distinctions

2024	<b>Paul Caseau</b> thesis prize (EDF, Académie des Technologies, shared with T. BELLOTI)	€ 10 000 /2
2024	<b>Ampère</b> thesis prize (SEE, shared with I.V. SOARES)	€ 2500 /2
2022	<b>Audience prize</b> of the best presentation (JCGE 2022)	€ 500