Filippo Agnelli

Curriculum Vitae

Professional title: Mitacs Accelerate Postdoctoral Researcher in Mechanical Engineering

Current address: McConnell Engineering Building,
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Education

École polytechnique, France	Ph.D. in Solid Mechanics	2018 – 2021
ENS Paris–Saclay, France	M.Sc. Materials and Engineering Sciences in Paris (MAGIS) *with the highest honours – Rank 2 / 44*	2017 – 2018
ENS Paris–Saclay, France	B.Sc. and M.Sc. in Mechanical Engineering	2014 – 2017

Research interests

Computational design of elastic micro-architectured materials • Periodic panels characterization • Topology optimization (using a level set method) • Polymer (FFF, stereolithography) and metal (DED) 3D printing • Shape-morphing structures • Design under manufacturing constraints • Image analysis for the experimental characterization of architectured sheets.

Research positions

Mitacs Accelerate postdoctoral researcher | McGill University, Montréal, (QC) & Autodesk Research, Toronto, (ON) Canada — 2022 –
Title: "Structural optimization of sheet metals subject to manufacturing constraints"
Subject: develop a geometry solver, which will take in a number of boundary conditions for a design space and synthesize a thin wall structure that meets performance and manufacturing requirements.
Advisor: Pr. Damiano Pasini, Canada Research Chair (Tier 1) and James McGill Professor

Ph.D. candidate | LMS, CNRS, École polytechnique, Palaiseau, France — 2018 – 2021
Thesis title: "On the design of 3D printable architectured sheets"
Subject: design and mechanically characterize periodic architectured materials obtained by 3D printing, with a focus on the case of thin sheets.
Supervisor: Dr. Andrei Constantinescu, CNRS research director

Research intern | LMS, CNRS, École polytechnique, Palaiseau, France — 6 months, 2018
Title: “Optimal design and testing of polymer lattice scaffolds”
Advisor: Dr. Andrei Constantinescu, CNRS research director

Professional experience

Collaborative project | PSA Group, Vélizy, France — 6 months, 2017
Title: “Design of an IVT for an automobile thermal energy recovery unit”

Engineer internship | NMB-Minebea, Lincoln, UK — 4 months, 2016
Title: “Intelligent Tram Coupling Bearing Project”

Tutored Research Project | LURPA, ENS Paris–Saclay & Systerel, Cachan, France — 4 months, 2016
Title: “Study of failures in the railway environment: trace analysis”

Awards, scholarships and fellowships

Mitacs Accelerate Fellowship for postdoctoral researcher — 2022 – 2023

CDSN *(Contrat Doctoral Spécifique Normalien)* scholarship for Ph.D. — 2018 – 2021

Laureate 2017 of the French "Agrégation" in Mechanical Engineering — 2017
French competitive examination to be entitled to teach at higher education

ENS Paris-Saclay "normalien" pre-doctoral studies scholarship. — 2014 – 2018

Academic visits

Visiting researcher, Daraio Group, Division of Engineering and Applied Science — 1 week, 2019
California Institute of Technology, Pasadena, (CA) USA

Thematic schools

Thematic school | Quiberon, France — 1 week, 2019
"Theory of control in Mechanics"

Summer school | Insitut d'études scientifique de Cargèse, Corsica, France — 2 weeks, 2018
"Mechanics and Physics of Stretchable Objects"

Teaching activities

Ecole polytechnique, France	PHY103: "Beginner's Physics Lab I", *Bachelor program*	2018 – 2021
	PHY514: Spatial project, *Engineer cycle program*	2020 – 2021
	MEC583: "Projects on Solar and Wind Energy: Resource and Performance Analysis", *Engineer cycle program*	2019 – 2020
	MEC589: "Smart Materials: Multiscale Modelling and Laboratory Experiments", *Engineer cycle program*	2018 – 2019
Université Paris Sud, France	Tutorial activities monitoring at IUT Cachan	2016 – 2017

Mentoring activities

Masters Internship co-advisor

Jianzhou Ma, ENSTA, (co-advised with A. Constantinescu) — 2 months, 2021
"Panneaux à couplage extension–flexion pour l'auto-déploiement d'une antenne spatiale"

Reviewer

Extreme Mechanics Letters — 2019

Publications

4. F. Agnelli, G. Nika, A. Constantinescu. Design of thin micro-architectured panels with extension–bending coupling effects using topology optimization. *Comput. Methods Appl. Mech. Eng.* 391, 114496 (2022). https://doi.org/10.1016/j.cma.2021.114496

3. F. Agnelli, M. Tricarico, A. Constantinescu. Shape-shifting panel from 3D printed undulated ribbon lattice. *Extreme Mech. Lett.* 42, 101089 (2021). https://doi.org/10.1016/j.eml.2020.101089

2. F. Agnelli, P. Margerit, P. Celli, C. Daraio, A. Constantinescu. Systematic two-scale image analysis of extreme deformations in soft architectured sheets. *Int. J. Mech. Sci.* 194, 106205 (2021). https://doi.org/10.1016/j.ijmecsci.2020.106205

1. F. Agnelli, A. Constantinescu, G. Nika. Design and testing of 3D-printed micro-architectured polymer materials exhibiting a negative Poisson's ratio. *Continuum Mech. Thermodyn.*, 32, 433–449 (2020). https://doi.org/10.1007/s00161-019-00851-6

Conferences and presentations

11. Design of 3D printable thin composite panels featuring a coupled response,
Stony Brook University, (NY) USA. December 2022 *(Invited talk)*

10. Design of 3D printable thin composite panels featuring an extension-bending coupling,
KAAS seminar series, Karlstad universitet, Sweden (Online). September 2022 *(Invited talk)*

9. Shape-shifting thin panels from 3D printed undulated ribbon lattice,
Séminaire Cafés, PMMH, ESPCI, Paris, France. November 2021 *(Invited talk)*

8. Conception de panneaux périodiques 3D imprimables minces à couplage extension–flexion par optimisation de formes, *Club Cast3M*, Paris, France. November 2021

7. Extreme deformation of soft auxetic sheets: a systematic two-scale image analysis,
ICTAM 2020+1 Virtual. September 2021

6. Computational design of shape shifting panels using a level set topology optimisation,
GDR Mephy, Paris, France. June 2021 *(Invited talk)*

5. 3D printed shape-shifting panels from undulated ribbon lattice,
up-comech2021: e-Workshop on design and analysis of non-classical architectured materials. May 2021

4. Design and testing of 3D-printed micro-architectured sheets,
FAPS seminars, CMAP, École polytechnique, Palaiseau, France. February 2020 *(Invited talk)*

3. Optimal design of micro-architectured auxetic polymeric sheets,
Symposium Jean Mandel, LMS, École polytechnique, Palaiseau, France. July 2019

2. Homogenisation bounds for micro-architected polymer materials with extreme mechanical properties,
APS March Meeting, Boston, (MA) USA. March 2019

1. Projet REDEMA (SATIE-LMS): Recalage 3D pour la déformation des matériaux architecturés,
11ème journée de l'Institut FARMAN, Cachan, France. October 2018

Languages

Fluent in English, native in French and Italian