



Pablo Castrillo Green

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Institutional CV



Education

- 2018–2023 **PhD degree in Engineering**, *Escola Superior d'Enginyeries Industrial, Aeroespacial i Audiovisual de Terrassa, Universitat Politècnica de Catalunya (BarcelonaTech)*, Barcelona, Spain
Scholarship: “*Personal Investigador en Formació de la Universitat Politècnica de Catalunya FPI-UPC 2018 (109)*” - Scholarship of the UPC and Banco Santander.
- 2014–2017 **Master's degree in Structural Engineering**, *Facultad de Ingeniería, Universidad de la República*, Montevideo, Uruguay
Scholarship: “*Beca de Posgrado Nacional 2014*” of ANII, Strategic Areas.
- 2011–2012 **Exchange semester**, *Instituto Superior Técnico, Universidade de Lisboa*, Lisbon, Portugal
Scholarship: “*Beca Santander Iberoamérica 2011*”.
- 2007–2013 **Bachelor's degree in Civil Engineering**, *Facultad de Ingeniería, Universidad de la República*, Montevideo, Uruguay

Doctoral thesis

- title *High-order finite volume method for solid dynamics in fluid-structure interaction applications.*
- supervisors Dr. Joaquim Rigola Serrano and Dr. Eugenio Schillaci.
- description This thesis introduces a high-order finite volume method for solid dynamics on unstructured three-dimensional meshes, aiming to overcome challenges in real engineering problems, particularly stress concentration and the shear locking effect. Developed within the Heat and Mass Transfer Technological Center (CTTC) research group, it addresses the absence of a finite volume method with high-order interpolation on unstructured meshes in computational solid mechanics. The proposed method is verified through extensive examples, demonstrating its potential for resolving complex structural problems. The thesis concludes with a summary of contributions and suggestions for future research.
<https://www.tdx.cat/handle/10803/689330>

Master thesis

- title *Simulation of the behavior of viscoelastic materials and application to the identification of the mechanical properties of the arterial wall.* (Spanish)
- supervisors D.Sc. Alfredo Canelas Botta and D.Sc. Daniel Bia Santana.
- description This thesis underscores the importance of simulating mechanical behavior in engineering and medicine, specifically in diagnosing arterial wall issues. Codes are developed to simulate viscoelastic behavior, assess mechanical properties using experimental measures, and analyze large deformations. The study verified these codes, identifies properties of seven sheep arteries, and compares results with existing literature. Findings show small deformation codes align with literature, but large deformation codes yield significantly different results.
Spanish version: <https://hdl.handle.net/20.500.12008/9441>

Publications

Journal papers

- 2024 **High-order cell-centered finite volume method for solid dynamics on unstructured meshes**, *P. Castrillo, E. Schillaci and J. Rigola*.
Computers & Structures, 18 January 2024 (online), vol. 295, article 107288, p. 1-20.
ISSN: 00457949; <https://doi.org/10.1016/j.compstruc.2024.107288>
- 2022 **High-order finite volume method for linear elasticity on unstructured meshes**, *P. Castrillo, A. Canelas, E. Schillaci, J. Rigola and A. Oliva*.
Computers & Structures, 1 August 2022, vol. 268, article 106829, p. 1-13.
ISSN: 00457949; <https://doi.org/10.1016/j.compstruc.2022.106829>
- 2017 **Development of a method for the identification of elastoplastic properties of timber and its application to the mechanical characterisation of Pinus taeda**, *J. M. Pérez Zepa, P. Castrillo and V. Baño*.
Construction and Building Materials, v.: 139, p.: 308 - 319, 2017.
ISSN: 09500618; <https://doi.org/10.1016/j.conbuildmat.2017.02.058>
- 2015 **IETFEM: An open source tool applied to teaching the Finite Element Method in Engineering**, (Spanish), *J. M. Pérez Zepa, P. Castrillo, X. Otegui and A. Canelas*
Revista Argentina de Enseñanza de la Ingeniería, v.: 8, p.: 51 - 58, 2015.
ISSN: 15155838 ; https://www.fing.edu.uy/~jorgepz/files/arc_2015-04-22_02_19_48-07.pdf

Conference papers

- 2024 **Reed Valve Simulation Using 3D High-order Finite Volume and Finite Element Methods**, *P. Castrillo, E. Schillaci and J. Rigola*
Conferences in Compressor Engineering, Refrigeration and Air Conditioning, and High Performance Buildings, West Lafayette, Indiana, Purdue University, 2024.
<https://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=3925&context=icec>

- 2022 **Analysis of high-order interpolation schemes for solving linear problems in unstructured meshes using the finite volume method**, *P. Castrillo, E. Schillaci and J. Rigola*
8th European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS Congress 2022)". Scipedia, 2022, p. 1-12.
https://www.scipedia.com/public/Castrillo_et_al_2022a
- 2021 **Power electronics high performance air-cooled heat sinks integrating graphite based materials**, *C. Oliet, Universitat Politècnica de Catalunya (UPC), P. Castrillo, E. Schillaci, D. Santos, J. Rigola, D. Mullen, N. Cochrane, C. McKay, E. Halimic, K. Hoell, F. Preishuber-Pfuegl, J. Freismuth, M. Bouton and M. Pontrucher*.
18th International Refrigeration and Air Conditioning Conference at Purdue, May 24-28, 2021: proceedings". Purdue Mall, West Lafayette, Indiana: Purdue University, 2021, p. 1-10.
<https://docs.lib.purdue.edu/iracc/2207/>
- 2021 **Experimental and numerical analysis of reed valve movement in an impact fatigue test system and reciprocating compressors**, *M. W. Tofique, A. Löf, E. Schillaci, P. Castrillo and Joaquim Rigola*.
25th International Compressor Engineering Conference at Purdue. International Compressor Engineering Conference at Purdue: proceedings from 2021". Purdue Mall, West Lafayette, Indiana: Purdue University, 2021, p. 1-11.
<https://docs.lib.purdue.edu/icec/2697/>
- 2021 **Simulation of fluid-structure interaction and impact force on a reed valve**, *P. Castrillo, E. Schillaci and J. Rigola*
8European Congress on Computational Methods in Applied Sciences and Engineering. "14th World Congress on Computational Mechanics (WCCM), ECCOMAS Congress 2020): virtual congress: 11-15 January 2021". 2021, p. 1-12.
https://www.scipedia.com/public/Castrillo_et_al_2021a
- 2019 **Numerical analysis of steel-concrete composite beams using the Volterra integral equation**, *(Spanish) P. Castrillo and B. Sensale*
Congress on Numerical Methods in Engineering - CNM 2019, Guimarães, Portugal, 2019. ISBN: 978-989-54496-0-6 - pág: 1329-1347.
- 2017 **New formulation of the indirect boundary element method with analytical integration to solve slab bending problems**, *(Spanish) P. Castrillo and B. Sensale*
Congress on Numerical Methods in Engineering - CNM 2017, Valencia, España, 2017. ISBN: 978-84-947311-0-5 - pág: 327-346.
http://congress.cimne.com/CMN2017/frontal/Doc/Ebook_CMN2017.pdf
- 2017 **Acceleration of a solid mechanics tool on multi- and multi-core architectures**, *(Spanish) R. Bayá Crapuchetta, P. Castrillo, J. M. Pérez Zerpa, E. Dufrechou and Pablo Ezzatti*
XXIII Congreso de Métodos Numéricos y sus Aplicaciones, Mar del Plata, Argentina, 2017.
<https://cimec.org.ar/ojs/index.php/mc/article/viewFile/5275/5227>
- 2014 **Development and extension of a finite element numerical tool for teaching undergraduate and graduate courses**, *(Spanish) P. Castrillo, F. Mondino, J. M. Pérez Zerpa and A. Canelas*
XXI Congreso de Métodos Numéricos y sus Aplicaciones, Bariloche, Patagonia Argentina, 2014
<http://www.cimec.org.ar/ojs/index.php/mc/article/view/4807/4738>

Projects

Competitive project

- 2016-2020 **Innovative COoling system for embedded Power Electronics (ICOPE)**, *Universitat Politècnica de Catalunya, Barcelona, Spain*, Financial Support: Commission of European Communities (H2020-755556-ICOPE), Participation: Collaborator.

Description: The main goal of this project is the design of innovative and efficient air cooled heat sinks to cool the power electronics modules that are a key component of the more electrical aircraft power management centre design. The new design is expected to be developed in two stages. The first one should be covered by the implementation of Annealed Pyrolytic Graphite (APG) and folded brazed fins, while in the second the integration of Metal Matrix Composites (MMC) is expected. The final target of the development is the reduction of weight of the whole power management system (by integrating four heat sinks), while maintaining an efficient and reliable cooling. Coming from advances in the power semiconductors field, by the use of high-temperature and more efficient materials such as Silicon Carbide (SiC) and Gallium Nitride (GAN), the thermal management strategy could take into consideration the implementation of air cooled solutions, which are expected to reduce the overall weight comparing to liquid or two-phase flow solutions, while also adding some benefits in terms of reliability and maintenance aspects. <https://cordis.europa.eu/project/id/755556>

I+D Project - Competitive project

- 2015-2017 **Extension of a numerical tool for viscoelastic modeling of biological tissues and analysis of algorithms for characterization of viscoelastic properties**, *(Spanish) Facultad de Ingeniería, Universidad de la República*, Financial Support: Comisión Sectorial de Investigación Científica (CSIC), Participation: Project Manager.

Description: The project aims to enhance an existing tool to model viscoelastic materials subjected to large deformations and exhibiting anisotropic behavior. The finalized software will be capable of solving quasi-static models considering large deformations and viscoelastic anisotropic materials in both compressible and incompressible scenarios. Validation will involve comparing numerical results with experimental data from other studies and/or numerical outcomes from different calculation programs. The versatile approach of the software will also enable the group to explore additional research tasks, potentially expanding into areas like structural analysis in Civil and Mechanical Engineering. The project will involve the development and analysis of methods for characterizing viscoelastic properties in non-homogeneous materials, contributing to the strengthening of the research group and its collaborations with national and international institutions. <https://www.csic.edu.uy/content/extensi%C3%B3n-de-una-herramienta-num%C3%A9rica-para-el-modelado-viscoel%C3%A1stico-de-tejidos-biol%C3%B3gicos-y>

- 2013-2015 **Implementation of a numerical simulation software of the mechanical behavior of arterial tissue and analysis of applicability to the diagnosis of Atherosclerosis**, *(Spanish) Facultad de Ingeniería, Universidad de la República*, Financial Support: Agencia Nacional de Investigación e Innovación (ANII), Participation: Collaborator. Description: Fondo María Viñas.

Student Project

- 2014–2014 **Validation of finite element codes for modeling arterial tissue and extension of a numerical tool for solving three-dimensional frames.**, (*Spanish*) *Facultad de Ingeniería, Universidad de la República*, Financial Support: *Comisión Sectorial de Investigación Científica (CSIC)*, Participation: Coordinator.
Description: *Proyecto de Apoyo a la Investigación Estudiantil 2014*.

Experience

- 2024–today **Member of the national system of researchers of ANII, Uruguay**, *Level: Beginner*.

Teaching

- 2011–today **Associate Professor - Grade 3**, *Facultad de Ingeniería, Universidad de la República*, Montevideo, Uruguay.
Professor at the *Instituto de Estructuras y Transporte* in the courses of Elasticity and Computational Methods Applied to Structural Analysis.
- 2020–2023 **Teaching and Research Staff**, *Universitat Politècnica de Catalunya*, Barcelona, Spain.
Participant as an instructor in the course “Internal Aerodynamics and Aeroelasticity in Turbomachinery”.
- 2009–2012 **Teaching assistant - Grade 1**, *Facultad de Ingeniería, Universidad de la República*, Montevideo, Uruguay.
Teaching assistant at the *Instituto de Matemática y Estadística Rafael Laguardia* in the courses of algebra and calculus.

Tutorship

- 2015 **Thesis Advisor for degree thesis at the Institute of Computing**, *Facultad de Ingeniería, Universidad de la República*, Montevideo, Uruguay.
Title: Development of a graphical interface for a structure calculation tool.

Industry experience

- 2013–2014 **Civil engineer**, *CRR Ingenieros.*, Montevideo, Uruguay.
Structural engineer.
- 2012–2013 **Assistant Engineer**, *Constructora Santa María.*, Montevideo, Uruguay.
Structural Calculations / Budget Development.
- 2008–2012 **Technical Assistant**, *Programa S.R.L.*, Montevideo, Uruguay.
Technical assistance in structural calculation and construction management.

Languages

Spanish	Native	
English	Upper-Intermediate	<i>Experience working on European projects during the PhD.</i>
Portuguese	Intermediate	<i>Six-month student exchange in Lisbon.</i>
Catalan	Upper-Intermediate	<i>Six years living in Barcelona, Spain.</i>

Computer skills

■ ■ ■ ■ ■	basic knowledge	■ ■ ■ ■ ■	extensive project experience
■ ■ ■ ■ ■	intermediate knowledge with some project experience	■ ■ ■ ■ ■	deepened expert knowledge
		■ ■ ■ ■ ■	expert / specialist

	Level	Skill	Years	Comment
Language:	■ ■ ■ ■ ■	MATLAB / GNU-Octave	15	<i>I have made many applications in MATLAB and Octave.</i>
	■ ■ ■ ■ ■	C* / C++	6	<i>I took a C* course and had experience in C++ working on European projects. I am also an experienced FreeFEM user.</i>
	■ ■ ■ ■ ■	L ^A T _E X	12	<i>I designed the L^AT_EX template used by post-graduate students in Uruguay.</i>
OS:	■ ■ ■ ■ ■	Linux	8	<i>Ubuntu (present) and Archlinux experience.</i>
	■ ■ ■ ■ ■	Windows	25	<i>Varied experience.</i>

References

- Dr. Alfredo Canelas Botta – e-mail: acanelas@fing.edu.uy
Master's Thesis Director. Full Professor (grade 5) of *Instituto de Estructuras y Transporte, Facultad de Ingeniería, Universidad de la República*.
- Dr. Eugenio Schillaci – e-mail: eugenio.schillaci@upc.edu
Doctoral's Thesis Director. Associate Professor of *Departament de Màquines i Motors Tèrmics, Campus de Terrassa, Universitat Politècnica de Catalunya (BarcelonaTech)*.