

Ismael Ben-Yelun

PHD IN AEROSPACE ENGINEERING · ASSISTANT PROFESSOR

Universidad Politécnica de Madrid (UPM), Pza Cardenal Cisneros 3, 28040 Madrid, Spain

✉ i.binsenser@upm.es | 🏠 ismaelbenyelun.github.io | 📺 ismael-ben-yelun-insenser



Education

Universidad Politécnica de Madrid (Intl. Mention from University of Cambridge)

Madrid, Spain

PHD IN AEROSPACE ENGINEERING (*Cum Laude*)

2020 - 2024

- Honorable Mention in the Technological and Experimental Sciences 2024 Award of the Royal Academy of Doctors of Spain (RADE)
- Thesis title: *Topology Optimization and Data-Driven Approaches for Functionally Graded Metamaterials*
- Advisors: Prof. Dr. Francisco J. Montáns & Dr. Luis Saucedo-Mora

Universidad Politécnica de Madrid

Madrid, Spain

MS IN AERONAUTICAL ENGINEERING

2017 - 2019

- Airbus Chair award for the best record in the 'Aircraft' intensification
- Final Thesis: *Machine Learning Prediction of CFRP Frame Reserve Factors (Cum Laude)*, acknowledged with honors.

Universidad Politécnica de Madrid

Madrid, Spain

BS IN AEROSPACE ENGINEERING

2013 - 2017

- Excellent academic record (top 5% students)

Professional Experience

- 2020-curr. **Assistant Professor in Solid Mechanics**, E.T.S.I. Aeronáutica y del Espacio (UPM). 4 years and 5 months
- 2024 **Postdoctoral Research Fellow**, ParisTech Arts et Métiers Institute of Technology (ENSAM). 3 months
- 2023 **PhD Research Fellow**, ParisTech Arts et Métiers Institute of Technology (ENSAM). 5 months
- 2022-2023 **PhD Research Fellow**, Department of Engineering, University of Cambridge. 4 months
- 2019-2020 **Stress & ML Engineer Intern (MINDS Scholarship)**, Airbus Defense & Space Spain. 12 months
- 2018-2019 **Graduate Research Assistant**, Department of Aircraft & Space Vehicles, UPM. 12 months
- 2018 **Simulation Engineer (internship)**, Department of Defense, GMV Spain. 2 months
- 2017 **Manufacturing Engineer (internship)**, Airbus Defense & Space Spain. 5 months
- 2016-2017 **Undergraduate Research Assistant**, Dept. of Fluid mechanics and Aerospace Propulsion, UPM. 9 months

Publications

RESEARCH GROUP: Member of GAMOSINOS: Group of Advanced MOdelling and Simulation of NOn-linear Solids. Lab's head: Prof. Dr. Francisco J. Montáns & Prof. Dr. José M. Benítez.

RESEARCH TOPICS: Topology Optimization; Machine Learning; Graph Neural Networks; Mechanical Meta-materials; Surrogate Modeling; Composites.

PUBLISHED

1. V. J. Amores, F. J. San Millán, **I. Ben-Yelun**, F. J. Montáns (2021). A finite strain non-parametric hyperelastic extension of the classical phenomenological theory for orthotropic compressible composites. *Composites Part B: Engineering*, 212, 108591.
2. **I. Ben-Yelun**, M. Díaz-Lago, L. Saucedo-Mora, M. Á. Sanz, R. Callado, F. J. Montáns (2023). Self-learning locally-optimal hypertuning using maximum entropy, and comparison of machine learning approaches for estimating fatigue life in composite materials of the aerospace industry. *Engineering Structures*, 283, 115829.
3. **I. Ben-Yelun**, G. Gómez-Carano, F. J. San Millán, M. Á. Sanz, F. J. Montáns, L. Saucedo-Mora (2023). GAM: General Auxetic Metamaterial with Tunable 3D Auxetic Behavior Using the Same Unit Cell Boundary Connectivity. *Materials*, 16(9), 3473.

4. L. Saucedo-Mora, **I. Ben-Yelun**, H. García-Modet, M. Á. Sanz-Gómez, F. J. Montáns (2023). The Updated Properties Model (UPM): A topology optimization algorithm for the creation of macro-micro optimized structures with variable stiffness. *Finite Elements in Analysis and Design*, 223, 103970.
5. **I. Ben-Yelun**, L. Saucedo-Mora, M. Á. Sanz, J. M. Benítez, F. J. Montáns (2023). Topology optimization approach for functionally graded metamaterial components based on homogenization of mechanical variables. *Computers & Structures*, 289, 107151.
6. **I. Ben-Yelun**, E. J. San Miguel Niddam, L. Saucedo-Mora, M. Á. Sanz, J. M. Benítez, F. J. Montáns (2023). 3DMecMet: A package to fill with metamaterials CAD designs and export them to structural calculation softwares and 3D printable formats. *Software Impacts*, 18, 100594.
7. **I. Ben-Yelun**, A. O. Yuksel, F. Cirak (2024). Robust topology optimisation of lattice structures with spatially correlated uncertainties. *Structural and Multidisciplinary Optimization*, 67(2), 16.
8. **I. Ben-Yelun**, L. Irastorza-Valera, L. Saucedo-Mora, F. J. Montáns, F. Chinesta (2024). On the data-driven description of lattice materials. *Results in Engineering*, 22, 102235.

IN PREPARATION

- I. Ben-Yelun**, V. Riera, L. Saucedo-Mora, M. Á. Sanz, F. J. Montáns. An elastic properties-based topology optimization algorithm for linear orthotropic, functionally graded materials.
- I. Ben-Yelun**, M. El Fallaki Idrissi, J. Mounayer, S. Rodríguez, F. Chinesta. Rank-reduction Autoencoders for Topology Optimization.

Awards, Mentions & Distinctions

- 2024 **Cum Laude in Thesis Dissertation**, UPM
Honorable Mention in the PhD for the Technological and Experimental Sciences 2024 Award, Royal Academy of Doctors of Spain (RADE)
- 2023 **“Editor’s Choice Article” Prize to ‘GAM’ paper**, MDPI: Materials
Excellent Teaching Faculty Evaluation, UPM
- 2022 **“Flap de Oro” Award to best professor of the 2nd year of the BS**, ETSIAE (UPM)
- 2019 **Diploma for best record in ‘Aircraft’ intensification (MS)**, Airbus Chair (UPM)

Presentations

* *presenting author*

CONTRIBUTED PRESENTATIONS

1. J. San Millán, V. J. Amores*, **I. Ben-Yelun**, F. J. Montáns. Large-strain Compressible Orthotropic Hyperelasticity Compliant with the Small-Strains Theory. 14th Virtual Congress WCCM & ECCOMAS 2020. January 2021.
2. **I. Ben-Yelun***, L. Saucedo-Mora, M. Á. Sanz Gómez, J. M. Benítez Baena, F. J. Montáns. Bounded updating generative design algorithm for optimized structures with variable stiffness. Congreso de Métodos Numéricos en Ingeniería - CMN 2022. Las Palmas de Gran Canaria, Spain, September 2022.
3. F. J. Montáns*, V. J. Amores, L. Moreno, **I. Ben-Yelun**, J. M. Benítez. Data-driven macro-micro-macro modelling of rubber-like materials. The Seventeenth International Conference on Civil, Structural and Environmental Engineering Computing. Pécs, Hungary, August 2023.
4. **I. Ben-Yelun***, A. O. Yuksel, F. Cirak. Robust topology optimisation of lattice structures with spatially correlated uncertainties. 17th International Conference on Computational Plasticity, COMPLAS 2023. Fundamentals and Applications. Barcelona, Spain, September 2023.
5. L. Saucedo-Mora*, **I. Ben-Yelun**, M. Á. Sanz, F. J. Montáns. Topological Optimization For Components Of Orthotropic Materials With Dirichlet And Neumann Boundary Conditions. 17th International Conference on Computational Plasticity, COMPLAS 2023. Fundamentals and Applications. Barcelona, Spain, September 2023.
6. **I. Ben-Yelun***. Topology optimization and data-driven approaches for functionally graded metmaterials. I Jornada de Jóvenes Investigadores. Escuela Politécnica Superior de la Universidad Nebrija. Madrid, Spain, November 2024.

Research Stay Experiences

École nationale supérieure d'Arts et Métiers - PIMM

ADVISOR: PROF. DR. FRANCISCO CHINESTA

Paris, France

Jul. 2024 - Oct. 2024

- Post-doctoral research stay under European Project funding
- Manuscript in preparation: *Rank-reduction Autoencoders for Topology Optimization*

École nationale supérieure d'Arts et Métiers - Dept. of Processes and Engineering in Mechanics and Materials (PIMM)

Paris, France

ADVISOR: PROF. DR. FRANCISCO CHINESTA

May 2023 - Oct. 2023

- Pre-doctoral (PhD) research stay under European Project funding
- Published paper: *On the data-driven description of lattice mechanics*

University of Cambridge - Dept. of Engineering

Cambridge, UK

ADVISOR: PROF. DR. FEHMI CIRAK

Sep. 2022 - Jan. 2023

- Pre-doctoral research stay for the international mention of the PhD
- Published paper: *Robust topology optimisation of lattice structures with spatially correlated uncertainties*

Teaching Experience

1 st 24/25	Dynamic Analysis , Professor (<i>MS in Theoretical-Practical Application of FEM & CAE</i>)	UNED
1 st 24/25	Composites Structures , Professor (<i>idem</i>)	UNED
2 nd 23/24	Strength of Materials & Elasticity , Assistant Professor (<i>BS in Aerospace Engineering</i>)	UPM
2 nd 22/23	Strength of Materials & Elasticity , Assistant Professor (<i>idem</i>)	UPM
2 nd 21/22	Strength of Materials & Elasticity , Assistant Professor	UPM
1 st 21/22	Solid Mechanics , Teaching Assistant	UPM
2 nd 20/21	Strength of Materials & Elasticity , Assistant Professor	UPM

FINAL THESIS SUPERVISION

- 8 **Final thesis supervised**, BS in Aerospace Engineering
- 2 **Final thesis supervised**, MS in Aeronautical Engineering

COURSES AND SEMINARS

E.T.S.I. Aeronáutica y del Espacio (UPM)

Madrid, Spain

SKILLS FOR FINAL DEGREE THESIS ON R&D IN COMPUTATIONAL ENGINEERING OF AEROSPACE

2023 - 2024

SOLIDS AND STRUCTURES

- 12 hours

MATERIALS AND OTHER TEACHING OR EDUCATIONAL PUBLICATIONS

1. L. Moreno, **I. Ben-Yelun**, G. K. Nguyen, V. F. González Albuixech, V. J. Amores, L. Saucedo-Mora (2022). *Strength of Materials and Elasticity Workbook: Course 2021/2022*. Archivo Digital UPM.
2. **I. Ben-Yelun**, L. Moreno, R. Callado, L. Saucedo-Mora. (2022). *Practice notebook on Strength of Materials and Elasticity*. Archivo Digital UPM

Research & Development Projects

2024-2025	Augmented Equity: discovering high-potential technology companies using deep learning on knowledge graphs , stellarXlabs, Inc., Public-private partnership project	14,000 €
2022-2025	CONcurrent METAmaterial-Structure design w/ functionally graded metamaterials , European Commission, Marie Skłodowska-Curie Actions H2020 (id: 101007815)	924,600 €
2022-2025	Efecto de angiogénesis y modulación inmune en el crecimiento del glioblastoma , Ministerio de Ciencia e Innovación, Spain National Plan	144,958 €

Educational Innovation

Member of Educational Innovation Group in Continuum Mechanics and Structures in Aerospace Engineering

PROJECTS

- 2022 **Online learning tool for the interactive solution of beam and portal frame problems in Strength of Materials**, UPM
- 2021 **Development of a virtual laboratory to promote the flipped classroom in structural engineering**, UPM
- 2021 **Research-based learning: An essential approach for involving students into real research projects during curricular practice**, UPM

PUBLICATIONS

1. **I. Ben-Yelun**. Lean methodology applied to final degree projects in engineering based on investigation and collaborative learning (2021). *EDUNOVATIC2021: 6th Virtual International Conference on Education, Innovation and ICT*
2. **I. Ben-Yelun**, L. Saucedo-Mora (2022). Research-based learning: a n eff ective methodology for the development of Final Degree Projects. *EDUNOVATIC2022: 7th Virtual International Conference on Education, Innovation and ICT*

Professional Development

LANGUAGES

- English **Full professional proficiency**, C1
- Spanish **Bilingual or native proficiency**, C2
- French **Elementary level**, B1

DEVELOPMENT TRAINING

Escuela de Organización Industrial

Madrid, Spain

MASTER IN SOFT AND COMMUNICATION SKILLS

2019 - 2020

- 130 hours

Stanford University (Coursera)

Online

MACHINE LEARNING COURSE

2019

- 33 hours

PEER REVIEW

- 3 peer-reviewed papers in *Computers & Structures*
- 1 peer-reviewed paper in *Results in Engineering*
- 1 peer-reviewed paper in *Archive of Applied Mechanics*

PROFESSIONAL MEMBERSHIPS

COMETAS (European Project) technical reports and content network manager on YouTube

In charge of GAMOSINOS research group social media management (YouTube, Twitter/X, LinkedIn)

Nominated for membership on the Early Career Editorial Board (ECEB) of Elsevier's journal *Computers & Structures*

Member of Young investigators Section (SEMNIj) of SEMNI (Sociedad Española de Métodos Numéricos en Ingeniería)