Dr. Alejandro Jiménez Rios

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My research interests include: the conservation of existing built heritage through inspection, diagnosis, intervention design and monitoring of buildings and bridges with historical/cultural value; the study of vernacular and sustainable architecture; exploring the mechanical properties and structural behavior of masonry, bamboo and earthen structures through the application of non-destructive testing and advanced numerical simulations; as well as the development and implementation of new technologies in the architecture, construction and engineering (AEC) industry such as artificial intelligence, the internet of things, structural health monitoring and digital twins.

Current position

01/11/2022 - Present:	MSCA Postdoctoral Research.
Universities:	Metropolitan University of Oslo, Norway and Technical University of Delft, Netherlands.
Supervisors:	Prof. Vagelis Plevris and Prof. Maria Nogal.
Description:	My MSCA fellowship has two specific objectives. The first objective is to build digital twin (DT) models of heritage/conventional bridges to assess and identify the highest performing anomaly detection algorithm (ADA) for damage and/or significant decay detection. Its second objective is to develop an ADA-informed open-source decision-making tool based on a reliability-based bridge management approach, to assess the need for bridge intervention while explicitly considering the bridge's cultural heritage value.
Funding:	HORIZON.1.2 - Marie Skłodowska-Curie Actions (MSCA)

Education

01/09/2016 - 03/10/2019:	PhD in Civil, Structural and Environmental Engineering.
University:	Trinity College Dublin, Ireland.
Supervisor:	Prof. Dermot O'Dwyer.
Thesis:	Conservation of earthen vernacular architecture in Ireland. Study of the mechanical properties and the structural behaviour of cob.
Funding:	Internal University funding Studentship Award.

01/09/2017 - 31/08/2018:	Postgraduate Certificate in Statistics.
University:	Trinity College Dublin, Ireland.
Description:	Base module, introduction to regression and design of experiments.
Funding:	Internal University funding Studentship Award.

01/09/2015 - 31/08/2016:	Erasmus Mundus Advanced Master in Structural Analysis of Monuments and Historical Constructions (SAHC).
Universities:	Czech Technical University, Czechia and Polytechnic University of Catalonia, Spain.
Supervisors:	Prof. Sergio Henrique Pialarissi Cavalaro and Prof. Pere Roca Fabregat.
Thesis:	Simulation of masonry structural behaviour using the Discrete Element Method.
Funding:	Erasmus+ Scholarship.

01/09/2009 - 31/08/2014:	Bachelor's Degree in Civil Engineering, Structural Engineering Specialization Path.
University:	University of Guadalajara.
Supervisor:	Prof. Miguel Zamora Palacios.
Thesis:	Comparative analysis of plane frames' structural behaviour considering the effect of end length offsets.

01/07/2012 - 30/06/2013:	International Academic Exchange.
University:	National Institute of Applied Sciences (INSA) Lyon, France.
Funding:	Mexfitec Scholarship.

Researcher experience

01/11/2020 - 31/10/2022:	Postdoctoral Researcher.
University:	Sapienza University of Rome, Italy.
Description:	The research project in which I participated focused on the study of the structural behaviour of masonry with the use of a non-standard limit analysis method implemented through the ALMA 2.0 program and on the development/extension of this software.
Funding:	Internal University funding.

Professional experience

01/02/2020 - 31/12/2020:	Structural Engineer and leader of R&I.
Company:	Xtructuras Ingenieria, Mexico.
Activities:	Modelling, analysing, designing and detailing of steel, concrete and masonry buildings. Working in and coordinating teams, liaising with architects and clients to ensure the completion and success of projects on time and within budget. Research and implementation of SOA BIM software and working methodologies.
01/09/2014 - 31/08/2015:	Structural Engineer.
Company:	ALBA Proyecto Estructural, Mexico.
Activities:	Modelling, analysing, designing and detailing of steel, concrete and masonry buildings. Working in and coordinating teams, liaising with architects and clients to ensure the completion and success of projects on time and within budget.
01/08/2014 - 31/08/2015:	Structural Engineer.
Company:	Ceromotion, Mexico.
Activities:	Modelling, analysing, designing and detailing of steel, concrete and masonry buildings.

Research publications

As of 02/11/2022 I have a total of 22 publications: 8 journal papers, 6 conference papers, 3 dissertations and 10 more publications between databases and conference posters.

Track record:

Scopus:	h-index:1, citations:11, documents:9.
Publons:	h-index:1, citations:8, documents:7.
Google Scholar:	h-index:2, citations:17, documents:16.
ResearchGate:	Research Interest: 53,1, citations: 21, recommendations: 25, reads: 3441.

Peer-reviewed scientific journal papers:

- Nela, B., **Jiménez, A. R.,** Pingaro, M., Reccia, E., & Trovalusci, P. (Accepted for publication) Masonry arches simulations using cohesion parameter as code enrichment for limit analysis approach. International Journal of Masonry Research and Innovation. *In this paper, the cohesion incorporation is calibrated for a variety of in-plane applications, accounting for the joints' indirect tensile strength, that can simulate the strengthening measures.*
- Nela, B., **Jiménez, A. R.,** Pingaro, M., Reccia, E., & Trovalusci, P. (2022) Limit analysis of locally reinforced masonry arches. Engineering Structures. DOI: 10.1016/j.engstruct.2022.114921. *In this paper, the influence of partial reinforcement on the structural response of masonry arches is studied.*
- **Jiménez, A. R.**, Nela, B., Pingaro, M., Reccia, E., & Trovalusci, P. (2022) Rotation and sliding collapse mechanisms for in plane masonry pointed arches: statistical parametric assessment. Engineering Structures. DOI: 10.1016/j.engstruct.2022.114338. *In this paper, the effects that different geometrical (slenderness and sharpness) and mechanical (friction and cohesion) parameters have on the in-plane structural response of masonry pointed arches are investigated. Two load scenarios are studied: vertical self-weight plus a proportional horizontal live load and vertical self-weight plus a vertical concentrated live load applied to individual voussoir.*
- **Jiménez, A. R.**, Pingaro, M., Reccia, E., & Trovalusci, P. (2022) Statistical assessment of in-plane masonry panels using limit analysis with sliding mechanism. ASCE Journal of Engineering Mechanics, special issue "Recent advances on the mechanics of masonry structures". DOI: 10.1061/(ASCE)EM.1943-7889.0002061. *In this paper the effects that different geometrical (panel ratio, block ratio, bond type) and mechanical (friction ratio) parameters have on the in-plane structural response of brick masonry panels are investigated.*

- **Jiménez, A. R.**, & O'Dwyer, D. (2020) Experimental validation of the application of the flat jack in cob walls. Construction and building materials. 254, p.119148. DOI: 10.1016/j.conbuildmat.2020.119148. *The purpose of the experimental campaign presented in this paper was to assess the feasibility of the technique to measure the average compressive levels of stress in existing cob walls and determine their mechanical properties.*
- **Jiménez, A. R.**, & O'Dwyer, D. (2020). Data collected from the experimental validation for the application of flat jack tests in cob walls. Data in brief. 31, p.105764. DOI: 10.1016/j.dib.2020.105764. *It contains data collected during the consolidation process of six cob wallettes and data collected after single and double flat jack test were applied for the first time to a set of cob wallettes at the laboratory facilities of the Department of Civil, Structural and Environ- mental Engineering at Trinity College Dublin.*
- **Jiménez, A. R.**, & O'Dwyer, D. (2020). Flat jack test adapted for its application in cob walls. MethodsX. 7, p.101003. DOI: 10.1016/j.mex.2020.101003. *Two standards have been developed for the application of the technique in masonry walls and this paper presents the adaptation of those methods for its application in cob walls.*
- **Jiménez, A. R.**, & O'Dwyer, D. (2019). Numerical modelling of cob´s non-linear monotonic structural behaviour. International Journal of Computational Methods. 17, p.1940013. DOI: 10.1142/S0219876219500464. *This paper presents the results obtained of the simulation of cob's nonlinear monotonic behaviour using two well-known finite element commercial packages.*

Peer-reviewed conference papers published in conference proceedings:
- Nela, B., **Jiménez, A. R.**, Pingaro, M., Reccia, E., & Trovalusci, P. (2022). Limit analysis for masonry arches: influence of pier texture, arch shallowness and joint friction. Abstract sent to the XXV CONVEGNO AIMETA. *Using an in-house code that utilizes limit analysis as a rigid block approach to modelling masonry with frictional joints, a study on the crucial parameters impacting the safety level of piers under the thrust of arches is performed.*
- Nela, B., Pingaro, M., **Jiménez, A. R.**, Reccia, E., & Trovalusci, P. (2021). Masonry simulations using cohesion parameter as code enrichment for a non-standard limit analysis approach. Abstract sent to the 7th Mechanics of Masonry Structures Strengthened with Composite Materials – Online Conference. *The cohesion incorporation is calibrated for a variety of in-plane applications, accounting for the joints' indirect tensile strength that is able to simulate the strengthening measures.*
- **Jiménez, A. R.**, Grimes, M. & O'Dwyer, D. W. (2021). Experimental campaign on the use of the flat jack test in cob walls. Abstract submitted to the 12th International Conference on Structural Analysis of Historical Constructions. *This paper presents the firs experimental campaign performed to validate the use of this Minor Destructive Technique (MDT) to determine the levels of stress in cob walls and their mechanical properties.*
- **Jiménez, A. R.**, & O'Dwyer, D. W. (2019). External post-tensioning system for the strengthening of historical stone masonry bridges. Paper presented at the 11th International Conference on Structural Analysis of Historical Constructions, Cuzco, Peru. *The objective of this paper is to present the evaluation of the feasibility of the use of an external post-tensioning arrangement to strengthen historical stone masonry bridges. The arrangement proposed is an alternative to those already existent and developed by other authors.*
- **Jiménez, A. R.**, & O'Dwyer, D. (2018). Earthen buildings in Ireland. Paper presented at the 6th International Congress on Construction History, Brussels, Belgium. Shortlisted within the top 10 best papers presented by PhD Students. *The objective of this paper is to present a summarized and concise picture of the present situation of the remaining earthen buildings in the country, identify their main characteristics, the values that make such buildings important, evaluate their vulnerability as vernacular architectural style and therefore, understand and better approach any future intervention on such kinds of structures.*
- **Jiménez, A. R.**, & O'Dwyer, D. (2018). FEM non-linear modelling of cob using ANSYS. Paper presented at the 9th International Conference on Computational Methods, Rome, *Italy. The aim of this paper is to evaluate the available material models' suitability for the modelling of cob's structural behaviour in one of the most commonly used FEM software in the market.*

Dissertations:
- **Jiménez, A. R.** (2019). Conservation of earthen vernacular architecture in Ireland. Study of the mechanical properties and the structural behaviour of cob. PhD thesis. Trinity College Dublin. http://hdl.handle.net/2262/91547. *The thesis presents a summarized and concise picture of the present situation of the remaining earthen buildings in Ireland, identifies their main characteristics, the values that*

make such buildings important, evaluates their vulnerability as vernacular architectural style and therefore, allows to understand and better approach any future intervention on such kinds of structures.

- **Jiménez, A. R.** (2016). Simulation of structural behaviour of masonry using discrete element modelling. Master thesis. Polytechnic University of Catalonia, Spain. *The objective of this master thesis is to evaluate the applicability of DEM to simulate the structural behaviour of masonry at a micro and macro-scale level, reproducing the response in terms of deflections, ultimate load and failure modes.*
- **Jiménez, A. R.** (2014). Comparative analysis of plane frames' structural behaviour considering the effect of end length offsets. Bachelor thesis. University of Guadalajara, Mexico. *The purpose of this thesis was to present a more realistic model to describe the structural response of plane frames by considering the effect that the actual geometrical dimensions of the nodes have in terms of lateral displacements.*

Other publications:

- **Jimenez, A. R.,** Pingaro, M., Trovalusci, P., Nela, B. and Reccia, E. (2022). Data from the parametric analysis of masonry buttressed arches with limit analysis subjected to vertical self-weight plus a proportional horizontal live load, <https://doi.org/10.5281/zenodo.6811858> (July). *For each one of the simulations performed from the parametric analysis of masonry buttressed arches with limit analysis subjected to vertical self-weight plus a proportional horizontal live load, this database contains a .txt, a .vtk and a .png file. In the .txt file the elapsed time and the collapse multiplier of each simulation can be found. The .vtk file contains all the geometry and displacement values of every masonry buttressed arch. Finally, the .png file presents the collapse mechanism obtained.*
- **Jimenez, A. R.,** Pingaro, M., Trovalusci, P., Nela, B. and Reccia, E. (2022). Data from the parametric analysis of masonry buttressed arches with limit analysis subjected to vertical self-weight plus a proportional concentrated vertical live load applied at mid-span, <https://doi.org/10.5281/zenodo.6811832> (July). *For each one of the simulations performed from the parametric analysis of masonry buttressed arches with limit analysis subjected to vertical self-weight plus a proportional concentrated vertical live load applied at mid-span, this database contains a .txt, a .vtk and a .png file. In the .txt file the elapsed time and the collapse multiplier of each simulation can be found. The .vtk file contains all the geometry and displacement values of every masonry buttressed arch. Finally, the .png file presents the collapse mechanism obtained.*
- **Jimenez, A. R.,** Pingaro, M., Trovalusci, P., Nela, B. and Reccia, E. (2022). Data from the parametric analysis of masonry buttressed arches with limit analysis subjected to vertical self-weight plus a proportional concentrated vertical live load applied at quarter-span, <https://doi.org/10.5281/zenodo.6811797> (July). *For each one of the simulations performed from the parametric analysis of masonry buttressed arches with limit analysis subjected to vertical self-weight plus a proportional concentrated vertical live load applied at quarter-span, this database contains a .txt, a .vtk and a .png file. In the .txt file the elapsed time and the collapse multiplier of each simulation can be found. The .vtk file contains all the geometry and displacement values of every masonry buttressed arch. Finally, the .png file presents the collapse mechanism obtained.*
- **Jimenez, A. R.,** Pingaro, M., Trovalusci, P., Nela, B. and Reccia, E. (2021). Data from the parametric analysis of masonry pointed arches with limit analysis subjected to vertical self-weight plus a proportional horizontal live load, <https://doi.org/10.5281/zenodo.5146824> (July). *For each one of the simulations performed from the parametric analysis of masonry pointed arches with limit analysis, this database contains a .txt, a .vtk and a .png file. In the .txt file the elapsed time and the collapse multiplier of each simulation can be found. The .vtk file contains all the geometry and displacement values of every masonry pointed arch. Finally, the .png file presents the collapse mechanism obtained.*
- **Jimenez, A. R.,** Pingaro, M., Trovalusci, P., Nela, B. and Reccia, E. (2021). Data from the parametric analysis of masonry pointed arches with limit analysis subjected to vertical self-weight plus a vertical concentrated live load, <https://doi.org/10.5281/zenodo.5146866> (July). *For each one of the simulations performed from the parametric analysis of masonry pointed arches with limit analysis, this database contains a .txt, a .vtk and a .png file. In the .txt file the elapsed time and the collapse multiplier of each simulation can be found. The .vtk file contains all the geometry and displacement values of every masonry pointed arch. Finally, the .png file presents the collapse mechanism obtained.*
- **Jimenez, A. R.**, Pingaro, M., Trovalusci, P., and Reccia, E. (2020a). Code from the parametric analysis of masonry panels with limit analysis, <https://doi.org/10.5281/zenodo.4321939> (December). *The code can be used to generate the geometry of all the tested masonry panels. It uses the functions defined in the masonry_panels module within the Sapienza package. It requires that the user specifies brick length, brick height, number of horizontal bricks and number of vertical bricks. The script generates the polylines in Autocad.*
- **Jimenez, A. R.**, Pingaro, M., Trovalusci, P., and Reccia, E. (2020b). Data from the parametric analysis of masonry panels with limit analysis, <https://doi.org/10.5281/zenodo.4320201> (December). *For each one*

of the simulations performed from the parametric analysis of masonry panels with limit analysis, this database contains a .txt, a .vtk and a .png file. In the .txt file the elapse time and the collapse multiplier of each simulation can be found. The .vtk file contains all the geometry and displacement values of every masonry panel. Finally, the .png file presents the collapse mechanism obtained.

- **Jiménez, A. R.** (2019). Proposal for the sustainable reuse and redevelopment of Newtownbutler's Lanesborough Hotel and former Market House. Poster presented at the Ulster Architectural Heritage & Irish Georgian Society Summer School. *The proposal consists in the adaptation of the Market House into a Craft Training and Sustainability Research Centre.*
- **Jiménez, A. R.** (2019), Cob wallettes' consolidation data, Mendeley Data, v1 http://dx.doi.org/10.17632/twbf86wxtx.1. *The raw data is divided in three files. The first one contains all the data points collected during the first cycle loading for load (kN), and displacement (mm) for each wallette. The second file contains the same data collected during a second loading cycle (except for wallette W1). Finally, the third one contains data points collected during the consolidation period of five days for load (kN), displacement (mm) and time (min).*
- **Jiménez, A. R.** (2019), Cob cylinder's data, Mendeley Data, v1 http://dx.doi.org/10.17632/h8ksd6mvkj.1. *The raw data file contains all the data points collected for load (N), test time (s) and displacement (mm) for each cylinder.*

Received funding

- *2022-2024 Marie Skłodowska-Curie Actions Individual Fellowship:* OsloMet/TU Delft. Around 227,000 € which cover living allowance, mobility allowance, family allowance, research, training and networking contributions as well as management and indirect contributions.
- *2020-2021 Internal University funding:* Sapienza University of Rome. Around 50,000 € which covered health insurance, travel expenses and a monthly stipend of 1600 €.
- *2016 Internal University funding Studentship Award: Trinity College Dublin*. Around 100,000 € which covered tuition fees, research expenses and a monthly stipend of 1 200 €.
- *2015 Erasmus+ Scholarship*: Around 25,000 € which covered tuition fees, health insurance and a monthly stipend of 1 000 €.
- *2012 Mexfitec Scholarship*: Around 20,000 €, which covered tuition fees, return flight Mexico-France, two-months French course, health insurance and a monthly stipend of 800 €.

Academic experience

2021:	New Master Program on Civil Engineering Creation Committee Member.
Activities:	I participated in the committee in charge of designing and implementing a new Master program in the field of Civil Engineering at the Department of Civil and Topography Engineering.
University:	University of Guadalajara, Mexico.
2019:	Assessment Assistant.
Activities:	Support of Trinity Assessment Fellows to map and analyse assessment practices within Schools across the University. Digital badge on programme-focused assessment.
University:	Trinity College Dublin, Ireland.
2016 – 2019:	Teaching Assistant
Activities:	Teaching assistant at the following engineering courses of the Departments of Civil, Structural and Environmental Engineering and Department of Mechanical Engineering:

- 2E9 Engineering design.
- 3A2 Structural design.
- 2E8 Materials.
- 3E4 Innovation and entrepreneurship.
- 2E4 Solids and structures.
- 4E6 Advanced theory of structures.
- 2E4 Solids and structures.
- 3B3 Mechanics of solids.
- C05 Spatial analysis using GIS.

University:	Trinity College Dublin, Ireland.
2018 – 2019:	Workshops

Activities:	Organization and facilitation of three one-day workshops on conservation, vernacular architecture, earthen construction techniques and sustainability.
University:	Trinity College Dublin, Ireland.

Other education

2022:	Book writing.
Institution:	Researcher Academy, Elsevier.
2022:	Technical writing skills.
Institution:	Researcher Academy, Elsevier.
2022:	Writing skills.
Institution:	Researcher Academy, Elsevier.
2022:	Fundamentals of manuscript preparation.
Institution:	Researcher Academy, Elsevier.
2022:	Research collaborations.
Institution:	Researcher Academy, Elsevier.
2022:	Research data management.
Institution:	Researcher Academy, Elsevier.
2021:	Research funding.
Institution:	Researcher Academy, Elsevier.

2019:	Conservation Without Frontiers International Summer School.
Topic:	Survival & Revival: Living Towns and Villages in Cavan and Fermanagh.
Institutions:	Ulster Architectural Heritage and Irish Georgian Society, Ireland.

2019:	Certified Peer Reviewer Course.
Institution:	Researcher Academy, Elsevier.

2018:	Reflective Teaching Assistantship Course.
Topic:	Introduction to current learning theories and teaching practices within higher education. Practical application during an undergraduate lab demonstration.
University:	Trinity College Dublin, Ireland.

2018:	BASEhabitat International Summer School on Earthen and Bamboo Construction.
Topic:	Practical workshops in building with earth and bamboo, theory classes on sustainable architecture and networking with people from all around the globe.
University:	University of Linz, Austria.

2017:	Academic Skills for Successful Learning Course.
Topic:	Leadership, time management, business presentations, communication skills.
University:	Trinity College Dublin, Ireland.

2015:	Certificate on the Analysis and Design of Post-Tensioned Buildings.
Institution:	ADAPT Professional Training Institute.

Completed Massive Open Online Courses:

- Preserving Norwegian stave churches, National Technical Norwegian University, Norway.
- The art and science of searching in systematic reviews, National University of Singapore, Singapore.
- Deep learning with TensorFlow, IBM, USA.
- Web applications and command-line tools for data engineering, Duke University, USA.
- Scripting with Python and SQL, Duke University, USA.
- Python and Pandas for data engineeting, Duke University, USA.
- Linux and Bash for data engineering, Duke University, USA.
- HTML, CSS, and Javascript for Web Developers, Johns Hopkins University, USA.
- Machine learning, University of Sandford, USA.
- Construire en terre crue aujourd'hui, Amaco, France.
- Introduction to Python, Microsoft, USA.
- Roman architecture, Yale University, USA.
- The ancient Greeks, Wesleyan University, USA.
- Rome, University of Reading, UK.
- Cultural heritage in transformation, RWTH Aachen University, Germany.

- Arts and heritage management, Bocconi University, Italy.
- Next generation infrastructures, TU Delft, Netherlands.
- The art of structures, Polytechnic University of Lausanne, Switzerland.
- Future smart cities, Swiss Federal Institute of Technology in Zurich, Switzerland.

Commissions of trust

2020 – Present: Review Editor at the Editorial Board of Computational Methods in Structural Engineering for Frontiers Built Environment.

2019 – Present: Review Editor at the Construction and Building Materials journal.

Scientific and professional memberships

2020 – Present: Colegio de Ingenieros Civiles del Estado de Jalisco, Structural Engineering Technical Session

2019 - Present: International Association for Bridge Maintenance and Safety (IABMAS).

2019 - Present: International Network for Traditional Building, Architecture and Urbanism (INTBAU).

2019 - Present: European Architectural History Network (EAHN).

2018 - Present: Earth Building UK and Ireland (EBUKI).

2017 - 2020:   Engineers Ireland (EI).

Research collaborations

Summer 2018:   Internal funding research project. Main researcher.
Activities: International research collaboration to design the experimental campaign on the use of minor-destructive tests to determine the mechanical properties of cob.
University: University of Cantabria, Spain.

Participation per invitation to scientific seminars/conferences

2021:   Mechanical Properties of Existing Cob Walls.
Event: NET+WORKING BASEhabitat Hybrid Summer School.
University: University of Art and Design Linz, Austria.

2021:   Conservation of Earthen Vernacular Buildings with an emphasis on minor destructive tests (MDT) and cob mechanical properties.
Event: Ruins to Riches, Revive, Repurpose, Reimagine Our Traditional Buildings.
Institutions: Ulster Architectural Heritage, Armagh City Banbridge & Craigavon and the Department for Communities, UK.

Informatic and language skills

Software:

- Skills with structural engineering design software: OpenSees, SAP2000, ETABS, SAFE, ANSYS, ABAQUS, AutoCAD, Revit, Robot, Advance Steel, FormIt, SeismoSignal, Prodisis, Sasid, ALMA.
- Skills with statistical software: Minitab.
- Skills with bibliometric software: VOSviewer
- Skills with programming languages: MATLAB, Python, VBA, XML, HTML, CSS, Javascript, SQL.
- Skills with developer software: VSCode, Spyder, Vim, Git, Docker, Windows Terminal, Anaconda.
- Skills with other software: Word, Excel, PowerPoint, Outlook, Project, Visio, Survey Monkey, Prezi, EndNote, LaTex, Mendeley, JabRef, Paraview, GIMP, Inkscape, kdenlive, VOSviewer, LibreOffice.

Languages:

- Spanish: Mother tongue.
- English: Advanced.
- French: Intermediate.

- Italian: Beginner.
- Norwegian: Beginner.