Diego Andrés Alvarez-Marín

curriculum vitae

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Personal information

name	Diego Andrés Alvarez-Marín
occupation	Associate Professor. Universidad Nacional de Colombia, Sede Manizales
citizenship	Colombian
Google Scholar profile	`https://scholar.google.com.co/citations?user=W6Lgv-0AAAAJ`
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Scientific interests

Dempster-Shafer evidence theory, digital signal processing, imprecise probability, machine learning, Monte Carlo simulation, neural networks, parameter estimation, pattern recognition, probabilistic mechanics, random set theory, support vector machines, stochastic processes, structural control, structural optimization, structural reliability, system identification, uncertainty analysis

Education

2004 – 2007	**Doctoral study in engineering sciences**, *Leopold-Franzens-Universität Innsbruck, Austria. Arbeitsbereich für Technische Mathematik am Institut für Grundlagen der Bauingenieurwissenschaften.*
dissertation	Infinite random sets and applications in uncertainty analysis
supervisor	Univ.-Prof. Dr. Dr. h.c. Michael Oberguggenberger
2001 – 2003	**Master on industrial automation**, *Universidad Nacional de Colombia, Sede Manizales.*
master thesis	Stochastic structural control of a bridge subjected to wind-induced vibrations using separated surfaces
supervisor	Prof. Dr. Jorge Eduardo Hurtado
1995 – 2000	**Civil engineering**, *Universidad Nacional de Colombia, Sede Manizales.*
final work	Structural reliability assessment using artificial neural networks
supervisor	Prof. Dr. Jorge Eduardo Hurtado

Honors and awards

2007	Doctoral dissertation: *Infinite random sets and applications in uncertainty analysis.* Marking: *Excellent.* Defense approved with distinction (*"mit Auszeichnung bestanden"*)
Mar 2004 – Feb 2007	Programme Alßan scholarship, European Union programme of high level scholarships for Latin America
2003	Thesis of master degree: *Stochastic structural control of a bridge subjected to wind-induced vibrations using separated surfaces.* Marking: *meritorious* (this marking is similar to *cum laude)*
II-2002 – 2003	COLCIENCIAS "Young Researcher" (COLCIENCIAS is the Colombian research promoter institute)
I-2002	Scholarship for graduate studies at the National University of Colombia granted by the same university
2000	Final undergraduate work: *Structural reliability assessment using artificial neural networks.* Marking: *meritorious*

II-1999 Prize for outstanding academic performance, National University of Colombia

1994 First place on the National University's admission test for Civil Engineering

1994 ICFES exam: 372/400 (this is the Colombia's state examination for university admission. I was between the ten best results in my state that year)

Reviewer for

I have reviewed papers for the following international journals:

- ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems, Part A: Civil Engineering
- ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems, Part B: Mechanical Engineering
- Applied Mathematics and Computation
- Chinese Journal of Aeronautics
- Computers and Concrete, an International Journal
- Engineering Science and Technology, an International Journal
- Fuzzy Sets and Systems
- International Journal for Numerical Methods in Engineering
- International Journal of Quality, Statistics and Reliability
- Journal of Risk and Reliability
- Mechanical Systems and Signal Processing
- Proceedings of the Institution of Mechanical Engineers: O. Journal of Risk and Reliability, (Proc. Inst. Mech. Eng. O, J. Risk And Reliab.)
- ScienceAsia
- Structural Engineering and Mechanics, An international Journal

Professional experience

Nov 2012–present **Associate Professor**, *Universidad Nacional de Colombia, Sede Manizales.*

Feb 2009 – Nov 2012 **Assistant Professor**, *Universidad Nacional de Colombia, Sede Manizales.*

Jun 2007 – Dec 2008 **Research engineer**, *SKF Research and Development Company B.V.*
I was hired as a research engineer in the SKF Engineering Research Center in Nieuwegein, The Netherlands. My work dealt with the application of techniques of signal processing, machine learning and probability for the design of algorithms of condition monitoring and remaining useful life prediction of bearing systems, design of fuzzy expert systems for steelmaker assessment among other artificial-intelligence-based techniques in practical mechanical engineering applications.

Courses taught

- **Computer programming**, *undergraduate*.
- **Finite element method for structural analysis 1**, *undergraduate/graduate*.
- **Finite element method for structural analysis 2**, *graduate*.
- **Machine learning (pattern recognition)**, *undergraduate*.
- **Mechanics of solids (theory of elasticity)**, *undergraduate*.
- **Numerical methods**, *undergraduate*.
- **Probability theory**, *undergraduate*.
- **Random vibrations**, *graduate*.

Computer skills

OS	Linux, Windows
programming	C/C++, Julia, Matlab, Python 3, VBA for Microsoft Excel
other	LaTeX, Microsoft Office, skills in parallel programming (MPI, OpenMP)

Languages

mother tongue: Spanish

other languages:

Language	Listening	Writing	Reading	Speaking
English	A	A	A	A
German	B	B	B	B
Dutch	D	D	D	D

A. Excellent, B. Good, C. Acceptable, D. Basic

Publications

Book

[1] Diego Andrés Álvarez Marín. *Introducción a la teoría de la elasticidad.* Expected publication year: 2020. My book is in preparation and it has already 770 pages.

Articles

[2] Jorge E. Hurtado and Diego A. Alvarez. Neural-network-based reliability analysis: a comparative study. *Computer Methods in Applied Mechanics and Engineering*, 191(1–2):113–132, 2001. http://dx.doi.org/10.1016/S0045-7825(01)00248-1.

[3] Jorge Eduardo Hurtado and Diego Alvarez. Optimización basada en confiabilidad por medio de redes neuronales y algoritmos evolutivos (translated title: Reliability-based optimization by means of neural networks and evolutionary algorithms). *Revista Internacional de Métodos Numéricos para Cálculo y Diseño en Ingeniería*, 18(4):573–593, 2002. http://hdl.handle.net/2099/3379.

[4] Jorge E. Hurtado and Diego A. Alvarez. Classification approach for reliability analysis with stochastic finite-element modeling. *Journal of Structural Engineering*, 129(8):1141–1149, 2003. http://dx.doi.org/10.1061/(ASCE)0733-9445(2003)129:8(1141).

[5] Jorge Eduardo Hurtado and Diego Alvarez. Aproximación de funciones implícitas

de decisión por medio de máquinas de soporte vectorial (translated title: Approximation of implicit decision functions by means of support vector machines). *Revista Internacional de Métodos Numéricos para Cálculo y Diseño en Ingeniería*, 19(3):363–382, 2003. http://hdl.handle.net/2099/4624.

[6] Diego A. Alvarez. On the calculation of the bounds of probability of events using infinite random sets. *International Journal of Approximate Reasoning*, 43(3):241–267, 2006. http://dx.doi.org/10.1016/j.ijar.2006.04.005.

[7] Diego A. Alvarez. Nonspecificity for infinite random sets of indexable type. *Fuzzy Sets and Systems*, 159(3):289–306, 2008. http://dx.doi.org/10.1016/j.fss.2007.08.008.

[8] Diego A. Alvarez. A Monte Carlo-based method for the estimation of lower and upper probabilities of events using infinite random sets of indexable type. *Fuzzy Sets and Systems*, 160(3):384–401, 2009. http://dx.doi.org/10.1016/j.fss.2008.08.006.

[9] Diego A. Alvarez. Reduction of uncertainty using sensitivity analysis methods for infinite random sets of indexable type. *International Journal of Approximate Reasoning*, 50(5):750–762, 2009. http://dx.doi.org/10.1016/j.ijar.2009.02.002.

[10] Jorge E. Hurtado and Diego A. Alvarez. An optimization method for learning statistical classifiers in structural reliability. *Probabilistic Engineering Mechanics*, 25(1):26–34, 2010. http://dx.doi.org/10.1016/j.probengmech.2009.05.006.

[11] Diego A. Alvarez, Jorge E. Hurtado, and Daniel Alveiro Bedoya-Ruíz. Prediction of modified Mercalli intensity from PGA, PGV, moment magnitude, and epicentral distance using several nonlinear statistical algorithms. *Journal of Seismology*, 16(3):489–511, 2012. http://dx.doi.org/10.1007/s10950-012-9291-x.

[12] Jorge E. Hurtado and Diego A. Alvarez. The encounter of interval and probabilistic approaches to structural reliability at the design point. *Computer Methods in Applied Mechanics and Engineering*, 225–228(1):74–94, 2012. http://dx.doi.org/10.1016/j.cma.2012.03.020.

[13] Jorge E. Hurtado, Diego A. Alvarez, and Juliana Ramírez. Fuzzy structural analysis based on fundamental reliability concepts. *Computers & Structures*, 112–113:183–192, 2012. http://dx.doi.org/10.1016/j.compstruc.2012.08.004.

[14] Oscar Cardona Morales, Diego A. Alvarez Marín, and German Castellanos-Domínguez. Outlier detection in rotating machinery under non-stationary operating conditions using dynamic features and one-class classifiers. *Dyna*, 80(182):173–181, 2013. http://dyna.unalmed.edu.co/en/verPDF.php?id_articulo=v80n182a21&tipo=articulo&id=182.

[15] Jorge E. Hurtado and Diego A. Alvarez. A method for enhancing computational efficiency in Monte Carlo calculation of failure probabilities by exploiting FORM results. *Computers & Structures*, 117:95–104, 2013. http://dx.doi.org/10.1016/j.compstruc.2012.11.022.

[16] Gilberto A. Ortiz, Diego A. Alvarez, and Daniel Bedoya-Ruíz. Identification of Bouc-Wen type models using multi-objective optimization algorithms. *Computers & Structures*, 114–115:121–132, 2013. http://dx.doi.org/10.1016/j.compstruc.2012.10.016.

[17] Diego A. Alvarez and Jorge E. Hurtado. An efficient method for the estimation of structural reliability intervals with random sets, dependence modeling and uncertain inputs. *Computers & Structures*, 142:54–63, 2014. http://dx.doi.org/10.1016/j.compstruc.2014.07.006.

[18] Daniel Alveiro Bedoya-Ruíz, Gilberto Alejandro Ortíz García, and Diego Andrés Álvarez Marín. Behavior of precast ferrocement thin walls under cyclic loading: an experimental and analytical study. *Ingeniería e Investigación*, 34(1):29–35, 2014. https://doi.org/10.15446/ing.investig.v34n1.40420.

[19] Edoardo Patelli, Diego A. Alvarez, Matteo Broggi, and Marco de Angelis. Uncertainty management in multidisciplinary design of critical safety systems. *Journal of Aerospace Information Systems*, 12(1):140–169, 2014. http://dx.doi.org/10.2514/1.I010273. This paper is a contribution to the NASA LaRC UQ Challenge 2014.

[20] Daniel Bedoya-Ruiz, Gilberto A. Ortiz, Diego A. Álvarez, and Jorge E. Hurtado. Modelo dinámico no lineal para evaluar el comportamiento sísmico de viviendas de ferrocemento (translated title: Nonlinear dynamical model for the assessment of the seismic behaviour of ferrocement houses). *Revista Internacional de Métodos Numéricos para Cálculo y Diseño en Ingeniería*, 31(3):139–145, 2015. http://dx.doi.org/10.1016/j.rimni.2014.04.001.

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[22] Diego A. Alvarez, Jorge E. Hurtado, and Juliana Ramírez. Tighter bounds on the probability of failure than those provided by random set theory. *Computers & Structures*, 189:101–113, 2017. https://doi.org/10.1016/j.compstruc.2017.04.006.

[23] Jorge E. Hurtado, Diego A. Alvarez, and Jairo A. Paredes. Interval reliability analysis under the specification of statistical information on the input variables. *Struc-*

tural Safety, 65:35–48, 2017. http://dx.doi.org/10.1016/j.strusafe.2016.12.005.

[24] Diego A. Alvarez, Felipe Uribe, and Jorge E. Hurtado. Estimation of the lower and upper bounds on the probability of failure using subset simulation and random set theory. *Mechanical Systems and Signal Processing*, 100(1):782–801, 2018. https://doi.org/10.1016/j.ymssp.2017.07.040.

Conference proceedings

[25] Jorge E. Hurtado and Diego A. Alvarez. Reliability assessment of structural systems using neural networks. In *Proceedings (CD-ROM) of the European Congress on Computational Methods in Applied Sciences and Engineering, ECCOMAS-2000*, Barcelona, September 11–14 2000.

[26] Jorge E. Hurtado, Diego A. Alvarez, and Alex H. Barbat. Monte Carlo analysis of structural systems using neural networks. In G .I. Schuëller and P. D. Spanos, editors, *Proceedings of the International Conference on Monte Carlo simulation, MCS-2000*, pages 265–271, Monte Carlo, Monaco, June 18–21 2000.

[27] Jorge E. Hurtado and Diego A. Alvarez. Stochastic evaluation of bridge control with side wings. In Johnson, Spencer, and Kareem, editors, *Proceedings (CD-ROM) of the 9th ASCE Joint Specialty Conference on Probabilistic Mechanics and Structural Reliability, PMC-2004*, volume 9, Albuquerque, New Mexico, USA, July 26–28 2004. Sandia National Laboratory.

[28] Carlos Lino Rengifo, Diego Andrés Alvarez, Ricardo Henao, Germán Castellanos, and Jorge Eduardo Hurtado. Active learning on the classification of voice pathologies. In Javier Ortega-García et. al., editor, *Proceedings of ODYSSEY-2004 - The Speaker and Language Recognition Workshop*, pages 271–274, Toledo, Spain, May 31–June 3 2004.

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[31] Daniel Bedoya-Ruíz, Diego A. Alvarez, Gilberto Ortíz-García, Jorge E. Hurtado, and Alberto Alberto García Fergusson. Cyclic behaviour of precast concrete modules with post-tensioned unbounded bars. In *Proceedings of 15 WCEE - 15th World Conference on Earthquake Engineering*, number Paper 3414 in series, Lisbon, Portugal, September 24–28 2012.

[32] Daniel Bedoya-Ruíz, Carlos A. Bermúdez, Diego A. Alvarez, Gilberto Ortíz-García, and Juan V. Escobar Sáenz. Cyclic behaviour of prestressed precast concrete walls. In *Proceedings of 15 WCEE - 15th World Conference on Earthquake Engineering*, number Paper 3415 in series, Lisbon, Portugal, September 24–28 2012.

[33] Daniel Bedoya-Ruíz, Jorge E. Hurtado, and Diego A. Alvarez. Nonlinear model and seismic vulnerability of ferrocement housing. In Hugo Wainshtok Rivas, Lázaro Prada Seosane, and Iria Granda Castro, editors, *Proceedings of FERRO 10 - 10th International Symposium on Ferrocement and Thin Reinforced Cement Composites*, pages 563–574, Palacio de Convenciones de La Habana, Cuba, October 15–17 2012.

[34] Diego A. Alvarez and Jorge E. Hurtado. An efficient random-set approach for the estimation of the bounds of the probability of failure with dependence modelling and uncertain inputs. In *Proceedings of ICOSSAR 2013: 11th International Conference on Structural Safety and Reliability*, New York, June 16–20 2013.

[35] O. Cardona-Morales, D. Alvarez-Marín, and G. Castellanos-Domínguez. Condition monitoring under non-stationary operating conditions using time–frequency representation-based dynamic features. In G. Dalpiaz, R. Rubini, G. D'Elia, M. Cocconcelli, F. Chaari, R. Zimroz, W. Bartelmus, and M. Haddar, editors, *Advances in Condition Monitoring of Machinery in Non-Stationary Operations. Proceedings of CMMNO 2013: Third International Conference Condition Monitoring of Machinery in Non-Stationary Operations*, pages 441–451, Ferrara, Italy, May 8–10 2013. Springer. `http://www.springer.com/engineering/mechanical+engineering/book/978-3-642-39347-1`.

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In *Proceedings of the 16th AIAA Non-Deterministic Approaches Conference*, National Harbor, Maryland, January 13–17 2014. http://dx.doi.org/10.2514/6.2014-1501.

[38] Felipe Uribe, Gilberto A. Ortíz, Diego A. Alvarez, and Daniel Bedoya-Ruiz. Nonlinear modeling and fragility analysis of ferrocement structures. In George Deodatis and Pol D. Spanos, editors, *Proceedings of the 7th International Conference on Computational Stochastic Mechanics*, pages 729–740, Santorini, Greece, June 15–18 2014. Research Publishing Services. https://doi.org/10.3850/978-981-09-5348-5_070.

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[40] Felipe Uribe, Diego A. Alvarez, Jorge E. Hurtado, Bryan Chalarca, and Daniel Bedoya-Ruíz. Hysteresis parameter identification and reliability assessment of ferrocement walls. In Wolfgang Brameshuber, editor, *Proceedings of FERRO-11 - 11th International Symposium on Ferrocement and 3rd International Conference on Textile Reinforced Concrete (ICTRC)*, pages 91–102, Aachen, Germany, June 7–10 2015. RILEM. http://www.rilem.org/gene/main.php?base=500218&id_publication=441.

[41] Diego A. Alvarez, Jorge E. Hurtado, and Juliana Ramírez. Narrower bounds on the failure probability than those estimated by random set theory. In Christian Bucher, editor, *Proceedings of ICOSSAR 2017 - 12th International Conference on Structural Safety and Reliability*, number Paper 7130, Vienna, August 6–10 2017.

[42] Jorge E. Hurtado, Diego A. Alvarez, and Juliana Ramírez. A two-level form approach for estimating reliability intervals under p-box input definition. In Christian Bucher, editor, *Proceedings of ICOSSAR 2017 - 12th International Conference on Structural Safety and Reliability*, number Paper 7155, Vienna, August 6–10 2017.

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