

# Luis R. Izquierdo

Professor

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[Google scholar profile](#)

## CURRENT POSITION: FULL PROFESSOR

- **Employer:** *University of Burgos*, Ed. A. Avda. Cantabria s/n, Burgos, Spain.
- **Dates of appointment:** October 2006 – Present. (Full Professor since November 2019)
- **Teaching duties:** Responsible for teaching Machine Learning, Game Theory, Statistics, Finance and Economic Theory, both in Spanish and –by personal choice– in English. I also supervise several students who are conducting their Master's Thesis for their degree in Computer Science or in Industrial Engineering.
- **Research duties:** Conduct research on Game Theory, Complex Systems, and Economics.

## ACADEMIC POSITIONS in OTHER INSTITUTIONS

- **Visiting Professor, Dept. of Mathematics, University of British Columbia, Canada.** Aug 2023 – July 2024.
- **Fulbright Scholar, Center for Control, Dynamical Systems, and Computation, UCSB, USA.** Jul – Sept 2022.
- **Visiting Scholar, Dept. of Economics, University of Wisconsin – Madison, USA.** Aug – Nov 2018.
- **Visiting Scholar, Dept. of Economics, University of Wisconsin – Madison, USA.** June – Sept 2016.
- **Visiting Professor, University of Western Australia Business School (Australia).** November 2015.
- **Visiting Professor, University of Western Australia Business School (Australia).** Oct – Nov 2014.
- **Visiting Professor, University of Western Australia Business School (Australia).** October 2013.
- **Visiting Fellow, Dept. of Economic Analysis, University of Zaragoza (Spain).** Feb. 2011 – May 2011.
- **Visiting Fellow, Dept. of Economics, European University Institute (Italy).** Dec 2009 – Aug 2010.
- **Visiting Fellow, Dept. of Economics, European University Institute (Italy).** March 2009 – June 2009.

## EDUCATION

### PhD in GAME THEORY and SOCIAL SIMULATION (2008)

Manchester Metropolitan University Business School      UK      February 2003 – April 2008

- Title: “Advancing Learning and Evolutionary Game Theory with an Application to Social Dilemmas”.
- Distinguished Thesis at the EDAMBA Thesis Competition (EDAMBA: European Doctoral Programmes Association in Management and Business Administration). Viva passed without any corrections.

### DOCTORAL PROGRAMME

University of Valladolid      Spain      September 2002 – September 2004

- Relevant courses: Advanced Analysis of Stochastic Processes, System Dynamics, and Behavioural Finance. Highest marks obtained in all of them.

### M.Sc (Eng) in INDUSTRIAL ENGINEERING. Spec.: INDUSTRIAL ORGANISATION

University of Valladolid      Spain      1995 – 1999, 2000 – 2002  
University of Newcastle upon Tyne      UK      1999 – 2000

- Best student's record award. Top marks in every subject related to Mathematics and Economics.
- 7-year-long degree with a strong emphasis on Science, Economics and Business Administration.

### B.Sc in BUSINESS AND MANAGEMENT (Studied part-time)

Universitat Oberta de Catalunya      Spain      September 1999 – June 2003

- 3-year-long degree. Degree Average: 9.5 / 10.

## PUBLICATIONS

### JOURNAL PAPERS

- Gonzalez-Asenjo, D., Izquierdo, L.R. & Sedano, J. (2023). A simple and efficient method to allocate costs and benefits in energy communities. *Journal of Industrial Engineering and Management*, 16(2), 398-424. [<link>](#)
- Izquierdo, S.S. & Izquierdo, L.R. (2023). Strategy sets closed under payoff sampling. *Games and Economic Behavior*, vol. 138, pp. 126-142. [<link>](#)
- Mauhe, N., Izquierdo, L.R. & Izquierdo, S.S. (2023). Social Simulation Models as Refuting Machines. *Journal of Artificial Societies and Social Simulation*, vol. 26, no. 2 (8) [<link>](#)
- Izquierdo, S.S. & Izquierdo, L.R. (2022). Stability of Strict Equilibria in Best Experienced Payoff Dynamics: Simple Formulas and Applications. *Journal of Economic Theory*, 105553. [<link>](#)
- Izquierdo, L.R., Izquierdo, S.S. & Rodríguez, J. (2022). Fast and Scalable Global Convergence in Single-Optimum Decentralized Coordination Problems. *IEEE Transactions on Control of Network Systems*, vol. 9, issue 4, pp. 1937-1948. [<link>](#)
- Izquierdo, S.S. & Izquierdo, L.R. (2022). "Test two, choose the better" leads to high cooperation in the Centipede game. *Journal of Dynamics and Games*, vol. 9, issue 4, pp. 461-498. [<link>](#)
- Sandholm, W.H., Izquierdo, S.S. & Izquierdo, L.R. (2020). Stability for Best Experienced Payoff Dynamics. *Journal of Economic Theory*, 185, 104957. [<link>](#)
- Izquierdo, L.R., Izquierdo, S.S. & Sandholm, W.H. (2019). An Introduction to ABED: Agent-Based Simulation of Evolutionary Game Dynamics. *Games and Economic Behavior*, 118, pp. 434-462. [<link>](#)
- Sandholm, W.H., Izquierdo, S.S. & Izquierdo, L.R. (2019). Best Experienced Payoff Dynamics and Cooperation in the Centipede Game. *Theoretical Economics*, 14, pp. 1347-1385. [<link>](#)
- Izquierdo, L.R., Izquierdo, S.S. & Sandholm, W.H. (2018). EvoDyn-3s: A Mathematica Computable Document to Analyze Evolutionary Dynamics in 3-Strategy Games. *SoftwareX*, vol. 7, pp. 226-233. [<link>](#)
- Izquierdo, S.S. & Izquierdo, L.R. (2018). Mamdani Fuzzy Systems for Modelling and Simulation: A Critical Assessment. *Journal of Artificial Societies and Social Simulation*, vol. 21, no. 3. [<link>](#)
- Izquierdo, S.S., Izquierdo, L.R. & López-Pintado, D. (2018). Mixing and diffusion in a two-type population. *Royal Society Open Science*, 5(2) 172102. [<link>](#)
- Almudí, I., Fatás-Villafranca, F., Izquierdo, L.R. & Potts, J. (2017). The economics of utopia: a co-evolutionary model of ideas, citizenship and socio-political change. *Journal of Evolutionary Economics*. [<link>](#)
- Izquierdo, S.S., Izquierdo, L.R., Galán J.M. & Santos, J.I. (2016). Economía Artificial: una valoración crítica. *Revista de Métodos Cuantitativos para la Economía y la Empresa*, vol. 22, pp. 36-54. [<link>](#)
- Izquierdo, S.S. & Izquierdo, L.R. (2015). The "Win-Continue, Lose-Reverse" rule in oligopolies: robustness of collusive outcomes. *Advances in Complex Systems*, vol. 18, nos. 5 & 6. [<link>](#)
- Izquierdo, L.R., Olaru, D., Izquierdo S.S., Purchase, S. & Soutar, G.N. (2015). Fuzzy Logic for Social Simulation Using NetLogo. *Journal of Artificial Societies and Social Simulation*, vol. 18, no. 4 (1) [<link>](#)
- Izquierdo, L.R., Izquierdo S.S. & Vega-Redondo, F. (2014). Leave and let leave: A sufficient condition to explain the evolutionary emergence of cooperation. *Journal of Economic Dynamics & Control*, 46, pp. 91-113. [<link>](#)
- Almudí, I., Fatás-Villafranca, F. & Izquierdo, L.R. (2013). Industry dynamics, technological regimes and the role of demand. *Journal of Evolutionary Economics*, 23 (5), pp.1073-1098. [<link>](#)
- Izquierdo S.S. & Izquierdo L.R. (2013). Stochastic Approximation to Understand Simple Simulation Models. *Journal of Statistical Physics*. 151 (1-2), pp. 254-276. [<link>](#)
- Almudí, I., Fatás-Villafranca, F. & Izquierdo, L.R. (2012). Innovation, catch-up, and leadership in science-based industries. *Industrial and Corporate Change*. [<link>](#)
- Frenken, K., Izquierdo, L.R. & Zeppini, P. (2012). Branching innovation, recombinant innovation, and endogenous technological transitions. *Environmental Innovation and Societal Transitions*, 4, pp. 25-35. [<link>](#)
- Izquierdo, S. S. & Izquierdo, L. R. (2011). Strictly Dominated Strategies in the Replicator-Mutator Dynamics. *Games* 2(3) pp. 355-364. [<link>](#)
- Izquierdo, S.S., Izquierdo, L.R. & Vega-Redondo, F. (2010). The Option to Leave: Conditional Dissociation in the Evolution of Cooperation. *Journal of Theoretical Biology* 267(1) pp. 76-84. [<link>](#)
- Izquierdo, L.R. (2010). Book Review of "Complexity: A Guided Tour. Melanie Mitchell. (2009, New York: Oxford University Press.)". *Artificial Life*. 16(3) pp.259-264. [<link>](#)
- Santos, J.I., Galán, J.M., Izquierdo, L.R. & Olmo, R. (2009). Aplicaciones de las TIC en el nuevo modelo de enseñanza de EEES. *Dirección y Organización*, no. 39, pp. 5-11. [<link>](#)

- Izquierdo, L.R., Izquierdo, S.S., Galán, J.M. & Santos, J.I. (2009). Techniques to Understand Computer Simulations: Markov Chain Analysis. *Journal of Artificial Societies and Social Simulation*, vol. 12, no. 1. [<link>](#).
- McAllister, R.R.J., Izquierdo L.R., Janssen, M.A. & Stafford Smith D.M. (2009). Research impact within the international arid literature: An Australian perspective based on network theory. *Journal of Arid Environments*, vol. 73, no. 9, pp. 862-871. [<link>](#)
- Galán, J.M., Izquierdo, L.R., Izquierdo, S.S., Santos, J.I., Olmo, R., López-Paredes, A. & Edmonds, B. (2009). Errors and Artefacts in Agent-Based Modelling. *Journal of Artificial Societies and Social Simulation*, vol. 12, no. 1. [<link>](#).
- Pascual, J.A., Galán, J.M., Izquierdo, L.R., Santos, J.I., Izquierdo, S.S., González, J. (2009). Una herramienta didáctica para la enseñanza de la teoría de juegos mediante internet. *EDUTEC, Revista Electrónica de Tecnología Educativa*, vol. 29. [<link>](#)
- Izquierdo, L.R., Galán, J.M., Santos, J.I. & Olmo, R. (2008). Modelado de sistemas complejos mediante simulación basada en agentes y mediante dinámica de sistemas. *Empiria. Revista de Metodología de Ciencias Sociales*, no. 16, pp. 85-112. [<link>](#)
- Smajgl, A., Izquierdo, L.R. & Huigen, M. (2008). Modeling Endogenous Rule Changes in an Institutional Context: the ADICO Sequence. *Advances in Complex Systems*, vol. 11, Issue 2, pp. 199–215. [<link>](#)
- Izquierdo, S.S., Izquierdo, L.R. & Gotts, N.M. (2008). Reinforcement Learning Dynamics in Social Dilemmas. *Journal of Artificial Societies and Social Simulation*, vol. 11, no. 2. [<link>](#)
- Izquierdo, L.R., Izquierdo, S.S., Gotts, N.M. & Polhill, J.G. (2007). Transient and asymptotic dynamics of reinforcement learning in games. *Games and Economic Behavior*, Volume 61, 2, pp. 259–276. [<link>](#)
- Izquierdo, S.S. & Izquierdo, L.R. (2007). The impact of quality uncertainty without asymmetric information on market efficiency. *Journal of Business Research*, Volume 60, Issue 8, pp. 858-867. [<link>](#)
- Izquierdo, S.S., Izquierdo, L.R. & Izquierdo, J.M. (2007). Publishing science in the digital age. The case of Neurocirugía. *Neurocirugía*, Volume 18, Issue 3, pp. 193-200. [<link>](#)
- Galán, J.M., Izquierdo, L.R., Izquierdo, S.S., López, A., Pascual, J.A., Posada, M., Santos, J.I. & Villafañez, F.A. (2007). Labexnet: un Laboratorio de Economía Experimental en Internet. *Revista Electrónica de Investigación y Evaluación Educativa*, Volume 13, Issue 1, pp. 105-125. [<link>](#)
- Izquierdo, L.R. & Polhill, J.G. (2006). Is your model susceptible to floating-point errors? *Journal of Artificial Societies and Social Simulation*, vol. 9, no. 4. [<link>](#)
- Polhill, J.G., Izquierdo, L.R., & Gotts N.M. (2006). What Every Agent-Based Modeller Should Know About Floating Point Arithmetic. *Environmental Modelling and Software*, 21 (3) pp. 283-309. [<link>](#)
- Galán, J.M. & Izquierdo, L.R. (2005). Appearances can be deceiving: lessons learned reimplementing Axelrod's "evolutionary approach to norms". *Journal of Artificial Societies and Social Simulation*, vol. 8, no. 3. [<link>](#)
- Polhill, J.G. & Izquierdo, L.R. (2005). Lessons learned from converting the Artificial Stock Market to interval arithmetic. *Journal of Artificial Societies and Social Simulation*, vol. 8, no. 2. [<link>](#)
- Polhill, J.G., Izquierdo, L.R., & Gotts N.M. (2005). The Ghost in the Model (and Other Effects of Floating Point Arithmetic). *Journal of Artificial Societies and Social Simulation*, vol. 8, no. 1 [<link>](#).
- Izquierdo, L.R., Gotts, N.M. & Polhill, J.G. (2004). Case-Based Reasoning, Social Dilemmas, and a New Equilibrium Concept. *Journal of Artificial Societies and Social Simulation*, vol. 7, no. 3 [<link>](#)

## OTHER SELECTED PUBLICATIONS

- Izquierdo, L.R. (2017). NetLogo 6.0 Quick Guide. *Published at the official webpage of NetLogo*. [<link>](#)
- Izquierdo, L.R., Izquierdo, S.S., Galán, J.M. & Santos, J.I. (2013). Combining Mathematical and Simulation Approaches. In Edmonds, B. & Meyer, R. (ed.) *Simulating Social Complexity*, 235-272. Springer. [<link>](#)
- Galán, J.M., Izquierdo, L.R., Izquierdo, S.S., Santos, J.I., del Olmo, R. & López-Paredes, A. (2013). Checking Simulations: Detecting and avoiding errors and artefacts. In Edmonds, B. & Meyer, R. (ed.) *Simulating Social Complexity*, 95-116. Springer. [<link>](#)
- Izquierdo, L.R., Izquierdo, S.S. & Vega-Redondo, F. (2011). Learning and Evolutionary Game Theory. In N. M. Seel (ed.) *Encyclopedia of the Sciences of Learning*. ISBN: 978-1-4419-1427-9. Springer. [<link>](#)
- Izquierdo, L.R. & Izquierdo, S.S. (2011). Reinforcement Learning. In N. M. Seel (ed.) *Encyclopedia of the Sciences of Learning*. ISBN: 978-1-4419-1427-9. New York: Springer. [<link>](#)
- Izquierdo, L. R. (2010) *Advancing Learning and Evolutionary Game Theory with an Application to Social Dilemmas*. LAP Lambert Academic Publishing. ISBN: 978-3-8433-6133-0.

- Izquierdo, L.R. & Izquierdo, S.S. (2008). Dynamics of the Bush-Mosteller learning algorithm in 2x2 games. Chapter 11 in **Reinforcement Learning. Theory and Applications**, edited by Cornelius Weber, Mark Elshaw and Norbert Michael Mayer. I-Tech Education and Publishing, Vienna, Austria. ISBN: 978-3-902613-14-1.<link>
- Izquierdo, L.R. & Hanneman, R.A. (2006). Introduction to the Formal Analysis of Social Networks Using Mathematica. *Published in digital form at Wolfram Library.* <link>

## EDITORIAL AND REVIEWING WORK

- Associate Editor of *JASSS (Journal of Artificial Societies and Social Simulation)*.
- President of the Scientific Committee of the 15th International Conference on Industrial Engineering and Industrial Management (2021).
- Reviews conducted for: *Theoretical Economics, Economic Theory, Journal of Business Research, International Journal of Game Theory, Games, American Political Science Review, Journal of Theoretical Biology, Physical Review E, Physica A: Statistical Mechanics and Its Applications, Journal of Mathematical Psychology, Advances in Complex Systems, SoftwareX, Artificial Life, Mathematical Biosciences, Ecology and Society, Behavioural Processes, Environmental Modelling and Software, Simulation: Transactions of the Society for Modeling and Simulation*, etc.
- Member of the Scientific Committee of Artificial Economics 2015-2017, Conference on Complex Systems 2017, Winter Simulation Conference 2015, DRUID 2014-2016, World Congresses on Social Simulation (2006-2014), ESSA (European Social Simulation Association) Conferences 2009-2016, SIMULTECH 2013-2016, CompleNet 2013 and 2016, and II International Conference on Industrial Engineering and Industrial Management 2008.

## PREVIOUS PROFESSIONAL EXPERIENCE AND OTHER CONTRACTS

### Consultant for Video-Game Company

- Employer: Contracted by **Valve Corporation**, Bellevue, Washington, USA. (May - June).
- Dates of appointment: May 2013 – June 2013.

### Network Theorist and Agent-Based Simulation Modeller

- Employer: **CSIRO Sustainable Ecosystems**, Queensland Bioscience Precinct, 306 Carmody Road, St. Lucia, QLD 4067, Australia.
- Dates of appointment: May 2007 – August 2007.

### Agent-Based Simulation Modeller (Postdoctoral position)

- Employer: **The Macaulay Institute**, Craigiebuckler, Aberdeen, AB15 8QH, UK.
- Dates of appointment: July 2002 – October 2006.

## TEACHING ACTIVITY

- Responsible for teaching **University courses on Machine Learning, Finance, Game Theory, Statistics, Introductory Economics, and Microeconomics** (both in Spanish and in English) since 2006. *University of Burgos* (Spain). Level: Bachelor's.
- Responsible for teaching a **PhD course titled "Analysis of Complex Systems"** (2009-2012). *University of Burgos* (Spain). Level: Postgraduate.
- Invited by the **University of Valladolid** to run a 3-day workshop titled "*Introduction to Agent-based Modelling using NetLogo*". Soria (Spain), 9<sup>th</sup>-11<sup>th</sup> December 2015. Level: Postgraduate.
- Invited by the School of Business of the **University of Western Sydney** to run a 2-day workshop titled "*Introduction to Agent-based Modelling using NetLogo*". Sydney (Australia), 18<sup>th</sup>-19<sup>th</sup> November 2014. Level: Postgraduate.
- Invited teacher at the *ESSA Summer School in Social Simulation - 2014*, organised by the *European Social Simulation Association* and the **Universitat Autònoma de Barcelona**. Barcelona (Spain), 8<sup>th</sup>-12<sup>th</sup> September 2014. Level: Postgraduate.
- Invited teacher at the *Complexity Winter School 2012*, organised by the **Netherlands Organisation for Scientific Research** (NWO), Zandvoort (The Netherlands), 10<sup>th</sup>-14<sup>th</sup> December 2012. Level: Postgraduate.
- Invited teacher at the course *The economy as a complex evolving system: network theory, evolutionary models and computational tools*, organised by the **Network of Excellence DIMETIC**, Maastricht (The Netherlands), 11<sup>th</sup>-15<sup>th</sup> October 2010. Level: Postgraduate.
- Invited teacher at the *Complex Systems Research Summer School 2007*, organised by the *Centre for Research*

in *Complex Systems*, **Charles Sturt University**, Australia, 18<sup>th</sup>-30<sup>th</sup> November 2007. Level: Postgraduate.

- Invited instructor at the 8<sup>th</sup> *Asia-Pacific Complex Systems Conference: Complex'07*. Gold Coast, Australia, 2<sup>nd</sup>-5<sup>th</sup> July 2007. Course imparted: "Introduction to Agent-based Modelling using NetLogo". Level: Postdoctoral.

## SELECTED INVITED SEMINARS

- Economics Department at the **University of British Columbia** (Vancouver, Canada). 18<sup>th</sup> October 2023.
- Center for Control, Dynamical Systems, and Computation at the **University of California** (Santa Barbara, USA). Seminar series 2022. 23<sup>rd</sup> September 2022.
- Economics Department at the **University of Wisconsin-Madison** (Madison, USA). Juli Plant Grainger Theory Workshops Fall 2018. 5<sup>th</sup> October 2018.
- Economics Dept. at the **Universidad Pablo de Olavide** (Seville, Spain). 23<sup>rd</sup> January 2017.
- Economics Department at the **University of Wisconsin-Madison** (Madison, USA). Juli Plant Grainger Theory Workshops Fall 2016. 23<sup>rd</sup> September 2016.
- **Centre for Economic and International Studies** (University of Rome Tor Vergata, Italy). Riccardo Faini CEIS Seminars. 29<sup>th</sup> April 2016.
- Invited keynote speaker at Artificial Economics 2015 (Porto, Portugal). 4<sup>th</sup> September 2015.
- **Business School of the University of Western Australia**. Marketing Seminar Series. 5<sup>th</sup> November 2014.
- **School of Agricultural and Resource Economics of the University of Western Australia** (Perth, Australia). Seminar Series. 11<sup>th</sup> October 2013.
- **Business School of the University of Western Australia** (Perth, Australia). Marketing Seminar Series. 7<sup>th</sup> October 2013.
- Invited Speaker at the 4th Workshop on Complex Networks. 13<sup>th</sup>-15<sup>th</sup> March 2013, Berlin, Germany.
- **Valve Corporation** (Seattle, USA). 5<sup>th</sup> June 2012. Led to a 1-month contract as a consultant in June 2013.
- Center for Nonlinear Dynamics in Economics and Finance (CeNDEF) at **Amsterdam School of Economics** (Amsterdam, The Netherlands). Amsterdam School of Economics. 9<sup>th</sup> December 2011.
- **United Nations University** (Maastricht, The Netherlands). UNU-MERIT and MGSoG Joint Seminar Series. 15<sup>th</sup> September 2011.
- **SKEMA Business School** (Sophia-Antipolis, France). Economics Department. 2<sup>nd</sup> May 2011.
- Economics Department at the **University of Zaragoza** (Spain). 10<sup>th</sup> March 2011.
- **Institute for Biocomputation and Physics of Complex Systems (BIFI)** (Zaragoza, España). Seminar and Colloquia series. 13<sup>th</sup> May 2010.
- **Manchester Complexity Seminars** (Manchester Metropolitan Uni, UK). 16<sup>th</sup> June 2006.
- **Australian Research Council Centre for Complex Systems** (Brisbane, Australia). 11<sup>th</sup> May 2006.
- **University of Aberdeen's** MSc programme in E-Technology, e-Science and Grid Computing. Feb. 2006.

## COMPUTING SKILLS

- Programming Languages with high expertise: Mathematica (see several demonstrations [here](#)) and Netlogo (see several models [here](#)). Basic knowledge of Matlab, HTML, CSS and Javascript. Github page: <https://github.com/luis-r-izquierdo>. All my models can be downloaded at <https://luis-r-izquierdo.github.io>.

## AWARDS

- **Fulbright Scholarship**, to visit the University of California – Santa Barbara, USA. Jul – Sept 2022
- **Distinguished PhD Thesis** at the EDAMBA Thesis Competition 2009 (EDAMBA: European Doctoral Programmes Association in Management and Business Administration).
- Third Prize in the Student Contest at the First World Congress on Social Simulation, Kyoto, Japan, 2006.
- Award granted by the European Social Simulation Association to attend the First World Congress on Social Simulation, Kyoto, Japan, August 2006.
- Award for best presentation. Postgraduate Student Seminar Day. Macaulay Institute (UK), 9<sup>th</sup> March 2006.
- Award for the best student's record in Industrial Engineering (2002). University of Valladolid (Spain).