

Esteban Moro

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Research Scientist, Massachusetts Institute of Technology
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Education

1994	BSc in Physics	Universidad de Salamanca, Spain.
1995	MSc in Physics	Universidad de Salamanca, Spain.
1999	Ph.D. in Physics	Universidad Carlos III de Madrid, Spain.

Professional appointments

2007-present	Associate Professor (on leave) Department of Mathematics School of Engineering Universidad Carlos III de Madrid, Spain.
2019-present	Research Scientist. SocioTechnical Systems Research Center. Schwarzman College of Computing. Massachusetts Institute of Technology.
2016-2019	Visiting Professor MIT Media Lab School of Architecture + Planning Massachusetts Institute of Technology.
2003-2007	Research Associate (Ramón y Cajal Fellow) Department of Mathematics School of Engineering Universidad Carlos III de Madrid.
2001-2003	Research Assistant Department of Mathematics School of Engineering Universidad Carlos III de Madrid (Spain).
1999-2001	Research Associate (Marie Curie Fellow) Rudolf Peierls Centre for Theoretical Physics

Department of Physics
University of Oxford (UK).

Other Relevant Experience

2015-2018 Academic director at AFI Business School (Spain)
2015-2016 Associate Director of the Data Analytics Group at AFI (Spain)
1999-2005 Innovation Leader at Instituto de Ingeniería del Conocimiento (Spain).

Peer-Reviewed Articles

(only in the last ten years; Student authors in bold, *- corresponding author)

- 2022 **Tianyu Su, Maoran Sun, Zhuangyuan Fan**, Ariel Noyman, Alex Pentland, Esteban Moro*. *Rhythm of the streets: a street classification framework based on street activity patterns*. EPJ Data Science **11**, 43.
- 2022 Alberto Aleta, **David Martin-Corral**, Michiel A. Bakker, Ana Pastore y Piontti, Marco Ajelli, Maria Litvinova, Matteo Chinazzi, Natalie E. Dean, M. Elizabeth Halloran, Ira M. Longini, Alex Pentland, Alessandro Vespignani*, Yamir Moreno*, Esteban Moro*. *Quantifying the importance and location of SARS-CoV-2 transmission events in large metropolitan areas*. Proceedings of the National Academy of Sciences **119**, e2112182119.
- 2021 Iñaki Ucar, Marco Gramaglia, Marco Fiore, Zbigniew Smoreda, Esteban Moro*. *News or social media? Socio-economic divide of mobile service consumption*. *Journal of the Royal Society Interface* **18**, 20210350.
- 2021 Esteban Moro*, **Dan Calacci**, Xiaowen Dong, Alex Pentland. *Mobility patterns are associated with experienced income segregation in large US cities*. Nature Communications **12**, 4633.
- 2021 Dhaval Adjudah, Yan Leng, Shi Kai Chong, P. M. Krafft, Esteban Moro, Alex Pentland. *Accuracy-Risk Trade-Off Due to Social Learning in Crowd-Sourced Financial Predictions*. Entropy **23**, 801.
- 2021 Ruth F. Hunter, Leandro Garcia, Thiago Herick de Sa, Belen Zapata-Diomed, Christopher Millett, James Woodcock, Alex 'Sandy' Pentland, Esteban Moro*. *Effect of COVID-19 response policies on walking behavior in US cities*. Nature Communications **12**, 3652.
- 2021 Esteban Moro*, **Morgan R. Frank**, Alex Pentland, Alex Rutherford, Manuel Cebrian, Iyad Rahwan. *Universal resilience patterns in labor markets*. Nature Communications **12**, 1972.
- 2020 Xiaowen Dong, Alfredo J. Morales, **Eaman Jahani**, Esteban Moro, Bruno Lepri, Burcin Bozkaya, Carlos Sarraute, Yaneer Bar-Yam, Alex Pentland. *Segregated interactions in urban and online space*. EPJ Data Science **9**, 20.

- 2020 Alberto Aleta, **David Martin-Corral**, Ana Pastore y Piontti, Marco Ajelli, Maria Litvinova, Matteo Chinazzi, Natalie E. Dean, M. Elizabeth Halloran, Ira M. Longini Jr, Stefano Merler, Alex Pentland, Alessandro Vespignani*, Esteban Moro*, Yamir Moreno*. *Modelling the impact of testing, contact tracing and household quarantine on second waves of COVID-19*. *Nature Human Behaviour* **4**, 964--971.
- 2019 Marcin Waniek, Kai Zhou, Yevgeniy Vorobeychik, Esteban Moro, Tomasz P Michalak, Talal Rahwan. *How to Hide One's Relationships from Link Prediction Algorithms*. *Scientific Reports* **9**, 12208.
- 2019 **Morgan R Frank**, David Autor, James E Bessen, Erik Brynjolfsson, Manuel Cebrian, David J Deming, Maryann Feldman, Matthew Groh, Jose Lobo, Esteban Moro, Dashun Wang, Hyejin Youn, Iyad Rahwan. *Toward understanding the impact of artificial intelligence on labor*. *Proceedings of the National Academy of Sciences* **116**, 201900949.
- 2018 David Garcia, Yonas Mitike Kassa, Angel Cuevas, Manuel Cebrian, Esteban Moro, Iyad Rahwan, Ruben Cuevas. *Analyzing gender inequality through large-scale Facebook advertising data*. *Proceedings Of The National Academy Of Sciences* **115**, 6958--6963.
- 2018 Patrick Baylis, Nick Obradovich, Yury Kryvasheyev, Haohui Chen, Lorenzo Coviello, Esteban Moro, Manuel Cebrian, James H Fowler. *Weather impacts expressed sentiment*. *PLoS ONE* **13**, e0195750.
- 2017 **Henry Navarro, Giovanna Miritello**, Arturo Canales, Esteban Moro*. *Temporal patterns behind the strength of persistent ties*. *EPJ Data Science* **6**, 97.
- 2016 Yury Kryvasheyev, Haohui Chen, Nick Obradovich, Esteban Moro, Pascal Van Hentenryck, James Fowler, Manuel Cebrian. *Rapid assessment of disaster damage using social media activity*. *Science Advances* **2**, e1500779.
- 2015 **S Nesic**, R Cuerno, E Moro*, L Kondic. *Fully nonlinear dynamics of stochastic thin-film dewetting*. *Physical Review E, Statistical, nonlinear, and soft matter physics* **92**, 061002.
- 2015 Jari Saramaki*, Esteban Moro*. *From seconds to months: an overview of multi-scale dynamics of mobile telephone calls*. *European Physical Journal B* **88**, 164.
- 2015 **Alejandro Llorente**, Manuel Garcia-Herranz, Manuel Cebrian, Esteban Moro*. *Social Media Fingerprints of Unemployment*. *PLoS ONE* **10**, e0128692.
- 2015 Talayeh Aledavood, Eduardo Lopez, Sam G B Roberts, Felix Reed-Tsochas, Esteban Moro, Robin I M Dunbar, Jari Saramaki. *Daily Rhythms in Mobile Telephone Communication*. *PLoS ONE* **10**, e0138098--.
- 2014 **S Nesic**, R Cuerno, E Moro*. *Macroscopic response to microscopic intrinsic noise in three-dimensional Fisher fronts*. *Physical Review Letters* **113**, 180602.
- 2014 Manuel Garcia-Herranz, Esteban Moro, Manuel Cebrian, Nicholas A Christakis, James H Fowler. *Using friends as sensors to detect global-scale contagious outbreaks*. *PLoS ONE* **9**, e92413.

- 2015 Yury Kryvasheyeu, Haohui Chen, Esteban Moro, Pascal Van Hentenryck, Manuel Cebrian. *Performance of social network sensors during Hurricane Sandy*. PLoS ONE **10**, e0117288.
- 2013 Alex Rutherford, Manuel Cebrian, Sohan D'souza, Esteban Moro, Alex Pentland, Iyad Rahwan. *Limits of social mobilization*. Proceedings Of The National Academy Of Sciences Of The United States Of America **110**, 6281--6286.
- 2013 **Giovanna Miritello**, Ruben Lara, Manuel Cebrian, Esteban Moro*. *Limited communication capacity unveils strategies for human interaction*. Scientific Reports **3**, 1950.
- 2013 Coco Krumme, **Alejandro Llorente**, Manuel Cebrian, Alex Sandy Pentland, Esteban Moro*. *The predictability of consumer visitation patterns*. Scientific Reports **3**, 1645.
- 2013 **Giovanna Miritello**, Esteban Moro*, Ruben Lara, Rocio Martinez-Lopez, John Belchamber, Sam G B Roberts, Robin I M Dunbar. *Time as a limited resource - Communication strategy in mobile phone networks*. Social Networks **35**, 89--95.
- 2012 Roger Guimera, **Alejandro Llorente**, Esteban Moro, Marta Sales-Pardo. *Predicting Human Preferences Using the Block Structure of Complex Social Networks*. PLoS ONE **7**, e44620.
- 2012 **Alex J Bladon**, Esteban Moro*, Tobias Galla. *Agent-specific impact of single trades in financial markets*. Physical Review E, Statistical, nonlinear, and soft matter physics **85**, 036103.
- 2012 **Przemyslaw A Grabowicz**, Jose J. Ramasco, Esteban Moro, Josep M Pujol, Victor M Eguiluz. *Social Features of Online Networks: The Strength of Intermediary Ties in Online Social Media*. PLoS ONE **7**, e29358.
- 2011 **Jose Luis Iribarren**, Esteban Moro*. *Branching dynamics of viral information spreading*. Physical Review E **84**, 046116.
- 2011 **Jose Luis Iribarren**, Esteban Moro*. *Affinity Paths and information diffusion in social networks*. Social Networks **33**, 134--142.
- 2011 **Giovanna Miritello**, Esteban Moro*, Ruben Lara. *Dynamical strength of social ties in information spreading*. Physical Review E **83**, 045102.

Peer-Reviewed Conference Proceedings

(only in the last ten years; students in bold)

- 2022 **Berke, Alex**, Ronan Doorley, Kent Larson, and Esteban Moro. *Generating synthetic mobility data for a realistic population with RNNs to improve utility and privacy*. In Proceedings of the 37th ACM/SIGAPP Symposium on Applied Computing, pp. 964-967.
- 2021 Mulay, Nidhi, Vikas Bishnoi, Yatin Katyal, Mohsen Bahrami, Esteban Moro, Ankur Saraswat, and Alex Pentland. *Effects of stimulus checks on spending patterns of different economic groups*. In 2021 International Conference on Data Mining Workshops (ICDMW), pp. 873-877. IEEE, 2021.

- 2020 **Adjodah, Dhaval, Dan Calacci**, Abhimanyu Dubey, Anirudh Goyal, P. M. Krafft, Esteban Moro, and Alex Pentland. *Leveraging Communication Topologies Between Learning Agents in Deep Reinforcement Learning*. In Proceedings of the 19th International Conference on Autonomous Agents and Multiagent Systems (AAMAS), pp. 1738-1740.
- 2018 **Eaman Jahani**, Peter M Krafft, Yoshihiko Suhara, Esteban Moro, Alex Sandy Pentland. *ScamCoins, S*** Posters, and the Search for the Next Bitcoin™ : Collective Sensemaking in Cryptocurrency Discussions*. Proceedings of the ACM on Human-Computer Interaction **2**, 79, 1--28.
- 2018 Dubey, Abhimanyu, Esteban Moro, Manuel Cebrian, and Iyad Rahwan. *Memesequencer: Sparse matching for embedding image macros*. In Proceedings of the 2018 World Wide Web Conference, pp. 1225-1235.
- 2017 **Jahani, Eaman**, Guillaume Saint-Jacques, Pål Sundsøy, Johannes Bjelland, Esteban Moro, and Alex Sandy Pentland. *Differential network effects on economic outcomes: A structural perspective*. In International Conference on Social Informatics, pp. 41-50. Springer, Cham.
- 2016 Kooti, Farshad, Esteban Moro, and Kristina Lerman. *Twitter session analytics: Profiling users' short-term behavioral changes*. In International Conference on Social Informatics, pp. 71-86. Springer, Cham.
- 2016 Aledavood, Talayeh, Eduardo López, Sam GB Roberts, Felix Reed-Tsochas, Esteban Moro, Robin IM Dunbar, and Jari Saramäki. *Channel-specific daily patterns in mobile phone communication*. In Proceedings of ECCS 2014, pp. 209-218. Springer, Cham, 2016.

Peer-Reviewed Book Chapters

- 2018 Yan Leng, Xiaowen Dong, Esteban Moro, and Alex Pentland, "The Rippling Effect of Social Influence via Phone Communication Network", chapter in *Complex Spreading Phenomena in Social Systems*, Sune Lehmann, Yong-Yeol Ahn editors, Springer Nature, 2018.
- 2015 Esteban Moro, "Network Analysis", in *The Princeton Companion to Applied Mathematics*, Nicholas J. Higham editor, Princeton University Press, 2015.
- 2013 Giovanna Miritello, Ruben Lara, Esteban Moro, "Time allocation in social networks: correlation between social structure and human communication dynamics", in *Temporal Networks*, Petter Holme and Jari Saramäki, Editors, Springer, Berlin, Heidelberg, 2013.
- 2004 Esteban Moro, "The Minority Game: an introductory guide" chapter in "Advances in Condensed Matter and Statistical Physics", Elka Korutcheva and Rodolfo Cuerno editors, Nova Science Publishers, New York, 2004.

Peer-Reviewed Articles Under Review

(only in the last ten years; Student authors in bold, *- corresponding author)

- 2022 T. Yabe*, **B. Garcia-Bulle**, X. Dong, A. Pentland, and E. Moro*. *Behavioral changes during the pandemic worsened income diversity of urban encounters*. arXiv preprint arXiv:2207.06895. Revise & resubmit in *Nature Communications*.
- 2022 S. Wang*, Y. Zheng, G. Wang, T. Yabe, E. Moro*, A. Pentland. *Infrequent activities predict economic outcomes*. Under review in *Nature Human Behavior*.
- 2022 **D. Martín-Corral**, M. García-Herranz, M. Cebrian, E. Moro*. *Social Media Sensors to Detect Early Warnings of Influenza at Scale*. medRxiv preprint 2022.11.15.22282355. Under consideration in *Nature Communications*.
- 2022 **B. Garcia-Bulle**, A. L. Horn, B. M. Bell, M. Bahrami, B. Bozkaya, A. Pentland, K. de la Haye, and E. Moro*. *You are where you eat: Effect of mobile food environments on fast food visits*. medRxiv preprint. Under review at *Nature Communications*.
- 2022 **Z. Fan**, **T. Su**, M. Sun, A. Noyman, F. Zhang, A. Pentland, and E. Moro*. *Diversity beyond density: experienced social mixing of urban streets*. arXiv preprint arXiv:2209.07041. Under review at *PNAS Nexus*.
- 2022 Y. Yanni, A. Pentland, and E. Moro*. *Identifying latent activity behaviors and lifestyles using mobility data to describe urban dynamics*. arXiv preprint arXiv:2209.12095. Under review in *EPJ Data Science*.
- 2021 Vedran Sekara, Márton Karsai, Esteban Moro, Dohyung Kim, Enrique Delamonica Manuel Cebrian, Miguel Luengo-Oroz Rebeca Moreno Jiménez, and Manuel Garcia-Herranz, *Are machine learning technologies ready to be used for sustainable global development?*, under review in *Nature Machine Intelligence*.
- 2021 A. L. Horn, B. M. Bell, **B. Garcia Bulle Bueno**, M. Bahrami, B. Bozkaya, Y. Cui, J. P. Wilson, A. Pentland, E. Moro, K. de la Haye. *Investigating mobility-based fast food outlet visits as indicators of dietary intake and diet-related disease*. Under review in *NPJ Digital Medicine*.

Reports and Other Non-Peer Reviewed Publications

- 2020 Esteban Moro, *Using big data to understand inequality in cities*, in Anand, P., Chiappero-Martinetti, E., Corneo, G., Mcknight, A., Moro, E., O'Brien, D., & Stuhler, J. (2020). *Multidimensional perspectives on inequality: conceptual and empirical challenges*. Publications Office of the European Union.

Patents

- 2021 Adjodah, D., Pentland, A.P., Moro, E., Leng, Y., Krafft, P., Calacci, D. and Dubey, A., Massachusetts Institute of Technology, 2021. *Methods and apparatus for communication network*. U.S. Patent 10,992,541.

Competitive Grants

- 2023-2026 Mobility Data for Communities (MD4C): Uncovering Segregation, Climate Resilience, and Economic Development from Cell-Phone Records, NSF HNDS 2022 (awarded). PI: Dan O'Brien (NU), Alex Pentland (MIT), Esteban Moro (MIT). \$950000.
- 2021-2022 Unequal socio-economic impact and recovery of COVID-19 in Mexico. MIT Sloan Latin America Office Seed Funds. PI: Esteban Moro (MIT), \$16,000.
- 2020-2023 Statistical Physics for cities: models of mobility and inequality. PID2019-106811GB-C32, Ministerio de Ciencia e Innovación (Spain). PI: Esteban Moro (UC3M), €32000.
- 2017-2020 Statistical Mechanics to model and predict human behavior. FIS2016-78904-C3-3-P. Ministerio de Economía y Competitividad (Spain). PI: Esteban Moro (UC3M), €36300.
- 2018-2019 MyBubble: Influence of Algorithms in Users Filter Bubbles (2018), MIT MISTI Global Seed Funds. PI: Iyad Rahwan (MIT), Rubén Cuevas (UC3M), Esteban Moro (UC3M) y Antonio Fernández Anta (IMDEA). \$33,000.
- 2014-2017 Statistical Mechanics for "Big Data": acquisition, analysis, and modelization. FIS2013-47532-C3-3-P. Ministerio de Economía y Competitividad (Spain). PI: Esteban Moro. (UC3M). €31460.
- 2005-2006 HI2004-0179 (2005), Mesoscopics of a stock market, Ministerio de Educación Ciencia y Deportes, Programa de Acciones Integradas España Italia (Spain). PI: Esteban Moro (UC3M), Rosario Mantegna (Univ. Di Palermo). €16000
- 2004-2007 Statistical mechanics and non-linear dynamics of complex systems. FIS2004-01001 (2004-2007). Ministerio de Educación Ciencia y Deportes (Spain). PI: Esteban Moro (UC3M). €12000.

Research contracts

- 2019-2021 Mobility Rich Census. Company: Ferrovial. From 1/9/2019 to 1/9/2021. PI: Esteban Moro, \$360000.
- 2017-2019 Computational social science applied to Location Based Services geolocation data. Company: Thasos INC. PI: Esteban Moro, \$87500.
- 2015 Analyzing the influence of Twitter in political elections. Company: Twitter Spain S.L. PI: Esteban Moro Egido. €30000.
- 2015 Asesoramiento y consultoría sobre BigData. Company: AFI. Partners: AFI y UC3M. PI: Esteban Moro. €45000.
- 2014 The complexity of human tasks and individuals' performance. Company: University of Southern California. PI: Esteban Moro. €12000.
- 2014 Understanding social group formation and evolution in social networks. Company: XING AG. PI: Esteban Moro Egido. €15000.

- 2009-2014 Analysis of Social Networks applied to industrial processes. Company: Instituto de Ingeniería del Conocimiento, Spain. PI: Esteban Moro. €80000.
- 2007 Diffusion Optimization in Social Networks. Company: IBM. PI: Esteban Moro. €37000.

Invited Lectures, Keynotes

(only in the last ten years)

- 2022 Keynote talk - *You are where you eat: the effect of mobile food environments to fast food consumption*, Computational Social Science Satellite at Complex Systems Conference 2022, Palma de Mallorca, Spain, October.
- 2022 Invited talk - *Understanding urban resilience through behavioral mobility data*. TESCO Data Mashup, London, UK, September.
- 2022 Invited talk - *You are where you eat: the effect of mobile food environments to fast food consumption*. University of Southern California Public Health & Nutrition Research, June.
- 2022 Invited Lecture - *Understanding urban resilience through behavioral mobility data*. 7th KAIST GSI-IF 2022, Science of Inequality and Injustice, South Korea, July 5th.
- 2022 Invited talk - *Understanding urban inequality through behavioral mobility data*, invited talk to the Workshop on “Understanding the inequality in urban mobility and its implications”, Mansueto Institute of Urban Innovation, University of Chicago, June 16th.
- 2022 Keynote talk - *COVID-19 and Data: how to understand the pandemic using mobility data in our cities*, BIFI International Conference, June 7-9, Zaragoza, Spain.
- 2022 Invited talk - *Understanding resilience through behavioral mobility data*. “Technologies for Decision-Making in Humanitarian Context”, iMMAP Organization, Colombia.
- 2022 Invited talk - *Effect of COVID-19 response policies on walking behavior in US cities*. Centers for Disease Control and Prevention (CDC), Physical Activity and Health Branch, (online), June.
- 2021 Invited talk - *Universal resilience of labor networks*. “Complex Networks in Economics and Innovation”, Satellite workshop of Networks’21, Indiana University Network Science Institute, July 5-10.
- 2021 Invited talk - *Understanding urban resilience through behavioral mobility data*, The Alan Turing Institute, “Using Mobility Data in Urban Science” Workshop, October.
- 2021 Invited talk - *COVID-19 and Data: How to Understand the Pandemic Using Mobility Data in Our Cities*, New College of Florida, March.

- 2021 Invited Masterclass - *COVID19 y datos: cómo seguir la pandemia utilizando datos de movilidad en nuestras ciudades*. Masterclass en AFI Escuela de Finanzas, Madrid, January 28.
- 2021 Invited webinar - *Resilient social systems in urban areas: from social segregation to labor markets*. KPMG Denmark, March 10
- 2021 Invited talk - *Universal resilience patterns in labor markets*, UC3M-Santander Big Data Insitute, Universidad Carlos III de Madrid, Spain, May 13.
- 2021 Invited talk - *Resilient social systems in urban areas: from social segregation to labor markets*. ANET Lab, Centre for Economic and Regional Studies, Eötvös Loránd Research Network, May 21.
- 2021 Invited talk - *Resilient social systems in urban areas: from social segregation to labor markets*. Digital Futures HiSS Project Workshop, KTH, Suecia, September 13.
- 2021 Invited webinar - *Inequality (and epidemics) in cities at high resolution*. Computational Social Science Laboratory, The Chinese University of Hong Kong, October 20.
- 2021 Invited talk - *Understanding urban resilience through behavioral mobility data*. University of Pittsburgh Computational Social Science Seminars, December 3.
- 2020 Invited talk - *The Atlas of Inequality*. DG Joint Research Center, European Commission, Ispra (Italy), January 24.
- 2020 Invited talk - *Segregation (and epidemics) in cities at high resolution*. Harvard Growth Lab, Harvard University, May 11.
- 2020 Invited talk - *El Atlas de desigualdad: entendiendo la segregación en nuestras ciudades con Big Data*, Spanish National Institute of Statistics, June 18.
- 2020 Invited talk - *Modelling the impact of testing, contact tracing, and household quarantine on second waves of COVID-19*. Colloquium on Computational Social Science/Computational Science and Informatics, Department of Computational and Data Sciences, George Mason University, September 18.
- 2020 Keynote talk - *Atlas of Inequality: segregation at high resolution in urban areas*, 7th Mobile Tartu 2020, Tartu, Estonia, June 30.
- 2020 Invited talk - *Segregation (and epidemics) in cities at high resolution*. Facebook, Palo Alto, California, October 15.
- 2020 Invited talk - *Resilient social systems in urban areas: from social segregation to labor markets*, “Merging social, economic and ecological networks for sustainable and resilient food systems” Symposium, Newcastle University, UK, December 7.
- 2019 Invited talk - *The Atlas of Inequality: segregation at high resolution*. Opportunity Insights Group Seminars, Harvard University, December 4.
- 2019 Invited talk - *The Atlas of Inequality: segregation at high resolution*. Data Science Seminars, Data Science Institute, Brown University, September 12.

- 2019 Invited Keynote - *The Atlas of Inequality: Understanding segregation at high resolution*, at “Network Science for Social Good”, Satellite workshop at NetSci 2019, Burlington, Vermont, May 27-31.
- 2019 Invited talk - *Urban behaviors and Segregation*. Department of Sociology, Harvard University, February 22.
- 2018 TED talk - Overcoming urban isolation, TEDx Cambridge, Cambridge, MA, September.
- 2018 Invited talk - *Cities at high resolution: understanding social segregation using encounter networks*. Center for Data Science NYU, New York City, March.
- 2018 Invited talk - *Cities at high resolution: understanding social segregation using encounter networks*. Unicef Innovation, New York City, March.
- 2018 Invited talk - *Cities at high resolution: understanding social segregation using encounter networks*, at “Network Interventions for the Social Good” workshop within the ICCS 2018 conference, Cambridge, MA. July 22-27.
- 2018 Invited talk - *The lifetime of strong ties*. Harvard T.H. Chan School of Public Health, February.
- 2017 Invited talk - *What comes first? Social strength or common friends?* Complex Systems Center, University of Vermont, May.
- 2017 Invited talk - *What comes first? Social strength or common friends?* Yale Institute for Network Science, May.
- 2017 Keynote talk - *The Lifetime of strong ties*. NERCCS 2018, 1st Northeast Regional Conference on Complex Systems, Binghamton, NY, April 12-13.
- 2017 Invited talk - *The Lifetime of strong ties*. University of Greenwich, London (UK), October.
- 2017 Invited talk - *Segregation networks in cities*, Insitute for Data Science, Imperial College, London (UK), November.
- 2017 Invited talk - *Segregation networks in cities*. Vodafone Research Lab, London (UK), November.
- 2016 Invited talk - *Are you a social explorer or a social keeper? Social strategies in dynamical networks*. Center for Complex Network Research, Northeastern University, Boston, August.
- 2016 Invited talk - *Pace of change in urban social networks*. DTU, Copenhagen, Denmark, June.
- 2016 Invited lecture - *Social and economic networks from (big-)data*. Lake Como School of Advanced Studies, Como, Italy, May 18.
- 2016 Invited talk - *Mining human behavior through proprietary and open data*. Vodafone Research Lab, London (UK), April.
- 2016 Invited lecture - *Dynamics in complex networks. Analyzing real-world (mobile) data*. Wroclaw University of Technology, Poland, January.

- 2015 Invited talk - *How does a tweet propagate? Information diffusion in social networks*. Ph.D. program in Physics, Universidad de Salamanca, Salamanca (Spain), March.
- 2015 Invited talk - *Social media fingerprints of unemployment*. IMDEA Networks, Madrid, June
- 2015 Invited talk - *Big problems and Data Science*. Telefónica Foundation, Madrid, Spain, March.
- 2014 Invited lecture - *Temporal Dynamics of human behavior in social networks*. Complex Networks Thematic School, Les Houches, France, April.
- 2014 Invited talk - *Are you a social keeper or a social explorer? The dynamics of human social behavior in communication networks*, Mathematics of Social Learning, UCLA, Los Angeles, January 6-10.
- 2013 Invited talk - *Using geolocalized big data for social good*. Universidad Politécnica de Madrid, Spain, November.
- 2013 Invited talk - *The geographical limits of social mobilization*. Barcelona digital, Barcelona, Spain, October.
- 2013 Invited talk - *Big Data and Human Behavior: social communication strategies*. BigDataCYL2013, Telefónica Digital, Boecillo, Spain, March.
- 2013 Invited talk - *Following information in social networks: how social structure and dynamics impact message transmission*. Jornadas MAVIR, UNED, Spain, March.
- 2012 Invited lectures - *Spreading on static and dynamical networks*. Aalto Complex Network Factory, Porvoo, Finland, June.
- 2011 Invited talk - *The dynamical strength of social ties in information spreading*. Aalto University, Finland, February.
- 2011 Invited talk - *The dynamical strength of social ties in information spreading*. Departament de Física Fonamental, Universidad de Barcelona, March 2011.
- 2011 Invited talk - *Market impact and Trading Strategies*. Departament de Física Fonamental, Universidad de Barcelona, March.
- 2011 Invited talk - *The dynamical strength of social ties in information spreading*. Yahoo Research Barcelona, Spain, June.
- 2011 Invited talk - *The dynamical strength of social ties in information spreading*. Department of Computer Science, University of California San Diego, August.

Oral Conference Presentations

(only in the last ten years, only as presenter)

- 2020 *Segregated behaviors in American Cities*, 6th International Conference on Computational Social Science (IC2S2), Massachusetts Institute of Technology, July 17-20.

- 2020 *Boston's invisible borders*, Boston Area Research Initiative (BARI) conference, Boston, March-July 2020.
- 2019 *Observing and overcoming Dunbar Cognitive Limitations in Financial Networks*, Lighting Talk in NetSci 2019, Burlington, Vermont, May 27-31.
- 2019 *Universal resilience of labor markets*, Lighting Talk in NetSci 2019, Burlington, Vermont, May 27-31.
- 2019 *News or Facebook? Regional socio-economical patterns of mobile service consumption*, Talk in Netmob19, Oxford, Reino Unido, July 8-10.
- 2019 *Economic Segregation of Encounter Networks in cities*, Talk in Netmob19, Oxford, Reino Unido, July 8-10.
- 2018 *Tie strength precedes social embeddedness*, 4th International Conference on Computational Social Science (IC2S2), Northwestern University, Evanston, July 12-15.
- 2018 *Economic Segregation of Encounter Networks in cities*, Netsci 2018, 11-15 June 2018, Paris. France.
- 2018 *Tie strength precedes social embeddedness*, Netsci 2018, 11-15 June 2018, Paris. France.
- 2018 *Tie strength precedes social embeddedness*, Complemet 2018, March 4-8 2018, Boston, USA.
- 2017 *What comes first? Social Strength or common friends?*, NetSci2017, June 19-23 2017, Indianapolis, USA.
- 2017 *What comes first? Social Strength or common friends?*, Netmob 2017, April 5-7 2017, Milano, Italy.
- 2017 *Why people stop calling? The temporal weakness of decaying ties?* Netmob 2017, April 5-7 2017, Milano, Italy.
- 2015 *Temporal dynamics of social networks within cities*, Netmob 2015, MIT Media Lab, Cambridge, April 7-10.
- 2015 *Social media fingerprints of unemployment*, NetSci 2015, Zaragoza, Spain, June 1-5.
- 2014 *Using friends as sensors to detect global-scale contagious outbreaks*, European Conference on Complex Systems (ECCS) 2014, Lucca, Italy, September 22-26.
- 2014 *Social media and city dynamics*, European Conference on Complex Systems (ECCS) 2014, Lucca, Italy, September 22-26.
- 2014 *The dynamics of social networks within cities*, European Conference on Complex Systems (ECCS) 2014, Lucca, Italy, September 22-26.
- 2013 *The dynamics of human social behavior in communication networks*, European Conference on Complex Systems (ECCS) 2013, Barcelona, Spain, September 16-20.
- 2013 *Using friends as sensors to detect global-scale contagious outbreaks*, NetSci 2013, Copenhagen, Denmark, June 3-7,

- 2013 *Limited communication capacity unveils strategies for human interaction*, NetSci 2013, Copenhagen, Denmark, June 3-7.
- 2013 *Limited communication capacity unveils strategies for human interaction*, Netmob 2013, Boston, MA, May 1-3.
- 2012 *Agent-specific impact of single trades in financial markets*, “Market MicroStructure: confronting many viewpoints” workshop, Paris, France, December 10-13.
- 2012 *Social features of online networks: The strength of intermediary ties in online social media*, NetSci 2012, Chicago, June 18-22.
- 2012 *The evolution of communication ties*, NetSci 2012, Chicago, June 18-22.
- 2011 *Time allocation in social networks*. Netmob 2011, MIT Media Lab, Cambridge, MA, October 10-11.

Professional Organizations

Network Science Society
 Spanish Physics Society
 Association for Computing Machinery
 Boston Area Research Initiative

Master’s Thesis, Advisor

- 2022 Tingyu Li, *Modeling the Efficacy of the 15-Minute City Using Large-Scale Mobility Data from the Perspective of Accessibility and User Choice: A Case Study on the Urban Food Environment*, Master of Engineering in Electrical Engineering and Computer Science, MIT May 2022.
- 2020 Srijith Poduval, *Simulating Income Segregation through Behavioral Adjustments using Mobile Location Data*, Master in Engineering in Electrical Engineering and Computer Science, MIT, May 2020.
- 2020 Juye Shirley Lu, *To Mirror or Not to Mirror – Modeling Relationships in Social Trading*, Master in Engineering in Electrical Engineering and Computer Science, MIT, May 2020.
- 2019 May Alhazzani, *Deep Embedding Approach to Classify Purpose of Trips between Cities from GPS Data*, Master of Science in Media Arts and Sciences, MIT, September 2019. Co-advisor.
- 2018 Katherine Botz, *Madrid City Location Intelligence using Big Data*, Master in Big Data, Universidad Carlos III de Madrid, June 2018.
- 2015 Henry Daniel Navarro Hernández, *The tie decay problem in social networks: Why do people stop calling?*, Master in Mathematical Engineering, Universidad Carlos III de Madrid, July 2015.

Doctoral Theses, Advisor

- 2024 Bernardo García Bulle Bueno, *Impact of social learning patterns of groups and individuals in health, educational, and societal systems*, co-advised with Prof. Sandy Pentland, IDSS, Massachusetts Institute of Technology, proposal expected June 2024.
- 2022 David Martin-Corral, *Mathematical models of digital epidemiology in social networks*, Universidad Carlos III de Madrid, defense expected December 2022.
- 2016 Llorente, Alejandro, *Mobility and interaction patterns in social networks*, Universidad Carlos III de Madrid, July 2016.
- 2015 Svetozar Netic, *Stochastic Dynamics of Substrate-confined systems: Fisher fronts and Thin Liquid Films*, Universidad Carlos III de Madrid, June 2015.
- 2013 Miritello, Giovanna, *Temporal Patterns of Communication in Social Networks*, Universidad Carlos III de Madrid, December 2013.

Doctoral Theses, Reader

- 2022 Ariel Noyman, *CityScope: an urban modeling and simulation platform*, advised by Kent Larson, Program in Media Arts and Sciences, MIT, May 2022.
- 2021 Yuan Yuan, *Understanding and Reshaping Social Networks with Advanced Computational Techniques*, advised by Prof. Alex Pentland, IDSS MIT, September 2021.
- 2021 Tara Sowrirajan, *Collective Dynamics from Heterogeneous Interactions in Socioeconomic Networks*, Tara Sowrirajan, School of Engineering and Applied Sciences, Harvard University, May 2021.
- 2020 Lorenzo Lucchini, *The Impact Of Innovators' Behavior: a study on attractiveness and coordination*, Department of Information Engineering and Computer Science, University of Trento, Italy, February 2020.
- 2020 Yan Leng, *Collective Behavior over Social Networks with Data-driven and Machine Learning Models*, Program in Media Arts and Sciences, School of Architecture and Planning, MIT, May 2020.
- 2019 Alejandro Noriega Campero, *Human and Artificial Intelligence in Decision Systems for Social Development*, Program in Media Arts and Sciences, School of Architecture and Planning, MIT, September 2019.
- 2019 Daval D. K. Adjodah, *Social Inductive Biases for Reinforcement Learning*, Program in Media Arts and Sciences, School of Architecture and Planning, MIT, September 2019.

2017 Andrey Bogomolov, *Predictive Modeling of Human Behavior: Supervised Learning from Telecom Metadata*, Department of Information Engineering and Computer Science, Università Degli Studi Di Trento, Italy, March 2017.

Service to College and University

2019- Evaluator of the MITSI See Fund Grants at the Massachusetts Institute of Technology.
2019- Organizer of the MIT Human Dynamics Computational Social Science seminars.
2005-2009 Director of the Ph.D. Program in Complex Systems at Universidad Carlos III de Madrid, Spain (2005-2009).

Service to the Community and Profession

2010- Member of the Journal of Statistical Mechanics: Theory and Experiment (JSTAT) Editorial Board. IOP Publishers.
2015- Member of the EPJ Data Science Editorial Board, Springer Nature.
2019-2022 General Chair of Complex Networks 2020 and 2021, Madrid, Spain.
2019-2020 Local Chair, International Conference on Computational Social Science (IC2S2), MIT, 2020.
2019-2020 Program Chair, Complex Networks 2019, Lisbon.
2019 General Chair Netmob 2019, University of Oxford, UK.
2017 General Chair Netmob 2017, Vodafone Italy, Milano, Italy.
2015 Program Chair Netsci 2015, Zaragoza, Spain.
2015 Organizer, General Chair of Netmob 2015, MIT, US.
2022 Program Committee Member of Netsci 2022, Shanghai, China.
2022 Program Committee Member of Complex Networks 2022.
2019 Senior Program Committee Member of Netsci 2019.
2019 Program Committee Member IC2S2 2019.
2019 Program Committee Member Netsci-X 2019, Santiago de Chile, Chile,
2018 Program Committee Member IC2S2 2018, Chicago, US.
2018 Program Committee Member of Complex Networks 2018, Cambridge, UK.
2018 Program Committee Member of Netsci 2018, Paris, France.
2018 Program Committee Member of CompleNet'18, Boston, US.
2018 Program Committee Member of NetSci-X 2018, Hangzhou, China.
2017 Program Committee Member of the Conference on Complex Systems. (CCS) 2017, Cancún, México.
2016 Program Committee Member of IC2S2 2016, Northwestern University, Chicago, US.
2016 Program Committee Member of Complex Networks 2016, Milan, Italy 2016.
2015 Program Committee Member of IC2S2 2015, Helsinki, Finland.

2007-2010 Editor, Revista Española de Física (Spanish Physics Society Proceedings), Spain.
2010-2015 Evaluator for the European Commission for the FP7 and & H2020 Programs.
2010- Evaluator for the Spanish Ministry of Science Research Programs.
2020- Member of the Scientific Committee at CARTO.

Awards & Honors

2015 Excellence in Research Award, Universidad Carlos III de Madrid.
2013 Excellence in Research Award, Universidad Carlos III de Madrid.
2007 IBM Shared University Award.
2003 *Ramón y Cajal* fellowship, Ministerio de Ciencia, Spain.
1999 *Marie Skłodowska Curie* fellowship, European Commission, EU.

Journal and Manuscript Review

Science, Nature, Nature Human Behavior, PNAS, Physical Review Letters, Nature Physics, Physical Review Letters, Nature Communications, Science Advances, Scientific Reports, PLoS ONE, EPJ Data Science, Physical Review E, Digital Health (SAGE), npj Urban Sustainability, Social Networks.

Teaching experience

26 years of teaching experience at undergraduate, graduate, and business school levels. More than 40 courses.

- Undergraduate programs:
 - Computer Science degree (Universidad Carlos II de Madrid).
 - Civil Engineering (Universidad Carlos III de Madrid).
 - Bio-Medical Engineering (Universidad Carlos III de Madrid).
 - Media Arts and Sciences (Massachusetts Institute of Technology).
 - Instructor and coordinator of courses. Typical enrollment ~100 students
 - Courses taught:
 - Linear Algebra: introduction to linear algebra. Years 2001 to 2016
 - Linear Algebra II: Advanced topics in linear algebra. Years 2001 to 2007
 - Calculus: introduction to calculus. Years 1997-1998.
 - Calculus III: advanced topics in Calculus. Years 2001
 - Discrete Mathematics. Years 1995-1996.
 - Partial Differential Equations. Years 2006.
 - AI for Impact, Years 2020.
- Graduate programs:
 - Mathematical Engineering Ph.D. program (Universidad Carlos III de Madrid).

- Complex Systems Ph.D. program. (Universidad Carlos III de Madrid).
- Master in Big Data Analytics (Universidad Carlos III de Madrid).
- Master in Political and Electoral Analysis (Universidad Carlos III de Madrid)
- Master in Data Science and Big Data in Finance (AFI Business School).
- Theoretical Physics Ph.D. program (University of Oxford).
- Instructor, coordinator, and designer of courses. Typical Enrollment ~20 students.
- Director of the Ph.D. Program in Complex Systems at UC3M (2005-2009).
- Courses taught:
 - Stochastic differential equations. Years: 2008, 2010. 2013, 2014, 2015.
 - Econophysics. Years: 2008, 2009, 2010.
 - Numerical methods in Complex Systems. Years: 2012
 - Complex Systems: Advanced Topics. Years: 2013.
 - Social Network Analysis. Years: 2015.
 - Graph Analysis and data visualization applications. Years: 2015.
 - Network analysis and data visualization. Years: 2017 to present.
 - Introduction to Big data. Years: 2018 to present.
- MBA Programs:
 - Master in Data Science and Big Data in Finance (AFI Business School).
 - Data Analytics Certificate, MIT Sloan and Universidad de Chile (MIT).
 - Instructor, coordinator, and designer of courses.
 - Director of the AFI Master in Data Science and Big Data (2014-2015).
 - Courses taught:
 - Applications of Social Network Analysis to Finance. 2018 to present.
 - Location Intelligence. Years: 2018 to present.
 - Analysis of mobility data. Years: 2022.

Media coverage

(only in the last ten years)

2022 *You are where you eat: Effect of mobile food environments on fast food visits.*

- [How Big Data Could Solve Food Inequity](#), *The Daily Beast*

2022 *News or social media? Socio-economic divide of mobile service consumption.*

- [A new digital gap in internet usage between rich and poor people has been detected](#), Universidad Carlos III de Madrid News.
- [A new digital gap in internet usage between rich and poor people has been detected](#), Eureka Alert, AAAS.
- [Del correo y las noticias a Facebook y Youtube: así se usa internet según barrios ricos y pobres](#), El País.

- 2021 *Mobility patterns are associated with experienced income segregation in large US cities.*
- [Mobility patterns influence how we experience income segregation in our cities](#), MIT Media Lab News.
- 2021 *Universal resilience patterns in labor markets.*
- [Job connectivity improves resiliency in US cities, study finds](#), MIT News.
 - [Track how technology is transforming work](#), Nature Journal Comment.
- 2021 *Quantifying the importance and location of SARS-CoV-2 transmission events in large metropolitan areas*
- [Los móviles geolocalizados cuentan cómo funciona la distancia social en Nueva York](#), SiNC.
- 2021 *Effect of COVID-19 response policies on walking behavior in US cities*
- [Lockdowns reveal inequities in opportunities for walking activities](#), MIT News
 - [Study: More people walked during the pandemic, but how much depended on their income level](#), Boston.com
 - [COVID-related lockdowns reveal inequities in opportunities for walking](#), Center for Public Health, Queen's University Belfast News.
- 2020 *Modeling the impact of social distancing, testing, contact tracing and household quarantine on second-wave scenarios of the COVID-19 epidemic*
- [Modeling the impact of testing, tracing, and quarantine](#), MIT News, September 8, 2020
 - [Measuring the Effectiveness of Coronavirus Social Distancing Policies](#), Wall Street Journal, April 10, 2020
 - [More waves of virus cases could follow the first, health experts warn](#), The Dallas Morning News, April 10, 2020
 - [Un estudio muestra que los test sin rastreo eficaz de contactos son insuficientes para frenar la oleada](#), El Pais, August 12, 2020
 - [The effectiveness of social distancing strategies in the face of an epidemic](#) Medical Xpress, March 27, 2020
 - [Lockdowns reveal inequities in opportunities for walking activities](#), MIT News
- 2018 *Analyzing gender inequality through large-scale Facebook advertising data*
- [Facebook Use Linked to Gender Equality](#), Scientific American
 - [Researchers are using Facebook data to study gender inequality](#), Mic

- [New tool using Facebook data shows worldwide gender gap](#), Phys.org
- [La brecha de género en Facebook refleja la desigualdad real](#), El País

2018 *Weather impacts expressed sentiment*

- [It's not just you: dark clouds are linked with darker moods](#), Newsweek
- [Under the Weather? How social media sentiments reflect weather patterns](#), PLOS Research News
- [The Way We Talk Online Is Impacted by Changing Weather, Study Finds](#), The Weather Channel
- [Bad weather is 'more depressing than terrorist attack', study finds](#), Yahoo UK News
- [When the weather is good, we are happier on social networks](#), Eureka News
- [Weather associated with sentiments expressed on social media](#), Phys.org
- [La temperatura de la felicidad es de 25 grados a mediodía y 10 por la noche](#), La Vanguardia

2019 *Atlas of Inequality*

- ['Atlas Of Inequality' Shows Income Segregation Around Boston](#), WBUR.
- [Dear White People: Moving To A Diverse Neighborhood Isn't Enough](#), WBUR
- [The Atlas of Inequality and Cuebiq's data for good initiative](#), The Gov Lab.
- [Visualizing where rich and poor people really cross paths—or don't](#), Fast Company.

2016 *Rapid assessment of disaster damage using social media activity*

- [Twitter can predict hurricane damage as well as emergency agencies](#), Science Magazine
- [Twitter Storms Can Help Gauge Damage of Real Storms and Disasters](#), Study Says, Wall Street Journal
- [Why your tweets could really matter during a natural disaster](#), The Washington Post
- [Twitter May Be Faster Than FEMA Models for Tracking Disaster Damage](#), Smithsonian.com
- [Tweets about Hurricane Sandy were a good predictor of storm damage, study suggests](#), The Verge
- [Twitter-Aktivität zeigt Ausmaß der Schadenshöhe](#), Die Welt
- [Twitter sabe antes que nadie cuánto cuestan las catástrofes](#), El País
- [Twitter predice la severidad de los daños materiales de un huracán](#), La Vanguardia
- [Investigadores señalan a Twitter como una herramienta útil para mejorar la respuesta ante desastres naturales](#), LaInformación.com

2016 *Social media fingerprints of unemployment*

- [Twitter "Exhaust" Reveals Patterns of Unemployment](#), MIT Technology Review.
- [Tweets Tell Whether You Have A Job](#), InformationWeek.
- [Así tuitea España](#), El País (spanish).
- [What makes Spain tweet?](#) El País (english).
- [Cómo la gente usa Twitter revela datos claves de la economía](#), Clarín.
- [Los viajes de un día en España, resumidos en un vídeo de menos de 2 minutos](#), EuropaPress.
- [Los datos no mienten: donde se tuitea con más faltas de ortografía, hay más paro](#), El Confidencial.
- [El nuevo mapa de España según Twitter](#), La Voz de Galicia.
- [Crean mapa interactivo que refleja como nos movemos los españoles](#). Antena 3.
- [Cómo, cuándo y dónde se tuitea en España](#), Marketing Directo.
- [¿Cómo se tuitea en España?](#) Merca2.0.
- [Así nos movemos los españoles en un día normal](#),
- [Los secretos del pájaro azul](#), El País.
- [What Twitter can tell us about Unemployment](#), Bloomberg CityLab.
- [You can use Twitter activity to track unemployment](#), Engadget.
- [Interesting Research Using Twitter; The Unemployed Get Up Late And Can't Spell](#), Forbes.
- [Là où le chômage est fort, les utilisateurs de Twitter sont plus nombreux](#), L'Express.

2014 *Performance of Social Network Sensors during Hurricane Sandy*

- [Popular friends on social media can help save you from disasters](#), The Conversation.

2014 *Using Friends as Sensors to Detect Global-Scale Contagious Outbreaks*

- [The science of going viral](#), The Chronicle of Higher Education.
- [How to Use Twitter Friends as Sensors to Detect Disease Outbreaks](#), Technology Review MIT.
- [Going viral: How 'social contagion' begins and escalates](#), Yale News.
- [How 'social contagion' begins and escalates](#),
- [System detects global trends in social networks two months in advance](#), ScienceDaily.

- [Tus tuits predicen el futuro](#), Huffington Post.
- [Predicting contagious outbreaks using your most popular friends](#), FastCompany.

2014 *The predictability of consumer visitation patterns*

- [All real-world shoppers are zombies](#), Lifehacker.
- [Animales de costumbres a la hora de la compra](#), ABC.es
- [Consumers almost always buy in the same shops](#), EurekAlert.
- [Compramos casi siempre en las mismas tiendas](#), Puromarketing
- [Shopping habits predictable to a point](#), ABC Science.

2013 *Limits of social mobilization*

- [How social media mobilizes society](#), LiveScience
- [La movilización por redes sociales puede ser rápida, pero tiene límites](#), Muy Interesante.
- [Researchers root out the limits of social mobilization.](#)
- [Using social networks for mobilization has its limits](#), DiCyT
- [¿Son las Redes sociales una buena herramienta de movilización social en situaciones críticas ?](#) (radio), RTVE
- [Las movilizaciones en redes sociales son muy eficientes, si están dirigidas](#), Tendencias21.
- [Facebook passes research test for quick responses, collaboration](#), NBC News.
- [Social media has limited mobilisation power](#), ABC Science.