Curriculum Vitae

Cristina Cano, PhD
Associate Professor

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Short Bio

I obtained the Telecommunications Engineering Degree at the **Universitat Politècnica de Catalunya (UPC)** in February 2006. Then, I received the M.Sc. (2007) and Ph.D. (2011) on Information, Communication and Audiovisual Media Technologies from the **Universitat Pompeu Fabra (UPF)**. From July 2012 to December 2014, I was working as a research fellow at the **Hamilton Institute** in the National University of Ireland, Maynooth (NUIM). Part of this research group is now based in **Trinity College Dublin** (School of Computer Science and Statistics), where I was working from January 2015 to January 2016 as a senior research fellow. I was a research scientist at the FUN team at **Inria Lille Nord-Europe** from January 2016 to July 2016. I joined the WINE Group of the **Universitat Oberta de Catalunya** in 2016 as a senior research fellow and from September 2018 I am an associate professor in the Faculty of Computer Science, Multimedia and Telecommunications of the university. My current research interests are related to coexistence of wireless heterogeneous networks and machine learning applied to optimisation of wireless networks.

Research Topics

- **Current Research Interests:**
    - Machine learning for wireless network optimisation.
    - Medium access control layer design, optimisation, coexistence, resource allocation and stability.
    - Unlicensed LTE, WiFi, 802.15.4e TSCH, 802.11ah, M2M, PLC and mmWave networks.
- **Most Recent Research Achievements:**
    - Identifying barriers to wireless adoption in the manufacturing industry and ways forward.
    - Providing fairness guarantees between unlicensed LTE and WiFi networks via bandit convex optimization.
    - Learning mechanisms for distributed TDMA operation in WiFi and mmWave networks.
    - Characterisation of a long transitory phase in random access protocols.

Academic Career

- September 2016 – now: Associate Professor, Universitat Oberta de Catalunya, Spain.
- September 2016 – September 2018: Senior Research Fellow, Universitat Oberta de Catalunya, Spain.
- January 2016 – July 2016: Research Scientist, Inria, FUN Team, Lille, France.
- January 2015 – January 2016: Senior Research Fellow, SCSS, Trinity College Dublin, Dublin, Ireland.
- July 2012 – December 2014: Research Fellow, Hamilton Institute, NUIM, Maynooth, Ireland .
- May 2011 – July 2012: Research Fellow, DTIC, UPF, Spain.
- Sept 2007 – May 2011: PhD student, DTIC / Teacher Assistant, Polytechnic School, UPF, Spain.

Education

- **Doctor of Philosophy (Ph.D.) - 2011**
    - Department of Information and Communication Technologies (DTIC)
    - Universitat Pompeu Fabra, Barcelona, Spain
    - Thesis: *"A Low Power Listening with Wake up after Transmissions MAC Protocol for WSNs"*
    - Advisors: Dr. Boris Bellalta (UPF), Dr. Miquel Oliver (UPF)

- **Master of Science (M.Sc.) - 2007**
  - Department of Information and Communication Technologies
  - Universitat Pompeu Fabra, Barcelona, Spain
  - Thesis: *"Flow-level Admission Control in IEEE 802.11e Networks"*
  - Advisors: Dr. Boris Bellalta (UPF), Dr. Miquel Oliver (UPF)

- **Higher Diploma in Telecommunications (*Telecommunications Engineering Degree*) – 2006**
  - Universitat Politècnica de Catalunya (Escola Politècnica Superior de Castelldefels), Spain
  - Thesis: *"Study of Traffic Fractality in Ad-hoc WLAN Networks"*
  - Advisor: Dr. David Rincón (UPC)

- **Bachelor of Telematics (*Technical Telecommunications Engineering spec. in Telematics*) – 2004**
  - Universitat Politècnica de Catalunya (Escola Politècnica Superior de Castelldefels), Spain
  - Thesis: *"Software Development Oriented to Analysis and Generation of Fractal Traffic"*
  - Advisor: Dr. David Rincón (UPC)

R&D Project Experience

- **Principal Investigator:**
  - Cisco Gift (expected 2019-pending signature). Silicon Valley Community Foundation.
    - Exploiting dual-band LPWAN for opportunistic low-cost communications. Funding: $120K.
  - UP-ORCA (2018). H2020 Open Call ORCA project.
    - Evaluation of unlicensed LTE approaches in ns-3 and SDR interfacing. Funding: 80K.
- **Involvement in projects:**
  - FAME (2012-2014). Science Foundation Ireland.
    - *Evaluation of pulsed interference in WLAN experiments.*
  - COMMONSENS (2009-2014). Spanish Government (CONSOLIDER-INGENIO).
    - *Development the fundamental theory to understand and optimally build WSNs.*
  - GEPETO (2009-2011). Spanish Government (CYCIT - Ministerio de Ciencia e Innovación).
    - *Design mechanisms for multimedia transmission in wireless networks.*
  - SYNCSEN (2008-2010). FP7 European Commission (CRAFT Program).
    - *Design and evaluation a new routing protocol for data collection in metering applications for WSNs.*
  - CITYBEE (2006-2008). FP7 European Commission (CRAFT Program).
    - *Evaluation of a new cluster-based routing approach for WSN.*
- Expertise in project-related **management** tasks (task leader, deliverables preparation and work coordination).
- Participation in **project proposal preparations**:
  - Horizon 2020, FP7, SFI (Science Foundation Ireland) and Cisco Awards.

Collaborations

List of main collaborators:

- **School of Computer Science and Statistics of Trinity College Dublin**
  - People involved:
    - Prof. Douglas Leith (Chair of Computer Systems).
  - Topic: Analysis of fairness of unlicensed LTE/WiFi and coexistence of multiple LTE networks.

- **NEC Labs Europe, Universidad Carlos III de Madrid and Software Radio Systems Limited**
  - People involved:
    - Dr. Andres Garcia-Saavedra (Research Fellow at NEC Labs).
    - Dr. Pablo Serrano (Associate Professor at UC3M).

- ■ Dr. Ismael Gomez-Miguelez and Dr. Paul D. Sutton (Directors of Software Radio Systems Limited).
    - ○ Topic: unlicensed LTE coexistence mechanisms in a real testbed implementation using srsLTE.

- **National Instruments Dresden GmbH**
    - ○ People involved:
        - ■ Dr. Clemens Felber (Research Scientist).
        - ■ Dr. Vincent Kotzsch (Research Associate).
    - ○ Topic: Implementation of unlicensed LTE approaches in ns-3 and NI SDR interfacing.

- **Nokia Bell Labs Ireland**
    - ○ People involved:
        - ■ Dr. Holger Claussen (Department Head of the Small Cells Research group at Bell Labs, Ireland).
        - ■ Dr. David Lopez-Perez (Member of Technical Staff at Bell Labs, Alcatel-Lucent in Ireland).
    - ○ Topic: Evaluation of unlicensed LTE feasibility.

- **Hamilton Institute in the National University of Ireland, Maynooth**
    - ○ People involved:
        - ■ Dr. David Malone (SFI Stokes Lecturer)
    - ○ Topic: PLC/WiFi networking for the IoT.

- **IMDEA Networks and University of Edinburgh**
    - ○ People involved:
        - ■ Dr. Joerg Widmer (ERC Consolidator Grant holder at the Institute IMDEA Networks in Madrid)
        - ■ Dr. Paul Patras (Assistant Professor in the School of Informatics at the University of Edinburgh)
        - ■ Dr. Gek Hong Sim (former Ph.D. student at IMDEA Networks, now postdoc at TU Darmstadt)
        - ■ Rui Li (Ph.D. student at the University of Edinburgh)
    - ○ Topic: Learning for decentralised scheduling in 60 GHz networks.

Supervision of research activities

List of supervision of students:

- **Ph.D. students:**
    - ○ Francesc Wilhelmi (Ph.D. student at Universitat Pompeu Fabra) - ongoing
        - ■ Supervision of Ph.D Thesis (ongoing).
        - ■ Co-supervision along with Dr. Boris Bellalta and Dr. Anders Jonsson.
        - ■ Topic: Machine Learning techniques to optimize spatial sharing in wireless networks.
- **Ph.D. Internships:**
    - ○ Gek Hong Sim (former Ph.D. student at IMDEA Networks)
        - ■ Supervision of internship at Trinity College Dublin (from April to June 2015).
        - ■ Tasks: supervision along with Dr. David Malone.
        - ■ Topic: Decentralised scheduling in 60 GHz networks.
- **M.Sc. Students:**
    - ○ Golshan Famitafreshi (M.Sc. student at Universitat Politècnica de Catalunya)
        - ■ Year: 2017 (ongoing).
        - ■ Task: Supervision of research internship in the WINE group at UOC.
        - ■ Topic: Convex Bandit Optimization in practice for wireless LANs.
    - ○ Alexandre Peyrard (M.Sc. student at Telecom-Lille, France)
        - ■ Year 2006.
        - ■ Task: Co-supervision of M.Sc. Thesis along with Dr. Simon Duquennoy.
        - ■ Topic: Periodic interference between multiple TSCH networks due to clock drifts.

- Luis Sanabria Russo (M.Sc. student Universitat Pompeu Fabra and Universitat de Valencia)
  - Year 2011-2012.
  - Tasks: Co-mentoring of M.Sc. Thesis along with Dr. Boris Bellalta.
  - Topic: Evaluation and design of localization protocols for wireless sensor networks.
- Júlio César Manco (M.Sc. student at Universitat Pompeu Fabra)
  - Year 2008-2009.
  - Tasks: Co-mentoring of M.Sc. Thesis along with Dr. Boris Bellalta.
  - Topic: MAC protocols for multi-channel wireless sensor networks.

- **Undergraduate students:**
  - Andres Cisneros, Victor Valls and Jose Luis Sanchez Ballesteros
    - Year 2011.
    - Tasks: Supervision of implementation of protocols in wireless sensor nodes.
    - Topics: Routing protocols for metering applications and management of traffic load increase.

Teaching Experience

- **Responsible** of the following courses at the Universitat Oberta de Catalunya:
  - Linear Algebra (2018-2019)
    - *Linear algebra fundamentals (telecommunications and computer science programs).*
- **Teacher** of the following course at the Universitat Pompeu Fabra:
  - Enginyeria del Tràfic (2018)
    - *Markov models of queueing theory used in traffic engineering.*
- **Teacher and responsible** of the following module at the National University of Ireland Maynooth:
  - Information Theory (2014-2015)
    - *Fundamentals of source and channel coding.*
- **Teaching assistant** of the following courses at the Universitat Pompeu Fabra:
  - Design of Infrastructures (2011-2012)
    - *General overview of Wireless Sensor Networks.*
  - Traffic Engineering (2010-2011, 2008-2009, 2007-2008)
    - *Introduction to Markov models of queueing theory used in traffic engineering.*
  - Data Transmission (2009-2010, 2008-2009, 2007-2008)
    - *Focused on the Data Link Layer with especial interest on MAC techniques.*
  - Networks and Services (2011-2012, 2010-2011, 2009-2010)
    - *General introduction to communication networks.*
  - Broadband Communications (2010-2011, 2008-2009, 2007-2008)
    - *Design of fiber-optic communication networks.*
- Currently **designing online courses** at the Universitat Oberta de Catalunya:
  - Linear Algebra – Data Science and Techniques of Software Development Programs.
  - Modeling and Optimisation – Data Science Program.
  - Network Architectures – Data Science Program.
- **Design of course content** (Design of Infrastructures and Traffic Engineering - UPF).
- Member of the **School Board of the Polytechnic School** of the Universitat Pompeu Fabra.
- Highly **positive feedback** from students in the official School pools *(available upon request).*
- Selected as one of the **best teachers** in the Telematics Engineering Degree (course 2009-2010).
- Published one **article on teaching methodologies**:
  - Cristina Cano, Veronica Moreno, Boris Bellalta; "*Aplicación del estudio de caso para el aprendizaje de protocolos de acceso al medio*". IX Jornadas de Ingenieria Telemática (JITEL) / Jornadas de Innovación Educativa (JIE), September/October 2010, Valladolid.

Certifications/Awards/Distinctions

- Featured in the inaugural list of the "**Rising Stars in Computer Networking and Communications**" of the N2Women organisation.
- **Best Paper Award** in:
    - WINTECH 2016. New York City, US. October 2016.
    - MACOM 2010. Barcelona, Spain. September 2010.
    - ISWCS 2009. Siena, Italy. September 2009.
    - WWIC 2009. Twente, The Netherlands. May 2009.
    - EUNICE 2008 Summer School. Brest, France. September 2008.
- My paper "Fair Coexistence of Scheduled and Random Access Wireless Networks: Unlicensed LTE/WiFi" is among the **50 most popular in IEEE/ACM Transactions on Networking** since December 2017.
- Selected as **exemplary reviewer of IEEE Communication Letters** in 2015 and 2011.
- The paper "*Quantitative Analysis of the Hidden Terminal Problem in Preamble Sampling WSNs*" featured in the ScienceDirect 25 list of **most downloaded articles** for Ad-Hoc Networks in the period July to September 2011.
- "**Profesor Contratado Doctor**" (Tenured) certification by the Spanish Certification Agency (ANECA).[1]
- **1st Sexeni (tram de recerca)** certification by the Agency for Management of University and Research Grants (AGAUR).[2]

Services to the Research Community

- **Executive Editor** of Transactions on Emerging Telecommunications Technologies journal (IF: 1.535).
- **Co-chair:**
    - Wireless Models and Simulations track of Wireless Days 2019.
    - EWSN 2018 Madcom Workshop.
- **Publication Chair** AdHocNow 2016, MACOM 2011 and 2012.
- Session Chair PIMRC 2013.
- Part of the **Technical Program Committee** in ICC 2018, IFIP Wireless Days 2018-2014, ISPLC 2018-2017, Globecom 2018-2016, PIMRC 2018-2014, TMA 2018-2017, CoWPER'16, SMARTCOMP 2016, MACOM 2010-2016, WiOpt 2014, Joint ERCIM eMobility MobiSense Workshop 2012-2013 and CFIC 2013.
- **Reviewer** of IEEE Transactions on Networking (ToN), Wireless Communications Magazine, IEEE Transactions on Communications, ACM Performance Evaluation Review, IEEE Journal on Selected Areas in Communication (JSAC), IEEE Transactions on Vehicular Technology, IEEE Transactions on Wireless Communications, IEEE Communication Letters and Infocom, among others.

Invited Talks

- Cristina Cano. Chile Women In Computing (**ChileWiC**). *Coexistencia en redes inalámbricas futuras: ¿qué es y cómo conseguirla?* Santiago de Chile, Chile, October 2017.
- Cristina Cano. Joint session **IEEE ChileCON 2017 and Spring School of Networks 2017**. *Optimización de redes inalámbricas complejas: ¿es machine learning la panacea?* Pucón, Chile, October 2017.
- Invited speaker at the Master's degree in Applied Telecommunications and Engineering Management (**MASTEAM**) at the School of Telecommunications and Aerospace Engineering in Castelldefels (Spain) in October 2016.
- Invited speaker **IoT Week by CITC** held in Lille from the 25 to the 29th of June 2016.
- Speaker at the **"30 minutes de sciences"** seminar at Inria Lille in May 2016.
- Invited speaker last **WiNeMO** (ICT COST Action IC0906) meeting in London in April 2014.

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1   "Acreditació de recerca" from AGAUR pending (expected 2019-all merits are in place but missing official process).

2   "2nd Sexeni" from AGAUR pending (expected 2019-all merits are in place but missing official process).

Publications[3]

Relevance of publications

In total, I have disseminated my work through the publication of **16 JCR journals**, 1 international journal and **more than 30 international conferences** (5 of them received the **best paper award**), attracting more than **900 citations** and resulting in an **h-index of 17** (i10-index of 26) according to Google Scholar.

Publications

Journals (selected)

1. B. Martinez, C. Cano, X. Vilajosana. *A Square Peg in a Round Hole: The Complex Path for Wireless in the Manufacturing Industry.* Accepted for publication at **IEEE Communications Magazine.** 2019.

2. C. Cano, D.J. Leith, A. Garcia-Saavedra, P. Serrano. *Fair Coexistence of Scheduled and Random Access Wireless Networks: Unlicensed LTE/WiFi* Accepted for publication in **IEEE Transactions on Networking.** 2017.

3. C. Cano, D. Lopez-Perez, H. Claussen, D. Leith. *Using LTE in Unlicensed Bands: Potential Benefits and Co-existence Issues.* Accepted for publication in **IEEE Communications Magazine.** December, 2016.

4. C. Cano, A. Pittolo, D. Malone, L. Lampe, A. M. Tonello, A. Dabak. *State-of-the-art in Power Line Communications: from the Applications to the Medium.* Accepted for publication in **IEEE Journal on Selected Areas in Communications.** Special Issue on Power Line Communications and its Integration with the Networking Ecosystem. 2016.

Conferences (selected)

1. C. Cano, G. Neu. *Wireless Optimisation via Convex Bandits: Unlicensed LTE/WiFi Coexistence*. **ACM SIGCOMM 2018 Workshop on Network Meets AI & ML (NetAI).** Budapest, 2018.

2. C. Cano, D. Malone. *Identification and Insight into a Long Transitory Phase in Random-Access Protocols.* **WiOpt 2017** - The 15th International Symposium on Modeling and Optimization in Mobile, Ad Hoc, and Wireless Networks. 2017.

3. G. H. Sim, R. Li, C. Cano, D. Malone, P. Patras, J. Widmer. *Learning from Experience: Efficient Decentralized Scheduling for 60GHz Mesh Networks*. Accepted for publication in **the 17th IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM)**. 2016.

4. I. Gomez-Miguelez, A. Garcia-Saavedra, P.D. Sutton, P. Serrano, C. Cano, D.J. Leith. *srsLTE: An Open-Source Platform for LTE Evolution and Experimentation* **ACM WiNTECH 2016** - The 10th ACM International Workshop on WIreless Network Testbeds, Experimental evaluation and Characterization. *Best paper award.*

5. C. Cano, D. Leith. *Unlicensed LTE/WiFi Coexistence: Is LBT Inherently Fairer Than CSAT?*. Accepted for publication in **IEEE International Conference on Communications (ICC)**. 2016.

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3   You can find the full list of articles and the citations in http://ccanobs.github.io/ and Google Scholar