

Alejandro Lancho

Contact information

Marie Curie postdoctoral fellow
Universidad Carlos III de Madrid (uc3m),
Signal Theory and Communications Department (TSC)

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Education

Universidad Carlos III de Madrid (UC3M), Leganés, Madrid, Spain

Ph.D., Multimedia and Communications **2015 – 2019**
• Supervisor: Prof. Tobias Koch
• Thesis title: *Fundamental limits of short-packet wireless communications*
M.S., Multimedia and Communications **2013 – 2014**
B.E., Communication Systems Engineering **2009 – 2013**

Professional experience

Universidad Carlos III de Madrid (UC3M), Leganes, Madrid, Spain

2023 – present

Marie Curie postdoctoral researcher: Information theory, machine learning, communications
• Supervisor: Prof. Tobias Koch

Massachusetts Institute of Technology (MIT), Cambridge, MA, USA

2021 – 2023

Marie Curie postdoctoral researcher: Information theory, machine learning, communications
• Supervisor: Prof. Yury Polyanskiy

Chalmers University of Technology, Gothenburg, Sweden

2019 – 2021

Postdoctoral researcher: Information theory, wireless communications
• Supervisor: Prof. Giuseppe Durisi

Grants and fellowships (selection)

Ayudas de atracción de Talento Investigador “César Nombela” (2023)

to start 01/04/2024

• Competitive grant by the Comunidad de Madrid. 5-year contract

Marie Skłodowska-Curie Individual Fellowship (European Commission)

01/10/2021 – present

• Global Fellowship to work two years at the MIT and one year at the UC3M
• Supervisors: Prof. Yury Polyanskiy (MIT), Prof. Tobias Koch (UC3M)

FPU fellowship

12/09/2015 – 31/01/2019

• Competitive grant by the Ministerio de Educación, Cultura y Deporte, Spain (Ranked first in his area)

Participation in Research Projects (selection)

AI-Enhanced Spectral Awareness and Interference Rejection

2019 – 2024

US Air Force Research Laboratory and the US Air Force Artificial Intelligence Accelerator

• Principal Investigators: Gregory Wornell (MIT) and Yury Polyanskiy (MIT)

An Information-Theoretic Perspective on Massive Asynchronous Connectivity

2021 – 2024

European Commission, Marie Skłodowska-Curie Individual Fellowships (Global)

• Principal investigator: Alejandro Lancho

Information Theory for Low-Latency Wireless Communications (LOLITA)

2017 – 2019

European Research Council (ERC) Starting Grant

• Principal investigator: Tobias Koch (UC3M)

Honors and awards

- Ph.D. thesis with grade: Excellence (*cum laude*)
- Finalist Jack Keil Wolf Student Paper Award at the 2017 IEEE Int. Symp. Inf. Theory
- FPU research visit grant 2017 (competitive)
- UC3M research visit grant 2017 (competitive)
- UC3M Master Grant 2013 (competitive)

- National Thesis Award (undergraduate level): Ranked third overall Spanish students graduated in Communications Engineering degrees.
- Excellence award. Best 20 students at UUC3M (2012)
- Excellence grant (Madrid, 2010 and 2012)
- Excellence certification (Madrid, 2009)

Teaching Experience

Universidad Carlos III de Madrid, Leganés, Madrid

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|---|-------------------------------|
| • Information Theory (master level) | 2023/2024 |
| • Linear Systems (undergraduate level) | 2023/2024 |
| • Communication Theory laboratory (undergraduate level) | 2017/2018-2016/2017-2013/2014 |
| • Digital Communications (undergraduate level) | 2016/2017 |
| • Access Network Technologies laboratory (undergraduate level) | 2014/2015 |
| • Communication Channels and Systems laboratory (undergraduate level) | 2014/2015 |
| • Digital Communications Overview (undergraduate level) | 2014/2015 |
| • Mobile Communications laboratory (undergraduate level) | 2013/2014 |

Publications

Journal Publications

- [J1] A. Lancho, G. Durisi, and L. Sanguinetti, "Cell-free Massive MIMO for URLLC: A finite-blocklength analysis," *IEEE Trans. Wireless Commun.*, vol. 22, no. 12, pp. 8723 - 8735, Dec. 2023.
- [J2] A.O. Kislal, A. Lancho, G. Durisi, and E. Strom, "Efficient evaluation of the error probability for pilot-assisted URLLC with Massive MIMO," *IEEE Journal Sel. Areas Commun.*, vol. 41, no. 7, pp. 1969 - 1981, Jul. 2023.
- [J3] K.-H. Ngo, A. Lancho, G. Durisi, and A. Graell i Amat, "Unsourced Multiple Access With Random User Activity," *IEEE Trans. Inf. Theory*, vol. 69, no. 7, pp. 4537 - 4558, Jul. 2023.
- [J4] J. Östman, A. Lancho, G. Durisi and L. Sanguinetti, "URLLC with Massive MIMO: Analysis and Design at Finite Blocklength", *IEEE Trans. Wireless Commun.*, vol. 20, no. 10, pp. 6387-6401, Apr. 2021.
- [J5] A. Lancho, J. Östman, G. Durisi, T. Koch and G. Vazquez-Vilar, "Saddlepoint approximations for short-packet wireless communications", *IEEE Trans. Wireless Commun.*, vol. 19, no. 7, pp. 4831-4846, Jul. 2020.
- [J6] A. Lancho, T. Koch, and G. Durisi, "On single-antenna Rayleigh block-fading channels at finite blocklength," *IEEE Trans. Inf. Theory*, vol. 66, no. 1, pp. 496-519, Jan. 2020.
- [J7] V. P. Gil Jiménez, A. Lancho Serrano, B. Genovés Guzmán and A. García Armada, "Learning mobile communications standards through flexible software defined radio base stations", *IEEE Commun. Mag.* vol. 55, no. 6, pp. 116-123, May 2017.
- [J8] B. Genovés Guzmán, A. Lancho Serrano and V. P. Gil Jiménez , "Cooperative optical wireless transmission for improving performance in indoor scenarios for visible light communications", *IEEE Trans. Consum. Electron.* vol. 61, no. 4, pp. 393-401, Nov. 2015.

Conference Publications (selection)

- [C1] T. Jayashankar, G.C.F. Lee, A. Lancho, A. Weiss, Y. Polyanskiy, G.W. Wornell, "Score-based Source Separation with Applications to Digital Communication Signals," *NeurIPS 2023*, New Orleans, LA, USA, Dec. 2023.
- [C2] A. Fengler, A. Lancho, Y. Polyanskiy, "Coded Orthogonal Modulation for the Multi-Antenna Multiple-Access Channel," in *Proc. IEEE Int. Symp. Topics Coding (ISTC)*, Brest, France, Sep. 2023.
- [C3] A. Weiss, A. Lancho, G.C.F. Lee, "Estimation, Filtering and Decoding via Deep Learning," *Tutorial at EU-SIPCO 2023*, Helsinki, Finland, Sep. 2023.
- [C4] A. Fengler, A. Lancho, K. Narayanan, Y. Polyanskiy, "On the Advantages of Asynchrony in the Unsourced MAC," in *Proc. IEEE Int. Symp. Inf. Theory (ISIT)*, Taipei, Taiwan, Jun. 2023.
- [C5] A. Weiss, A. Lancho, Y. Bu, G.W. Wornell, "A Bilateral Bound on the Mean-Square Error for Estimation in Model Mismatch," in *Proc. IEEE Int. Symp. Inf. Theory (ISIT)*, Taipei, Taiwan, Jun. 2023.
- [C6] G.C.F. Lee, A. Weiss, A. Lancho, Y. Polyanskiy, G.W. Wornell, "On neural architectures for deep learning-based source separation of co-channel OFDM signals," in *Proc. IEEE Int. Conf. Acoust., Speech, Signal Process. (ICASSP)*, Rhodes Island, Greece, Jun. 2023.
- [C7] A. Lancho, A. Weiss, G.C.F. Lee, J. Tang, Y. Bu, Y. Polyanskiy and G.W. Wornell, "Data-driven blind synchronization and interference rejection for digital communication signals," in *Proc. IEEE Global Communications Conference (GLOBECOM)*, Rio de Janeiro, Brazil, Dec. 2022.

- [C8] A. Lancho, A. Fengler and Y. Polyanskiy, "Finite-blocklength results for the A-channel: applications to un-sourced random access and group testing," in Proc. 58th Annual Allerton Conference on Communication, Control, and Computing, Champaign, IL, Sep. 27-30, 2022.
- [C9] G.C.F. Lee, A. Weiss, A. Lancho, J. Tang, Y. Bu, Y. Polyanskiy and G.W. Wornell, "Exploiting temporal structures of cyclostationary signals for data-driven single-channel source separation," in Proc. IEEE International Workshop for Machine Learning and Signal Processing (MLSP), Xi'an, China, Aug. 2022. (**Best student paper award**)
- [C10] A. Lancho, J. Östman and G. Durisi, "On Joint Detection and Decoding in Short-Packet Communications," in Proc. IEEE Global Communications Conference (GLOBECOM), Madrid, Spain, Dec. 2021.
- [C11] A. Lancho, G. Durisi, and L. Sanguinetti, "Cell Free Massive MIMO with Short Packets," in Proc. IEEE Int. Workshop on Signal Process. Adv. and Wireless Commun. (SPAWC), Lucca, Italy, Sep. 2021.
- [C12] A. Lancho, J. Östman, G. Durisi, T. Koch and G. Vazquez-Vilar, "Saddlepoint approximations for Rayleigh block-fading channels", in Proc. IEEE Int. Symp. Inf. Theory (ISIT), Paris, France, Jul. 2019.
- [C13] A. Lancho, T. Koch and G. Durisi. "A high-SNR Normal approximation for single-antenna Rayleigh block-fading channels", in Proc. IEEE Int. Symp. Inf. Theory (ISIT), Aachen, Germany, Jun. 2017. **Finalist IEEE Jack Keil Wolf ISIT Student Paper Award**