Alejandro Lancho

Contact information

Atracción de Talento Cesar Nombela Research 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 **Jul. 2024 – present**

Atracción de Talento Cesar Nombela Research Fellow: 5-year contract (tenure-track-like in Spanish system)

Universidad Carlos III de Madrid (UC3M), Leganes, Madrid, Spain **2023 – 2024**

Marie Curie postoctoral researcher: Information theory, machine learning, communications

- Supervisor: Prof. Tobias Koch

Massachusetts Institute of Technology (MIT), Cambridge, MA, USA **2021 – 2023**

Marie Curie postoctoral researcher: Information theory, machine learning, communications

- Supervisors: Prof. Yury Polyanskiy

Chalmers University of Technology, Gothenburg, Sweden **2019 – 2021**

Postoctoral researcher: Information theory, wireless communications

- Supervisor: Prof. Giuseppe Durisi

Grants and fellowships (selection)

Ayudas de atracción de Talento Investigador "César Nombela" (2023) **01/07/2024 – 30/06/2029**

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

Marie Skłodowska-Curie Individual Fellowship (European Commission) **01/10/2021 – 30/06/2024**

- 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

- **Best student paper award** at the 2022 Asilomar Conf. Signals, Syst., Comput.
- **Best student paper award** at the 2022 IEEE Int. Workshop Machine Learning Signal Process. (MLSP)
- 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 UC3M (2012)
- Excellence grant (Madrid, 2010 and 2012)
- Excellence certification (Madrid, 2009)

Teaching Experience

Universidad Carlos III de Madrid, Leganés, Madrid

- 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 EUSIPCO 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 unsourced 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**