Borja M. Peleato-Inarrea

CONTACT

Cell: +34 629 376 315
E-mail: borjapeleato@gmail.com

RESEARCH INTERESTS:

Optimizing the protocols and algorithms used in modern communication and storage networks with the goal of improving their speed, reliability and versatility.

Keywords: communications, storage, wireless networks, information theory, spectrum management, distributed optimization, coded caching, NAND Flash, LDPC codes, rate adaptation.

TEACHING STATEMENT:

I strive to keep my students engaged during class using active learning techniques to maximize retention and comprehension. I emphasize the intuitive understanding of fundamental principles over their systematic application to more advanced techniques.

ACADEMIC POSITIONS

UNIVERSIDAD CARLOS III — **Madrid, Spain**

CONEX Research Fellow — **Sept. 2020 - Present**

PURDUE UNIVERSITY — **Indiana, USA**

Associate Director of Graduate Admissions — **Aug. 2018 - July 2020**
Assistant Professor in ECE — **Aug. 2016 - July 2020**
Visiting Assistant Professor in ECE — **Jan. 2014 - Aug. 2016**

EDUCATION

STANFORD UNIVERSITY — **California, USA**

Ph.D. Electrical Engineering, January 2013.
M.S. Electrical Engineering, June 2009.

- Dissertation: "A signal processing approach to overcome data integrity challenges in flash SSD design". Advisor: John M. Cioffi.
- Also worked on mathematical optimization, channel coding and image processing.
- GPA 3.97

MASSACHUSETTS INSTITUTE OF TECHNOLOGY — **Massachusetts, USA**

Visiting student, January-December 2006.

- Thesis in Telecommunications Engineering: "Channel sharing protocols for underwater acoustic sensor networks". Advisor: Milica Stojanovic.

UNIVERSITAT POLITECNICA DE CATALUNYA — **Barcelona, Spain**

B.S. (5 years), Telecommunications Engineering, February 2007.
B.S. (5 years), Mathematics, February 2006.

TEACHING EXPERIENCE

VERTICALLY INTEGRATED PROJECTS — **ECE479, Purdue**
Instructor — **2 semesters**

ENGINEERING FUNDAMENTALS I — **ECE2001, Purdue**
Instructor — **1 semester**

LINEAR CIRCUIT ANALYSIS I — **ECE201, Purdue**
Instructor — **8 semesters**

TRANSMISSION OF INFORMATION — **ECE440, Purdue**
Instructor — **4 semesters**

MATHEMATICS OF RIDDLES AND INFORMATION — **GERI 2019**
Instructor

CONVEX OPTIMIZATION — **EE364A, Stanford**
Teaching assistant

INTRODUCTION TO LINEAR DYNAMICAL SYSTEMS — **EE263, Stanford**
Teaching Assistant

SOCIAL AND INFORMATION NETWORK ANALYSIS — **CS224w, Stanford**
Head TA (twice)

INTRODUCTION TO PROBABILITY — **CS109, Stanford**
Teaching Assistant (twice)

DESIGN AND ANALYSIS OF ALGORITHMS — **CS161, Stanford**
Teaching Assistant

Industry Experience

HISILICON TECHNOLOGIES — **Hanzhou, China**
Consultant — **March - Aug. 2014**

- Noise Characterization for the Flash Read and Write Channels.
- Assist with the design and implementation of LDPC codes.

PROTON DIGITAL SYSTEMS — **California, USA**
Senior Flash Channel Architect — **Aug 2012 - Dec 2013**
System Architect — **June-Sept. 2011**

- Design and implement schemes for reading, writing, and protecting information stored in NAND flash memories.
- Characterize failure mechanisms in NAND flash memories and develop algorithms for improving their endurance and reliability.
- Design LDPC codes with efficient hardware implementation.

AUDIONEWSPAPER — **California, USA**
Technical Co-founder — **Jan-June 2010**

- Developed the iphone application and participated in market study, decision making and general tasks involved in starting the company.
- Company did not succeed due to lack of funding.

APPLE — **California, USA**
iPhone Systems Engineering Intern — **June-Sept. 2009**

- Investigated new receiver architectures for 3G wireless communications and evaluated them through simulations.

MULTICEL TELECOM — **Belo Horizonte, Brazil**
Telecommunications Engineering Intern (IAESTE) — **July-Sept. 2005**

- Performed maintenance tasks in radio and fiber optic networks for a company subcontracted by the main telecommunications operator in Brazil.

Invited talks

"Coded Caching with Heterogeneous User Profiles", Universidad Carlos III, Madrid, Spain, October 2020.

"Exposure-Aware Beamforming and Adaptive HARQ for Millimeter-Wave Networks", Universidad Rey Juan Carlos, Madrid, Spain, January 2019.

"Optimizing QC-LDPC error correction in mmWave networks with limited feedback", Universidad Carlos III, Madrid, Spain, April 2018.

"Data modulation and retrieval in NAND flash memories", Purdue University, West Lafayette, IN, March 2016.

"Spreading Modulation and Multi-Page Read for NAND Flash Memories", University of Illinois at Urbana-Champaign, IL, May 2015.

"On data-spreading applications to non-volatile memories", Information Theory and Applications workshop, San Diego, CA, Feb. 2015.

"Channel coding and data recovery in NAND flash memories", Illinois Institute of Technology, Chicago, IL, Oct. 2014.

"New schemes for addressing data integrity in NAND flash", HGST, Western Digital, San Jose, CA, Aug. 2014.

"Efficient construction and decoding of LDPC codes", HiSilicon/Huawei, Hangzhou, China, April 2014.

"A Signal Processing Approach to Overcome Data Integrity Challenges in Flash SSD Design", Purdue University, West Lafayette, IN, Nov. 2013.

"A Signal Processing Approach to Overcome Data Integrity Challenges in Flash SSD Design", LSI, San Jose, CA, Jul. 2012.

"A Signal Processing Approach to OvercomeData Integrity Challenges in Flash SSD Design", Sandisk, Milpitas, CA, Jun. 2012.

Research grants

Co-Principal Investigator: Top 5 in DARPA SC2 competition (2^{nd} round)	\$375,000, 2019
Co-Principal Investigator: National Science Foundation (NSF) "Exploiting Luminescence Emissions of Solar Cells for Internet-of-Things Applications"	\$450,000, 2018
Co-Principal Investigator: Top 10 team in DARPA SC2 competition	\$750,000, 2018
Co-Principal Investigator: Nokia Networks, Unrestricted Gift	\$60,000, 2017
Co-Principal Investigator: Air Force Research Lab "Adaptive Wireless Networks for Spectrally Efficient Communication"	\$500,000, 2017
Co-Principal Investigator: Nokia Networks, Unrestricted Gift	\$60,000, 2016
Co-Principal Investigator: Nokia Networks, Unrestricted Gift	\$60,000, 2015
Purdue PRF XR Research Grant	\$28,000, 2014
Externally funded project with Huawei	\$25,000, 2014
Gift in kind from Proton Digital Systems	\$16,000, 2014

Honors and Awards

CONEX Fellowship, 2020-2023

IEEE Senior Member, 2020.

Study Abroad Intercultural Pedagogy Grant, Award \$10,000, 2019.

National Effective Teaching Institute (NETI-1A) Fellow, 2019.

Purdue Seed for Success Award-Excellence in Research, 2017.

Guest speaker in Ideas for Pamplona, Navarra, Spain 2015.

Featured engineer EEWeb, 2014.

Guest speaker in Agora Talentia, Navarra, Spain 2009.

Stanford Certificate of Achievement for first place in Image Processing competition, 2008.

La Caixa fellowship for graduate studies in the USA, 2007-2009.

Bronze medal in Latin-American University Math Olympics, 2003-2004 (twice).

Service

Thesis supervised:

- (Ph.D.) "Exposure-Aware Signal Design for Millimeter Wave MIMO Communication Systems", Miguel Rodrigo Castellanos, April 2020. Currently at U.T. Austin.
- (Ph.D.) "Signal Processing for Caching Networks and Non-Volatile Memories", Tianqiong Luo, April 2018. Currently at Google.
- (Ph.D.) "Optimal monitoring and mitigation of systemic risk in lending networks", Zhang Li, May 2016. Currently at Google Ads.
- (M.S.) "Modelación y simulación de un sistema de comunicación de ondas milimétricas", Martín Rodriguez Vega, May 2017. Currently doing his Ph.D.
- (M.S.) "Object storage in NAND Flash", Yu Liu, Dec. 2014.
- (M.S.) "Advanced read retry in NAND Flash", Ajinkya Potdar, May 2014.

Ph.D. students currently advising:

- Mai Zhang (4^{th} year)
- Ciyuan Zhang (2^{nd} year)

Ph.D. advisory and defense committees:

- In progress: Pin-Wen Su, Diyu Yang, Chih-Hua Chang, Tomohiro Arakawa.
- Stephen Larew, "Adaptive beam training for millimeter wave communications and applications in software defined radio", June 2019.
- Wei-Kang Hsu, "Resource allocation in nano-communication networks and online service platforms", June 2018.
- Jim Vaught, "Cryptographic applications of permutation polynomials", April 2016.

Technical Program Committees:

- ICC, Wireless Communications, Cloud Computing and Data Storage, 2015-present
- Globecom, SAC-Data Storage and Wireless Communications, 2014-present
- Milcom, Waveforms and Signal Processing, 2014-present
- IEEE Data Storage Technical Committee, 2015-present
- Comnetsat, 2016
- Society of Hispanic Professional Engineers, 2016
- IARIA Internat. Conf. on Wireless and Mobile Comm., 2019
- Non-Volatile Memory Workshop, 2020-present

Other Memberships:

- IEEE Senior Member (Comm., Inform. Theory, and Data Storage Societies), 2020-present
- NSF mmWave Research Coordination Network

IEEE Senior Member review panel, 2020

NSF CNS proposal review panelist, 2019

Purdue ECE Associate Director of Graduate Admissions, 2018-Present

Purdue Admissions Committee, 2014-Present

Purdue ECE Undergraduate Curriculum Committee, 2017-Present

President of Iberia, association of Spanish students at Stanford, 2010

Volunteering:

- Gifted Educational Research Institute, West Lafayette (IN, USA) July 2019: Taught a course in the summer camp program.
- Desos Accion Solidaria, Barcelona (Spain) Jan-Dec 2005: Designed a long-range radio link for telemedicine in Bluefields (Nicaragua)
- Enlace Hispano-Americano de Salud, Cuzco (Peru) July-Sept 2004: Planned and deployed a network of voice and e-mail over HF radios powered by solar cells and evaluated the links for a future wi-fi high speed network.

Publications

Journal Papers:

M. Zhang, J. Song, D. J. Love, D. Ogbe, A. Ghosh, and B. Peleato, "Increasing Throughput in Wireless Communications by Grouping Similar Bits", to appear in IEEE Communication Letters.

D. Ying, M. Castellanos, D. J. Love, B. Peleato, and B. M. Hochwald, "Dynamic Electromagnetic Exposure Allocation For Rayleigh Fading MIMO Channels", to appear in IEEE Transactions on Wireless Communications.

Miguel R. Castellanos, Yanan Liu, David J. Love, Borja Peleato, Jian-Ming Jin, Bertrand M. Hochwald "Signal-Level Models of Pointwise Electromagnetic Exposure for Millimeter Wave Communication", IEEE Transactions on Antennas and Propagation: Vol 68: no. 5, pp 3963-3977, 2020.

T. Luo, V. Aggarwal, and Borja Peleato, "Coded Caching for Distributed Storage", IEEE Transactions on Information Theory: Vol. 65: no 12, pp 7743-7755, Sept. 2019.

T. Luo and B. Peleato "The Transfer Load-I/O Trade-off for Coded Caching", IEEE Communications Letters: Vol. 22: no 8, pp 1524-1527, Aug. 2018.

M. Castellanos, V. Raghavan, J. H. Ryu, O. H. Koymen, J. Li, D. J. Love, and B. Peleato, "Channel Reconstruction-Based Hybrid Precoding for Millimeter Wave Multi-User MIMO Systems", IEEE Selected Topics on Signal Processing: Vol. 12: no 2, pp 383-398, May 2018.

T. Luo and B. Peleato, "Multi-page Read for NAND Flash", IEEE Transactions on Circuits and Systems II: Express Briefs: Vol. 64, no. 1, pp. 76-80, 2017.

T. Luo and B. Peleato, "Spreading Modulation for Multi-Level Non-Volatile Memories", IEEE Transactions on Communications: Vol.64: no. 3, pp 1110-1119, 2016.

H. Tabrizi, B. Peleato, G. Farhadi, and J. M. Cioffi, "Spatial reuse in dense wireless areas: a cross-layer optimization approach via ADMM", IEEE Transactions on Wireless Communications: Vol. 14: no. 12, pp 7083-7095, 2015.

B. Peleato, R. Agarwal, J. Cioffi, M. Qin, and P. Siegel, "Adaptive read thresholds for NAND flash", IEEE Transactions on Communications: Vol. 63: no. 9, pp 3069-3081, 2015.

Z. Li, X. Lin, B. Peleato-Inarrea, and I. Pollak, "Optimal Monitoring and Mitigation of Systemic Risk in Financial Networks", SSRN 2506326, 2014.

S. Boyd, N. Parikh, E. Chu, B. Peleato, and J. Eckstein. "Distributed Optimization and Statistical Learning via the Alternating Direction Method of Multipliers". Foundations and Trends in Machine Learning: Vol. 3: no. 1, pp 1-122, 2011.

B. Peleato, M. Stojanovic. "A Channel-Sharing Scheme for Underwater Cellular Networks". Sea Technology: Vol. 49: no. 5, pp 39-41, 2008.

B. Peleato, M. Stojanovic. "Distance Aware Collision Avoidance Protocol for Ad-Hoc Underwater Acoustic Sensor Networks". IEEE Communication Letters: Vol. 11: no. 12, pp 1025–1027, Dec. 2007.

Submitted journal papers:

M. Zhang, A. Castillo, and B. Peleato, "Optimizing HARQ and Relay Strategies in Limited Feedback Communication Systems", submitted to MDPI Applied Sciences.

S. Kadirvelu, W. D. Leon-Salas, X. Fan, J. Kim, B. Peleato, S. Mohammadiand, and B. Vijayalakshmi, "A Circuit for Simultaneous Reception of Power and Data using a Solar Cell", submitted to IEEE Transactions on Circuits and Systems I.

C. Chang, B. Peleato, and C. Wang, "Coded Caching with Full Heterogeneity: Exact Capacity of The Two-User/Two-File Case", submitted to IEEE Transactions on Information Theory.

M. Castellanos, B. Peleato, D.J. Love, "Position-Based Adaptive Power Back-off for User Electromagnetic Exposure Management in Millimeter Wave Systems", submitted to IEEE Communications Letters.

Patents:

B. Peleato-Inarrea, N. Miladinovic, and A. Vityaev. "Dual-Stage Data Decoding for Non-Volatile Memories" U.S. Patent 9,294,132, March 2016.

B. Peleato-Inarrea, A. Vityaev, N. Miladinovic, "Two-Dimensional Encoding for Non-Volatile Memory Blocks," U.S. Patent 8,856,616, Oct. 2014.

Conference Papers/Posters:

C. Chang, C. Wang, B. Peleato "On Coded Caching for Two Users with Overlapping Demand Sets", IEEE International Conf. on Comm. (ICC), June 2020.

C. Zhang, B. Peleato, "On the Average Rate for Coded Caching with Heterogeneous User Profiles", IEEE International Conf. on Comm. (ICC), June 2020.

Walter D. Leon-Salas, Xiaozhe Fan, James Hidalgo, Pablo J. Molina, Borja Peleato, "Modulation of LED Photo-Luminescence for Underwater Optical Communications", IEEE International Symposium on Circuits and Systems (ISCAS), May 2020.

M. Zhang and B. Peleato, "HARQ Strategies for Relay Systems with Limited Feedback" Asilomar Conference on Signals, Systems and Computers, 2019.

M. Castellanos, B. Peleato, and D.J. Love "User-exposure-cancelling beamforming for multi-antenna systems" Asilomar Conference on Signals, Systems and Computers, 2019.

Su Wang and B. Peleato "Coded Caching with Heterogeneous User Profiles" IEEE International Symposium on Information Theory (ISIT), July 2019

M. Zhang and B. Peleato, "Improved LDPC Coding with QAM", IEEE Wireless Comm. and Networking Conf., April 2018.

V. Raghavan, M. Castellanos, J. Ryu, O. Hizir Koymen, J. Li, D. J. Love and B. Peleato, "Hybrid Multi-User Precoding with Amplitude and Phase Control", IEEE International Conf. on Comm. (ICC), 2018.

M. Zhang, A. Castillo, B. Peleato, "Optimizing HARQ Feedback and Incremental Redundancy in Wireless Communications", IEEE Wireless Comm. and Networking Conf., April 2018.

A. M. Mohamed, B. Peleato, "Caching for integrated access and backhaul relay networks", mmWave RCN Workshop, Jan. 2018.

B. Peleato, "Feedback-Assisted Incremental Redundancy in mmWave Communications", mmWave RCN Workshop, July 2017.

B. Peleato, "QC-LDPC codes for mmWave", mmWave Research Coordination Network Workshop, Dec 2016.

T. Luo, O. Milenkovic, and B. Peleato, "Compensating for Sneak Currents in Multi-Level Crossbar Resistive Memories", Asilomar Conference on Signals, Systems and Computers, 2015.

T. Luo, B. Peleato, "Spread Programming for NAND Flash", IEEE International Conf. on Comm. (ICC), 2015.

B. Peleato, H. Tabrizi, R. Agarwal, and J. Ferreira, "BER-based wear leveling and bad block management for NAND flash", IEEE International Conf. on Comm. (ICC), 2015.

H. Tabrizi, B. Peleato, R. Agarwal, and J. Ferreira, "Improving NAND Flash Read Performance through learning", IEEE International Conf. on Comm. (ICC), 2015.

T. Luo, B. Peleato, "Multi-Page Read for ICI Equalization in NAND Flash", Non-Volatile Memory Workshop, 2015.

T. Luo, B. Peleato, "Minimizing BER in NAND Flash through multiple reads", Flash Memory Summit, 2014.

B. Peleato, R. Agarwal, J. Cioffi, M. Qin, and P. Siegel, "Towards minimizing read time for NAND flash", IEEE Globecom, 2012.

B. Peleato, R. Agarwal, J. Cioffi, "Analysis of Trade-offs in V2P-Table Design for NAND Flash", Asilomar Conference on Signals, Systems and Computers, 2012.

B. Peleato, R. Agarwal, and J. Cioffi, "Probabilistic graphical model for Flash memory programming" IEEE Statistical Signal Processing Workshop, 2012.

B. Peleato, R. Agarwal, and J. Cioffi, "On the distribution of valid pages with greedy garbage collection for NAND flash", IEEE Statistical Signal Processing Workshop, 2012.

Borja Peleato and Rajiv Agarwal. "Maximizing MLC NAND lifetime and reliability in the presence of write noise". IEEE International Conference on Communications, 2012.

Borja Peleato and Milica Stojanovic. "A Channel Sharing Scheme for Underwater Cellular Networks". 2007 IEEE Oceans Conference.

Borja Peleato and Milica Stojanovic. "A MAC Protocol for Ad-Hoc Underwater Acoustic Sensor Networks". 2006 ACM International Workshop on UnderWater Networks (WUWNet).

OTHER

- Languages: Spanish, English, French, Catalan (excellent); German (elementary).
- Diploma in International Cooperation (ISF, Barcelona, Spain).
- Diploma in Rural Telecommunications (PUCP, Lima, Peru).