Alberto Giuseppe Perotti

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About me

I am a research engineer with 13 years experience [2012-2025] in wireless communications contributing to research on physical layer technologies for 4G, 5G, and emerging 6G networks, with a particular focus on 3GPP standardization. Prior to this, I spent nearly a decade [2002-2011] as a researcher in Academia, where I worked on wireless broadband terrestrial and satellite communications. I hold a Ph.D. in Electronics and Communications [2003] ad a *Laurea* degree in Telecommunications Engineering [1999] from Politecnico di Torino, Italy.

Research

Error correction codes: Low Density Parity Check (LDPC) codes, polar codes, sparse superposition codes, parallel (turbo) and serial concatenations of convolutional codes, algebraic codes (Reed-Solomon, BCH, etc.), nonlinear codes, codes for identification. [1], [2]; [17], [18], [19], [20], [21], [22], [23], [24], [25], [26], [27], [28], [29]; [55], [56]. **AI/Machine-learning**: deep learning-based design and decoding of ultra-reliable error correction codes. [3], [4], [5], [6]; [30]; [57]. **Modulations and waveforms**: constant-envelope continuous phase modulations (CPM); trellis-coded modulation; adaptive coded modulation methods; waveforms for simultaneous information and power transfer (SWIPT); coded modulations for direct satellite uplink. [7], [8], [9], [10]; [31], [32], [33], [34], [35], [36], [37], [38]; [58]. **Channel estimation and prediction**: massive MIMO channel prediction in FDD networks. [59]. **Multiple access**: orthogonal/non-orthogonal multiple access; interleaver-division multiple access; multiuser detection and interference cancellation. [11], [12]; [39], [40], [41], [42], [43], [44]. **V2X communications.** High-gain beamforming and opportunistic relay for V2V and V2I communications. [13], [14] [45]. **Cognitive radio and spectrum sensing.** Sensing of DVB signals, signal processing software optimization of sensing algorithms, RF immunity evaluations. [15], [16]; [46], [47], [48], [49], [50]; [52], [53], [54]. **Software-defined radios**: optimization of real-time wireless transceiver signal processing algorithms on digital signal processing platforms. [47], [51].
Corresponding patents: 17 granted patents, 27 pending applications, 6 patents with potential standard-essential declarations.

Further expertise

Quantum Error Correction. Developer of $\left\langle \mathbf{q} \middle| {}^{\text{LDPC}}_{\text{sim}} \right\rangle$, a Stim-based quantum LDPC simulator focused on decoding algorithms. Check out the GitHub repository.
Modeling and simulation. Developed several link/system-level simulators for performance evaluation of lower (PHY/MAC) layer functionalities in wireless systems.
3GPP standardization. Participated as Huawei delegate to 3GPP RAN1 meetings from 2015 to 2017.
Management and coordination of research projects. Project manager of Huawei internal research projects in cooperation with Academia:

- *5G NR FR1/FR2 V2X communications*, cooperation with Politecnico di Milano, Italy;
- *Iterative error correction codes for channels with noisy feedback*, *Iterative error correction codes for realistic wireless channels*, both in cooperation with Imperial College London, UK.

Teaching. Lectured several undergraduate and graduate courses – see detailed list below.
Editorial experience. Associate Editor-in-Chief of IEEE Communications Magazine for two years.
Programming. Matlab/Simulink, Keras/Tensorflow, Pytorch; python, C/C++, assembly languages of Intel x86 processors, TI's C6000 DSPs, ARM processors, PIC microcontrollers, Z80; GIT, SVN; Windows, Linux; GPU configuration and system maintenance.
Languages. *Italian*: mother tongue; *English*: professional working proficiency; *French*: basic.

Education

Aug 2003. Ph.D. degree in Electronics and Communications, Politecnico di Torino. Dissertation on **Design of concatenated convolutional codes with interleavers and their decoder implementation on multi-DSP systems**.
Supervisor: prof. S. Benedetto.

Mar 1999. Laurea[1] degree in Telecommunications Eng., Politecnico di Torino. Monograph on **Design and real-time DSP implementation of a CCSDS turbo decoder**.
Supervisors: prof. S. Benedetto, prof. A. Serra.

Employment

June 2013 - present Huawei Technologies Sweden/Italy. Principal research engineer, research on PHY layer of 5G/6G radio access networks; contributing to 3GPP standardization in Radio Access Networks Working Group on Radio Layer 1 - Physical layer (RAN1); management of research projects in cooperation with Academia.

April 2011 - May 2013. CSP–ICT Innovation, Torino (Italy). Head of the *Wireless Communications and Networks* research unit.

Mar 2010- Mar 2011. Assistant Professor at Università e-Campus, Novedrate (Como), Italy. Research on spectral/energy efficient wireless communication systems.

Aug 2003–Mar 2010. Post-doctoral researcher at Politecnico di Torino, Italy. Research on PHY algorithms and architectures for wireless multimedia broadband transmission, adaptive coding and modulation system for satellite communications.

Jan-Oct 2002. Sequoia Communications (no longer in business), San Diego (CA), USA. Staff member of baseband signal processing branch in Los Angeles. Development of baseband signal processing algorithms for a prototype 3G (UMTS) receiver. Head of division/supervisor: prof. Dariush Divsalar (JPL).

Jan-Aug 2002. University of California, Los Angeles (CA), USA. Visiting scholar in the Electrical Eng. Dept. Research on design of serially concatenated convolutional codes. Supervisor: prof. Richard D. Wesel.

Teaching

I taught several graduate (G) and undergraduate (UG) courses at my alma mater – Politecnico di Torino – and in other Universities, as part of Politecnico's joint programs with those institutions. All courses have been taught in Italian unless otherwise indicated.

As lecturer:

2012–13 *Software-defined radio on open-source platforms*, Telecom. Eng., (G, taught in English).

2011–12 *Software-defined radio on open-source platforms*, Telecom. Eng. (G, taught in English).

2010–11 *Trasmissione sul Canale Radiomobile* (Wireless transm.), Telecom. Eng. (UG); *Comunicazioni Elettriche* (Communication Systems), Elec. Eng. (UG).

[1] In the Italian academic system before the 1999 reform, the *laurea* degree was the highest academic degree obtainable before Ph.D. It is considered equivalent to a masters' degree.

2009–10	*Trasmissione sul Canale Radiomobile* (Wireless transm.), Telecom. Eng. (UG); *Comunicazioni Elettriche* (Communication Systems), Elec. Eng. (UG).
2008–09	*Wireless Transmission Systems*, Telematics Eng., (G, taught in English). *Trasmissione sul Canale Radiomobile* (Wireless transm.), Telecom. Eng. (UG); *Comunicazioni Elettriche* (Communication Systems), Elec. Eng. (UG).
2007–08	*Trasmissione sul Canale Radiomobile* (Wireless transm.), Telecom. Eng. (UG). *Comunicazioni Elettriche* (Communication Systems), Elec. Eng., (UG).
2006–07	*Fondements de communications électriques*, Information Eng., joint program with Polytech Grenoble (UG, taught in English);
2005–06	*Fondements de communications électriques*, Information Eng., joint program with Polytech Grenoble (UG, taught in English).

As teaching assistant:

2006–07	*Trasmissione sul Canale Radiomobile* (Wireless Transm.), Telecom. Eng. (UG). *Comunicazioni Elettriche* (Communication Systems), Elec. Eng. (UG).
2005–06	*Trasmissione sul Canale Radiomobile* (Wireless Transm.), Telecom. Eng. (UG). *Elaborazione Numerica dei Segnali* (Digital Signal Proc.), Telecom. Eng. (UG); *Comunicazioni Elettriche* (Communication Systems), Elec. Eng. (UG).
2004–05	*Trasmissione sul Canale Radiomobile* (Wireless Transm.), Telecom. Eng. (UG). *Elaborazione Numerica dei Segnali* (Digital Signal Proc.), Telecom. Eng. (UG); *Comunicazioni Elettriche* (Communication Systems), Elec. Eng. (UG).
2003–04	*Trasmissione sul Canale Radiomobile* (Wireless Transm.), Telecom. Eng. (UG). *Elaborazione Numerica dei Segnali* (Digital Signal Proc.), Telecom. Eng. (UG);

Supervised master theses

Supervised/co-supervised twelve master theses 2009-2013.

Editorial Experience

IEEE Senior Member since 2014.
Served as editorial board member of IEEE Communications Magazine:

- *Associate Editor in Chief* from Nov 2021 to Dec 2023;
- *Lead Editor* of Mobile Communications and Networks Series from Sep 2019 to Nov 2021.
- *Associate Technical Editor* from Oct 2014 to Aug 2019;

Serving as a journal/magazine article reviewer and conference TPC member/reviewer:

Journals and Magazines (selected)

- IEEE Communications Magazine
- IEEE Transactions on Communications
- IEEE Transactions on Information Theory
- IEEE Transactions on Signal Processing
- IEEE Transactions on Wireless Communications
- IEEE Communications Letters (exemplary reviewer in 2015)
- IEEE Journal of Selected Topics in Signal Processing
- IET Communications
- Computer Communications (Elsevier)
- Wireless Personal Communications (Springer)
- European Transactions on Telecommunications (Wiley)

Conference TPC Memberships (selected)

- IEEE Global Communications Conference (Globecom)
- IEEE International Conference on Communications (ICC)
- IEEE Personal, Indoor and Mobile Radio Communications (PIMRC)
- IEEE Wireless Communications and Networking Conference (WCNC)
- IEEE International Symposium on Information Theory (ISIT)
- IEEE Information Theory Workshop (ITW)
- EuCNC & 6G Summit
- International Symposium on Wireless Communication Systems (ISWCS)

Appointments/board membership

- Springer book series Textbooks in Telecommunication Eng.: member of Editorial Advisory Board, 2024-now.
- CCABA - Advanced Broadband Communications Center at Universitat Politécnica de Catalunya: member of External Advisory Board, 2021-now.
- French National Research Agency, project proposal reviewer, 2020.

Bibliography

See also my Google Scholar profile and my complete list of publications.

Journal Articles

[1] A. Perotti and S. Benedetto, "A new upper bound on the minimum distance of turbo codes," *IEEE Transactions on Information Theory*, vol. 50, no. 12, pp. 2985–2997, 2004. DOI: 10.1109/TIT.2004.838358.

[2] A. Perotti and S. Benedetto, "An upper bound on the minimum distance of serially concatenated convolutional codes," *IEEE Transactions on Information Theory*, vol. 52, no. 12, pp. 5501–5509, 2006. DOI: 10.1109/TIT.2006.885447.

[3] A. R. Safavi, A. G. Perotti, B. M. Popović, M. Boloursaz Mashhadi, and D. Gündüz, "Deep extended feedback codes," *ITU Journal on Future and Evolving Technologies*, vol. 2, no. 6, pp. 33–41, 2021. DOI: 10.52953/SNLM1743.

[4] E. Ozfatura, Y. Shao, A. G. Perotti, B. M. Popović, and D. Gündüz, "All you need is feedback: Communication with block attention feedback codes," *IEEE Journal on Selected Areas in Information Theory*, vol. 3, no. 3, pp. 587–602, 2022. DOI: 10.1109/JSAIT.2022.3223901.

[5] M. Boloursaz Mashhadi, D. Gündüz, A. G. Perotti, and B. M. Popović, "DRF codes: Deep SNR-robust feedback codes," *ITU Journal on Future and Evolving Technologies*, vol. 4, no. 3, pp. 447–460, 2023. DOI: 10.52953/DAPE6014.

[6] Y. Shao, E. Ozfatura, A. G. Perotti, B. M. Popović, and D. Gündüz, "Attentioncode: Ultra-reliable feedback codes for short-packet communications," *IEEE Transactions on Communications*, vol. 71, no. 8, pp. 4437–4452, 2023. DOI: 10.1109/TCOMM.2023.3280563.

[7] A. Perotti, S. Benedetto, and P. Remlein, "Adaptive coded continuous-phase modulations for frequency-division multiuser systems," *Advances in Electronics and Telecommunications*, vol. 1, no. 1, pp. 50–58, 2010, Journal published by Poznan University of Technology, Poznan, Poland, during years 2010-2013.

[8] A. Perotti, A. Tarable, S. Benedetto, and G. Montorsi, "Capacity-achieving CPM schemes," *IEEE Transactions on Information Theory*, vol. 56, no. 4, pp. 1521–1541, 2010. DOI: 10.1109/TIT.2010.2040861.

[9] P. Remlein, M. Jasinski, and A. Perotti, "Receiver algorithm for coded multiuser CPM systems," *IET Electronics Letters*, vol. 48, no. 11, pp. 631–633, 2012. DOI: 10.1049/el.2011.3769.

[10] A. G. Perotti, M. N. Khormuji, and B. M. Popović, "Simultaneous wireless information and power transfer by continuous-phase modulation," *IEEE Communications Letters*, vol. 24, no. 6, pp. 1294–1298, 2020. DOI: 10.1109/LCOMM.2020.2981316.

[11] H. Wu, L. Ping, and A. Perotti, "User-specific chip-level interleaver design for IDMA systems," *IET Electronics Letters*, vol. 42, no. 4, pp. 233–234, 2006. DOI: 10.1049/el:20063770.

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[13] F. Linsalata, S. Mura, M. Mizmizi, M. Magarini, P. Wang, M. N. Khormuji, A. Perotti, and U. Spagnolini, "LoS-map construction for proactive relay of opportunity selection in 6G V2X systems," *IEEE Transactions on Vehicular Technology*, vol. 72, no. 3, pp. 3864–3878, 2023. DOI: 10.1109/TVT.2022.3217966.

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Conference Papers

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Book Chapters

[52] D. Riviello, S. Benco, F. L. Crespi, A. Ghittino, R. Garello, and A. Perotti, "Spectrum sensing algorithms for cognitive TV white-spaces systems," in *Cognitive Communication and Cooperative HetNet Coexistence*, M.-G. Di Benedetto and F. Bader, Eds. Springer, 2014. DOI: 10.1007/978-3-319-01402-9.

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Non peer-reviewed publications

[55] A. G. Perotti, B. M. Popović, and A. R. Safavi, *Accumulative iterative codes based on feedback*, Jun. 2021. DOI: 10.48550/arXiv.2106.07415. [Online]. Available: https://arxiv.org/abs/2106.07415.

[56] A. G. Perotti, *Identification codes applications in next generation wireless networks*, Invited talk, Braunschweig, DE: 6G-life, 6G-RIC Workshop on Post-Shannon Theory, and Molecular Communication, Mar. 2025.

[57] A. G. Perotti, *Deep learning-based error correction codes for feedback channels*, San Diego (CA), USA: Information Theory and Applications Workshop, Feb. 2024.

In preparation manuscripts

[58] A. G. Perotti and B. M. Popović, "Pilot-less direct satellite up-link by quasi-orthogonal sparse superposition codes (provisional title)," In preparation.

[59] A. G. Perotti and B. M. Popović, "FDD massive MIMO prediction based on partial reciprocity (provisional title)," In preparation.

GDPR STATEMENT

I authorise the processing of personal data contained within this CV, according to GDPR (EU) 2016/679, Article 6.1(a).