

Mustafa Cemil Coşkun

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Interests

My broad interests include *applied probability*, *information theory* and *coding theory* with applications to *wireless communications*. In particular, I enjoy developing and implementing algorithms for inference in graphical models appearing in communications. In the course of my Ph.D. studies, I focused on the design of polar(-like) codes and their low-complexity decoding. This includes also non-coherent receiver designs for block-fading channels, where my techniques aim at joint channel estimation and decoding of short codes.

Education

- Sep. 2017–Apr. 2022 **Dr.-Ing. in Electrical and Computer Engineering**, *Technical University of Munich (TUM)*, Munich, Germany. Advisor: Prof. Gerhard Kramer.
◦ Thesis title: “Code analysis and design for successive cancellation list decoders”
- Aug. 2019–Jan. 2020 **Visiting Ph.D.**, *Duke University*, Durham, USA. Host: Prof. Henry D. Pfister.
◦ Efficient (near-)optimum decoding of Reed–Muller and polar(-like) codes over binary-input memoryless symmetric channels and theoretical characterization of the required complexity
- Oct. 2014–Feb. 2017 **M.Sc. in Communications Engineering (MSCE)**, *TUM*, Munich, Germany.
◦ Graduation with high distinction (summa cum laude)
◦ Focus on coding theory, communication and information theory
◦ Thesis title: “Successive cancellation decoding of single parity-check product codes”
- Sep. 2010–Aug. 2014 **B.Sc. in Electrical and Electronics Engineering**, *Boğaziçi University*, İstanbul, Turkey.
◦ Graduation with high honor (summa cum laude)
◦ Focus on control theory

Experience

- May 2022– present **Post-Doctoral Researcher**, *TUM*, Munich, Germany. Advisor: Prof. Gerhard Kramer.
◦ Polar-coded non-coherent transmission for MIMO and high-order modulation
- Mar. 2017–Aug. 2020 **Research Fellow**, *DLR*, Wessling, Germany. Group leader: Dr. Gianluigi Liva.
◦ Project title: “Efficient coding and modulation for satellite links with severe delay constraints”
◦ Developing list decoding techniques over fading channels
◦ Efficient (near-)optimum decoding of product codes with or without an outer code
- Apr. 2016–Feb. 2017 **Internship & Master Thesis**, *DLR*, Wessling, Germany. Advisor: Dr. Gianluigi Liva.
◦ Weight enumerator analysis of short polar codes
◦ Short codes under ordered-statistics decoding
◦ Successive cancellation list decoding of single parity-check product codes

Selected Publications

Peer-Reviewed Journal Papers (5 in total)

- 1 **M. C. Coşkun**, H. D. Pfister, “An information-theoretic perspective on successive cancellation list decoding and polar code design,” *to appear IEEE Trans. Inf. Theory*, 2022.
- 2 P. Yuan, **M. C. Coşkun**, G. Kramer, “Polar-coded non-coherent communication,” *IEEE Commun. Lett.*, vol. 25, no. 6, pp. 1786–1790, Feb. 2021.
- 3 **M. C. Coşkun**, T. Jerkovits, G. Liva, “Successive Cancellation List Decoding of Product Codes with Reed-Muller Component Codes,” *IEEE Commun. Lett.*, vol. 23, no. 11, pp. 1972–1976, Nov. 2019.

- 4 **M. C. Coşkun**, G. Durisi, T. Jerkovits, G. Liva, William Ryan, B. Stein, F. Steiner, "Efficient error-correcting codes in the short blocklength regime," *Elsevier Phys. Commun.*, vol. 34, pp. 66-79, Jun. 2019.

Preprints (2 in total)

- 1 P. Yuan, **M. C. Coşkun**, "Successive cancellation ordered search decoding of modified G_N -coset codes," *submitted to IEEE Trans. Commun.*, 2021, [Online].
- 2 **M. C. Coşkun**, G. Liva, A. Graell i Amat, M. Lentmaier, H. D. Pfister, "Successive cancellation decoding of single parity-check product codes: Analysis and improved decoding," *submitted to IEEE Trans. Inf. Theory (minor revisions)*, 2020, [Online].

Peer-Reviewed Conference Papers (7 in total)

- 1 **M. C. Coşkun**, H. D. Pfister, "Bounds on the list size of successive cancellation list decoding," in *Proc. IEEE SPCOM*, Bangalore, India, Jul. 2020.
- 2 **M. C. Coşkun**, J. Neu, H. D. Pfister, "Successive cancellation inactivation decoding for modified Reed-Muller and eBCH codes," in *Proc. IEEE ISIT*, LA, CA, USA, Jun. 2020.
- 3 J. Neu, **M. C. Coşkun**, G. Liva, "Ternary quantized polar code decoders: Analysis and design," in *Proc. 53rd Asilomar Conf.*, Pacific Grove, CA, USA, Nov. 2019.
- 4 **M. C. Coşkun**, G. Liva, J. Östman, G. Durisi, "Low-complexity joint channel estimation and list decoding of short codes," in *Proc. 12th SCC*, Rostock, Germany, Feb. 2019.

Patents (6 in total)

- 1 P. Yuan, **M. C. Coşkun**, G. Kramer, "Decoding apparatus and method of decoding," Deutsches Patent- und Markenamt, DE102020128918, Granted, Nov. 2021.
- 2 **M. C. Coşkun**, T. Jerkovits, "Decoding method," Deutsches Patent- und Markenamt, DE102019200941B4, Granted, Aug. 2020.
- 3 **M. C. Coşkun**, G. Liva, "Decoding method," Deutsches Patent- und Markenamt, DE102017216264B4, Granted, Sep. 2019.
- 4 **M. C. Coşkun**, G. Liva, "Decryption method and communication system," Deutsches Patent- und Markenamt, DE102017200075B4, Granted, Jul. 2018.

Selected Invited Talks & Tutorials

- Nov. 2021 "Polar codes for communication over unknown fading channels," *Short packet transmission for wireless communications*, Paris, France.
- Sep. 2021 "Optimum decoding of modified polar codes: From inactivation decoding to tree-search," *Ferienakademie 2021*, Sarntal, Italy.
- May 2021 Polar code design for SCL decoding: An information-theoretic perspective, *The 35. Meeting of ITG Professional Group Applied Information Theory*, Germany (Online).
- Nov. 2020 "Polar codes: Basics and recent advances," *H2020 INCOMING School*, Novi Sad (Online), Serbia.
- Jul. 2020 "Average list size of successive cancellation inactivation decoding," *2020 Workshop on Coding, Cooperation, and Security in Modern Communication Networks (COCO)*, Ben-Gurion University (Online), Israel.
- Jun. 2020 "List decoding of short codes for communication over unknown fading channels," *Institut-skolloquium*, DLR, Wessling, Germany.
- Mar. 2019 "Successive cancellation decoding of single parity-check product codes: Analysis and improved decoding algorithms," *The 33. Meeting of ITG Professional Group Applied Information Theory*, Ulm, Germany.

Selected Teaching

Coursework

- 2020, 2021 **Lecturer**, 2-week (75-hour) B.Sc. module “Digital Communications” (EDE3205), TU-MAsia, Singapore.
- 2018 – 2021 **Invited Lecturer**, Seminar on polar codes as a part of M.Sc. module “Channel Codes for Iterative Decoding” (EI7411) (summer semester), TUM, Munich, Germany.
- 2018 **Teaching Assistant**, Summer school organized for international M.Sc. students on “Redundancy and Irrelevance in Source and Channel Coding” (Prof. Gerhard Kramer and Prof. Bernd Edler), Ferienakademie 2018, Sarntal, Italy.

Supervision

M.Sc. Theses (6 in total)

- 2019 Marvin Xhemrishi (TUM) – “Polar codes for pilot-assisted transmission” (joined TUM as a Ph.D. candidate).
- 2018 Joachim Neu (TUM) – “Quantized polar code decoders: Analysis and design” (with Dr. Gianluigi Liva and joined Stanford as a Ph.D. candidate).

M.Sc. Research Internships (6 in total)

- 2021 Gökberk Erdoğan (TUM) – “Polar codes for binary-adder channel” (started M.Sc. thesis at TUM).
- 2021 Anmoal Porwal (TUM) – “Inactivation decoding of single parity-check product codes” (started M.Sc. thesis at TUM).

B.Sc. Theses (4 in total)

- 2020 Z. Asena Kırık (BOUN) – “Investigation of error-correcting codes over the binary erasure channel” (with Prof. Ali E. Pusane & joined U of T as a graduate student).

Selected Professional Service

- 2018–Present Reviewer for *IEEE Commun. Lett.* (28 papers), *IEEE Trans. Commun.* (25 papers), *IEEE Wireless Commun. Lett.* (5 papers), *IEEE Trans. Wireless Commun.* (3 papers), *IEEE Trans. Inf. Theory* (2 papers), *IEEE Trans. Signal Process.* (1 paper).
- Jul. 2018 Co-organizer of “TUM-COM Workshop on Ultra-Reliable Low-Latency Communications (URLLC) and Applications for 5G”.

Honors & Fellowships

- 2021 IEEE Trans. Commun. Exemplary Reviewer.
- 2017-2020 Munich Aerospace Doctoral Fellow.
- 2014-2017 DAAD-TEV-Master's Degree Scholarship.
- 2014 Netaş Outstanding Success Scholarship.
- 2010-2014 TEV (Turkish Education Foundation) Scholarship.

Computer Skills

C, C++, Julia, Matlab, SageMath.

Languages

Turkish **Native**
English **Fluent**
German **Intermediate**

References

Prof. Gerhard Kramer (TUM), gerhard.kramer@tum.de
Dr. Gianluigi Liva (DLR), gianluigi.liva@dlr.de
Prof. Henry D. Pfister (Duke), henry.pfister@duke.edu