Asst. Prof. AHMED HAREEDY

Personal Information

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International Researcher IDs
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Biography

Ahmed Hareedy is an Assistant Professor with the Electrical and Electronics Engineering Department at Middle East Technical University (METU), Turkey. He is interested in questions in coding/information theory that are fundamental to opportunities created by the current, unparalleled access to data and computing. He received the Bachelor and M.S. degrees in Electronics and Communications Engineering from Cairo University, Egypt, in 2006 and 2011, respectively. He received the Ph.D. degree in Electrical and Computer Engineering from the University of California, Los Angeles (UCLA) in 2018. He was a Postdoctoral Associate with the Electrical and Computer Engineering Department at Duke University between 2018 and 2021. He worked with Mentor Graphics Corporation (currently, Siemens EDA) between 2006 and 2014. He worked as an Error-Correction Coding Architect with Intel Corporation in the summers of 2015 and 2017.

Dr. Hareedy won the 2018-2019 Distinguished Ph.D. Dissertation Award in Signals and Systems from the Electrical and Computer Engineering Department at UCLA. He is a recipient of the Best Paper Award from the 2015 IEEE Global Communications Conference (GLOBECOM), Selected Areas in Communications, Data Storage Track. He won the 2017-2018 Dissertation Year Fellowship (DYF) at UCLA. He won the 2016-2017 Electrical Engineering Henry Samueli Excellence in Teaching Award for teaching Probability and Statistics at UCLA. He is a recipient of the Memorable Paper Award from the 2018 Non-Volatile Memories Workshop (NVMW) in the area of devices, coding, and information theory. He is a recipient of the 2018-2019 Best Student Paper Award from the IEEE Data Storage Technical Committee (DSTC). He has been recently awarded the TÜBİTAK 2232-B International Fellowship for Early Stage Researchers in 2022.

Education Information

Post Doctorate, Duke University, Pratt School of Engineering, Department of Electrical and Computer Engineering, United States Of America 2018 - 2021
Doctorate, University of California, Los Angeles, Henry Samueli School of Engineering and Applied Science, Department of Electrical and Computer Engineering, United States Of America 2014 - 2018
Postgraduate, Cairo University, Faculty of Engineering, Department of Electronics and Communications Engineering, Egypt 2006 - 2011
Undergraduate, Cairo University, Faculty of Engineering, Department of Electronics and Communications Engineering, Egypt 2001 - 2006

Foreign Languages

English, C2 Mastery
Arabic, C2 Mastery

Dissertations

Doctorate, Graph-Based Error Correcting Codes for Modern Dense Storage Devices, University of California, Los Angeles, Henry Samueli School of Engineering and Applied Science, Department of Electrical and Computer Engineering, 2018
Postgraduate, LDPC Decoding Using Selective Max-Min (SMM) Algorithm: Theory and Implementation, Cairo University, Faculty of Engineering, Department of Electronics and Communications Engineering, 2011

Research Areas

Information Theory, Communication Networks, Error Corrector Codes, Distributed Systems, Information Security and Reliability, Memory and Storage, Quantum Calculation, Data Representation and Storage, Computer Learning, Biosignal Processing

Academic Titles / Tasks

Assistant Professor, Middle East Technical University, Faculty of Engineering, Department of Electrical and Electronics Engineering, 2022 - Continues
Researcher, Duke University, Pratt School of Engineering, Department of Electrical and Computer Engineering, 2018 - 2021

Courses

Computer Architecture I, Undergraduate, 2024 - 2025, 2023 - 2024, 2022 - 2023
Coding Theory, Postgraduate, 2024 - 2025, 2023 - 2024, 2022 - 2023, 2021 - 2022
Probability and Random Variables, Undergraduate, 2023 - 2024
Signals and Systems II, Undergraduate, 2023 - 2024, 2022 - 2023, 2021 - 2022

Advising Theses

Hareedy A., EFFICIENT DECODERS FOR MODERN LDPC CODES WITH APPLICATIONS IN EDGE DEVICES, Postgraduate, M.CELIK(Student), Continues
Hareedy A., EFFICIENT ERROR PREVENTION AND CORRECTION CODING TECHNIQUES FOR RELIABLE DNA DATA STORAGE, Postgraduate, O.SIMAY(Student), Continues
Hareedy A., CONSTRAINED CODING PLUS MACHINE LEARNING FOR TWO-DIMENSIONAL MAGNETIC RECORDING, Postgraduate, D.ÖZBAYRAK(Student), Continues
Hareedy A., CONSTRAINED CODES THAT ENHANCE THE RELIABILITY OF RESISTIVE RANDOM-ACCESS MEMORIES, Postgraduate, S.KAAN(Student), Continues
Hareedy A., APPLICATION-DRIVEN ERROR CORRECTION AND CONSTRAINED CODING SOLUTIONS FOR MODERN CONVENTIONAL AND DNA DATA STORAGE, Doctorate, C.IRIMAGZI(Student), Continues
Hareedy A., GRAPH-BASED CODES WITH LOCAL MESSAGE RECOVERY AND LOW-LATENCY DECODING FOR COMPUTATIONAL STORAGE, Doctorate, M.FURKAN(Student), Continues

Hareedy A., POWER SPECTRAL DENSITY OF MULTI-LEVEL CONSTRAINED SEQUENCES WITH APPLICATIONS, Postgraduate, S.BUSE(Student), 2024

Published journal articles indexed by SCI, SSCI, and AHCI

I. **Eliminating Media Noise While Preserving Storage Capacity: Reconfigurable Constrained Codes for Two-Dimensional Magnetic Recording**
Guzel I., ÖZBAYRAK D., Calderbank R., HAREEDY A.
IEEE Transactions on Information Theory, vol.70, no.7, pp.4905-4927, 2024 (SCI-Expanded)

II. **Efficient Constrained Codes That Enable Page Separation in Modern Flash Memories**
HAREEDY A., Zheng S., Siegel P., Calderbank R.
IEEE Transactions on Communications, vol.71, no.12, pp.6834-6848, 2023 (SCI-Expanded)

III. **Breaking the Computational Bottleneck: Probabilistic Optimization of High-Memory Spatially-Coupled Codes**
Yang S., HAREEDY A., Calderbank R., Dolecek L.
IEEE Transactions on Information Theory, vol.69, no.2, pp.886-909, 2023 (SCI-Expanded)

IV. **The Secret Arithmetic of Patterns: A General Method for Designing Constrained Codes Based on Lexicographic Indexing**
HAREEDY A., Dabak B., Calderbank R.
IEEE Transactions on Information Theory, vol.68, no.9, pp.5747-5778, 2022 (SCI-Expanded)

V. **Hierarchical Coding for Cloud Storage: Topology-Adaptivity, Scalability, and Flexibility**
Yang S., Hareedy A., Calderbank R., Dolecek L.
IEEE Transactions on Information Theory, vol.68, no.6, pp.3657-3680, 2022 (SCI-Expanded)

VI. **Power Spectra of Constrained Codes with Level-Based Signaling: Overcoming Finite-Length Challenges**
Centers J., Tan X., HAREEDY A., Calderbank R.
IEEE Transactions on Communications, vol.69, no.8, pp.4971-4986, 2021 (SCI-Expanded)

VII. **Managing Device Lifecycle: Reconfigurable Constrained Codes for M/T/Q/P-LC Flash Memories**
HAREEDY A., Dabak B., Calderbank R.
IEEE Transactions on Information Theory, vol.67, no.1, pp.282-295, 2021 (SCI-Expanded)

VIII. **Non-Binary Constrained Codes for Two-Dimensional Magnetic Recording**
Dabak B., HAREEDY A., Calderbank R.
IEEE Transactions on Magnetics, vol.56, no.11, 2020 (SCI-Expanded)

IX. **Minimizing the Number of Detrimental Objects in Multi-Dimensional Graph-Based Codes**
HAREEDY A., Kuditipudi R., Calderbank R.
IEEE Transactions on Communications, vol.68, no.9, pp.5299-5312, 2020 (SCI-Expanded)

X. **A Channel-Aware Combinatorial Approach to Design High Performance Spatially-Coupled Codes**
HAREEDY A., Wu R., Dolecek L.
IEEE Transactions on Information Theory, vol.66, no.8, pp.4834-4852, 2020 (SCI-Expanded)

XI. **LOCO Codes: Lexicographically-Ordered Constrained Codes**
HAREEDY A., Calderbank R.
IEEE Transactions on Information Theory, vol.66, no.6, pp.3572-3589, 2020 (SCI-Expanded)

XII. **A Combinatorial Methodology for Optimizing Non-Binary Graph-Based Codes: Theoretical Analysis and Applications in Data Storage**
HAREEDY A., Lanka C., Guo N., Dolecek L.
IEEE Transactions on Information Theory, vol.65, no.4, pp.2128-2154, 2019 (SCI-Expanded)

XIII. **Finite-length construction of high performance spatially-coupled codes via optimized partitioning and lifting**
Esfahanizadeh H., HAREEDY A., Dolecek L.
IEEE Transactions on Communications, vol.67, no.1, pp.3-16, 2019 (SCI-Expanded)

XIV. **Spatially-Coupled Codes for Channels with SNR Variation**
Esfahanizadeh H., HAREEDY A., Wu R., Galbraith R., Dolecek L.
IEEE Transactions on Magnetics, vol.54, no.11, 2018 (SCI-Expanded)

XV. **Spatially Coupled Codes Optimized for Magnetic Recording Applications**
Esfahanizadeh H., HAREEDY A., Dolecek L.
IEEE Transactions on Magnetics, vol.53, no.2, 2017 (SCI-Expanded)

XVI. **A General Non-Binary LDPC Code Optimization Framework Suitable for Dense Flash Memory and Magnetic Storage**
HAREEDY A., Lanka C., Dolecek L.
IEEE Journal on Selected Areas in Communications, vol.34, no.9, pp.2402-2415, 2016 (SCI-Expanded)

XVII. **Non-Binary LDPC Codes for Magnetic Recording Channels: Error Floor Analysis and Optimized Code Design**
Hareedy A., Amiri B., Galbraith R., Dolecek L.
IEEE Transactions on Communications, vol.64, no.8, pp.3194-3207, 2016 (SCI-Expanded)

XVIII. **Selective max-min algorithm for low-density parity-check decoding**
HAREEDY A., Khairy M. M.
IET Communications, vol.7, no.1, pp.65-70, 2013 (SCI-Expanded)

Articles Published in Other Journals

I. **Protecting the Future of Information: LOCO Coding With Error Detection for DNA Data Storage**
İRİMAĞZI C., Uslan Y., HAREEDY A.
IEEE Transactions on Molecular, Biological, and Multi-Scale Communications, vol.10, no.2, pp.317-333, 2024 (ESCI)

Refereed Congress / Symposium Publications in Proceedings

I. **Low-Complexity Constrained Coding Schemes for Two-Dimensional Magnetic Recording**
ÖZBAYRAK D., Uyar D., HAREEDY A.
2024 IEEE International Symposium on Information Theory, ISIT 2024, Athens, Greece, 7 - 12 July 2024, pp.825-830

II. **Probabilistic Design of Multi-Dimensional Spatially-Coupled Codes**
İRİMAĞZI C., Tanrikulu A., HAREEDY A.
2024 IEEE International Symposium on Information Theory, ISIT 2024, Athens, Greece, 7 - 12 July 2024, pp.653-658

III. **LDPC Decoders Prefer More Reliable Parity Bits: Unequal Data Protection Over BSC**
Dabak B., Tiryaki E., Calderbank R., HAREEDY A.
12th International Symposium on Topics in Coding, ISTC 2023, Brest, France, 4 - 08 September 2023

IV. **Read-and-Run Constrained Coding for Modern Flash Devices**
HAREEDY A., Zheng S., Siegel P., Calderbank R.
2022 IEEE International Conference on Communications, ICC 2022, Seoul, South Korea, 16 - 20 May 2022, vol.2022-May, pp.3466-3471

V. **GRADE-AO: Towards Near-Optimal Spatially-Coupled Codes with High Memories**
Yang S., HAREEDY A., Venkatasubramanian S., Calderbank R., Dolecek L.
2021 IEEE International Symposium on Information Theory, ISIT 2021, Virtual, Melbourne, Australia, 12 - 20 July 2021, vol.2021-July, pp.587-592

VI. **Q-ary Asymmetric LOCO Codes: Constrained Codes Supporting Flash Evolution**
HAREEDY A., Dabak B., Calderbank R.
2020 IEEE International Symposium on Information Theory, ISIT 2020, California, United States Of America, 21 - 26 July 2020, vol.2020-June, pp.688-693

VII. **Topology-Aware Cooperative Data Protection in Blockchain-Based Decentralized Storage Networks**
Yang S., HAREEDY A., Calderbank R., Dolecek L.
2020 IEEE International Symposium on Information Theory, ISIT 2020, California, United States Of America, 21 - 26 July 2020, vol.2020-June, pp.622-627

VIII. **Hierarchical coding to enable scalability and flexibility in heterogeneous cloud storage**
Yang S., HAREEDY A., Calderbank R., Dolecek L.
2019 IEEE Global Communications Conference, GLOBECOM 2019, Hawaii, United States Of America, 9 - 13 December 2019

IX. **Asymmetric LOCO Codes: Constrained Codes for Flash Memories**
HAREEDY A., Calderbank R.
57th Annual Allerton Conference on Communication, Control, and Computing, Allerton 2019, Illinois, United States Of America, 24 - 27 September 2019, pp.124-131

X. **A New Family of Constrained Codes with Applications in Data Storage**
HAREEDY A., Calderbank R.
2019 IEEE Information Theory Workshop, ITW 2019, Visby, Sweden, 25 - 28 August 2019

XI. **Increasing the Lifetime of Flash Memories Using Multi-Dimensional Graph-Based Codes**
HAREEDY A., Kuditipudi R., Calderbank R.
2019 IEEE Information Theory Workshop, ITW 2019, Visby, Sweden, 25 - 28 August 2019

XII. **Multi-Dimensional Spatially-Coupled Code Design Through Informed Relocation of Circulants**
Esfahanizadeh H., HAREEDY A., Dolecek L.
56th Annual Allerton Conference on Communication, Control, and Computing, Allerton 2018, Illinois, United States Of America, 2 - 05 October 2018, pp.695-701

XIII. **High performance non-binary spatially-coupled codes for flash memories**
HAREEDY A., Esfahanizadeh H., Dolecek L.
2017 IEEE Information Theory Workshop, ITW 2017, Kao-hsiung, Taiwan, 6 - 10 November 2017, vol.2018-January, pp.229-233

XIV. **Spatially-Coupled Code Design for Partial-Response Channels: Optimal Object-Minimization Approach**
HAREEDY A., Esfahanizadeh H., Tan A., Dolecek L.
2018 IEEE Global Communications Conference, GLOBECOM 2018, Abu Dhabi, United Arab Emirates, 9 - 13 December 2018

XV. **Spatially-Coupled Codes for Channels with SNR Variation**
Esfahanizadeh H., HAREEDY A., Wu R., Galbraith R., Dolecek L.
IEEE International Magnetics Conference (INTERMAG), Singapore, Singapore, 23 - 27 April 2018

XVI. **A novel combinatorial framework to construct spatially-coupled codes: Minimum overlap partitioning**
Esfahanizadeh H., HAREEDY A., Dolecek L.
2017 IEEE International Symposium on Information Theory, ISIT 2017, Aachen, Germany, 25 - 30 June 2017, pp.1693-1697

XVII. **The finite length analysis of spatially-coupled codes for 1-D magnetic recording channels**
Esfahanizadeh H., HAREEDY A., Dolecek L.
50th Asilomar Conference on Signals, Systems and Computers, ACSSC 2016, California, United States Of America, 6 - 09 November 2016, pp.1128-1132

XVIII. **The weight consistency matrix framework for general non-binary LDPC code optimization: Applications in flash memories**
HAREEDY A., Lanka C., Schoeny C., Dolecek L.
2016 IEEE International Symposium on Information Theory, ISIT 2016, Barcelona, Spain, 10 - 15 July 2016, vol.2016-August, pp.2709-2713

XIX. **Non-binary LDPC code optimization for partial-response channels**
HAREEDY A., Amiri B., Zhao S., Galbraith R., Dolecek L.
58th IEEE Global Communications Conference, GLOBECOM 2015, California, United States Of America, 6 - 10 December 2015

XX. **CUSPARC IP processor: Design, characterization and applications**
Hussein E. E. O., Shams S. I., Ali M. I., Suleiman A. A., ElWazeer K., Sobhy E. A., Ibrahim A. A., Ibrahim A. M., Khairy M. S., Fouda M. F., et al.
2010 International Conference on Microelectronics, ICM'10, Cairo, Egypt, 19 - 22 December 2010, pp.435-438

XXI. **Novel Method for Modeling IBIS4.2 Four-Level Hysteresis Behavior in an Analog Simulator**
Sabry Y. M., HAREEDY A., Selim M. A.
10th Electronics Packing Technology Conference, Singapore, Singapore, 9 - 12 December 2008, pp.1403-1408

Supported Projects

Hareedy A., TUBITAK Project, Reliable Low-Latency Storage and Computing at the Network Edge via Combining Machine Learning and Coding, 2023 - 2026
HAREEDY A., TUBITAK Project, Reliable Low-Latency Storage and Computing at the Network Edge via Combining Machine Learning and Coding (Acronym: MLCOD-SC), 2023 - 2026

Activities in Scientific Journals

IEEE BITS Magazine (IEEE Information Theory Magazine), Special Issue Editor, 2022 - Continues

Scientific Refereeing

IEEE TRANSACTIONS ON INFORMATION THEORY, SCI Journal, July 2022
IEEE TRANSACTIONS ON COMMUNICATIONS, SCI Journal, February 2022
IEEE COMMUNICATIONS LETTERS, SCI Journal, December 2021
IEEE TRANSACTIONS ON MAGNETICS, SCI Journal, May 2019
IEEE WIRELESS COMMUNICATIONS LETTERS, SCI Journal, March 2019
IET COMMUNICATIONS, SCI Journal, December 2014

Metrics

Publication: 40
Citation (WoS): 240
Citation (Scopus): 294
H-Index (WoS): 10
H-Index (Scopus): 10

Invited Talks

Graph-based error correcting codes for Flash memories, Workshop, Flash Memory Summit (FMS), United States Of America, August 2019

Awards

Hareedy A., IEEE Data Storage Best Student Paper Award, Ieee Data Storage Technical Committee (Dstc), August 2020
Hareedy A., UCLA Distinguished Ph.D. Dissertation Award, University Of California, Los Angeles, June 2019
Hareedy A., NVMW Memorable Paper Award, Non-Volatile Memories Workshop (Nvmw), March 2018

Hareedy A., UCLA Henry Samueli Excellence in Teaching Award, University Of California, Los Angeles, June 2017

Hareedy A., UCLA Dissertation Year Fellowship, University Of California, Los Angeles, May 2017

Hareedy A., IEEE GLOBECOM Best Paper Award, Ieee Global Communications Conference (Globecom), December 2015

Hareedy A., Egyptian Engineering Day Award, Ieee Young Professionals (Yp) Egypt, August 2006

Non Academic Experience

Company, Intel Corporation, Non-Volatile Memory Solutions Group

Company, Intel Corporation, Non-Volatile Memory Solutions Group

Company, Mentor Graphics Corporation (Siemens EDA), Deep Sub-Micron (DSM) Division