

Ali Emre Pusane

Research Interests

Information theory, digital communications, coding theory, codes on graphs, iterative decoding algorithms, low-density parity-check (convolutional) codes, bandwidth efficient communications.

Education

- 2002–2008 **Ph.D. in Electrical Engineering**, *University of Notre Dame*, Notre Dame, IN.
Dissertation: "Analysis of LDPC convolutional codes derived from LDPC block codes"
Advisor: Daniel J. Costello, Jr.
GPA: 3.96/4.00
- 2004–2006 **M.Sc. in Applied Mathematics**, *University of Notre Dame*, Notre Dame, IN.
Advisor: Joachim Rosenthal
GPA: 3.94/4.00
- 2002–2004 **M.Sc. in Electrical Engineering**, *University of Notre Dame*, Notre Dame, IN.
Advisor: Daniel J. Costello, Jr.
GPA: 3.96/4.00
- 1999–2002 **M.Sc. in Electronics and Communications Engineering**, *Istanbul Technical University*, Istanbul, Turkey.
Advisor: Umit Aygolu
GPA: 4.00/4.00
- 1995–1999 **B.Sc. in Electronics and Communications Engineering**, *Istanbul Technical University*, Istanbul, Turkey.
GPA: 3.21/4.00

Work Experience

- 2008–Present **Visiting Assistant Professor**, *University of Notre Dame*, Notre Dame, IN.
- Summer 2008 **Post-Doctoral Research Associate**, *University of Notre Dame*, Notre Dame, IN.
- 2003–2008 **Research Assistant**, *University of Notre Dame*, Notre Dame, IN.
- 2002–2003 **Teaching Assistant**, *University of Notre Dame*, Notre Dame, IN.
- 1999–2002 **Research and Teaching Assistant**, *Istanbul Technical University*, Istanbul, Turkey.

Teaching Experience

Instructor

- Spring 2009 Advanced Digital Communications - graduate level
- Fall 2008 Coding Theory - graduate level
- Spring 2002 Digital Communications - undergraduate level

Teaching Assistant

- Introduction to Electrical Networks
- Digital Communications
- Communication Systems
- Communication Theory
- Introduction to Mobile Communications
- Mobile and Personal Communication Sys.
- Communications Laboratory I
- Communications Laboratory II

Publications

Journal papers / preprints

- ✍ "Asymptotically good LDPC convolutional codes based on protographs," D. G. M. Mitchell, A. E. Pusane, K. Sh. Zigangirov, and D. J. Costello, Jr., *in preparation, to be submitted to IEEE Transactions on Information Theory* in August 2009.
- ✍ "Deriving good LDPC convolutional codes from LDPC block codes," A. E. Pusane, R. Smarandache, P. O. Vontobel, and D. J. Costello, Jr., *in preparation, to be submitted to IEEE Transactions on Information Theory* in May 2009.
- ✍ "Pseudo-codeword performance analysis for LDPC convolutional codes," R. Smarandache, A. E. Pusane, P. O. Vontobel, and D. J. Costello, Jr., *IEEE Transactions on Information Theory*, Vol. 55, No.6, June 2009.
- ✍ "On the error correcting capability of LDPC codes," K. Sh. Zigangirov, A. E. Pusane, D. K. Zigangirov, and D. J. Costello, Jr., *Problems of Information Transmission (Problemy Peredachi Informatsii)*, Vol. 44, No.3, pp. 50-62, September 2008.
- ✍ "A low-cost serial decoder architecture for LDPC convolutional codes," S. Bates, Z. Chen, L. Gunthorpe, A. E. Pusane, K. Sh. Zigangirov, and D. J. Costello, Jr., *IEEE Transactions on Circuits and Systems I*, Vol. 55, No.7, pp. 1967-1976, August 2008.
- ✍ "Implementation aspects of LDPC convolutional codes," A. E. Pusane, A. Jimenez-Feltstrom, A. Sridharan, M. Lentmaier, K. Sh. Zigangirov, and D. J. Costello, Jr., *IEEE Transactions on Communications*, Vol. 56, No.7, pp. 1060-1069, July 2008.
- ✍ "Sequence estimation with transmit diversity for wireless communications," E. Panayirci, U. Aygolu, and A. E. Pusane, *International Journal of Electronics and Communications (AEU)*, Vol. 57, No.5, pp. 309-316, September 2003.

Papers in conference proceedings

- ✍ "Trapping set analysis of protograph-based LDPC convolutional codes," D. G. M. Mitchell, A. E. Pusane, and D. J. Costello, Jr., *accepted for publication in Proc. IEEE International Symposium on Information Theory*, Seoul, Korea, July 2009.
- ✍ "Asymptotic trapping set analysis of regular protograph-based LDPC convolutional code ensembles," D. G. M. Mitchell, A. E. Pusane, and D. J. Costello, Jr., in *Proc. Information Theory and Applications Workshop*, San Diego, CA, USA, February 2009.
- ✍ "Free distance bounds for protograph-based regular LDPC convolutional codes," D. G. M. Mitchell, A. E. Pusane, N. Goertz, and D. J. Costello, Jr., in *Proc. International Symposium on Turbo Codes & Related Topics*, Lausanne, Switzerland, September 2008.
- ✍ "Asymptotically good LDPC convolutional codes based on protographs," D. G. M. Mitchell, A. E. Pusane, K. Sh. Zigangirov, and D. J. Costello, Jr., in *Proc. IEEE International Symposium on Information Theory*, Toronto, Ontario, Canada, July 2008.
- ✍ "On deriving good LDPC convolutional codes from QC LDPC block codes," A. E. Pusane, R. Smarandache, P. O. Vontobel, and D. J. Costello, Jr., in *Proc. IEEE International Symposium on Information Theory*, Nice, France, June 2007.

- ✍ "A comparison of ARA- and protograph-based LDPC block and convolutional codes," D. J. Costello, Jr., A. E. Pusane, C. R. Jones, and D. Divsalar, in *Proc. Information Theory and Applications Workshop*, San Diego, CA, USA, January 29-February 2, 2007.
- ✍ "LDPC convolutional codes: what are they? how do they work? are they any good?," D. J. Costello, Jr. and A. E. Pusane, in *Book of Abstracts, AMS Joint Mathematics Meetings*, New Orleans, LA, USA, January 5-8, 2007.
- ✍ "Pseudo-codewords in LDPC convolutional codes," R. Smarandache, A. E. Pusane, P. O. Vontobel, and D. J. Costello, Jr., in *Proc. IEEE International Symposium on Information Theory*, Seattle, WA, USA, July 9-14, 2006.
- ✍ "Construction of irregular LDPC convolutional codes with fast encoding," A. E. Pusane, K. Sh. Zigangirov, and D. J. Costello, Jr., in *Proc. IEEE International Conference on Communications*, Istanbul, Turkey, June 2006.
- ✍ "Decoders for low-density parity-check convolutional codes with large memory," S. Bates, L. Guntorphe, A. E. Pusane, Z. Chen, K. Sh. Zigangirov, and D. J. Costello, Jr., in *Proc. IEEE International Symposium on Circuits and Systems*, Kos, Greece, May 2006.
- ✍ "A comparison between LDPC block and convolutional codes," D. J. Costello, Jr., A. E. Pusane, S. Bates, and K. Sh. Zigangirov, in *Proc. Information Theory and Applications Workshop*, San Diego, CA, USA, February 6-10, 2006.
- ✍ "Decoders for low-density parity-check convolutional codes with large memory," S. Bates, L. Guntorphe, A. E. Pusane, Z. Chen, K. Sh. Zigangirov, and D. J. Costello, Jr., in *Proc. 12th NASA Symposium on VLSI Design*, Coeur d'Alene, Idaho, October 4 - 5, 2005.
- ✍ "Multilevel coding/modulation using LDPC convolutional codes," A. E. Pusane, M. Lentmaier, T. E. Fuja, K. Sh. Zigangirov, and D. J. Costello, Jr., in *Proc. International Symposium on Information Theory and its Applications*, Parma, Italy, pp. 685-689, October 10 - 13, 2004.
- ✍ "Reduced complexity decoding strategies for LDPC convolutional codes," A. E. Pusane, M. Lentmaier, K. Sh. Zigangirov, and D. J. Costello, Jr., in *Proc. IEEE International Symposium on Information Theory*, Chicago, Illinois, USA, p. 490, June 27 - July 2, 2004.
- ✍ "EM-based sequence estimation for wireless systems with orthogonal transmit diversity," E. Panayirci, U. Aygolu, and A. E. Pusane, in *Proc. IEEE International Conference on Communications*, Anchorage, Alaska, USA, pp. 3210-3214, May 11-15, 2003.
- ✍ "Power control for orthogonal space-time coding with multiple receive antennas," A. E. Pusane and U. Aygolu, in *Proc. 13th International Symposium on Personal, Indoor and Mobile Radio Communications Conference*, Lisbon, Portugal, pp. 95-99, September 15-18, 2002.
- ✍ "Orthogonal space-time coded OFDM over correlated fading channels", A. E. Pusane, U. Aygolu, and E. Panayirci, in *Proc. 10th IEEE Signal Processing and Communication Applications Conference*, Pamukkale, Denizli, Turkey, pp. 383-388, June 12-14, 2002.
- ✍ "Power control for orthogonal space-time coding with multiple receive antennas," A. E. Pusane and U. Aygolu, in *Proc. 10th IEEE Signal Processing and Communication Applications Conference*, Pamukkale, Denizli, Turkey, pp. 743-788, June 12-14, 2002. (**Best Student Paper Award**)
- ✍ "Space-time coded multiple MSK," A. E. Pusane and U. Aygolu, in *Proc. 8th International Conference on Advances in Communications and Control*, Crete, Greece, pp. 25-35, June 25-29, 2001.

- ✍ "MSK modulated OFDM systems," A. E. Pusane, U. Aygolu, and E. Panayirci, in *Proc. 9th IEEE Signal Processing and Applications Conference*, Famagusta, Cyprus, pp. 318-323, April 25-27, 2001.
- ✍ "Space-time coded multiple MSK modulation," A. E. Pusane and U. Aygolu, in *Proc. 9th IEEE Signal Processing and Applications Conference*, Famagusta, Cyprus, pp. 312-317, April 25-27, 2001.
- ✍ "Performance analysis of trellis-coded MSK in two-ray fading channels," A. E. Pusane, U. Aygolu, and I. Altunbas, in *Proc. First IEEE Balkan Conference on Signal Processing, Communications, Circuits and Systems*, Istanbul, Turkey, June 2-3, 2000.

Theses and reports

- ✍ "Analysis of LDPC convolutional codes derived from LDPC block codes," Ph.D. Dissertation, *Department of Electrical Engineering, University of Notre Dame*, Notre Dame, IN, April 2008.
- ✍ "NTRU public-key cryptosystem and lattice reduction algorithms," Master's Project Report, *Department of Mathematics, University of Notre Dame*, Notre Dame, IN, April 2006.
- ✍ "Space-time coded multiple MSK schemes," Master's Thesis, *Department of Electronics and Communications Engineering, Istanbul Technical University*, Istanbul, Turkey, June 2002.

Talks in addition to papers in conference proceedings

- ✍ "Pseudo-codewords in LDPC convolutional codes," presented at the *16th Symposium on Applied Algebra, Algebraic Algorithms, and Error Correcting Codes*, Las Vegas, NV, February 20-24, 2006.
- ✍ "Finite length analysis of iterative decoding: Pseudo-codewords in LDPC convolutional codes," presented at the *CAM Graduate Fellowship Poster Session, University of Notre Dame*, Notre Dame, IN, March 8, 2006.
- ✍ "On irregular bandwidth efficient LDPC convolutional code constructions," presented at the *ITR meeting, University of Illinois*, Chicago, IL, December 3, 2004.
- ✍ "Expander codes," presented at the *Working Seminar on Expander Graphs, University of Notre Dame*, Notre Dame, IN, March 23, 2004.
- ✍ "Direct message updating rule for LDPC codes," presented at the *ITR meeting, University of Notre Dame*, Notre Dame, IN, November 6, 2003.

Honors and Awards

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| 2002–2008 | Full Tuition Scholarship, University of Notre Dame. |
| 2006–2007 | Graduate Fellow of the Center for Applied Mathematics, University of Notre Dame. |
| Summer 2004 | Graduate Fellow of the Center for Applied Mathematics, University of Notre Dame. |
| June 2002 | Best Student Paper Award, "Power control for orthogonal space-time coding with multiple receive antennas," <i>10th IEEE Signal Processing and Communication Applications Conference</i> , Pamukkale, Denizli, Turkey. |
| June 2002 | Werner von Siemens Excellence Award, awarded for studies throughout the M.Sc. program at the Department of Electronics and Communication Engineering, Istanbul Technical University. |
| December 1998 | Ranked in the top 0.2% of 30,000 examinees in the Graduate Studies Entrance Examination of Turkey. |
| April 2005 | Ranked in the top 0.1% of 1,500,000 examinees in the University Entrance Examination of Turkey. |

Professional Activities

Memberships

- IEEE and IEEE Information Theory Society

Peer-reviewing

Reviewed more than 70 journal and conference submissions for the following publications:

- IEEE Transactions on Communications
- IEEE Transactions on Information Theory
- IEEE Transactions on Wireless Communications
- IEEE Transactions on Circuits and Systems I
- IEEE Journal on Special Areas in Communications
- IEEE Transactions on VLSI Systems
- IEEE Communications Letters
- IEEE Communications Magazine
- Computers and Electrical Engineering Journal
- EURASIP Journal on Wireless Communications and Networking
- IEEE International Symposium on Information Theory
- IEEE International Conference on Communications
- IEEE Information Theory Workshop
- IEEE GLOBECOM
- IEEE Vehicular Technology Conference
- IEEE Wireless Communications and Networking Conference
- IEEE International Symposium on Circuits and Systems
- International Symposium on Turbo Codes and Related Topics
- Milcom

Skills and Qualifications

Programming
Languages

Fortran, C, C++, Perl, Java, Javascript.

Software Packages

Mathcad, MATLAB, Maple, MAGMA, LaTeX, Octave.

References

Available upon request.