HASTI SHABANI

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RESEARCH INTEREST

Computational Microscopy, 3D Image Processing, Optimization, Computational Pathology, Inverse Problem,

EDUCATION

PhD The University of Memphis, Memphis, USA — Sep 2013 – May 2019
Electrical Engineering
- Advisor: Dr. Chrysanthe Preza
- Area of Study: Computational Microscopy, 3D Image Processing
- GPA: 3.96/4.00

MS Iran University of Science & Technology (IUST), Tehran, Iran — Sep 2007 – Oct 2010
Electrical Engineering, Majoring in communication systems
- Advisor: Dr. Mohammad Hossein Kahaei
- Area of Study: Blind source Separation, Speech recognition, Compressive Sensing, Missing Feature Theory
- GPA: 3.81/4.00

BS Amirkabir University of Technology (Tehran Polythechnic), Tehran, Iran — Sep 98 – Jun 2003
Biomedical Engineering, Majoring in Bioelectric
- Advisor: Dr. Farshad Almasganj
- Area of Study: Speech processing
- GPA: 3.59/4.00

BS Amirkabir University of Technology (Tehran Polythechnic), Tehran, Iran — Sep 98 – Sep 2003
Electrical Engineering, Majoring in Electronics
- Advisor: Dr. Mohammad Ahadi
- Area of Study: Speech processing
- GPA: 3.58/4.00
- Allowed exceptionally as an award for honor students in 2000

PROJECTS

Shahid Beheshti University, Iran
Institute of Medical Science and Technology (IMSAT) — Feb 2021 – Present
- Developing a robust and artifact-free image stitching algorithm

Department of Electrical and Computer Engineering, The University of Memphis, USA
Research assistant at Computational Imaging Research Laboratory (CIRL) — Jan 2015 – April 2019
(Project funded by NSF, DBI 1353904, PI: C. Preza, $750k)
- Developing a reconstruction algorithm for tunable 2D-SIM.

- Developing a new reconstruction algorithm, which is applicable to 2D-SIM and 3D-SIM where the structured pattern is separable into axial and lateral functions considering axial scanning of the sample.
- Engineering the synthetic optical transfer function (OTF) of a tunable 3D-SIM based on the Fresnel biprism and multiple linear sources to perform best in for different application.
- Assisting to align the open optical setup for a novel approach to generate the 3D structured pattern.

Research assistant at Computational Intelligence Laboratory (CIL) Sep 2013 – Dec 2014
(Project funded by NSF, IIS-1231620, PI: B. Banerjee, $298k)

- Machine learning algorithms for tuning cochlear implants from speech production

Department of Electrical Engineering, IUST Sep 2008 – Nov 2010
Iran Telecommunication Research Center (ITRC), Tehran, Iran

- Simulation Results of New Algorithms for Blind Separation of Speakers' Voice
- An Investigation on New Algorithms for Blind Separation of Speakers' Voice

Department of Electrical Engineering, IUST, Tehran, Iran Sep 2007 – Oct 2010

- BSS approaches for Localization
- Using LMS Filters for Removing Residual Crosstalk Components in Blind Source Separation (BSS) Outputs.
- Simulation of AWGN and Rayleigh Fading Channels for different modulations to find BER, with Jammer.
- Blind Source Separation of Convolved Sources by Joint Approximate Diagonalization of Cross-Spectral Density Matrices.
- A Hybrid Speech Enhancement System by Blind Source Separation (BSS) and Adaptive Noise Cancelation (ANC).

Department of Electrical Engineering, Sharif University, Tehran, Iran Nov 2008 – Feb 2009

- Using Wavelet Packets to Reinforcing Speaker Verification

PUBLICATIONS

Journal Publications

1. **H. Shabani**, A. Doblas, G. Saavedra, E. Sanchez-Ortiga, C. Preza, "Optical transfer function engineering for a novel structured illumination microscope," Opt. Lett, 44(7), 1560-1563 (2019).
2. A. Doblas, **H. Shabani**, G. Saavedra, and C. Preza, "Tunable-frequency three-dimensional structured illumination microscopy with reduced data-acquisition," Opt. Express, 26(23), 30476-30491 (2018).

   ** First two co-authors have contributed equally to this work.
3. **H. Shabani**, A. Doblas, G. Saavedra, E. Sanchez-Ortiga, C. Preza, "Improvement of two-dimensional structured illumination microscopy with an incoherent illumination pattern of tunable frequency," Appl. Opt., 57, B92-B101 (2018).

   ** First two co-authors have contributed equally to this work.
4. N. Patwary, **H. Shabani**, A. Doblas, G. Saavedra, C. Preza, "Experimental validation of a customized phase mask designed to enable efficient computational optical sectioning microscopy through wavefront encoding," Appl. Opt. 56, D14-D23 (2017).

Peer-Reviewed Conference Papers

1. CTS. Van, **H. Shabani**, C. Preza, "Experimental Verification of 3D Model-Based Restoration for 3D-SIM with Data Reduction," Computational Optical Sensing and Imaging. Optical Society of America, (2020).
2. CTS. Van, **H. Shabani**, C. Preza, "3D model-based restoration with positivity constraint using a reduced number of 3D-SIM images." *arXiv preprint arXiv:1910.11342* (2019).

3. **H. Shabani**, S. Labouesse, A. Sentenac, and C. Preza, "Three-dimensional deconvolution based on axial-scanning model for structured illumination microscopy," IEEE 16th International Symposium on Biomedical Imaging (ISBI 2019), pp. 552-555, IEEE, Venice, Italy (2019).
4. **H. Shabani**, A. Doblas, G. Saavedra, C. Preza, "Investigating the impact of structured illumination design on the synthetic optical transfer function," Proc. SPIE, Three-Dimensional and Multidimensional Microscopy: Image Acquisition and Processing XXV, accepted, San Francisco, USA (2019).
5. **H. Shabani**, A. Doblas, G. Saavedra, C. Preza, "3D structured illumination microscopy using an incoherent illumination system based on a Fresnel biprism," Proc. SPIE 10499, Three-Dimensional and Multidimensional Microscopy: Image Acquisition and Processing XXV, 1049903, San Francisco, USA (2018).
6. **H. Shabani**, A. Doblas, G. Saavedra, C. Preza, "Preprocessing method to correct illumination pattern in sinusoidal-based structured illumination microscopy," Proc. SPIE 10499, Three-Dimensional and Multidimensional Microscopy: Image Acquisition and Processing XXV, 104991Z, San Francisco, USA (2018).
7. **H. Shabani**, A. Doblas, and C. Preza, "Simultaneous optical sectioning and super resolution in 2D-SIM using tunable structured illumination," in Imaging and Applied Optics 2017 (3D, AIO, COSI, IS, MATH, pcAOP), OSA Technical Digest (online) (Optical Society of America), paper CW4B.4, San Francisco, USA (2017).
8. **H. Shabani**, N. Patwary, A. Doblas, G. Saavedra, C. Preza, "Comparison of two structured illumination techniques based on different 3D illumination patterns," Proc. SPIE 10070, Three-Dimensional and Multidimensional Microscopy: Image Acquisition and Processing XXIV, 1007013, San Francisco, USA (2017).
9. A. Doblas, **H. Shabani**, G. Saavedra, C. Preza, "Comparison of 3D structured patterns with tunable frequency for use in structured illumination microscopy," Proc. SPIE 10070, Three-Dimensional and Multidimensional Microscopy: Image Acquisition and Processing XXIV, 100700H, San Francisco, USA (2017).
10. S. V. King, C. Taylor, A. Doblas, **H. Shabani**, N. Patwary, G. Saavedra, C. Preza, "Implementation of an incoherent 3D patterned illumination design in a structured illumination microscope," Proc. SPIE 10070, Three-Dimensional and Multidimensional Microscopy: Image Acquisition and Processing XXIV, 1007004, San Francisco, USA (2017).
11. **H. Shabani**, E. Sánchez-Ortiga, C. Preza, "Investigating the performance of reconstruction methods used in structured illumination microscopy as a function of the illumination pattern's modulation frequency," Proc. SPIE 9713, Three-Dimensional and Multidimensional Microscopy: Image Acquisition and Processing XXIII, 971305, San Francisco, USA (2016).
12. N. Patwary, S. V. King, **H. Shabani**, C. Preza, "Experimental Implementation of Wavefront Encoding in 3D Widefield Fluorescence Microscopy Using a Fabricated Phase Mask Designed to Reduce System Depth Variability," in *Imaging and Applied Optics 2016*, OSA Technical Digest (online) (Optical Society of America), paper CW2D.3, Heidelberg, Germany (2016).
13. **H. Shabani**, M. H. Kahaei. "Missing feature mask generation in BSS outputs using pitch frequency," In Digital Signal Processing (DSP), 2011 17th International Conference on, pp. 1-6. IEEE, Corfu, Greece (2011).
14. **H. Shabani**, T. Noohi, M. H. Kahaei. "Post-processing for crosstalk cancellation in convolutive BSS outputs based on pitch frequency," In Digital Signal Processing (DSP), 2011 17th International Conference on, pp. 1-5. IEEE, Corfu, Greece (2011).
15. T. Noohi, **H. Shabani**, M. H. Kahaei. "An introduction to EIP-NLMS post-processing method for cross-talk cancellation in BSS outputs," In Computer and Automation Engineering (ICCAE), 2010 The 2nd International Conference on, vol. 3, pp. 548-552. IEEE, Singapore (2010).

Conference Papers and Presentations

1. Cong T.S. Van, **H. Shabani**, and C. Preza, "3D model-based restoration methods for 3D-SIM," Quantitative BioImaging (QBI), accepted, the University of Oxford's Mathematical Institute, Oxford, UK, Jan. 6-9, 2020.

2. A. Doblas, **H. Shabani**, G. Saavedra, and C. Preza, "Recent advances in tunable 3D structured illumination microscopy," 20th International Conference on Transparent Optical Networks ICTON 2018, Bucharest, Romania, July 1-5, in press, 2018.
3. **H. Shabani**, A. Doblas, G. Saavedra, and C. Preza, "Novel structured illumination improves 3- D resolution in fluorescence microscopy," Image Science Gordon Research Conference, Easton, MA, June 17-22, 2018.
4. A. Doblas, J. Sola-Pikabea, **H. Shabani**, G. Saavedra, M. Martinez-Corral, and C. Preza, "Incoherent structured illumination system with a tunable 3D pattern," Computational Imaging III, SPIE Commercial & Scientific Sensing and Imaging, talk 10669-12, Orlando, FL, 15 April 2018.
5. **H. Shabani**, A. Doblas, G. Saavedra, and C. Preza, "3D Tunable structured illumination microscope using a Fresnel biprism," Focus on Microscopy," Singapore, March 27, 2018.
6. C. Preza, N. Patwary, **H. Shabani**, A. Doblas, and G. Saavedra, "PSF engineering using a fabricated SQUBIC phase mask to reduce the effect of spherical aberration in 3D wide field fluorescence Imaging," Focus on Microscopy, Bordeaux, France, April 10 2017.
7. A. Doblas, **H. Shabani**, G. Saavedra, and C. Preza, "Improvement of 2D-SIM achieved based on tunable structured illumination," Focus on Microscopy," Bordeaux, France, April 10 2017.
8. **H. Shabani**, N. Patwary, A. Doblas, G. Saavedra, and C. Preza, "Investigating the effect of different 3D illumination patterns on structured illumination microscopy performance," Quantitative BioImaging (QBI), Texas A&M University, College Station, TX, Jan. 5-7, 2017.
9. N. Patwary, **H. Shabani**, A. Doblas, G. Saavedra, and C. Preza, "Implementation of PSF engineering using a fabricated phase mask to reduce the effect of spherical aberration in 3D wide field fluorescence microscopy," Quantitative BioImaging (QBI), Texas A&M University, College Station, TX, Jan. 5-7, 2017.
10. N. Patwary, S. V. King, **H. Shabani**, and C. Preza, "Reducing the effect of depth-induced aberration in 3D fluorescence imaging using wavefront encoding" Image Science Gordon Research Conference, Stonehill College, Easton, MA, June 5-10, 2016.
11. B. Banerjee, L. L. Mendel, J. K. Dutta, **H. Shabani**, S. Najnin. "Identifying hearing deficiencies from statistically learned speech features for personalized tuning of cochlear implants," Twenty-Ninth AAAI Conference on Artificial Intelligence Workshop (Artificial Intelligence Applied to Assistive Technologies and Smart Environments), January 25-29 (2015).
12. B. Banerjee, **H. Shabani**, S. Najnin, L. L. Mendel, C. Patro, S. Lee, M. P. King. "Machine learning algorithms for tuning cochlear implants from speech production errors," Annual Convention of the American Academy of Audiology - Audiology NOW!, March 26-29 (2014).

PRESENTATIONS

April 2018: "Novel Structured illumination improves 3D resolution in fluorescence microscopy," 6rd Annual graduate poster presentation, The University of Memphis, Memphis, TN, USA.

June 2017: "Simultaneous optical sectioning and super resolution in 2D-SIM using tunable structured illumination," Computational Optical Sensing and Imaging, San Francisco, CA, USA.

April 2017: "Insights gained from the current computational methods used in Super-Resolution Structured Illumination Microscopy (SR-SIM)," 5rd Annual graduate poster presentation, The University of Memphis, Memphis, TN, USA.

June 2016: "Assessing super-resolution and optical sectioning capability in structured illumination microscopy," Gorden Research Conference, Easton, MA, USA.

February 2016: "Investigating the performance of reconstruction methods used in structured illumination microscopy as a function of the illumination pattern's modulation frequency," Three-Dimensional and Multidimensional Microscopy: Image Acquisition and Processing, San Francisco, CA, USA.

April 2015: "Insights gained from the current computational methods used in Super-Resolution Structured Illumination Microscopy (SR-SIM)," 3rd Annual graduate poster presentation, The University of Memphis, Memphis, TN, USA.

November 2014: "Bottom-Up Auditory Saliency Model: Looking at the sound as a time-evolving entity," Institute for Intelligent Systems (Speed Date) poster presentation, The University of Memphis, Memphis, TN, USA.

November 2013: "Discovering the Objective of Computation by the Hair Cells," Institute for Intelligent Systems (Speed Date) poster presentation, The University of Memphis, Memphis, TN, USA.

February 2010: "Identification of evolving IMT-2000 systems and beyond," Iran Telecommunication Research Center (ITRC), Tehran, Iran.

May 2009: "Evaluating New Methods in Speech Feature Extraction," Iran University of Science and Technology (IUST), Tehran, Iran.

October 2006: "Session Initiation Protocol (SIP)," Telecommunication Infrastructure Company (TIC), Tehran, Iran.

HONORS AND AWARDS

2nd place in 5th Annual graduate poster presentation, The University of Memphis	2017
Herff Graduate Fellowship Award	2016
3nd place in 5th Annual graduate poster presentation, The University of Memphis	2016
Frances Marie Dean Fellowship Award	2015
2nd place in 5th Annual graduate poster presentation, The University of Memphis	2015
Research award for M.S. Thesis, Iran University of Science & Technology	2010
Research award, Iran Telecommunication Research Center	2009
University entrance exam rank for M.S.: 144/~15,000	2007
Research award for B.S. Thesis, Iran Telecommunication Research Center	2003
Double degree award, Amirkabir University of Technology, I was honored to study two majors simultaneously at AUT as one of the top students	2000
University entrance exam rank for B.S.: 234/~300,000	1998
Primer award for the 1st ranked High school Alumni	1998

TEACHING EXPERIENCE

Shahid Beheshti University
Institute of Medical Science and Technology (IMSAT)

- Seminar (Graduate course)– Spring 2021 — Feb 2021
- Medical Image Processing (Graduate course)– Fall 2021 — Sep 2021

The University of Memphis

- Dept. of EECE (Dr. Preza's TA), Communication Theory (EECE4231/6231), Spring 2015 — Feb 2015
  Delivered lectures in four class sessions, and graded some of the weekly assignments
- Dept. of EECE (Dr. Robinson's TA), Probabilistic System Analysis (EECE4235/6235), Spring 2015 — Jan 2015
- Dept. of EECE (Dr. Robinson's TA), Matrix Computer Method (EECE 3221) – Fall 2015 — Sep 2015
  Provided office hour support and graded grading weekly homework, quizzes and exams as well as provided office hours to address students' questions and delivered lectures in Dr. Robinson's absence

PROFESSIONAL AFFILIATIONS

Shahid Beheshti University (SBU) — Feb 2021 - Present
Title: Assistant Professor in Institute of Medical Science and Technology (IMSAT)
Research interests:

- Algorithm development, computational pathology, whole slide imaging

Telecommunication Infrastructure Company (TIC) — Jan 2006 - Aug 2013, Aug 2019 – Feb 2021
Title: Traffic Engineer

Projects and activities in switch center:

- Analyzing the traffic to make decision for expanding and establishing new routes and links
- Troubleshooting and recommending new plan for problems
- Expert member of ITU-T SG13-Wp1 (Coordination, Planning and Global Outreach of Next Generation Networks including Mobile)

PAND Industries Jul 2004 - Nov 2005
Title: Software Engineer

Projects and activities in R&D department:

- Microcontroller programming for electronic scale
- Designing electronic board for electronic scale

Iranian Research Organization for Science & Technology (IROST) Jul 2003 - Jun 2004
Title: Research Assistant

Projects and activities in electrical engineering department, biomedical group:

- Design and manufacturing of Peritoneal Dialysis (PD) unit

Member, Optical Society of America (OSA)

Member, International Society for Optical Engineering (SPIE)

Member, Institute of Electrical and Electronics Engineers (IEEE)

Member, IEEE-HKN (IEEE-Eta Kappa Nu)

PROFESSIONAL SERVICE

Peer-Reviewed Articles for:

- Applied Optics Journal
- Optics Express
- Frontiers