EMRAH BOSTAN

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EDUCATION

Swiss Federal Institute of Technology in Lausanne (EPFL), Lausanne, Switzerland

- Ph.D. in Electrical Engineering   2011 - 2016
    Thesis : « Sparsity-Based Data Reconstruction Models for Biomedical Imaging »
    Advisor: Prof. Michael Unser

- M.Sc. in Electrical Engineering (specialization in Information Technologies)   2009 - 2011
    Thesis : « Efficient Algorithms for Vector Field Reconstruction »
    Advisor: Prof. Michael Unser

Istanbul Technical University (ITU), Istanbul, Turkey
- B.Sc. in Telecommunication Engineering   2005 - 2009

PROFESSIONAL EXPERIENCE

University of California, Berkeley (UCB)

Postdoctoral Research Fellow in Computational Imaging Lab   *9/2016 - ongoing*
- Developing computational methods for designing new generation imaging systems that integrate *optics, signal processing,* and *machine learning*. My research efforts concentrate on large-scale and multi-dimensional imaging algorithms for biomicroscopy applications.

EPFL

Postdoctoral Researcher in Biomedical Imaging Group   *5/2016 - 9/2016*

Research and Teaching Assistant in Biomedical Imaging Group   *5/2011 - 5/2016*
- Developed theory and algorithms for *inverse problems in biomedical imaging, iterative image reconstruction, and statistical data modeling.* Defined and supervised research projects, all of which involved the design and implementation of specific tools for image processing/analysis applications.

ITU

Undergraduate Student Researcher in Electromagnetic Research Group   2009
- Performed anechoic chamber experiments with a tomographic imaging modality for non-destructively measuring the thickness of dielectric coatings on metal surfaces.

RESEARCH INTERESTS

Computational Imaging

- 4D tomography
- Super-resolution methods
- Light-field imaging
- Large-scale image reconstruction
- Phase retrieval
- Coherence imaging

Algorithm Design

- Convex and nonconvex optimization techniques
- Nonlinear inverse problems
- Machine learning for physical modeling
- Continuous-domain stochastic models
- Bayesian inference
- Multiscale data analysis

PUBLICATIONS

Journal Papers

1. **E. Bostan**, U. S. Kamilov, and L. Waller « Learning-based Image Reconstruction via Parallel Proximal Algorithm, » IEEE Signal Processing Letters, *in press.*

2. A. Descloux, K. S. Grußmayer, **E. Bostan**, T. Lukes, A. Bouwens, A. Sharipov, S. Geissbuehler, A.-L. Mahul-Mellier, H. A. Lashuel, M. Leutenegger, and T. Lasser « Combined Multi-Plane Tomographic Phase Retrieval and Stochastic Optical Fluctuation Imaging for 4D Cell Microscopy, » Nature Photonics, vol. 12, pp.165–172, January 2018.

3. N. Antipa, G. Kuo, R. Heckel, B. Mildenhall, **E. Bostan**, R. Ng, and L. Waller « DiffuserCam: Lensless Single-Exposure 3D Imaging, » Optica, vol. 5, no. 1, pp. 1-9, January 2018.

4. H. Q. Nguyen, **E. Bostan**, and M. Unser « Learning Convex Regularizers for Optimal Bayesian Denoising, » IEEE Transactions on Signal Processing, vol. 6, no. 4, pp. 1093-1105, February 2018.

6. M. Nilchian, **E. Bostan**, Z. Wang, M. Stampanoni, and M. Unser, « Joint Absorption and Phase Retrieval in Grating-Based X-ray Radiography, » Optics Express, vol. 24, no. 7, pp. 7253-7265, April 2016.

7. **E. Bostan,** E. Froustey, M. Nilchian, D. Sage, M. Unser, « Variational Phase Imaging Using the Transport-of-Intensity Equation, » IEEE Transactions on Image Processing, vol. 25, no. 2, pp. 807-817, February 2016.

8. J. Fageot, **E. Bostan,** M. Unser, « Wavelet Statistics of Sparse And Self-Similar Images, » SIAM Journal on Imaging Sciences, vol. 8, no. 4, pp. 2951-2975, December 2015.

9. **E. Bostan,** M. Unser, J. P. Ward, « Divergence-free Wavelet Frames, » IEEE Signal Processing Letters, vol. 22, no. 8, pp. 1142-1146, August 2015.
    ★ Recognized as part of the « Top 10% » papers at IEEE International Conference on Image Processing 2015.

10. **E. Bostan,** S. Lefkimmiatis, O. Vardoulis, N. Stergiopulos, M. Unser, « Improved Variational Denoising of Flow Fields with Application to Phase-Contrast MRI Data, » IEEE Signal Processing Letters, vol. 22, no. 6, pp. 762-766, June 2015.
    ★ Recognized as part of the « Top 10% » papers at IEEE International Conference on Image Processing 2015.

11. U. S. Kamilov, **E. Bostan,** and M. Unser, « Variational Justification of Cycle Spinning for Wavelet-Based Solutions of Inverse Problems, » IEEE Signal Processing Letters, vol. 21, no. 11, pp. 1326-1330, November 2014.

12. **E. Bostan,** U. S. Kamilov, M. Nilchian, and M. Unser, « Sparse Stochastic Processes and Discretization of Linear Inverse Problems, » IEEE Transactions on Image Processing, vol. 22, no. 7, pp. 2699-2710, July 2013.

13. A. Kazerouni, U. S. Kamilov, **E. Bostan,** and M. Unser, « Bayesian Denoising: From MAP to MMSE Using Consistent Cycle Spinning, » IEEE Signal Processing Letters, vol. 20, no. 3, March 2013.

14. A. Bourquard, N. Pavillon, **E. Bostan,** C. Depeursinge, M. Unser, « A Practical Inverse-Problem Approach to Digital Holographic Reconstruction, » Optics Express, vol. 21, no. 3, pp. 3417-3433, February, 2013.

15. A. Amini, U. S. Kamilov, **E. Bostan,** and M. Unser, « Bayesian Estimation for Continuous-Time Sparse Stochastic Processes, » IEEE Transactions on Signal Processing, vol. 61, no. 4, pp. 907-920, February 2013.

16. U. S. Kamilov, **E. Bostan,** and M. Unser, « Wavelet Shrinkage with Consistent Cycle Spinning Generalizes Total Variation Denoising, » IEEE Signal Processing Letters, vol. 19, no. 4, pp. 187-190, April 2012.

Conference Papers

1. **E. Bostan**, M. Soltanolkotabi, D. Ren, and L. Waller, « Fourier Fourier Ptychographic Microscopy with Multiplexed Coded Illumination via Accelerated Wirtinger Flow, » Proceedings of the 25th IEEE International Conference on Image Processing (ICIP'18), *submitted.*

2. D. Ren, **E. Bostan**, L.-H. Yeh, and L. Waller, « Total-Variation Regularized Fourier Ptychographic Microscopy with Multiplexed Coded Illumination, » Proceedings Imaging and Applied Optics 2017-Mathematics in Imaging (MATH'17), San Francisco CA, USA, June 26-29, 2017, pp. 1-3.

3. P. Tohidi, **E. Bostan**, P. Pad, and M. Unser, « MMSE Denoising of Sparse and Non-Gaussian AR(1) Processes, » Proceedings of the 41st IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP'16), Shanghai,China, March 20-25, 2016, pp. 4333-4337.

4. **E. Bostan,** E. Froustey, B. Rappaz, E. Shaffer, D. Sage, M. Unser, « Phase Retrieval by using Transport-of-Intensity Equation and Differential Interference Contrast Microscopy," Proceedings of the 21st IEEE International Conference on Image Processing (ICIP'14), Paris, France, October 27-30, 2014, pp. 3939-3943.
    ★ Recognized as part of the « Top 10% » papers.

5. J. Fageot, **E. Bostan,** M. Unser, « Statistics of Wavelet Coefficients For Sparse Self-Similar Images, » Proceedings of the 21st IEEE International Conference on Image Processing (ICIP'14), Paris, France, October 27-30, 2014, pp. 6096-6100.

6. E. Froustey, **E. Bostan,** S. Lefkimmiatis, M. Unser, « Digital Phase Reconstruction via Iterative Solutions of Transport-of-Intensity Equation, » Proceedings of the 13th IEEE Workshop on Information Optics (WIO'14), Neuchâtel NE, Switzerland, July 7-11, 2014, pp. 1-3.

7. **E. Bostan,** J. Fageot, U. S. Kamilov, and M. Unser, « MAP Estimators for Self-Similar Sparse Stochastic Models, » Proceedings of the 10th International Conference on Sampling Theory and Applications (SampTA'13), Bremen, Germany, July 1-5, 2013, pp. 197-199.

8. **E. Bostan,** U. S. Kamilov, M. Nilchian, and M. Unser, « Consistent Discretization of Linear Inverse Problems using Sparse Stochastic Processes, » 5th Workshop on Signal Processing with Adaptive Sparse Structured Representations (SPARS'13), July 8-11, 2013, Lausanne.

9. **E. Bostan,** O. Vardoulis, D. Piccini, P. D. Tafti, N. Stergiopulos, and M. Unser, « Spatio-Temporal Regularization of Flow-Fields, » Proceedings of the 10th IEEE International Symposium on Biomedical Imaging: From Nano to Macro (ISBI'13),San Francisco CA, USA, April 7-11, 2013, pp. 824-827.

10. P.D. Tafti, **E. Bostan,** and M. Unser, « Variational Decomposition of Vector Fields in the Presence of Noise, » Proceedings of the 10th IEEE International Symposium on Biomedical Imaging: From Nano to Macro (ISBI'13), San Francisco CA, USA, April 7-11, 2013, pp. 1162-1165.

11. U. S. Kamilov, A. Bourquard, **E. Bostan,** and M. Unser, « Autocalibrated Signal Reconstruction from Linear Measurements using Adaptive GAMP, » Proceedings of the 38th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP'13),Vancouver BC, Canada, May 26-31, 2013, pp. 5925-5928.

12. B. Tekin, U. S. Kamilov, **E. Bostan,** and M. Unser, « Benefits of Consistency in Image Denoising with Steerable Wavelets, » Proceedings of the 38th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP'13), Vancouver BC, Canada, May 26-31, 2013, pp. 1355-1358.

13. **E. Bostan,** U. Kamilov, M. Unser, « Reconstruction of Biomedical Images and Sparse Stochastic Modeling, » Proceedings of the 9th IEEE International Symposium on Biomedical Imaging: From Nano to Macro (ISBI'12), Barcelona, Spain, May 2-5, 2012, pp. 880-883.

14. **E. Bostan,** P.D. Tafti, M. Unser, « A Dual Algorithm for L1-Regularized Reconstruction of Vector Fields, » Proceedings of the 9th IEEE International Symposium on Biomedical Imaging: From Nano to Macro (ISBI'12), Barcelona, Spain, May 2-5, 2012, pp. 1579-1582.

15. U. Kamilov, **E. Bostan,** M. Unser, « Generalized Total Variation Denoising via Augmented Lagrangian Cycle Spinning with Haar Wavelets, » Proceedings of the 37th IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP'12), Japan, March 25-30, 2012, pp. 909-912.

16. O. Ozdemir, H. Haddar, C. Fidan, **E. Bostan,** « Thickness Reconstruction of Dielectric Coatings by the Use of Higher Order Impedance Boundary Conditions, » 6th Workshop on Advanced Computational Electromagnetics (ACE'10), July 5-7, 2010, Zurich

INVITED TALKS & LECTURES

1. « Divergence-Free Wavelet Frames for Phase-Contrast MRI Denoising, » Siemens Corporate Research, Princeton, NJ, USA, March 2016.

2. « Multi-Plane Tomographic Phase Retrieval for 4D Cell Microscopy, » in Workshop on Phaseless Imaging in Theory and Practice: Realistic Models, Fast Algorithms, and Recovery Guarantees, Minneapolis, MN, USA, August 2017.

3. « Fundamentals of Algorithms for Computational Imaging, » in STROBE Tutorial Series, Berkeley, CA, USA, December 2017.

4. « Learning Convex Regularizers for Optimal Bayesian Denoising, » in Berkeley Artificial Intelligence Research Seminar Series, Berkeley, CA, USA, November 2017.

RESEARCH GRANTS

- Swiss National Science Foundation (SNSF) **Early Postdoc Mobility Research Grant**
  Project Name: Computational light-field microscopy for high-speed imaging of neuronal activity
  Duration: 18 Months

HONORS & AWARDS

- Member of the TA team that has won the **Education Award** of EPFL's Life Sciences Section (2013)
- EPFL **Excellence Scholarship** for Master Studies (2009-2011)
- Alcatel-Lucent **Graduation Award** at Undergraduate Level (2009)
- Graduated as **Salutatorian** at Undergraduate Level (2009)
- ITU **High Honor Student** for all eight semesters (2005-2009)
- ITU **Merit Scholarship** at Undergraduate Level (2005)

TEACHING & SUPERVISION

- Supervised the following B. Sc. students at UCB:
  1. Anaga Rajan, 2016
     Project: « Deep Learning for Object Recognition in Highly Scattering Media »

  2. Emily Gosti, 2017
     Project: « An ImageJ Plug-In for Single-Shot Phase Imaging »

- Guest Lecturer for « Statistical Digital Signal Processing (EE225A) » at UCB, Autumn 2017.

- Teaching Assistant (TA) for the following courses at EPFL:
  Signals and Systems I:
     Autumn 2011, Autumn 2012, Autumn 2013, Autumn 2014
  Signals and Systems II:
     Spring 2012, Spring 2013, Spring 2014

- Supervised the following M. Sc. students at EPFL:
  1. Bugra Tekin (co-advised with U. Kamilov and Prof. Michael Unser), 2012
     Semester Project: « Solving Inverse Problems with Sparsifying Transforms »

  2. Emmanuel Froustey (co-advised with Prof. Michael Unser), 2013
     Semester Project: « Optical Flow Estimation under Sparsity Constraints »

     Master Project: « A practical inverse problem approach for phase imaging »

  3. Abbas Kazerouni (co-advised with U. Kamilov and Prof. Michael Unser), 2013
     Master Project: « MMSE Estimation Using Consistent Cycle Spinning »

  4. Pascal Bienz (co-advised with S. Lefkimmiatis and Prof. Michael Unser), 2013
     Master Project: « Coil Sensitivity Estimation for Parallel Magnetic Resonance Imaging »

5. David Nguyen (co-advised with Prof. Michael Unser), 2013
    Semester Project: « Transport-of-intensity approach for quantitative phase imaging »

6. Florence Gavin (co-advised with J. Ward and Prof. Michael Unser), 2014
    Semester Project: « Flow field enhancement with divergence-free wavelets »

7. Christopher Finelli (co-advised with D. Fortun and Prof. Michael Unser), 2015
    Master Project: « Variational approaches for optical flow estimation »

8. Pouria Tohidi (co-advised with P. Pad and Prof. Michael Unser), 2015
    Semester Project: « MMSE Denosing of Sparse and Non-Gaussian AR(1) Processes »

9. Arik Girsault (co-advised with V. Uhlmann and Prof. M. Unser), 2015
    Semester project: « A nonlinear forward model of phase contrast microscopy »

TECHNICAL SKILLS

- Coding Languages: Python, C
- Computation tools: MATLAB, Mathematica, Maple
- Technologies, Libraries: ImageJ, Fiji, Icy, Paraview, VTK, OpenCV, SVN, Git
- Environments: Mac OS X, GNU/Linux, Windows

PROFESSIONAL ACTIVITIES

- Co-organizer of the UC Berkeley Center for Computational Imaging Seminar Series

- Reviewer for the following journals:
    Nature Publishing: Nature Communications and Scientific Reports

    IEEE: Transactions on Computational Imaging, Transactions on Image Processing, Transactions on Pattern Analysis and Machine Intelligence, Transactions on Signal Processing, Transactions on Medical Imaging, and Signal Processing Letters

    Elsevier: Journal of Visual Communication and Image Representation and Journal of Biomechanics

    OSA: Optica and Applied Optics

    SIAM: Journal on Imaging Sciences

- Reviewer for the following conferences:
    IEEE ICASSP 2013, IEEE ISBI 2013, SampTA 2013, IEEE ISBI 2014, IEEE ISBI 2016, IEEE ICASSP 2017, IEEE ISBI 2017, and IEEE ICIP 2018

- IEEE Student Member (2011 - 2016), Member (2016 - ongoing)
- SIAM Student Member (2011 - 2016)
- OSA Member (2017 - ongoing)

PERSONAL

- Languages: Turkish (native), English (fluent), French (intermediate)
- Photography: I am interested in traditional film photography as well as darkroom printing. You can find the link to my portfolio here.