TAO HONG

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RESEARCH INTERESTS

My research interests are:

- Numerical Optimization & Multigrid Computational Methods
- Scientific Computing & Signal Processing & Machine Learning
- Computational Imaging & Arterial Spin Labeling (ASL) & MRI & Optical Imaging

POSITION

Postdoc, Functional MRI Lab, University of Michigan, Ann Arbor *Dec. 2021 -*

- Topics in inverse problems and ASL MRI
- Advisors: Prof. Jeffrey A. Fessler and Prof. Luis Hernandez-Garcia

EDUCATION

Ph.D. in the Faculty of Computer Science (Direct Track), **Technion** *Mar. 2016 - Oct. 2021*

- Title of thesis: Numerical Optimization and Multigrid Comoutational Methods with Applications GPA: 97.1/100.
- Advisors: Prof. Irad Yavneh and Dr. Michael Zibulevsky
- Thesis comittee: Prof. Irad Yavneh, Dr. Michael Zibulevsky, Prof. Michael Elad, and Prof. Hans De Sterck

Visiting Student, EPFL, Lausanne, Switzerland *Aug. 2019 - Nov. 2019*

- Topic: Multigrid Methods for the Helmholtz Equation with Application to Diffraction Tomgoraphy.
- Host: Prof. Michael Unser

B.E. Student, **Zhejiang University of Technology (ZJUT)** *Sep. 2008 - Jun. 2012*

- Major: Telecommunications Engineering.
- Title of thesis: FFT Algorithm Based On FPGA Implementation.
- Advisor: Prof. Gang Li

JOURNAL PUBLICATIONS (* equal contribution)

1. **Tao Hong***, Thanh-an Pham*, Irad Yavneh, and Michael Unser, "A Mini-Batch Quasi-Newton Proximal Methods for Constrained Total Variation Nonlinear Image Reconstruction," *In submission to IEEE Transactions on Computational Imaging*, 2023. [link][pdf][poster]
2. **Tao Hong**, Luis Hernandez-Garcia, and Jeffrey A. Fessler, "A Complex Quasi-Newton Proximal Method for Image Reconstruction in Compressed Sensing MRI," *In submission to IEEE Transactions on Computational Imaging after major revison,* 2023. [link][pdf][code]

3. **Tao Hong***, Thanh-an Pham*, Eran Treister, and Michael Unser, "Diffraction Tomography with Helmholtz Equation: Efficient and Robust Multigrid-based Solver," *In preparation for submitting to Inverse Problems.* [link][pdf]
4. **Tao Hong** and Irad Yavneh, "On Adapting Nesterov's Scheme to Accelerate Iterative Methods for Linear Problems," *Numerical Linear Algebra with Applications*, e2417, Mar. 2022. [link] [pdf][code]
5. **Tao Hong**, Irad Yavneh, and Michael Zibulevsky, "Merging Multigrid Optimization with SESOP," *In preparation for submitting to SIAM Journal on Scientific Computing.* [link][pdf] [slides]
6. **Tao Hong**, Irad Yavneh, and Michael Zibulevsky, "Solving RED with Weighted Proximal Methods," *IEEE Signal Processing Letters,* vol. 27, pp. 501-505, Mar. 2020. [link] [pdf] [slides] [code]
7. **Tao Hong**, Yaniv Romano, and Michael Elad, "Acceleration of RED via Vector Extrapolation," *Journal of Visual Communication and Image Representation,* vol. 63, Aug. 2019. [link] [pdf] [code]
8. **Tao Hong**, Xiao Li, Zhihui Zhu, and Qiuwei Li, "Optimized Structured Sparse Sensing Matrices for Compressive Sensing," *Signal Processing,* vol. 159, pp. 119-129, Jun. 2019. [link] [pdf]
9. **Tao Hong** and Zhihui Zhu, "Online Learning Sensing Matrix and Sparsifying Dictionary Simultaneously for Compressive Sensing," *Signal Processing*, vol. 153, pp. 188-196, Dec. 2018. [link] [pdf] [code]
10. **Tao Hong** and Zhihui Zhu, "An Efficient Method for Robust Projection Matrix Design," *Signal Processing*, vol. 143, pp. 200-210, Feb. 2018. [link] [pdf] [code]
11. **Tao Hong**, Huang Bai, Sheng Li, and Zhihui Zhu, "An Efficient Algorithm for Designing Projection Matrix in Compressive Sensing Based on Alternating Optimization," *Signal Processing,* vol. 125, pp. 9-20, Aug. 2016. [link][code]

CONFERENCE PUBLICATIONS

1. **Tao Hong**, Huang Bai, Yabin Wei, Jie Yang, and Zhihui Zhu, "Sparse two-dimensional FIR digital filters design using FISTA", *Image and Signal Processing (CISP), 2014 7th International Congress on,* pp. 815-819, Oct. 2014. (Poster Presentation, Dalian, P.R. China)
2. **Tao Hong**, Huang Bai, Sheng Li, Chaogeng Huang, and Liping Chang, "A new method for design allpass filters with equiripple group delay errors," *Industrial Electronics and Applications (ICIEA), 2014 IEEE 9th Conference on*, pp. 1024-1028, Jun. 2014. (Poster Presentation, Hangzhou, P.R. China)
3. **Tao Hong**, Chaogeng Huang, Gang Li, and Yongching Lim, "A Hessenberg-based input balanced realization for all-pass systems," *Information, Communications and Signal Processing (ICICS) 2013 9th International Conference on,* pp. 1-5, Dec. 2013. (Oral Presentation, Tainan, Taiwan)
4. **Tao Hong**, Si Tang, Gang Li, Xiongxiong He, and Liping Chang,"All-pass based efficient and robust structures for finite precision implementation of digital filters," *Control Conference (CCC), 2013 32nd Chinese*, pp. 4517-4522, Jul. 2013. (Oral Presentation, Xi'an, P.R. China)

HONORS AND AWARDS

- 2014, National Scholarship for Graduate Students, the Ministry of Education, China
- 2014, 2nd Class Academic Scholarship of ZJUT
- 2014, I have successfully completed a free online offering of *Convex Optimization* by Stephen P. Boyd in Stanford.
- 2013, 2nd Class Academic Scholarship of ZJUT
- 2012, New Graduate Scholarship of ZJUT
- 2011, 2nd Class Academic Scholarship of ZJUT
- 2011, 1st Price of The Third National College Students' Mathematical Contest (Zhejiang Province)

ACADEMIC EXPERIENCE

Zhejiang Key Lab. for Signal Processing *Feb. 2010 - Mar. 2016*

Research Assistant

- "Sparse Signal Representation Based on the Theory of System parameterization and Observation Matrix Optimization Design," *Project of National Science Foundation of China (NSFC),* 2013-2016.
- "Projection Matrix Optimization for Compressive Sensing," *Project of National Science Foundation of China (NSFC),*, 2012-2016.
- "Design of Low Complexity Robust Digital Filter Structure," *Project of National Science Foundation of China (NSFC),* 2010-2012.

Teaching Assistant

- Prepared tutorials for the graduate course *Advanced Signal Processing* (Fall 2012, taught by Prof. Gang Li, 48 Hours).
- Prepared tutorials and labs for the undergraduate course *Signal and System* in English and providing one-on-one assistance to students (Fall 2012, taught by Prof. Gang Li, 64 Hours).
- Prepared tutorials for the graduate course *Signal Analysis* (Spring 2013, taught by Prof. Gang Li, 32 Hours)
- Supervised course projects for the graduate courses *Multigrid Methods* (2 credits taught by Prof. Irad Yavneh) and *Introduction to Optimization* (3 credits taught by Prof. Michael Zibulevsky).

Professional Activity

- Reviewer for SIAM Journal on Scientific Computing, Journal
- Reviewer for IEEE Signal Processing Letters, Journal
- Reviewer for IEEE Trans. Signal Processing, Journal
- Reviewer for IEEE Trans. Circuits and Systems for Video Technology, Journal
- Reviewer for IEEE Trans. CAS-II, Journal
- Reviewer for Journal of Computational and Applied Mathematics
- Reviewer for Digital Signal Processing, Journal
- Reviewer for Signal Processing, Journal

- Reviewer for *2013 9th International Conference on Information, Communications and Signal Processing* (ICICS 2013).
- Reviewer for *2014 IEEE 9th Conference on Industrial Electronics and Applications* (ICIEA 2014).

Workshop Attended

- 2023, SIAM Great Lakes workshop, Michigan State University
- 2023, MTMI workshop, Travel Award for Traving and Lodging, University of Chicago
- 2023, ICERM – Acceleration and Extrapolation Methods, Travel Award for Traving and Lodging, Brown University
- 2013, The 1st International Workshop on Signal Processing, ZJUT.

Project Experience – FPGA

- I had built a system named "Optimal design and implementation of an automatic explanation system" based on FPGA (Altera Cyclone II EP2C35F484C8). I also finished many micro electrical systems by myself, such as FFT algorithm based FPGA implementation, produce of PWM wave, stepping motor control, wireless car alarm, and traffic light control etc.

TECHNICAL SKILLS

- **Programming:** MATLAB, Python, PyTorch, Torch, C, C++, Mathematica, LATEX.
- **Hardware Development:** FPGA (Altera), DSP (TI), Microcontroller.
- **Simulation and Hardware Description language:** Verilog, VHDL, Assembly for MCU51.

Referees

- Irad Yavneh (Full Professor)
  Joan Callner Miller Professor of Computer Science
  Technion – Israel Institute of Technology, Haifa, Israel
  Email: irad@cs.technion.ac.il
  Website: https://irad.cs.technion.ac.il
- Jeffrey A. Fessler (Full Professor)
  William L. Root Collegiate Professor of EECS
  University of Michigan, Ann Arbor, USA
  Email: fessler@umich.edu
  Website: https://web.eecs.umich.edu/ fessler/
- Hans De Sterck (Full Professor)
  Department of Applied Mathematics
  University of Waterloo, ON, Canada
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  Website: https://uwaterloo.ca/scholar/hdesterc