

Oguzhan Teke

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Education

- **Ph.D. in Electrical Engineering**
California Institute of Technology, Pasadena, CA
Advisor: Prof. P. P. Vaidyanathan
 - **Minor Degree in Applied and Computational Mathematics**
California Institute of Technology, Pasadena, CA
 - **M.S. in Electrical and Electronics Engineering**
Bilkent University, Ankara, Turkey
Advisor : Prof. Orhan Arikan
Thesis: Robust Compressive Sensing Techniques
 - **B.S. in Electrical and Electronics Engineering**
Bilkent University, Ankara, Turkey

2014 - 2020 (Expected)
GPA: 4.1/4.0

2020 (Expected)
GPA: 4.1/4.0

2012 - 2014
GPA: 3.96/4.00

2008 - 2012
GPA: 3.93/4.00

Research Interests

Broadly interested in problems with strong theoretical and mathematical foundation with applications in signal and data analysis. Particular research interests are:

- Graphical models,
- Randomized numerical linear algebra,
- Optimization,
- Statistical signal processing and inverse problems.

Research Experience

- Graduate Research Assistant at California Institute of Technology
Advisor: Prof. P. P. Vaidyanathan

Random Asynchronous Linear Systems: Analyzed the convergence and stability behavior of randomized asynchronous linear updates and their applications in network defined signals and other data related applications. Proved that randomized asynchronicity is not necessarily a limitation, and it can, in fact, reduce the total computational cost in certain cases and stabilize unstable systems.

Uncertainty Principles on Graphs: Analyzed discrete sparsity-based uncertainty principles on graphs. Proved that a signal cannot be arbitrarily sparse on vertex domain and graph Fourier domain simultaneously. Proved that graphs can have sparse eigenvectors in certain cases.

Multirate Processing of Graph Signals: Extended the multirate processing techniques to the case of graphs. Proved that classical multirate ideas can be extended to the case of graphs under certain restrictions.

2014 - Present
- Summer Intern at Qualcomm (Multimedia R&D)
Worked on graph based transform techniques for H.266 video coding standard.

June - September 2018
- Graduate Research Assistant at Bilkent University
Advisor: Prof. Orhan Arikan

Robust Compressive Sensing Techniques: Proposed robust sparse recovery techniques in the presence of a basis mismatch due to the discretization of the underlying continuous parameter space.

2012 - 2014

- Undergraduate Summer Intern at Aselsan June - July 2010
Worked on histogram based real-time autofocus techniques for FPGA controlled thermal cameras.

Teaching Experience

TA for the following courses at Caltech:

- Signals and Systems, EE 111 2015-2020.
- Digital Signal Processing, EE 112 2015-2020.
- The Science of Data, Signals,
and Information, EE 1 2019.

TA for the following courses at Bilkent University:

- Linear Algebra, MATH 225 2013-2014.
- Senior Project, EEE 491 2013-2014.
- Probability and Statistics, MATH 255 2013.
- Engineering Mathematics, MATH 241 2012.

Publications

Preprints

1. **O. Teke**, P. P. Vaidyanathan, "Random Asynchronous Linear Systems: Frequency Response Behavior", *IEEE Transactions on Signal Processing*, in preparation.
2. H. Egilmez, **O. Teke**, A. Said, V. Seregin, M. Karczewicz, "Parametric Graph-based Separable Transforms for Video Coding," *IEEE Signal Processing Letters*, under review, Nov. 2019.
3. **O. Teke**, P. P. Vaidyanathan, "Random Node-Asynchronous Graph Computations", *IEEE Signal Processing Magazine*, submitted as a white paper, Oct. 2019.
4. **O. Teke**, P. P. Vaidyanathan, "IIR Filtering on Graphs with Random Node-Asynchronous Updates," *IEEE Transactions on Signal Processing*, under review, June 2019.

Journal Papers

1. **O. Teke**, P. P. Vaidyanathan, "Random Node-Asynchronous Updates on Graphs," *IEEE Transactions on Signal Processing*, vol. 67, no. 11, pp. 2794–2809, June 2019.
2. **O. Teke**, P. P. Vaidyanathan, "Uncertainty principles and sparse eigenvectors of graphs," *IEEE Transactions on Signal Processing*, vol. 65, no. 20, pp. 5406–5420, Oct. 2017.
3. **O. Teke**, P. P. Vaidyanathan, "On the Role of the Bounded Lemma in the SDP Formulation of Atomic Norm Problems," *IEEE Signal Processing Letters*, vol. 24, no. 7, pp. 972–976, July 2017.
4. **O. Teke**, P. P. Vaidyanathan, "Extending Classical Multirate Signal Processing Theory to Graphs - Part I: Fundamentals," *IEEE Transactions on Signal Processing*, vol. 65, no. 2, pp. 409–422, Jan. 2017.
5. **O. Teke**, P. P. Vaidyanathan, "Extending Classical Multirate Signal Processing Theory to Graphs - Part II: M-Channel Filter Banks," *IEEE Transactions on Signal Processing*, vol. 65, no. 2, pp. 423–437, Jan. 2017.
6. **O. Teke**, A. Gurbuz, O. Arikan, "A Robust Compressive Sensing Based Technique For Reconstruction of Sparse Radar Scenes," *Digital Signal Processing*, vol. 27, pp. 23–32, April 2014.
7. **O. Teke**, A. Gurbuz, O. Arikan, "Perturbed orthogonal matching pursuit," *IEEE Transactions on Signal Processing*, vol. 61, no. 24, pp. 6220–6231, Dec. 2013.
8. A. Gurbuz, **O. Teke**, O. Arikan, "Sparse ground-penetrating radar imaging method for off-the-grid target problem," *Journal of Electronic Imaging*, vol. 22, no. 2, pp. 1–8, 2013.

Conference Papers

1. **O. Teke**, P. P. Vaidyanathan, "Node-Asynchronous Spectral Clustering on Directed Graphs," *Int. Conf. Acoust. Speech, Signal Process. (ICASSP)*, submitted, 2020.

2. **O. Teke**, P. P. Vaidyanathan, "Randomized Asynchronous Recursions with a Sinusoidal Input," *Asilomar Conference on Signals, Systems, and Computers*, to appear, 2019.
3. **O. Teke**, P. P. Vaidyanathan, "The random component-wise power methods," *Proc. SPIE, Wavelets and Sparsity XVIII*, vol. 11138, Sep. 2019.
4. **O. Teke**, P. P. Vaidyanathan, "Node-asynchronous Implementation of Rational Filters on Graphs," *Int. Conf. Acoust. Speech, Signal Process. (ICASSP)*, pp. 7530–7534, May 2019.
5. **O. Teke**, P. P. Vaidyanathan, "Energy Compaction Filters on Graphs," *Global Conf. on Signal and Inf. Process. (GlobalSIP)*, pp. 783–787, Nov. 2018.
6. **O. Teke**, P. P. Vaidyanathan, "Asynchronous Nonlinear Updates on Graphs," *Asilomar Conference on Signals, Systems, and Computers*, pp. 998–1002, Oct. 2018.
7. **O. Teke**, P. P. Vaidyanathan, "The Asynchronous Power Iteration: A Graph Signal Perspective," *Int. Conf. Acoust. Speech, Signal Process. (ICASSP)*, pp. 4059–4063, April 2018.
8. **O. Teke**, P. P. Vaidyanathan, "Time Estimation for Heat Diffusion on Graphs," *Asilomar Conference on Signals, Systems, and Computers*, pp. 1963–1967, Oct. 2017.
9. **O. Teke**, P. P. Vaidyanathan, "Extending classical multirate signal processing theory to graphs," *Proc. SPIE, Wavelets and Sparsity XVII*, vol. 10394, Aug. 2017.
10. **O. Teke**, P. P. Vaidyanathan, "Sparse Eigenvectors of Graphs," *Int. Conf. Acoust. Speech, Signal Process. (ICASSP)*, pp. 3904–3908, March 2017.
11. **O. Teke**, P. P. Vaidyanathan, "Linear systems on graphs," *Global Conf. on Signal and Inf. Process. (GlobalSIP)*, pp. 358–389, Dec. 2016.
12. **O. Teke**, P. P. Vaidyanathan, "Discrete Uncertainty Principles on Graphs," *Asilomar Conference on Signals, Systems, and Computers*, pp. 1475–1479, Nov. 2016.
13. **O. Teke**, P. P. Vaidyanathan, "Graph filter banks with M-channels, maximal decimation, and perfect reconstruction," *Int. Conf. Acoust. Speech, Signal Process. (ICASSP)*, pp. 4089–4093, March 2016.
14. **O. Teke**, P. P. Vaidyanathan, "Fundamentals of multirate graph signal processing," *Asilomar Conference on Signals, Systems, and Computers*, pp. 1791–1795, Nov. 2015.
15. **O. Teke**, A. Gurbuz, O. Arikan, "A recursive way for sparse reconstruction of parametric spaces," *Asilomar Conference on Signals, Systems, and Computers*, pp. 637–641, Nov. 2014.
16. **O. Teke**, A. Gurbuz, O. Arikan, "Sparse delay-doppler image reconstruction under off-grid problem," *Sensor Array and Multichannel Signal Processing Workshop (SAM)*, pp. 409–412, June 2014.
17. **O. Teke**, A. Gurbuz, O. Arikan, "Sparse Reconstruction Under Model Uncertainties," *Signal Processing with Adaptive Sparse Structured Representations (SPARS)*, July 2013.
18. E. Turgay, **O. Teke**, "Autofocus method in thermal cameras based on image histogram," *Signal Processing and Communications Applications Conference (SIU)*, pp. 462–465, April 2011.

Courses Taken

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|---|---|-----------------------------------|
| • Linear algebra and applied operator theory | • High dimensional probability | • Statistical inference |
| • Convexity in matrices | • Quantum information processing with tensors | • Detection and estimation theory |
| • Optimization theory | • Neural networks | • Information theory |
| • Topics in optimization (SoS relaxation, Hilbert's 17 th problem) | • Machine learning data mining | • Coding theory |
| • Stochastic processes and Markov chains | • Networks: structure & economics | • Adaptive signal processing |
| • Brunn–Minkowski theory | • Mathematical signal processing | • Multirate signal processing |
| | • Inverse problems and data assimilation | • Speech processing |
| | | • Combinatorial analysis |

Honors and Awards

- Ranked 1st in Electrical Engineering Qualifying Exam, Caltech, January 2015.
- M.S. scholarship of TUBITAK (The Scientific and Technological Research Council of Turkey).
- Scholarship for M.S. degree, Bilkent University.
- Scholarship for B.S. degree, Bilkent University.

Professional Activities

Invited Referee for Journals: IEEE Transactions on Signal Processing, IEEE Signal Processing Letters.

References

Available upon Request.