




OMER BURAK DEMIREL, Ph.D.

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SUMMARY

Researcher with experience in magnetic resonance imaging, computer vision and deep learning applications for image enhancement. Proven ability to develop deep learning algorithms for accelerated imaging. A significant contributor to research in the field, with publications in several high-impact journals, work presented at industry conferences, and two patents pending. U.S. permanent resident eligible to work in the U.S. for any employer without sponsorship.

TECHNICAL SKILLS

Excellent programming skills: Python (5+ yrs.), PyTorch (3+ yrs.), MATLAB (10+ yrs.), and LaTeX (8+ yrs.). Experience with C++, JAVA, VHDL, Adobe Illustrator, 3T and 7T Siemens MRI scanners.

JOB EXPERIENCE

Postdoctoral Research Fellow *August 2023 - Present*
Beth Israel Deaconess Medical Center and Harvard University, Boston, MA, USA

- Researched and developed deep learning algorithms to improve image reconstruction for accelerated cine imaging and 3D late gadolinium enhancement for cardiac MRI. These algorithms are implemented inline and are currently being used in clinical practice.

EDUCATION

University of Minnesota, Minneapolis, MN, USA *August 2017 - May 2023*

Ph.D. in Electrical and Computer Engineering, **Advisor:** Prof. Mehmet Akçakaya

- **Thesis:** Physics-Driven Deep Learning Techniques for High-Resolution MRI
 - Researched and developed deep learning algorithms to improve image reconstruction for highly accelerated MRI acquisitions. Self-acquired data and knowledge of the full-pipeline for the reconstruction of cardiac MRI and functional MRI.
- **Education and Teaching**
Teaching Assistant: Image Processing and Applications (*Fall 2019*), Signals and Systems (*Spring 2021*)
 - Developed/graded weekly assignments and programming assignments for deep learning implementation.

Bilkent University, Ankara, Turkey *January 2015 - July 2017*

M.Sc. in Electrical and Electronics Engineering, **Advisor:** Prof. Emine Ulku Saritas

- **Thesis:** Safety Limits & Rapid Scanning Methods in Magnetic Particle Imaging
 - Developed and built in-house magnetic particle imaging scanner along with experiments on peripheral nerve simulation to determine safety-limits.

Bilkent University, Ankara, Turkey *September 2010 - January 2015*

B.Sc. in Electrical and Electronics Engineering

OTHER RELEVANT EXPERIENCE

Center for Magnetic Resonance Research, Research Assistant *2017 - 2023*

- Developed reconstruction algorithms for highly accelerated image acquisitions for Human Connectome Project. Successfully developed unique reconstruction methods for dynamic contrast-enhanced MRI.

National Magnetic Resonance Research Center, Research Assistant *2012 - 2017*

- Built an in-house magnetic particle imaging scanner consist of permanent magnets, driven by a motor arm and controlled through MATLAB, via custom imaging toolbox.

FRAUNHOFER IIS, Summer Internship *2014*

- Reduced the power consumption of fire-detection devices. Analyzed the power consumption levels of various circuits using gate level analysis and run-time progresses on different processors.

PATENTS

1. S. Moeller, M. Akçakaya, K. Uğurbil, **O. B. Demirel**, L. Vizioli and C. Olman, "Noise Suppressed Deep Learning Reconstruction", US Patent Pending
2. M. Akçakaya, S. Moeller and **O. B. Demirel**, "Methods for Parallel Magnetic Resonance Imaging Reconstruction with Multiple k-space Interpolation Strategies", US Patent Pending

JOURNAL PUBLICATIONS

1. **O. B. Demirel**, S. Yoon, F. Ghanbari, C. W. Hoeger, C. W. Tsao, T. Wallace, P. Pierce, S. Johnson, K. Arcand, J. Street, J Rodriguez, K. Chow, W. J. Manning and R. Nezafat, "Accelerated Late Gadolinium Enhancement CMR with Generative AI", Submitted to Journal of Cardiovascular Magnetic Resonance 2024
2. **O. B. Demirel**, F. Ghanbari, M. A. Morales, P. Pierce, S. Johnson, J Rodriguez and R. Nezafat, "Accelerated Cardiac Cine with Spatio-Coil Regularized Deep Learning Reconstruction", Submitted to Magnetic Resonance in Medicine 2024
3. **O. B. Demirel**, L. Vizioli, B. Yaman, S. Moeller, E. Yacoub, K Uğurbil and M. Akçakaya, "Physics driven deep learning overcomes MRI resolution limits in functional human brain mapping" Submitted to Nature Communications 2024
4. **O. B. Demirel**, C. Zhang, B. Yaman, M. Gulle, C. Shenoy, T. Leiner, P. Kellman and M. Akçakaya, "Database Free Subject Specific Physics Guided Deep Learning Reconstruction for Real-Time Cine CMR", Submitted to Journal of Cardiovascular Magnetic Resonance 2024
5. C. Zhang, D. Piccini, **O. B. Demirel**, G. Bonanno, C. W. Roy, B. Yaman, S. Moeller, C. Shenoy, M. Stuber and M. Akçakaya "Large-scale 3D non-Cartesian coronary MRI reconstruction using distributed memory-efficient physics-guided deep learning with limited training data", Magnetic Resonance Materials in Physics, Biology and Medicine (2024): 1-10.
6. T. Kilic, P. Liebig, **O. B. Demirel**, J. Herrler, A. M. Nagel, K Uğurbil and M. Akçakaya, "Unsupervised deep learning with convolutional neural networks for static parallel transmit design: A retrospective study", Magn Reson Med. 2024.
7. **O. B. Demirel**, B Yaman, C Shenoy, S. Moeller, S. Weingärtner and M. Akçakaya, "Signal Intensity Informed Multi-Coil Encoding Operator for Physics-Guided Deep Learning Reconstruction of Highly Accelerated Myocardial Perfusion CMR", Magn Reson Med. 2022;1-14.
8. B Yaman, H Gu, SAH Hosseini, **O. B. Demirel**, S Moeller, J Ellermann, K Uğurbil, M Akçakaya. "Multi-mask self-supervised learning for physics-guided neural networks in highly accelerated magnetic resonance imaging.", NMR Biomed. 2022 Jul 5:e4798. doi: 10.1002/nbm.4798. Epub ahead of print. PMID: 35789133.
9. C Zhang, S Moeller, **O. B. Demirel**, K Uğurbil, M Akçakaya "Residual RAKI: A hybrid linear and non-linear approach for scan-specific k-space deep learning", NeuroImage 256 (2022): 119248.
10. **O. B. Demirel**, S. Weingärtner, S. Moeller and M. Akçakaya, "Improved Simultaneous Multi-slice Imaging with Composition of k-space Interpolations (SMS-COOKIE) for Myocardial T1 Mapping," PloS one 18 (7), e0283972.
11. **O. B. Demirel**, B Yaman, Logan Dowdle, S. Moeller, Luca Vizioli, Essa Yacoub, John Strupp, Cheryl Olman, Kâmil Uğurbil and M. Akçakaya, "20-fold Accelerated 7T fMRI Using Referenceless Self-Supervised Deep Learning Reconstruction", arXiv:2105.05827
12. **O. B. Demirel**, B Yaman, Logan Dowdle, S. Moeller, Luca Vizioli, Essa Yacoub, John Strupp, Cheryl Olman, Kâmil Uğurbil and M. Akçakaya, "Improved Simultaneous Multi-Slice Functional MRI Using Self-supervised Deep Learning", arXiv:2105.04532
13. **O. B. Demirel**, S. Weingärtner, S. Moeller and M. Akçakaya, "Improved simultaneous multislice cardiac MRI using readout concatenated k-space SPIRiT", Magn. Reson. Med. 2021;85:3036–3048.
14. **O. B. Demirel**, T. Kilic, T. Cukur, E.U. Saritas. "Anatomical Measurements Correlate with Individual Magnetostimulation Thresholds for kHz-range Homogeneous Magnetic Fields". Medical physics 47 (4), 1836-1844.

15. A.A. Ozaslan, A. Alacaoglu, **O. B. Demirel**, T. Cukur, E.U. Saritas. "Fully Automated Gridding Reconstruction for Non-Cartesian X-Space Magnetic Particle Imaging". *Phys Med Biol*, 64(16):165018, 2019.
16. Y. Muslu, M. Utkur, **O. B. Demirel**, E.U. Saritas. "Calibration-Free Relaxation-Based Multi-Color Magnetic Particle Imaging" *IEEE Transactions on Medical Imaging*. 37.8 (2018): 1920-1931.
17. **O. B. Demirel**, E. U. Saritas. "Effects of Duty Cycle on Magnetostimulation Thresholds in MPI", *International Journal on Magnetic Particle Imaging*, 3(1):1703010, 2017.

CONFERENCE PUBLICATIONS

1. **O. B. Demirel**, M. A. Morales, J. A. Street, W. J. Manning and R. Nezafat, "3D Image Enhancement for High-Resolution k_y - k_z Accelerated 3D LGE CMR" Proc. 33rd Meeting of ISMRM, May 2024. **Magna Cum Laude**
2. **O. B. Demirel**, F. Ghanbari, M. A. Morales, P. Pierce, S. Johnson, J. Rodriguez, J. A. Street, W. J. Manning and R. Nezafat, "Deep Learning with Spatio-Channel Regularization for Accelerated Cardiac Cine" Proc. 33rd Meeting of ISMRM, May 2024.
3. **O. B. Demirel**, T. Wallace, P. Pierce, S. Johnson, S. Assana, J. Rodriguez, K. Arcand, K. Chow, W. J. Manning and R. Nezafat, "Free Breathing Single-Beat Myocardial Late Gadolinium Enhancement Imaging" Proc. 33rd Meeting of ISMRM, May 2024.
4. **O. B. Demirel**, T. Wallace, P. Pierce, S. Johnson, S. Assana, J. Rodriguez, K. Arcand, K. Chow, W. J. Manning and R. Nezafat, "Rapid 2D Myocardial Late Gadolinium Enhancement Imaging with Resolution Enhancement Generative Adversarial Inline Neural Network" Proc. 33rd Meeting of ISMRM, May 2024.
5. M Gulle, **O. B. Demirel**, L. Dowdle, S. Moeller, E. Yacoub, K. Uğurbil and M. Akçakaya, "Highly-Accelerated High-Resolution Multi-Echo fMRI Using Self-Supervised Physics-Driven Deep Learning Reconstruction", 9th IEEE CAMSAP, December 2023.
6. **O. B. Demirel**, C. Zhang, B. Yaman, M. Gulle, C. Shenoy, T. Leiner, P. Kellman and M. Akçakaya, "High-fidelity Database-free Deep Learning Reconstruction for Real-time Cine Cardiac MRI", 45th IEEE EMBC, July 2023
7. **O. B. Demirel**, C. Zhang, B. Yaman, S. Moeller, C. Shenoy, S. Weingärtner and M. Akçakaya, "Highly-accelerated Free-breathing Perfusion CMR Reconstruction Using Subject-specific Zero-shot Deep Learning", Proc. 26th SCMR Annual Scientific Session, January, 2023.
8. **O. B. Demirel**, B Yaman, S. Moeller, S. Weingärtner and M. Akçakaya, "Signal-Intensity Informed Multi-Coil MRI Encoding Operator for Improved Physics-Guided Deep Learning Reconstruction of Dynamic Contrast-Enhanced MR", Proc. 44th IEEE EMBC, Virtual Conference, July 2022.
9. **O. B. Demirel**, S. Moeller, L. Vizioli, B. Yaman, L. Dowdle, E. Yacoub, K. Uğurbil and M. Akçakaya, "High-Quality 0.5mm Isotropic Functional MRI Using a Synergistic Combination of NORDIC Denoising and Deep Learning Reconstruction" Proc. 30th Meeting of ISMRM, May 2022.
10. **O. B. Demirel**, B. Yaman, S. Moeller, S. Weingärtner, and M. Akçakaya. "Highly Accelerated Myocardial Perfusion Using Physics-guided Deep Learning With Structure-encoded Coil Maps" Proc. 30th Meeting of ISMRM, May 2022.
11. **O. B. Demirel**, B. Yaman, L. Dowdle, S. Moeller, L. Vizioli, E. Yacoub, J. Strupp, C. Olman, K. Uğurbil and M. Akçakaya, "20-fold Accelerated 7T fMRI Using Referenceless Self-Supervised Deep Learning Reconstruction" Proc. 43rd IEEE EMBC, Virtual Conference, November 2021.
12. **O. B. Demirel**, B. Yaman, L. Dowdle, S. Moeller, L. Vizioli, E. Yacoub, J. Strupp, C. Olman, K. Uğurbil and M. Akçakaya, "Improved Simultaneous Multi-Slice Functional MRI Using Self-supervised Deep Learning", Proc. IEEE Asilomar, Virtual Conference, November 2021.
13. **O. B. Demirel**, B. Yaman, S. Moeller, L. Dowdle, L. Vizioli, K. Kay, E. Yacoub, J. Strupp, C. Olman, K. Uğurbil and M. Akçakaya. "Improved Accelerated fMRI Reconstruction using Self-supervised Deep Learning" Proc. 29th Meeting of ISMRM, Virtual Conference, May 2021, **Summa Cum Laude**
14. **O. B. Demirel**, S. Weingärtner, S. Moeller and M. Akçakaya. "Improved SMS Reconstruction using ReadOut-Concatenated K-space SPIRiT (ROCK-SPIRiT)" Proc. 28th Meeting of ISMRM, Virtual Conference, August 2020, **Summa Cum Laude**

15. **O. B. Demirel**, T. Kilic, T. Cukur, E.U. Saritas. "Simple Anatomical Measures Correlate with Individual PNS Thresholds for kHz-range Homogeneous Magnetic Fields" Proc. 28th Meeting of ISMRM, Virtual Conference, August 2020, **Magna Cum Laude**
16. **O. B. Demirel**, S. Weingärtner, S. Moeller and M. Akçakaya. "Readout-Concatenated k-Space SPIRiT (ROCK-SPIRiT): Regularized Reconstruction for Improved SMS Imaging" Proc. ISMRM Workshop on Data Sampling & Image Reconstruction, Sedona, AZ, USA, January 2020
17. **O. B. Demirel**, S. Weingärtner, S. Moeller and M. Akçakaya. "Improved Regularized Reconstruction for Simultaneous Multi-Slice Cardiac MRI T1 Mapping" Proc. 27th EUSIPCO, A Coruña, Spain, September 2019
18. S. Weingärtner, **O.B. Demirel**, C. Shenoy, F. Wenson, L. R. Schad, J. Schulz-Menger and M. Akçakaya. "Functional LGE Imaging: Cardiac Phase-Resolved Assessment of Focal Fibrosis" Proc. 41st EMBC, Berlin, Germany, July 2019
19. **O. B. Demirel**, S. Weingärtner, S. Moeller and M. Akçakaya. "Multi-Band SPIRiT Strategies for Improved Simultaneous Multi-slice Myocardial T_1 Mapping" Proc. 27th Meeting of ISMRM, Montreal, QC, Canada, May 2019
20. **O. B. Demirel**, D. Sarica and E. U. Saritas. "Rapid Scanning in X-Space MPI: Impacts on Image Quality" Proc. of the 6th International Workshop on Magnetic Particle Imaging, Lubeck, Germany, March 2016.
21. D. Sarica, **O. B. Demirel**, Y. Muslu and E. U. Saritas. "DC Shift Imaging for XSpace MPI Reconstruction", Proc. of the 6th International Workshop on Magnetic Particle Imaging, Lubeck, Germany, March 2016.
22. G. Onuker, **O.B. Demirel**, D. Sarica, Y. Muslu and E. U. Saritas. "Deconvolving Relaxation Effects in Multi-Dimensional X-space M", Proc. of the 6th International Workshop on Magnetic Particle Imaging, Lubeck, Germany, March 2016.
23. E. Bozkurt, **O. B. Demirel**, D. Sarica, Y. Muslu and E. U. Saritas. "Effects of Safety Limits on Image Quality in MP", Proc. of the 6th International Workshop on Magnetic Particle Imaging, Lubeck, Germany, March 2016.
24. Y. Muslu, M. Utkur, **O. B. Demirel** and E. U. Saritas. "Calibration-Free Color MP", Proc. of the 6th International Workshop on Magnetic Particle Imaging, Lubeck, Germany, March 2016.
25. A. Alacaoglu, A. A. Ozaslan, **O. B. Demirel** and E. U. Saritas. "Nonlinear Scanning in X-Space MPI", Proc. of the 6th International Workshop on Magnetic Particle Imaging, Lubeck, Germany, March 2016.

TALKS

1. "Basics of Image Reconstruction", MRI Innovations for Dental applications Seminar, August 2022.
2. "Signal-Intensity Informed Multi-Coil MRI Encoding Operator for Improved Physics-Guided Deep Learning Reconstruction of Dynamic Contrast-Enhanced MR", Proc. 44th IEEE EMBC, Virtual Conference, July 2022.
3. "High-Quality 0.5mm Isotropic Functional MRI Using a Synergistic Combination of NORDIC Denoising and Deep Learning Reconstruction" Proc. 30th Meeting of ISMRM, May 2022.
4. "Highly Accelerated Myocardial Perfusion Using Physics-guided Deep Learning With Structure-encoded Coil Maps" Proc. 30th Meeting of ISMRM, May 2022.
5. "20-fold Accelerated 7T fMRI Using Referenceless Self-Supervised Deep Learning Reconstruction" Proc. 43rd IEEE EMBC, Virtual Conference, November 2021.
6. "Improved Simultaneous Multi-Slice Functional MRI Using Self-supervised Deep Learning", Proc. IEEE Asilomar, Virtual Conference, November 2021.
7. "Improved Accelerated fMRI Reconstruction using Self-supervised Deep Learning" Proc. 29th Meeting of ISMRM, Virtual Conference, May 2021, **Summa Cum Laude**
8. "Improved SMS Reconstruction using ReadOut-Concatenated K-space SPIRiT (ROCK-SPIRiT)", Proc. 28th Meeting of ISMRM, Virtual Conference, August 2020, **Summa Cum Laude**
9. "Simple Anatomical Measures Correlate with Individual PNS Thresholds for kHz-range Homogeneous Magnetic Fields", Proc. 28th Meeting of ISMRM, Virtual Conference, August 2020, **Magna Cum Laude**

10. "Readout-Concatenated k-Space SPIRiT (ROCK-SPIRiT): Regularized Reconstruction for Improved SMS Imaging", ISMRM Workshop on Data Sampling & Image Reconstruction Sedona, AZ, USA, January 2020
11. "Improved Regularized Reconstruction for Simultaneous Multi-Slice Cardiac MRI T_1 Mapping", 27th EU-SIPCO, A Coruña, Spain, September 2019
12. "Effects of Duty Cycle on Magnetostimulation Thresholds in MPI", 7th International Workshop on Magnetic Particle Imaging, Prague, Czech Republic, March 2017.

POSTER PRESENTATIONS

1. "Highly-accelerated Free-breathing Perfusion CMR Reconstruction Using Subject-specific Zero-shot Deep Learning", Proc. 26th SCMR Annual Scientific Session, San Diego, USA, January, 2023.
2. "Multi-Band SPIRiT Strategies for Improved Simultaneous Multi-slice Myocardial T_1 Mapping" Proc. 27th Meeting of ISMRM, Montreal, QC, Canada, May 2019
3. "Magnetostimulation Thresholds in Magnetic Particle Imaging (MPI)", Proc of the Graduate Research Conference, Bilkent University, Turkey, March 2017.
4. "Rapid Scanning in X-Space MPI: Impacts on Image Quality", Proc of the 6th International Workshop on Magnetic Particle Imaging, Lubeck, Germany, March 2016.
5. "Maintaining Image Quality During Rapid Scanning in Magnetic Particle Imaging (MPI)", Proc of the Graduate Research Conference, Bilkent University, Turkey, March 2016.

HONORS & AWARDS

Predoctoral Fellowship	<i>2020-2021</i>
American Heart Association (AHA) Predoctoral Fellowship, Percentile Rank: .12%	
Student Travel Award	<i>2021</i>
29th International Society for Magnetic Resonance in Medicine (ISMRM)	
Student Travel Award	<i>2020</i>
28th International Society for Magnetic Resonance in Medicine (ISMRM)	
Student Travel Award	<i>2020</i>
International Symposium on Biomedical Imaging (ISBI) 2020	
Student Travel Award	<i>2020</i>
ISMRM Workshop on Data Sampling & Image Reconstruction	
NSF Travel Award	<i>2019</i>
27th European Signal Processing Conference (EUSIPCO)	
Student Travel Award	<i>2019</i>
27th International Society for Magnetic Resonance in Medicine (ISMRM)	
Gary H. Glover Fellowship	<i>2017-2018</i>
University of Minnesota	
Bruce J. Bergman Graduate Fellowship	<i>2017-2018</i>
University of Minnesota	
High Honor Student	<i>2011-2015</i>
Bilkent University, Merit Scholarship: 100%	