

## RIZWAN AHMAD

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### SUMMARY

Research Scientist at The Ohio State University Medical Center. Research interests include tomographic reconstruction, electron paramagnetic resonance, magnetic resonance imaging, inverse problems, and distribution of points over hypersphere

### EDUCATION

**PhD** in Electrical and Computer Engineering, The Ohio State University, Columbus, OH, USA  
Thesis: EPR Image Reconstruction, Major: Signal Processing, Minor: Circuits (Aug 2007)

**MS** in Electrical and Computer Engineering, The Ohio State University, Columbus, OH, USA  
Thesis: Wavelet Image Compression, Major: Signal Processing, Minor: Circuits (Mar 2004)

**BS** in Electrical Engineering, University of Engineering & Technology, Lahore, Pakistan  
Thesis: Fractal Image Compression, Major: Electronics, Minor: Communication Systems (Dec 2000)

### TECHNICAL SKILLS

C/C+, MATLAB, OPERA 2d/3d, LabVIEW, VHDL, Microprogramming, Assembly, Fortran, Cadence, ADS, AutoCAD, FEMLAB, HTML/JavaScript, Latex, Windows, HP-UX, Mac, Office XP

### EXPERIENCE

**Research Scientist**, Medical Center, Ohio State University (2007-Present)

Hardware and software development for novel acquisition and reconstruction techniques for both MRI and Electron Paramagnetic Resonance Imaging and Spectroscopy.

- ◆ Develop algorithms for rapid data collection and image reconstruction from parallel ray data
- ◆ Find optimum data distribution over the acquisition space
- ◆ Develop hardware capabilities to implement the data acquisition algorithms
- ◆ Develop software capabilities to perform image reconstruction from the collected data

**Graduate Research Associate**, Medical Center, Ohio State University (2004-2007)

Algorithm development for novel acquisition and reconstruction techniques for Electron Paramagnetic Resonance Imaging and Spectroscopy to improve the image quality and reduce the acquisition time.

- ◆ Develop algorithms for efficient data collection and image reconstruction from parallel ray data
- ◆ Carry out simulations and experiments to validate the finding

**Graduate Research Associate**, Chemical Engineering Dept., Ohio State University (2001-2004)

Analyze various sensor design options for electrical capacitance tomography using various software packages like FEMLAB and Opera

- ◆ Hardware implementation of successful sensor designs
- ◆ Reconstruction of 3D images from the data

### COURSEWORK EMPHASIS

**DSP/Communication:** Digital Signal Processing I & II, Stochastic Digital Signal Processing, Digital Image Processing, Medical Imaging, Computer Vision, Adaptive Filtering, Communication Systems, Communication

Networks, Coding Theory, Random Signal Analysis, Random Processes & Applications, Estimation & Detection, Telecommunications

**Computers:** Theory and Design of Digital Computers I & II, Digital Systems, Advanced Computer Design, Data Structures and Algorithms, System Design

**Electronics:** Electronics I, II and III, Microwave Amplifier and Oscillators, Industrial Electronics, Analog Integrated Circuits, Electrical Instruments

### TECHNICAL PROJECTS

- ◆ Develop methods for reconstruction from projections (Radon transform).
- ◆ Image compression using MATLAB by efficient encoding and quantization of the wavelet coefficients.
- ◆ Practical experience of designing and building sensors used in Electrical Capacitance Tomography
- ◆ EE706: MRI, EPR, and ultrasound related medical imaging projects
- ◆ EE722: Design a two stage operational amplifier using Cadence
- ◆ EE710: Design a pass band microwave amplifier using ADS
- ◆ EE762: Design controllers, ALUs, floating point units, and memory management units using VHDL
- ◆ CIS560: Design and implementation of system software including assembler and linker/loader
- ◆ EE 662: Design a general purpose digital computer and test its design using computer simulation system
- ◆ Implementation of various data compression algorithms using C++, and Fractal Image Compression
- ◆ Design and build analog filters, power supplies, and noise meter

### BOOK CHAPTERS

**Ahmad, R.**, Kuppusamy, P., EPR Imaging – Theory and Applications. To appear in *Chemical Reviews*

**Ahmad, R.**, Khan, M., Vikram, D.S., Bratasz, A., and Kuppusamy, P., EPR Oximetry – Method and Application, Ed. Dipak K Das, To appear in *Handbook of Redox signaling*

### PEER-REVIEWED PUBLICATIONS

Som, S., Potter, L. C., **Ahmad, R.**, Vikram, D.S., Kuppusamy P., EPR oximetry for sparse probe distribution. *J. Magn. Reson.*, 193, 210-217 (2008)

Vikram, D. S., **Ahmad, R.**, Pandian, R., Petryakov, S., Kuppusamy, P., Evaluation of response time of particle-based EPR oximetry probes *J. Magn. Reson.*, 193, 127-132 (2008)

**Ahmad, R.**, Vikram, D. S., Potter, L. C., Kuppusamy, P., Decomposition of composite EPR lineshape, *J. Magn. Reson.* 192, 269-274 (2008)

**Ahmad, R.**, Vikram, D. S., Clymer, B., Potter, L. C., Deng, Y., Srinivasan, P., Zweier, J. L., Kuppusamy, P., Uniform distribution of projection data for improved reconstruction quality of 4D EPR imaging. *J. Magn. Reson.* 187, 277-287 (2007)

Som, S., Potter, L. C., **Ahmad, R.**, Kuppusamy, P., A Parametric Approach to Spectral-Spatial EPR Imaging. *J. Magn. Reson.*, 186, 1-10 (2007)

Vikram, D. S., Bratasz, A., **Ahmad, R.**, Kuppusamy, P., A Comparative Evaluation of EPR and OxyLite Oximetry Using a Random Sampling of pO<sub>2</sub> in a Murine Tumor. *Radiat Res.*, 168, 308-315 (2007)

**Ahmad, R.**, Clymer, B., Vikram, D. S., Deng, Y., Hirata, H., Zweier, J. L., and Kuppusamy, P., Enhanced resolution for EPR imaging by two-step deblurring. *J. Magn. Reson.*, 184, 246-257 (2007)

**Ahmad, R.**, Deng, Y., Vikram, D., Clymer, B., Srinivasan, P., Zweier, J. L., Kuppusamy, P., Quasi Monte Carlo-based isotropic distribution of gradient directions for improved reconstruction quality of 3D EPR imaging. *J. Magn. Reson.*, 184, 236-245 (2007)

Deng, Y., Pandian, R. P., **Ahmad, R.**, Kuppusamy, P., Zweier, J. L., Application of magnetic field over-modulation for improved EPR linewidth measurements using probes with Lorentzian lineshape. *J. Magn. Reson.* 181, 254-261 (2006)

**Ahmad, R.**, Vikram, D. S., Petryakov, P., Deng, Y., Zweier, J. L., Kuppusamy, Clymer, B., Automated on-the-fly detection and correction procedure for EPR imaging data acquisition. *Magn. Reson. Med.*, 56, 644-653 (2006)

**Ahmad, R.**, Clymer, B., Deng, Y., He, G., Vikram, D.S., Kuppusamy, P., Zweier, J. L., Optimization of data acquisition for EPR imaging. *J. Magn. Reson.*, 179, 263-272 (2006)

### CONFERENCE PRESENTATIONS

Designing Radial  $k$ -space Trajectories for Reduced Undersampling Artifacts, ISMRM 2009, Honolulu, HI, USA

Progressive uniform sampling, poster presentation at RMC 2007, Breckenridge, CO, USA

4D Uniform sampling for EPRI, oral presentation at EPR 2007, Chicago, IL, USA

Detection of damaged data, poster presentation at ISMRM, 2006, Seattle, WA, USA

Adaptive sampling for in vivo EPRI, poster presentation at EPR 2005, Columbus, OH, USA

Adaptive sampling for 2D EPRI, poster presentation at ISMRM, 2005, Miami, FL, USA

### HONORS AND DISTINCTIONS

Annual position of 4<sup>th</sup>, 4<sup>th</sup>, 4<sup>th</sup>, 6<sup>th</sup> in BSEE among 280 students in the department of electrical engineering at The University of Engineering and Technology, Lahore, Pakistan

Best researcher award at 2005 EPR conference

Honorarium award for Rocky Mountain Conference of analytical chemistry 2007