Hamidreza Saligheh Rad, Ph.D.

CONTACT INFORMATION

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EDUCATION

Queen's University, Kingston, Canada **September 2001 - December 2005**
Department of Electrical and Computer Engineering
Ph.D., Communications, 2001-2005, GPA: 93/100, includes research, Ph.D. level course-work.

- Dissertation topic:
  "Space-time-frequency characterization for MIMO outdoor radio propagation channels"
- Advisor: Prof. Saeed Gazor

Teaching Assistantship **September 2001 - January 2005**
Co-taught undergraduate and graduate level courses for the electrical engineering students: shared responsibility for lectures, exams, homework assignments, quizzes and grades.

- Digital Signal Processing (DSP)
- Signals and Systems II
- Signals and Systems I

Laboratory Development **May - September 2001**
Development of a laboratory for ELEC-421; Digital Signal Processing (DSP), for fourth year undergraduate students. The job is done on TMS320C6211/6711, products of Texas Instruments Inc. A complete laboratory manual for this lab has been designed in four experiments: http://www.ece.queensu.ca/hpages/faculty/gazor/labelec421/labelec421.html

Isfahan University of Technology, Isfahan, Iran **September 1997 - September 2000**
Department of Electrical and Computer Engineering
M.Sc., Communications, 1997-2000, GPA: 92.3/100, includes research, master's level course-work.

- Dissertation topic:
  "Space vector modulation based on classification method for three-phase multi-level voltage source inverters"
- Advisor: Dr. Alireza Bakhshai

Teaching Assistantship **September 1999 - January 2000**
Co-taught undergraduate level courses for the electrical engineering students: shared responsibility for lectures, exams, homework assignments, quizzes and grades.

- Control Systems
- Communication Systems I
- Communication Systems II

Sharif University of Technology, Tehran, Iran **September 1993 - September 1997**
Electrical Engineering Department
B.Sc., Control systems, 1993-1997, GPA: 82.5/100

- Dissertation topic:
  "Applications of active noise control for noise cancelation inside moving vehicles"
- Advisor: Dr. Mohammad Haeri

Academic Appointments

Tehran University of Medical Sciences, Tehran, Iran **December 2010 – Ongoing**
Department of Medical Physics and Biomedical Engineering

Assistant Professor, includes research, teaching and advising graduate students
http://http://rcstim.tums.ac.ir/En/Default.aspx

Leadership and Collaboration in Magnetic Resonance Imaging (MRI) and Positron Emission Tomography (PET) Research

- Diagnosis and staging soft-tissue tumors like ewing-sarcoma and osteo-sarcoma employing single-voxel and multi-voxel magnetic resonance spectroscopy (MRS) at 1.5T and 3T
- Grading spinal injuries like glial scar employing single-voxel MRS at 3T
- Bone detection and segmentation in PET/MRI of brain and pelvis
- Bone water concentration as an emerging metric for the bone quality on the Iranian nation

Teaching Graduate Courses

- Principles of MRI
- Digital Signal Processing

University of Pennsylvania, Philadelphia, USA **May 2008 – Ongoing**
Laboratory for Structural NMR Imaging (LSNI)
Postdoctoral Fellow, includes research, training graduate students and part-time teaching
http://www.uphs.upenn.edu/radiology/depa/lsni/members.html

- Advisor: Prof. Felix Wehrli

Leadership and Collaboration in Magnetic Resonance Imaging (MRI) Research

- Quantification of bone water in cortical bone using MRI
- Motion correction employing projection (linear and radial) navigators
- High field (7T) Proton-1H and Phosphorous-31P micro-MRI of trabecular and cortical bone

Harvard University, Cambridge, USA **January 2006 – February 2008**
School of Engineering and Applied Sciences (SEAS) and *Harvard Medical School (HMS)*
Postdoctoral Research Scholar, includes research, student supervision in the Ph.D. and master level, as well as undergraduate level teaching.

- Advisors: Prof. Vahid Tarokh and Dr. Reza Nezafat

Exploring Some New Fields of Research **February 2006 – November 2007**

- RF pulse design for magnetization transfer imaging (MTI)
- Inverse imaging via solving 3D linear and non-Linear inverse problems
- Advanced communication and networking techniques for satellite communications

Student Supervision on Ph.D. Related Topics **January 2007 – Ongoing**
Supervision of three master students in the area of "multiple-input multiple-output (MIMO) channel modeling and evaluation" that includes project definition, students supervision on their thesis and research works progress, evaluation of the obtained results and guiding the students to write conference and journals articles. For more details, see the "Research Interests".

- Information theoretic approaches to antenna design in MIMO systems
- Capacity analysis of MIMO wireless systems using realistic channel models
- Modeling and evaluation of wideband and ultra-wideband wireless channels

Instructorship **September 2007 - December 2007**
Co-teaching undergraduate second year course: shared responsibility for exams, homework assignments, quizzes and grades.

- Applied mathematics I

Research Interests

My major research interest falls in the are of advanced image acquisition and processing techniques for *Magnetic Resonance Imaging (MRI) and Spectroscopy in Medicine*. As my second interest, I conduct research in *Wireless Communication Channel Modeling*. These include:

- **Magnetic Resonance Imaging**

  - *Clinical Application of Single-Voxel and Multi-Voxel MR Spectroscopy in Brain, Spine and Musculoskeletal System* Magnetic resonance spectroscopy (MRS) allows the non-invasive measurement of selected biological compounds in vivo. Feasibility was first demonstrated in humans in the mid-1980s. Since that time, much experience has been accumulated with the use of MRS in both research and clinical applications. Nearly all MRI scanners have the capability to perform MRS, and MRS techniques still continue to improve, even after two decades of development. MRS has been applied to the study of all major pathologies, particularly in the brain, but has also found application in other organ systems as well, like musculoskeletal and spine. In spite of this considerable research effort and the unique biochemical information provided, only limited integration of MRS into clinical practice has occurred to date. Here at the Tehran University of Medical Sciences, I have established close collaborations among technical research as well as clinics to explore potentials of MRS as an emerging technique into clinics, and in a few selected problems like quantification of soft-tissue tumors (e.g. ewing-sarcoma and osteo-sarcoma), brain tumors and spinal injuries (e.g. glial scar).

  - *MRI-Guided Attenuation and Scatter Correction Positron Emission Tomography (PET) in Brain and Pelvis:* Reliable attenuation correction methods for quantitative 3D PET require accurate delineation of both the organ contour and spatial distribution of attenuation coefficients. To this end, it is necessary to carefully segment body organs into three different categories of soft tissue (e.g. muscle and fat), hard tissue (e.g. bone) and air (e.g. lung cavity). Conventional MRI (cMRI) techniques can easily segment segment out the soft-tissue, while they usually confuse bone and air since they both do not enough visible signal in cMRI. Therefore, advanced MR imaging techniques like UTE-based methods are required to distinguish bone from air. Here at Tehran University of Medical Sciences, I have established strong collaborations with our nuclear medicine center to conduct mutual research, starting with PET/MR imaging in brain and pelvis.

  - *Ultra-Short Echo-Time (UTE) Imaging for Quantification of Bone Water in Cortical Bone:* A significant portion of the bones mechanical competence is attributed to the composition and micro-architecture of cortical bone. Although the age-related thinning of the cortex is partially offset by periosteal expansion, this process is accompanied by other remodeling changes that adversely affect bone quality. Key among these is an age-related increase in cortical porosity that is exacerbated in osteoporosis. Although the mechanism for this process is poorly understood, there is evidence from histomorphometry that in the femoral neck of hip fracture patients, Haversian canals are expanded as a result of formation of "composite" osteonal systems in which a single canal is surrounded by multiple packets of osteonal bone. In this study, we proposed a new 3D hybrid-radial variable-TE sequence with half-pulse selective excitation to image the micro-structure of the cortical bone and to accurately quantify the bone water and bone porosity, by inference, in cortical bone, specifically in the tibial shaft. The experiment was designed at 123MHz on a TIM Trio MR system (Siemens Medical Solutions). In this project, I developed all imaging pulse sequences, reconstruction codes and analysis techniques to precisely capture and to analyze the acquired bone water signal. I managed a clinical study to analyze sixty five subjects in different age ranges in order to establish a base-line for the new introduced metric of bone water concentration.

  - *Motion Correction for High-Resolution Trabecular Bone Imaging Employing Projection Navigators:* High-resolution magnetic resonance imaging (micro-MRI) to captures structural details of trabecular bone (TB) that are reflective of metabolic bone disease and treatment. Necessary resolutions to resolve TB are in the order of the structure's thickness: $\sim$100-200μm.

Three-dimensional imaging of TB is hindered by involuntary rigid body motion as it causes significant blurring of the TB structure. Motion correction techniques that are developed to correct for different types of motion (translation, rotation, etc), and to provide high precision on the order of a half voxel dimension, still suffer from: 1) not enough signal-to-noise ratio (SNR) for high-precision detection, and 2) not enough degrees of freedom for both translation and rotation detection. In this study, I proposed a novel motion detection/correction technique based on acquiring high SNR low-resolution full images as navigators usig advanced SNR enhancement techniques. I also developed all required pulse sequences as well as reconstruction codes in MATLAB in order to implement it on a Siemens 1.5T MAGNETOM Sonata scanner.

- *Compressed Sensing MRI:* MRI requires a relatively long scan time compared to other biomedical imaging modalities, which makes it also expensive. MRI data are collected in the spatial-frequency domain, denoted by k-space. MRI data acquisition can be accelerated by undersampling k-space from the Nyquist rate. As a new project in the field, I have introduced high performance compressed sensing algorithms to accelerate the current time-consuming micro-MRI of trabecular as well as whole body MR Angiography (MRA).

- *High Field (7T) In vivo Phosphorus (31P) Imaging of Cortical Bone:* Phosphorus concentration of bone plays an important role in the maintenance of bone strength in disorders such as osteomalacia which is characterized by hypomineralization of bone. 31P MRI potentially provides a noninvasive method to evaluate the degree of bone mineralization, however it is difficult to obtain sufficient SNR at desirable resolutions due to the extremely short T2* ($\sim 220\mu$ sec) and long T1 ($\sim$50sec) of bone phosphorus, as well as its relatively small gyromagnetic ratio. We estimate that 31P SNR at 7T is intrinsically about 1000 times less than that of muscle water. For this reason, optimization of the imaging hardware, pulse sequence and post processing is particularly important. In this study, we constructed small surface coils for use in a 7T whole-body MRI scanner and developed a 3D radial concentric-cone imaging sequence to image 31P of tibial cortical bone in vivo.

- *Large Flip Angle RF Pulse Design with Inverse Scattering Transform:* Magnetization transfer (MT) contrast can be used in MRI as an endogenous tissue contrast. Large flip angle, off-resonance RF pulses are commonly used for MT contrast generation. Small tip angle approximation and SLR techniques are two robust and efficient methods in design of low flip angle pulses, however they are not practical in high flip angle (>180) pulse design. In this study, I investigated the use of inverse scattering transform (IST) as an alternative strategy for high flip angle pulse design.

- **Wireless Channel Modeling**

  - *Space-Time-Frequency Characterization of Wireless Channels:* Wave propagation in two-dimensional and three-dimensional random scattering media, MIMO multi-carrier wireless channels, narrowband and wideband wireless channel characterization, straight and non-straight movements of the mobile station (MS), random movements of MS and/or scatterers, fading statistics of Rayleigh channels, modeling and evaluation of MIMO relay channels (Ph.D. work and individual works to advise master students)

  - *Capacity Evaluation of Wireless Channels:* Information theoretic approaches to antenna design in MIMO systems, capacity analysis of MIMO systems employing realistic channel correlation models (individual works to advise master students)

- **Space-Time Coding Techniques**

  - *Space-Time Coding Ambiguities:* Identification of space-time coding ambiguities in joint adaptive channel estimation and detection

- **Image Processing**

  - *Inverse Imaging:* Theoretical methods in inverse imaging and 3D image reconstruction

Teaching Interests

My main teaching interests fall in the are of *magnetic resonance imaging* and *digital signal processing*, for both graduate and undergraduate levels. These include:

- Biomedical signal and image processing
- Principles of MRI
- Principles of Clinical MRS
- Diffusion MRI in Clinics
- Signals and Systems I & II
- Digital signal processing

Honors and Awards

- Best Poster Award, 7th Annual Postdoc Research Symposium, UPenn, October 2007
- NSERC Postdoctoral Fellowship (PDF), national, 2006-08
- Ontario Graduate Scholarship (OGS), provincial, Queen's University, 2005-06
- Ontario Graduate Scholarship (OGS), provincial, Queen's University, 2004-05
- IEEE Canada Vehicular Technology Travel Bursary, academic, Queen's University, 2004
- IEEE Award for CCECE Conference Participation, academic, Queen's University, 2004
- Queen's University Graduate Student Award, institutional, Queen's University, 2004
- Queen's University Graduate Award (QGA), institutional, Queen's University, 2001-2005
- Nortel Networks Graduate Fellowship, national, Queen's University, 2002-03
- Tuition Bursary, institutional, Queen's University, 2002-05
- Sun Microsystems of Canada Scholarship in Computational Science, provincial, Queen's University, 2002-03
- Gold Medalist: M.Sc., institutional, Isfahan University of Technology (IUT), 1999
- Excellence Research Award, institutional, IUT, 1998
- 3rd Place Medalist: B.Sc., institutional, Sharif University of Technology, 1997
- 39th Place: Nationwide entrance exam of universities, national, Kamal High School, 1993
- 13th Place: Fifth Physics Olympiad, national, Kamal High School, 1992

Publications

Book Chapter

H. S. Rad and V. Tarokh, "Analog Transmission," in *The handbook of computer networks,* H. Bidgoli, first revision, June 2006.

Peer-Reviewed Journal Papers

1. AM Pistea and H Saligheh Rad, "Three-Dimensional Space-Time-Frequency Description of WB and UWB MIMO Channels," *IEEE Communication Letters,* in print.
2. C Li, JF Magland, H Saligheh Rad, HK Song and FW Wehrli, "Comparison of Soft-Tissue Suppression Schemes for Creating Short-T2 Contrast with Ultra-short Echo Time (UTE) Imaging," *Magnetic Resonance in Medicine,* in print.
3. A Fathi Kazerooni, M Rabbani, M Yazdchi, S Kasiri and H Saligheh Rad, "Effects of Electric and Magnetic Loadings on Bone Surface Remodeling: A Model Modification and Simulation", Biomed Tech (Berl) 2011; 56 (3): 167–173.
4. H Saligheh Rad, SCB Lam, JF Magland, H Ong, C Li, HK Song, J Love and FW Wehrli, "Quantifying Cortical Bone Water in vivo by 3D Ultra-Short Echo-Time MRI," *NMR in Biomedicine*, vol. 3, pp. 1–11, September 2010.

5. K Shahtalebi, GR Bakhshi and H Saligheh Rad, "Parallel Optimisation of Time-Varying Adaptive Algorithms for Interference Cancellation in Code Division Multiple Access Systems," *IET Communication Journal*, Vol. 4, no. 16, pp. 1963–1973, November 2010.
6. P Shariatpanahi, BH Khalaj, AA Shishegar and H Saligheh Rad, "Decorrelating Closely Spaced Antennas by Pattern Design in Uniform Scattering Environments," *IET Microwaves, Antennas and Propagations*, vol 4, no. 11, pp. 1903–1909, November 2010.
7. H Saligheh Rad and S Gazor, "Space-Time-Frequency Characterization of 3D Non-Isotropic MIMO Multicarrier Propagation Channels Employing Directional Antennas," *EURASIP Journal on Wireless Communications and Networking*, doi:10.1155/ 2008/893705, 14 pages, 2008.
8. H Saligheh Rad and S Gazor, "Effects of Mobile Rotational Movements in Wireless Propagation," *IET Communications*, vol. 2, no. 9, pp. 1109–1117, October 2008.
9. H Saligheh Rad and S Gazor, "The Impact of Non-Isotropic Scattering and Directional Antennas on MIMO Multicarrier Mobile Communication Channels," *IEEE Transactions on Communications*, vol. 56, no. 4, pp. 642–652, April 2008.
10. S Gazor and H Saligheh Rad, "Space-Time-Frequency Characterization of MIMO Wireless Channels," *IEEE Transactions on Wireless Communications*, vol. 5, no.9, pp. 2369–2375, September 2006.
11. S Gazor and H Saligheh Rad, "Space-Time Coding Ambiguities in Joint Adaptive Channel Estimation and Detection," *IEEE Transactions on Signal Processing*, no. 2, vol. 52, pp. :372–384, February 2004.
12. H Saligheh Rad, M Saeedifard and A Bakhshai, "SVM Classification Algorithm; A General and Efficient PWM Technique for Three-Phase Multilevel Inverters," *Esteghlal Research Journal,* Isfahan University of Technology (IUT), Isfahan, Iran, 2004.
13. M Saeedifard, H Saligheh Rad, A Bakhshai and R Iravani, "A Neuro-Based Classification Algorithm for Implementation of Space Vector Modulation for Multi-Level Converters," *European Power Electronics And Drives Journal*.

Submitted and under Preparation Journal Papers

14. H Saligheh Rad, W Sun, SCB Lam, J Love, MB Leonard and FW Wehrli, "Bone Water Concentration as a New Metric for Cortical Bone Quality," *Magnetic Resonance in Medicine,* under preparation.
15. H Saligheh Rad, AM Pistea and S Gazor, "Effects of MS Random Displacements and Non-Fixed Scatterers on the Correlation Function of MIMO Wireless Propagation Channels," submitted.
16. M Baboli, A Sharafi, A Ahmadian and H Saligheh Rad, "Wireless Ultra Wide Band (UWB) Based Technique to Measure Heart and Respiratory Rates," submitted.
17. P Shariatpanahi, AA Shishegar, BH Khalaj and H Saligheh Rad, "On Performance Enhancement of 2×2 MIMO Systems Using Directional Antenna Elements," under preparation.
18. O Darvishi, B Abolhassani and H Saligheh Rad, "On the Effectiveness of Directional Antennas in MIMO Communication Systems," under preparation.
19. O Darvishi, B Abolhassani and H Saligheh Rad, "Impact of Power Control on the MIMO Mutual Information", under preparation.

Peer-Reviewed Conference Papers

1. P Khateri, H Saligheh Rad, A Fathi and M Ay, "Generation of Attenuation Map for MR-Based Attenuation Correction of PET Data in the Head Area Employing 3D Short Echo-Time MR Imaging", *Proceedings of PET/MR and SPECT/MR: New Paradigms for Combined Modalities in Molecular Imaging Conference (PSMR'12)*, May 2012, La Biodola, Italy.

2. A Fathi Kazerooni, A Ahmadian, H Saberi, J Alirezaie and H Saligheh Rad, "An Efficient Algorithm for Registration of Pre- and Intra- Operative Brain MRI Images to Correct Intensity Inhomogeneity", *Proceedings of the 11th International Conference on Information Sciences, Signal Processing and their Applications (ISSPA'12)*, July 2012, Montreal, Canada.
3. H Saligheh Rad, AM Pistea, M Mohseni and A Kazemi, "High Precision Quantification of 1H-MRSI Spectra in Brain and Musculoskeletal Tumors," *Proceedings of 20th ISMRM Scientific Meeting and Exhibition,* Melbourne, Australia.
4. J Zamani, AN Moghaddam, and H Saligheh Rad, "Application of L1-Regularized Optimization for Compressed Sensing CE-MRA," *Proceedings of 20th ISMRM Scientific Meeting and Exhibition,* Melbourne, Australia.
5. J Zamani, M Shirdel, H Saligheh Rad and AN Moghaddam, "Improved SVD-based Sparsity Basis for Compressed Sensing MRI ," *Proceedings of 20th ISMRM Scientific Meeting and Exhibition,* Melbourne, Australia.
6. A Mehranian, H Saligheh Rad, M Ay and A Rahmim, "3D TV-Based Compressed MR Image Reconstruction Using a Primal Dual Algorithm," *Proceedings of 20th ISMRM Scientific Meeting and Exhibition,* Melbourne, Australia.
7. A Fathi Kazerooni, A Ahmadian, N Dadashi Serej, H Saligheh Rad, H Saberi, H Yousefi and P Farnia, "Segmentation of Brain Tumors in MRI Images Using Multi-scale Gradient Vector Flow", *Proceedings of 33rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC'11)*, September 2011, Boston, USA.
8. P-H Tsai, AC Seifert, AC Wright, H Saligheh Rad, JF Magland, HK Song, MB Leonard and FW Wehrli, "Feasibility of in vivo phosphorus imaging of cortical bone at 7T in humans," *Proceedings of 19th ISMRM Scientific Meeting and Exhibition,* April 2011, Montreal, Canada.
9. M Mahrooghi and H Saligheh Rad, "Compressive Sensing for micro-MRI of Trabecular Bone Using Smooth Projected Landweber (SPL)," *Proceedings of 19th ISMRM Scientific Meeting and Exhibition,* April 2011, Montreal, Canada.
10. H Saligheh Rad, SCB Lam, JF Magland, J Love and FW Wehrli, "Quantifying Proton Density in Cortical Bone In-Vivo by 3D Ultra-short Echo-time Imaging," candidate for the **best e-poster award,** *Proceedings of 18th ISMRM Scientific Meeting and Exhibition,* April 2010, Stockholm, Sweden.
11. H Saligheh Rad, J Love, JF Magland, M Leonard and FW Wehrli, "Bone Water Concentration as a New Metric for Cortical Bone Quality," **oral presentation,** *Proceedings of 18th ISMRM Scientific Meeting and Exhibition,* April 2010, Stockholm, Sweden.
12. CS Rajapakse, H Saligheh Rad, SCB Lam, J Love, JF Magland and FW Wehrli, "Ultra-Short Echo-Time Imaging Based Estimation of Cortical Bone Stiffness," *Proceedings of 18th ISMRM Scientific Meeting and Exhibition,* April 2010, Stockholm, Sweden.
13. SCB Lam, H Salilgheh Rad, JF Magland and FW Wehrli, "Automatic segmentation of MR images for long-bone cross-section parametric analysis," *Proceedings of 18th ISMRM Scientific Meeting and Exhibition,* April 2010, Stockholm, Sweden.
14. JF Magland, H Saligheh Rad and FW Wehrli, "Correcting for Gradient Imperfections in Ultra-Short Echo Time Imaging," *Proceedings of 18th ISMRM Scientific Meeting and Exhibition,* April 2010, Stockholm, Sweden.
15. FW Wehrli, H Saligheh Rad, MB Leonard, J Magland, J Love, HK Song and H Peachey, "Cortical Bone Water Measured by UTE MRI Far Exceeds Variations in Mineral Density," *Proceedings of 2010 ASBMR,* 2010.
16. AM Pistea, T Palade, A Moldovan and H Saligheh Rad, "Cross correlation Function for Wideband MIMO Channels: Derivation and Analysis," *Proceedings of the 6th International Wireless Communications and Mobile Computing Conference*, pp. 819–823, Caen, France, 2010.

17. AM Pistea and H Saligheh Rad, "Wideband and UWB Communication Channels with Dirrectional Antenna Arrays in Non-isotropic Propagation Environment," *Proceedings of PIERS,* 2010.

18. GR Bakhshi, K Shahtalebi and H Saligheh Rad, "A Novel Full-Three-Dimensional MIMO Mobile-to-Mobile Channel Reference Model," *Proceeding of 3rd International Conference on Signal Processing and Communication Systems (ICSPCS'2009)*, Nebraska, USA, September 2009.

19. H Saligheh Rad, MJ Wald, JF Magland and FW Wehrli, "High Precision Translational Motion Correction for Micro-MRI of Trabecular Bone Using Cartesian Navigators," **oral presentation,** *Proceedings of 17th ISMRM Scientific Meeting and Exhibition,* April 2009, Hawaii.

20. JF Magland, AC Wright, H Saligheh-Rad and FW Wehrli, "Low-SAR Trabecular Bone Micro-MRI for use at Ultra-High Field," poster presentation, *Proceedings of 17th ISMRM Scientific Meeting and Exhibition,* April 2009, Hawaii.

21. YA Bhagat, MJ Wald, CS Rajapakse, H Saligheh Rad, JF Magland, MB Leonard and FW Wehrli, "Evaluation of Motion Corruption on Image Quality in Micro MRI of Trabecular Bone: Impact on Structural Parameters," poster presentation, *Proceedings of 17th ISMRM Scientific Meeting and Exhibition,* April 2009, Hawaii.

22. H Saligheh Rad, MJ Wald, JF Magland and FW Wehrli, "Motion Correction for High-Resolution Trabecular Bone Imaging via Low-Resolution Full Radial Navigators," winner of the **best poster award** at *7th Annual Postdoc Research Symposium, UPenn,* October 2008.

23. O Darvishi, B Abolhassani and H Saligheh Rad, "Impact of Power Normalization on the MIMO Mutual Information," *Proceedings of 4th International Symposium on Telecommunications,* August 2008, Tehran, Iran.

24. P Shariatpanahi, AA Shishegar, BH Khalaj and H Saligheh Rad, "Low SNR Regime Capacity Analysis of MIMO Systems Using Directional Antennas", Proceedings of *International Symposium on Telecommunications 2008 (IST'08)*, Tehran, August 2008.

25. O Darvishi, B Abolhassani and H Saligheh Rad, "Impact of Physical Channel Properties on the Capacity of MIMO Communication Systems", *Proceedings of 16th Iranian Conference on Electrical Engineering (ICEE'08)*, May 2008, Tehran, Iran.

26. O Darvishi, B Abolhassani and H Saligheh Rad, "On the Efficiency of Directional Antennas in MIMO Communication Systems," *Proceedings of 2009 IEEE Sarnoff Symposium,* March 2008, Princeton, NJ, USA.

27. S Ghavami, H Alikhanian , B Abolhassani and H Saligheh Rad, "Blind Multiuser Data Estimation in Asynchronous and Unequal Power DS-SS Systems without any Prior Knowledge of Spreading Sequences," *Proceedings of 2009 IEEE Sarnoff Symposium,* Princeton, New Jersey.

28. K Shahtalebi, GR Bakhshi and H Saligheh Rad, "Interference Cancellation in Coherent CDMA Systems Using Parallel Iterative Algorithms," Proceedings of *International Symposium on Telecommunications 2008 (IST'08)*, Tehran, August 2008.

29. P Shariatpanahi, BH Khalaj, AA Shishegar and H Saligheh Rad, "Decorrelating Closely-Placed Antennas by Pattern Design in Uniform Scattering Environments", *International Conference on Advanced Communication Technology 2008 (ICACT'08)*, Korea, Feb 2008.

30. K Shahtalebi, GR Bakhshi and H Saligheh Rad, "Interference Cancellation in Non-Coherent CDMA Systems Using Parallel Iterative Algorithms," Proceedings of *IEEE Wireless Communications and Networking Conference 2008 (WCNC'08)*, March 2008, Las Vegas, USA.

31. H Saligheh Rad, S Gazor and P Shariatpanahi, "Non-Fixed Scatterers and Their Effects on MIMO Multicarrier Fading Communication Channels," *IEEE Global Communications Conference 2007 (GLOBECOM'07)*, July 2007.

32. H Saligheh Rad and S Gazor, "Space-Time-Frequency Characterization of 3D Non-Isotropic MIMO Multicarrier Propagation Channels Employing Directional Antennas," *IEEE Wireless Communications and Networking Conference 2007 (WCNC'07)*, March 2007.
33. M Saeedifard, H Saligheh Rad, A Bakhshai and R Iravani, "A Fast and Universal Neuro-Based SVM Algorithm for Multi-Level Converters," *IEEE APEC'07*.
34. H Saligheh Rad and S Gazor, "A Cross-Correlation Model for Non-Isotropic Scattering with Non-Omnidirectional Antennas in MIMO Propagation Channels," *6th IEEE Workshop on Signal Processing Advances in Wireless Communications 2005 (SPAWC'05)*, pp. 251–255, June 2005.
35. H Saligheh Rad and S Gazor, "A 3D Correlation Model for MIMO Non-Isotropic Scattering with Arbitrary Antenna Arrays," *Wireless Communications and Networking Conference 2004, (WCNC'04)*, pp. 938–943, vol. 3, August 2004.
36. H Saligheh Rad and S Gazor, "The Effect of Mobile Station Rotation on a Correlation Model for Microcellular Environments," *IEEE Global Telecommunications Conference, 2004 (GLOBECOM '04)*, pp. 3058–3062, vol. 5, July 2004.
37. H Saligheh Rad and S Gazor, "MIMO Space-Time Correlation Model for Microcellular Environments," *5th IEEE Workshop on Signal Processing Advances in Wireless Communications 2004 (SPAWC'04)*, pp. 125–129, Lisboa, Portugal, July 11-14, 2004.
38. J Wu, H Saligheh Rad, SD Blostein and S Gazor, "Matrix Form Lapped Space Time Block Coding in Frequency Selective Channels," *22nd Biennial Symposium on Communications, Department of Electrical and Computer Engineering, Queen's University*, Kingston, May 31 - June 3, 2004.
39. S Gazor and H Saligheh Rad, "Time-Varying Coding for Space-Time Ambiguities," *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing, (ICASSP'04)*, Montreal, May 2004.
40. NA Ali, H Saligheh Rad, S Gazor and H Mouftah, "WMPLS Throughput Efficiency in Multipath Rayleigh Fading Environments," *Canadian Conference on Electrical and Computer Engineering 2004 (CCECE'04)*, Niagara Falls, May 2004.
41. H Saligheh Rad and S Gazor, "An Optimal Receiver for Transmission Diversity Over Uncertain Channels," *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing, (ICASSP'03)*, vol. 4, pp. IV:341-344, Hong Kong, April 6–10, 2003.
42. H Saligheh Rad and S Gazor, "Transmission Diversity Ambiguities and Adaptive Channel Tracking," *Proceedings of Seventh International Symposium on Signal Processing and Its Applications, (ISSPA'03)*, 2003, vol. 1, pp. 45–48, July 1-4, 2003.
43. S Gazor and H Saligheh Rad, "Joint Estimation and Detection for Transmit Diversity Over Fast Fading Channels," *Proceedings of Seventh International Symposium on Signal Processing and its Applications, (ISSPA'03)*, 2003, vol. 1, pp. 37–40, July 1-4, 2003.
44. H Saligheh Rad and S Gazor, "A MIMO Channel Model and Simulator," *Special Forum for Design and Developers, GLOBCOM'03*, December 2003.
45. A Bakhshai and H Saligheh Rad, "Space Vector Modulation Based on Classification Method in Three-Phase Multi-Level Voltage Source Inverters," *IEEE Industry Applications Conference, Thirty-Sixth IAS Annual Meeting*, vol. 1, pp. 597–602, 30 Sept.-4 Oct. 2001.
46. H Saligheh Rad and A Bakhshai, "Space Vector Modulation Based on Vector Classification Methods in Three-Phase Three-Level Voltage Source Inverters," *Proceedings of 9th - Iranian Conference on Electrical Engineering, (ICEE'01)*, May 2001.

Submitted Conference Papers

1. A Fathi Kazerooni, A Ahmadian, H Saberi, V Asayesh and H Saligheh Rad, "A Wavelet-Based Similarity Measure to Register Pre-/Intra-Operative MR Images of the Brain", *submitted to 34rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC'12)*, August 2012, San Diego, USA.
2. J Zamani, H Saligheh Rad and AN Moghaddam, "Application of Split Bregman Optimization Method for Compressed Sensing CE-MRA," *submitted to 34rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC'12)*, August 2012, San Diego, USA.
3. J Zamani, H Saligheh Rad and AN Moghaddam, "K-Space Under-Sampling Patterns in Compressed Sensing MRI," *submitted to 21st Biennial International Conference (BioSignal'12)*, June 2012, Brno, Czech Republic.
4. J Zamani, AN Moghaddam and H Saligheh Rad, "Improved Singular Value Decomposition -Based Sparsity Basis for Compressed Sensing MRI," *submitted to 21st Biennial International Conference (BioSignal'12)*, June 2012, Brno, Czech Republic.
5. A Mehranian, H Salighe Rad, M Ay, A Rahmim and H Zaidi , "CstimSmoothly Clipped Absolute Deviation (SCAD) Regularization for Compressive Dynamic MRI Using an Augmented Lagrangian Algorithm," *submitted to 2012 Nuclear Science Symposium, Medical Imaging Conference (NSS-MIC'12)*, October 2012, California, USA.

PRESENTATIONS

Invited Talks

- "Quantifying Cortical Bone Proton Density In Vivo: Technical Design and Clinical Study," *Science and Engineering Department, Land Forces Academy,* Sibiu, Romania, July 2011.
- "Bone Water Concentration as a New Metric for Cortical Bone Quality," *Engineering and Medical Center, Isfahan University, Department of Electrical and Computer Engineering, Isfahan University of Technology,* Isfahan, Iran, and *Electrical Engineering Department, Sharif University of Technology,* Tehran, Iran, September 2009.
- "High Precision Translational Motion Correction for Micro-MRI of Trabecular Bone Using Cartesian Navigators," *Engineering and Medical Center, Isfahan University,* and *Department of Electrical and Computer Engineering, Isfahan University of Technology,* Isfahan, Iran, January 2009.
- "Frequency Selective Pulses for Magnetic Resonance Imaging," *International Seminar of Electrical Engineering Department, Sharif University of Technology,* Tehran, Iran, September 2007.
- "Modeling and Evaluation of Outdoor Wireless Channels," *International Seminar of Electrical Engineering Department, Sharif University of Technology,* Tehran, Iran, January 2007.
- "Correlation Modeling of Wireless Propagation Media," *Electrical Engineering Department, Oxford University,* Oxford, Britain, February 2007.

Oral Presentations

- "WASPI: Water- and Fat-Suppressed Projection MR Imaging," *Laboratory for Structural NMR Imaging,* University of Pennsylvania, Philadelphia, PA, December 2009.
- "SWIFT: Sweep Imaging with Fourier Transformation," *Laboratory for Structural NMR Imaging,* University of Pennsylvania, Philadelphia, PA, December 2009.
- "Soft Tissue Suppression," *Laboratory for Structural NMR Imaging,* University of Pennsylvania, Philadelphia, PA, September 2009.
- "Gradient Eddy Currents in MRI; Principles and Compensation Techniques," *Laboratory for Structural NMR Imaging,* University of Pennsylvania, Philadelphia, PA, May 2009.
- "Designing Long-T2 (Soft Tissue) Suppression Pulses for Ultra-short Echo Time Imaging," *Laboratory for Structural NMR Imaging,* University of Pennsylvania, Philadelphia, PA, February 2009.

- "TELEX: A Practical T2-Selective RF Excitation Pulse," *Laboratory for Structural NMR Imaging,* University of Pennsylvania, Philadelphia, PA, Novemver 2008.
- "Motion Correction via Radial Navigators," *Laboratory for Structural NMR Imaging,* University of Pennsylvania, Philadelphia, PA, August 2008.
- "Non-Fixed Scatterers and Their Effects on MIMO Multicarrier Fading Communication Channels," *IEEE Global Communications Conference 2007 (GLOBECOM'07),* Washington DC, November 2007.
- "Spatial-Temporal-Frequency Decomposition for Uncorrelated 3D MIMO Microcellular Wireless Channels," *Canadian Conference on Electrical and Computer Engineering 2004 (CCECE'04),* Niagara Falls, May 2004.
- "Matrix Form Lapped Space Time Block Coding in Frequency Selective Channels," *22nd Biennial Symposium on Communications,* Department of Electrical and Computer Engineering, Queen's University, Kingston, May 31 - June 3, 2004.
- "Transmission Diversity Ambiguities and Adaptive Channel Tracking," *Seventh International Symposium on Signal Processing and its Applications, ISSPA'03,* France, July 2003.
- "Joint estimation and detection for transmit diversity over fast fading channels," *Seventh International Symposium on Signal Processing and Its Applications, ISSPA'03,* France, July 2003.
- "MIMO Systems for Wireless Communications: Some advances in MIMO Channel Modeling and Space-Time Coding," *Presentation for the Ph.D. Comprehensive Exam-Part II (Proposal Session),* Department of Electrical and Computer Engineering, Queen's University, Canada, June 2003.
- "An Optimal Receiver for Transmission Diversity over Uncertain Channels," *Canadian Conference on Electrical and Computer Engineering 2003,* May 2003, Montreal, Canada.
- "New Trends in Spatial Channel Modeling for Wireless Communications and its application for MIMO systems," *Presentation for the Ph.D. Comprehensive Exam-Part I,* Department of Electrical and Computer Engineering, Queen's University, Canada, June 2002.
- "MIMO Systems for Fading Channels," *Presentation for the Wireless Communications Course,* Department of Electrical and Computer Engineering, Queen's University, Canada, December 2001.

Poster Presentations

- "Quantifying Proton Density in Cortical Bone In-Vivo by 3D Ultra-short Echo-time Imaging," candidate for the **best e-poster award,** at *18th ISMRM Scientific Meeting and Exhibition,* April 2010, Stockholm, Sweden.
- "Motion Correction for High-Resolution Trabecular Bone Imaging via Low-Resolution Full Radial Navigators," winner of the **best poster award** at *7th Annual Postdoc Research Symposium, UPenn,* October 2008.
- "A cross-correlation model for non-isotropic scattering with non-omnidirectional antennas in MIMO propagation channels," *2005 IEEE 6th Workshop on Signal Processing Advances in Wireless Communications,* New York, USA, June 2005.
- "MIMO Space-Time Correlation Model for Microcellular Environments," *Fifth IEEE Workshop on Signal Processing, Advances in Wireless Communications,* Lisboa, Portugal, July 2004.
- "Time-Varying Coding for Space-Time Ambiguities," *IEEE International Conference on Acoustics, Speech, and Signal Processing, (ICASSP'04),* Montreal, May 2004.

Professional Memberships

- ISMRM (International Society for Magnetic Resonance in Medicine)
- IEEE (Institute of Electrical and Electronics Engineers, Inc.)
- Harvard University Alumni Association
- Queen's University Alumni Association
- Sharif University of Technology Alumni Association
- Engineers without Borders (Canada and USA sections)

Article Reviews

- IEEE Transactions on Signal Processing
- IEEE Transactions on Wireless Communications
- IEEE Transactions on Communications
- EURASIP Journal on Wireless Communications and Networking
- EURASIP Journal on Applied Signal Processing
- Proceedings of the IEEE
- Electronics and Telecommunications Research Institute (ETRI) Journal
- Signal Processing for Mobile Communications Handbook, CRC Press
- Handbook of Computer Networks, John Wiley & Sons, Inc.
- Journal of Communications and Networks
- IEEE International Conference on Communications, ICC'05-ICC'06
- IEEE International Symposium on Information Theory 2006, ISIT'06
- IEEE Vehicular Technology Conference, VTC'03-VTC'06
- 5th International Symposium on Communication systems, Networks, and Digital Signal Processing
- International Symposium on Signal Processing and its Applications, ISSPA'07
- Wireless Communication and Networking Conference, 2006-07

Hobbies and Activities

- Hiking, biking, jogging, mountain climbing, horse riding

Personal Information

- Gender: Male.
- Date of birth: March 21, 1975
- Citizenship: Canadian - Iranian