Muhammad Naveed Tabassum

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Summary & Objective

I completed BS under scholarship in telecommunication engineering with GPA of **3.54**/4 and started working in field as *software engineer*. I developed various iPhone and iPad apps, which further improve my mathematical and programming skills. Later, I started MS in electrical engineering (communications) under fellowship at King Saud University and got GPA of **4.56**/5. I also worked as *research assistant* for funded projects by KACST and pursued my thesis. I published, presented and submitted in total five peer-reviewed conferences, two ISI and one non-ISI journal manuscripts. I also did teaching assistance for various courses and labs. Now, my *main objective* is to further my qualifications with a PhD and conduct some ground-breaking research with some of the best minds in the research industry.

Research Interests

Signal and image processing, biomedical imaging, compressed sensing, sparse recovery, machine learning, computer vision, data optimization and statistical analysis.

Education

King Saud University, Riyadh 11421, Kingdom of Saudi Arabia

M.S., Electrical Engineering (Communications) *Expected:* March-April 2015

- CGPA: **4.56**/5.00
- Thesis Topic: *Enhanced Nearfield Three-Dimensional Electromagnetic Imaging using Compressed Sensing*
- Advisors: Prof. Ibrahim Elshafiey and Dr. Mubashir Alam

National University of Computer & Emerging Sciences, Islamabad, Pakistan

B.S., Telecommunication Engineering June 2010

- CGPA: **3.54**/4.00

Journal Publications

1. **M. N. Tabassum**, R. Meer, and Z. Ali, "B-positive Particle Swarm Optimization (B.P.S.O)," *International Journal of Computing and Network Technology*, vol. 1, pp. 95-102, 2013.

Submitted ISI Journal Manuscripts

1. **M. N. Tabassum**, I. Elshafiey, and M. Alam, "Temperature Monitoring of Localized Brain Tumor for Hyperthermia Treatment".
2. **M. N. Tabassum**, I. Elshafiey, and M. Alam, "Enhanced Three Dimensional Nearfield Head Imaging for brain Tumor Localization".

Accepted Peer-Review Conference Papers

1. **M. N. Tabassum**, I. Elshafiey, and M. Alam, "Enhanced Noninvasive Imaging System for Dispersive Highly Coherent Space," in *40 th IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Brisbane, Australia, 19-24 April, 2015.
2. **M. N. Tabassum**, I. Elshafiey, and M. Alam, "Efficient Techniques to Enhance Nearfield Imaging of Human Head for Anomaly Detection," in *10 th IEEE International Symposium on Medical Measurements and Applications (MeMeA)*, Torino, Italy, 7-9 May, 2015.

Peer-Reviewed Conference Proceedings

1. **M. N. Tabassum**, I. Elshafiey, and M. Alam, "Compressed Sensing Based Nearfield Electromagnetic Imaging," in *Proceedings of 4th IEEE International Conference on Control System, Computing and Engineering (ICCSCE)*, Penang, Malaysia, 28-30 November, 2014.
2. **M. N. Tabassum**, I. Elshafiey, and M. Alam, "Innovative Nearfield Electromagnetic Imaging System," in *Proceedings of IEEE International Conference on Smart Instrumentation, Measurement and Applications (ICSIMA)*, Kuala Lumpur, Malaysia, 25-27 November, 2014.

Submitted Peer-Review Conference Paper

1. **M. N. Tabassum**, I. Elshafiey, and M. Alam, "High-Resolution Nearfield Imaging Using Spatiospectral Compressed Sensing," in *10 th IEEE International Symposium on Medical Measurements and Applications (MeMeA)*, Torino, Italy, 7-9 May, 2015.

Research Experience

Graduate Research Assistant Feb 2012 to present

King Saud University, Riyadh

- Developed new technique for particle swarm optimization called *B-positive Particle Swarm Optimization (B.P.S.O)*. This research work is published as journal in International Journal of Computing and Network Technology (IJCNT) in 2013.
- Worked as a member of a research team on a funded research project entitled *Facility Development for Optimizing Tumor Ablation Treatment Plans Based on Electromagnetic Hyperthermia*. The project was funded by the National Plan of Science and Technology (NPST) Program at KACST, Kingdom of Saudi Arabia. Five peer-reviewed conferences in total are submitted and accepted for this project. Moreover, two ISI journal manuscripts are submitted and are under-review.

Teaching Experience

Graduate Teaching Assistant Oct 2011 to present

King Saud University, Riyadh

- Did teaching assistance in logic design, computer programming for engineers in C++, signals and systems analysis, communication systems and computer networks courses, as Tutorial Instructor and for assigning and checking homework and quizzes.
- Worked as Lab Instructor for the labs of MATLAB for engineers, computer programming for engineers in C++, logic design and signals and systems analysis.
- Worked as Lab Assistant for electronics lab.

Field Experience

Software Engineer Dec 2010 to Sept 2011

Coeus Solutions GmbH, Lahore Branch, Pakistan

- Did work on *Stampr* iPhone App for e-commerce, which rewards customers with gratuities. Just scan the codes at participating venues and collect stamps. It includes many features such as scanning QR code, maps to view nearby deals.
- Did work on *1-2-3 It's on a cruise we want to be!*, an iPad interactive child development App. Its main features are animations with picture book format with page turning function and choice of English or German versions.
- Did work on *Qype* iPhone App, which has now been *integrated* into *Yelp* iPhone App. It includes many features like searching for nearby restaurants, shops, and services, finding deals, reading reviews and filtering search results by neighborhood, distance, rating, and price.
- Also did work on other iPhone and iPad Apps.

Technical Skills

Languages & APIs

- MATLAB, MS Visual C++, C, Objective-C, VBA Macros Programming, Python, Extensible Markup Language (XML), JavaScript Object Notation (JSON), LaTeX, Verilog HDL.

Software Tools

- CST Microwave Studio and SEMCAD X - 3D EM simulation tools, Thomson Reuters EndNote X7 and RRCHNM's Zotero - Reference management tools, MS Office, Edraw Max, MS Visio, Xcode IDE, OPNET IT Guru, Wireshark, Network Simulator, Asterisk, Apache Subversion (SVN).

Operating Systems

- Microsoft Windows, Apple's Mac OS, Linux.

Awards & Honors

Student Awards

- Recipient of *the best paper award* for paper entitled: *"Innovative Nearfield Electromagnetic Imaging System"* in Proceedings of IEEE International Conference on Smart Instru- mentation, Measurement and Applications, Kuala Lumpur, Malaysia, 2014.
- Recipient of *Dean's list award* during undergraduate degree for five semesters.

Scholarships

- Recipient of merit-based fellowship award for *Master of Science* by *Attracting Outstanding Faculty and Researchers (AOFR)* Program of King Saud University, Kingdom of Saudi Arabia.
- Recipient of merit-based scholarship award for *Bachelor of Science* in 2006 by *NICT Outreach Scholarship Program (OSP)* of National ICT R&D Fund, Ministry of Information Technology, Pakistan.

Certificates

- IELTS exam with overall Band Score of 6.5.
- GRE revised General Test with Quantitative Score of 157.
- The Institute of Electrical and Electronics Engineers (IEEE) membership.
- Earned a Statement of Accomplishment certificate for online course *Linear and Integer Programming* from Coursera Inc.
- Attended training workshop for CST Microwave Studio.
- Attended two IEEE international conferences and presented three research papers.

References

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ANNEX

1. Abstracts of accepted/published peer-reviewed conferences and journal papers.

Annex 1: Abstracts of accepted/published peer-reviewed conferences and journal papers.

Enhanced Noninvasive Imaging System for Dispersive Highly Coherent Space	A new noninvasive nearfield electromagnetic imaging (EMI) system for highly coherent and compressively sensed (CS) data at only few sensing positions is presented in this paper. Principal component analysis (PCA) in combination with spatial CS and background subtraction is implemented for the enhanced imaging of highly dispersive and coherent target space. The proposed imaging system is applied by forming an incoherent dictionary, which is later tested and validated for head imaging of single and multiple brain tumor targets using CS based sparse recovery. The head imaging model containing the tumor with an applicator antenna array around it is designed using CST Microwave Studio. Consequently, enhanced imaging results reveal the potential of the developed imaging system.
Efficient Techniques to Enhance Nearfield Imaging of Human Head for Anomaly Detection	This paper proposes efficient processing techniques to enhance the nearfield electromagnetic imaging of human head. Forward problem is modelled with geometrically complex shaped SAM head phantom containing brain tumor anomalies and with a circular applicator antenna array. Scattered signals are compressively sensed at only a few sensing positions. The sensed signals are preprocessed efficiently by proposed novel technique to extract the difference signals of useful samples, resulting in temporal compressed sensing. A dictionary is formed and tested in inverse problem solution using compressed sensing for head imaging of multiple brain tumor targets of different shapes and sizes at different locations. Compressed Sensing based imaging results are compared with standard back-projection (SBP) technique and are later post processed by applying proposed techniques to improve the quality and the spatial resolution. Additionally, imaging results are compared quantitatively by image quality metric in terms of peak signal-to-noise ratio (PSNR) values, expressed in decibels. Quality of the reconstructed images and the corresponding PSNR values clearly reveals the validity of the proposed processing techniques.
Compressed Sensing Based Nearfield Electromagnetic Imaging	This paper proposes a novel method of nearfield electromagnetic imaging using compressed sensing technique. Orthogonal matching pursuit (OMP) reconstruction algorithm is implemented for reconstruction of the target space. A dictionary is tested considering head imaging of single and multiple brain tumor targets. The received scattered time-domain signals are captured using spatial compressed sensing and later interpolated for full target space. These signals are also processed for temporal compressed sensing using background subtraction. Simulation of the forward problem it is conducted using CST Microwave Studio using frequency range of 300-3000 megahertz. The quality of reconstructed images reveals the potential of the proposed method.
Innovative Nearfield Electromagnetic Imaging System	An innovative reconstruction system using compressed sensing for nearfield electromagnetic imaging is presented in this paper. The proposed imaging system is tested and validated by creating a dictionary for head imaging of single and multiple brain tumor targets. The scattered time-domain signals are collected at few sensor positions, considering a limited number of possible spatial locations of tumor targets, and using spatial compressed sensing. The sensed signals are further preprocessed for spectral sparsity in frequency domain, resulting in further reduction in the number of samples. Simulation of the forward problem is presented, considering a head model, using CST Microwave Studio tool. Image reconstruction is performed considering various levels of signal to noise ratio. The quality of the reconstructed images of the target space reveals the potential of the developed imaging system.
B-Positive Particle Swarm Optimization (B.P.S.O)	This paper introduces a comparatively new technique for Particle Swarm Optimization (P.S.O). The standard P.S.O technique is modified in a unique way to come up with B-positive Particle Swarm Optimization. The B.P.S.O which is simulated in Matlab lets the particles in a multi-dimensional space to move in an overall positive

direction. In other words the particles are made to move from one side of the space to the other without negative (backward) displacement in search of the global best position. At the same time the displacement magnitude is slightly reduced randomly to discourage the particles from jumping out of the space boundary. The lost particles are randomly thrown around the then known best position, this in return saves a lot of time and effort resulting in improved overall simulation results. Five popular benchmark functions are used to evaluate the performance of B.P.S.O and the result in terms of mean and standard deviation values for global minimum and mean time per replica are compared with previous Standard P.S.O results. The B.P.S.O turns out to be more efficient in terms of optimum convergence and simulation speed.