Muhammmad Zubair Malik

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RESEARCH INTERESTS

Automated Software Engineering, in particular: Automated Debugging and Automated Repair of Programs, Graph Spectra for Invariant Detection, Data Structure Repair, Program Transformation and Analysis.

Belief Networks and Graph Analytics, in particular: efficiently querying Bayesian Belief Networks for predicting and explaining identity fraud.

EDUCATION

The University of Texas at Austin, Austin, TX

PhD in Software Engineering	2009-2014
MSE in Computer Engineering	2006-2007

- **PhD Thesis:** Combining Data Structure Repair and Program Repair (July 2014, Supervisor: Sarfraz Khurshid)

- **MSE Thesis:** Design of Deryaft: A Novel Framework for Generating Representation Invariants of Structurally Complex Data (Nov 2007, Supervisor: Sarfraz Khurshid)

- **Awards:**

  - David Bruton Jr. Graduate School Fellowship, UT Austin (2008)

  - Fulbright Scholarship, US Department of State (2005)

- **Significant Courses:** Probability and Stochastic Processes, Pattern Recognition, Information Theory, Machine Learning, Data Mining, Object Recognition, Computer Vision, Empirical Software Engineering, Compiler Design, Engineering Programming Languages, Software Verification and Validation, Software Testing.

National University of Computer and Emerging Sciences, Pakistan

MS in Computer Science	2001-2003

- **MS Thesis:** Object Based Segmentation of Video using Statistical Fusion of Multiple Cues (May 2003, Supervisor: S. Amjad Hussain)

- **Awards:**

  - Silver Medal for outstanding thesis and performance (2003)

  - Higher Education Commission of Pakistan PhD Scholarship (ranked 4th in Pakistan, 2002)

  - Punjab Information Technology Board Outstanding Talent Scholarship (2001)

- **Significant Courses:** Advanced Algorithms, Complexity Theory, Digital Signal Processing, Intelligent Systems, Speech Processing, Video Processing, Image Processing, Advanced Computer Networks

- **GRE:** Quantitative Ability 800, Analytical Reasoning 790, Verbal Skills 520

Ghulam Ishaq Khan Institute of Engineering Sciences and Technology, Pakistan

BS in Computer System Engineering	1995-1999

- **Significant Courses:** Parallel Programming, Simulation and Modeling, System Programming, Operating Systems, Artificial Intelligence, Scientific Computing, Numerical Analysis

EXPERIENCE

Postdoctoral Fellow   Dec 2014 -
Robotics Institute at Carnegie Mellon University,
I am leading the various aspects of Tiramisu, a crowd sourced transit information and accessibility project. It is a challenging project with various dimensions, including human computer interaction, machine learning, language technologies and software engineering.

Research Fellow   Jul 2013 - Sep 2014
The Center for Identity at the University of Texas at Austin,
I worked in a *post-doctoral* role and lead the design and development effort for *Identity EcoSystem* project under the supervision of Prof. Suzanne Barber. We built a probabilistic graphical model to analyze and predict identity fraud.

Research Assistant   Jan 2006 - May 2013
The Center for Advanced Research in Software Engineering at the University of Texas at Austin,
I worked with Prof. Sarfraz Khurshid in Software Verification, Validation and Testing research group and worked on various projects involving *Automated Debugging, Data Structure Repair*, and *Invariant Detection.*

Teaching Assistant
ECE and CS Departments at the University of Texas at Austin,
- Engineering Programming Languages with Dr. Craig Chase   Spring 2013
- (Head TA) Software System Design with Dr. Suzanne Barber   Fall 2012
- Software Verification and Validation with Dr. Sarfraz Khurshid   Spring 2012
- (Head TA) Software System Design with Dr. Craig Chase   Fall 2011
- Data Structures with Dr. Herb Krasner and Dr. Sarfraz Khurshid   Spring 2011
- Advanced Compiler Design with Dr. Keshav Pingali   Fall 2010
- (Head TA) Intro. to Programming using C with Dr. Craig Chase   Spring 2010
- Introduction to Programming using C with Dr. Craig Chase   Fall 2009
- (Grader) Data Structures with Dr. Sarfraz Khurshid and Dr. David Pan Spring 2006

Teaching Fellow
CS Department at Lahore University of Management Sciences, Lahore, Pakistan
- Introduction to Programming using C++ with Dr. Fareed Zaffar   Fall 2008
- Circuit and Systems II with Dr. Jahangir Ikram   Summer 2008
- Comp. Organization & Assembly Language with Dr. Jahangir Ikram Winter 2008
- (TA) Advanced Programming Techniques with Dr. Zartash Uzmi   Winter 2004

Research and Development Intern   Summer 2007
ObjectVideo Inc., Reston, VA
I worked on developing HiRes Video processing techniques. My job included reviewing state of the art in video processing, specifically in target tracking, implementing it in the most efficient manner possible and finding optimizations for very HiRes videos. I developed software in C++ using ObjectVideo internal libraries.

Research Officer   2004 - 2005
National University of Computer and Emerging Sciences, Lahore, Pakistan
I worked at the Multimedia Lab with Dr. Amjad Hussain on Colorization of videos and faster implementation of Graph Cuts technique.

Senior Software Engineer   Jul 2003 - Aug 2005

Xavor Corporation Pvt. Ltd., Lahore, Pakistan
I lead the development team of billing module for Standard Chartered Bank B2B exchange. The work involved designing and modeling the solution in UML and development in C and Java.

Research Assistant   Summer 2003
CS Department at Lahore University of Management Sciences, Lahore, Pakistan
Worked as research assistant in the Computer Vision Lab with Dr. Sohaib Khan on optimization of Logarithmic Opinion Pooling, a belief aggregation strategy.

Research Officer   2002 - 2003
National University of Computer and Emerging Sciences, Lahore, Pakistan
I worked at the Multimedia Lab with Dr. Arshad Hussain and helped implement a reference implementation of H.323 for testing and proposing new changes in the standard.

Teaching Assistant
CS Department at National University of Computer and Emerging Sciences, Lahore, Pakistan
- Digital Signal Processing with Dr. Amjad Hussain   Spring 2003
- Computer Networks with Dr. Arshad Hussain   Fall 2002
- Final year Project Design with Dr. Arshad Hussain   Spring 2002

Software Engineer   Feb 2001 - Dec 2001
Xavor Corporation Pvt. Ltd., Lahore, Pakistan
I was part of the J2EE based e-business solution development team.

Software Engineer (Consultant)   1999 - 2001
IBM Pakistan, Karachi, Pakistan
Provided development consultancy to IBM clients for WebSphere and VisualAge.

PUBLICATIONS

1. R. Zaeem, M.Z.Malik and S. Khurshid. Repair Abstractions for More Efficient Data Structure Repair. *In Proc. Fourth International Conference on Runtime Verification (RV2013)*, Rennes, France, September, 2013.

2. M. Z. Malik and S. Khurshid. Dynamic Shape Analysis using Topological and Spectral Graph Properties. *In Proc. Fifth International Conference on Software Testing, Verification and Validation (ICST 2012)*, Montreal Canada, April, 2012. **[Nominated for the Best Paper Award]**

3. M. Z. Malik. Dynamic shape analysis of program heap using graph spectra. *In Proc. 33rd International Conference on Software Engineering (ICSE 2011), NIER-Track*, Hawaii USA, May 2011.

4. M. Z. Malik, J.H.Siddiqui, and S. Khurshid. Program Repair using Data Structure Repair. *In Proc. IEEE Fourth International Conference on Software Testing, Verification and Validation(ICST 2011)*, Berlin, Germany. March 2011.

5. D. Gopinath, M.Z. Malik and S. Khurshid. Counter Example Driven Program Repair using Program Contracts. *In Proc. 17th International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS 2011)*, Saarbrcken, Germany, March 2011.

6. M. Z. Malik, K. Ghori, B. Elkarablieh, and S. Khurshid. A Case for Automated Debugging Using Data Structure Repair. *In Proc. 24th IEEE/ACM Interna-*

tional Conference on Automated Software Engineering (ASE 2009), Auckland, New Zealand. Nov 2009.

7. M. Z. Malik, A. Pervaiz, E. Uzuncaova, and S. Khurshid. Deryaft: A tool for generating representation invariants of structurally complex data. *In Proc. 30th International Conference on Software Engineering (ICSE 2008) Research Demo Paper.* Leipzig, Germany. May 2008.

8. M. Z. Malik, A. Pervaiz, and S. Khurshid. Generating Representation Invariants of Structurally Complex Data. *In Proc. 13th International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS 2007).* Braga, Portugal. March 2007.

9. S. Khurshid, M. Z. Malik, and E. Uzuncaova. Generating Alloy Specifications from Instances. *In Proc. 2nd International Symposium on Leveraging Applications of Formal Methods, Verification and Validation (ISoLA 2006).* Paphos, Cyprus. November 2006.

SERVICE
- *Reviewer* for IEEE Transaction on Knowledge Discovery and Data Engineering 2009, ICSE 2011, and ICAART 2013
- Marketing and Fund Raising Team for SKM Cancer Hospital and Research Center (summer 2008)

CERTIFICATIONS
- SUN certified Java Developer (2001)
- IBM certified in Object Oriented Analysis and Design using UML (2001)

REFERENCES
- Dr. Sarfraz Khurshid
  Associate Professor, The University of Texas at Austin
  ✉ khurshid@ece.utexas.edu
  ✆ (512) 471-8244

- Dr. Suzanne Barber
  Professor and Director of the Center for Identity, The University of Texas at Austin
  ✉ sbarber@identity.utexas.edu
  ✆ (512) 471-6152

- Dr. Dewayne Perry
  Professor and Director of Center for Advanced Research in Software Engineering, The University of Texas at Austin
  ✉ perry@ece.utexas.edu
  ✆ (512) 471-8244

- Dr. Craig Chase
  Associate Professor, The University of Texas at Austin
  ✉ chase@ece.utexas.edu
  ✆(512) 471-7457

Personal
- **Citizenship**: Pakistan
- **Marital Status**: Married