Dr. Salman Saeed Khan

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Summary

Salman Khan is an international award-winning scientist in the field of Satellite & Aerial Remote Sensing with a background in Computer Science, Electronic & Electrical Engineering. He is also a Fulbright Scholar and recipient of the best paper prize for IEEE Geoscience & Remote Sensing Society (GRSS) JSTARS journal awarded at International Geoscience & Remote Sensing Symposium (IGARSS) in Melbourne, Victoria (2013). His research interests include Classification/Clustering Algorithms, Image & Signal Processing, Statistical Modeling, and Pattern Recognition using remotely sensed data from Synthetic Aperture Radar (SAR), Polarimetric SAR (PolSAR), LIDAR, Microwave Radiometers, and Optical/Multispectral/Hyperspectral sensors. He is currently investigating the use of airborne LIDAR and Multispectral data in detecting hidden Amazonian archaeology.

Education

Ph.D. Electronic Engineering–University of Surrey, U.K.   *Sep 2009–May 2013*

Thesis: "Non-Gaussian multivariate probability models and parameter estimation for polarimetric synthetic aperture radar data". Supervisors: Dr. Raffaella Guida & Prof. Sir Martin Sweeting.

Impact: Extended the state-of-the-art in statistical modeling of PolSAR data with the proposal & software implementation of a more accurate multivariate probability distribution equipped with a simple, accurate, and computationally inexpensive framework of parameter estimation algorithms implemented in MATLAB integrated with the C/C++ implementation of GNU Scientific Library (GSL). The novelties have been published as conference proceedings and three high quality journal papers, one of which received the 2013 IEEE GRSS JSTARS best paper award (see 2011-2013 in Publications list).

M.Sc. Electrical Engineering–University of Central Florida,   *Aug 2007–Aug 2009*
U.S.A., CGPA: 3.9/4.0

Thesis: "Simulation of brightness temperatures for the microwave radiometer on the Aquarius/ SAC-D mission". Supervisor: Dr. W. Linwood Jones.

Impact: Provided pre-launch simulated ocean brightness temperatures for the Microwave Radiometer, launched later in June 2011 on the NASA Aquarius/SAC-D Mission, by spatially averaging real data from the WindSat polarimetric radiometer on board the Coriolis satellite. The algorithm was implemented in C/C++ and MATLAB. These data have been later used for pre-launch geophysical retrieval algorithm development, validation testing, and inter-satellite radiometric calibration (see 2010 in Publications list). This thesis has six citations.

B.Sc. Computer Science–National University of Computer & Aug 2000–May 2004
Emerging Sciences, Pakistan, CGPA 3.01/4.0

Final Project: "An adaptive multithresholding technique for binarization of color images".
Impact: A novel algorithm based on colour hue, which improves the human perception of the thresholded (reduced file size) optical images, was implemented in C++ with excellent results and was subsequently published (see 2005 in Publications list). This paper has five citations.

Awards & Scholarships

▷ IEEE GRSS JSTARS Best Paper Award, Melbourne, Victoria   Jul 2013
    ▷ Khan, S. and Guida, R. (2012). On single-look multivariate $\mathcal{G}$ distribution for PolSAR data. *IEEE J. Sel. Topics Appl. Earth Observations Remote Sens.*, 5(4):1149 –1163
▷ University of Surrey Research Scholarship for Ph.D. (U.K.)   Oct 2009–Sep 2012
▷ Fulbright Scholarship for M.Sc. (U.S.A.)   Sep 2007–Aug 2009
▷ Ministry of Science & Technology Scholarship for B.Sc. (Pakistan)   Jan 2001–May 2004
▷ Bronze Medal in Higher Secondary School Examination (Pakistan)   Aug 2000

Work Experience

Associate Research Fellow–University of Exeter, U.K.   Sep 2014–present

Responsible for Remote Sensing, data collection, analysis, and algorithm/software development aspects of an inter-disciplinary, 1.7m-euro, European Research Council project investigating the nature and scale of environmental disturbances produced by Pre-Columbian humans and their modern legacy on Amazonian forests. A BBC news article, and a recent interview of Salman Khan on the project, published in The Atlantic (Washington newspaper), are listed below:

▷ www.bbc.co.uk/news/science-environment-31467619
▷ www.theatlantic.com/technology/archive/2015/03/lost-civilizations-found-by-drones/386923/

Details of relevant tasks and responsibilities are:
▷ Assisting in all aspects of assembling an aerial drone mounted with LIDAR and Multispectral sensors
▷ Hardware/software requirements gathering including technical specifications, financial evaluation, and equipment/software purchasing
▷ Hardware/software systems integration, testing, data acquisition, and equipment operation
▷ Analyze aerial and satellite imagery collected over archaeological sites and correlate with in-field data using a programming environment like MATLAB
▷ Develop novel algorithms and write software code to detect hidden archaeology, analyze forest structure and composition using LIDAR and Multispectral data
▷ Build and maintain the GIS database of the project in a suitable software like Google Earth, ArcGIS, or QGIS
▷ Disseminate project findings in high profile journals like Nature and Science

Employment Relocation Period   Aug 2014

One month employment break for relocation to a new city.

Research Fellow & Research Assistant–Surrey Space Centre,   *Oct 2012–Jul 2014*
University of Surrey, U.K.

▷ *Research Fellow, Nov 2013–Jul 2014:*
Managed the work package of a European Commission FP7 project, D-BOX (Demining tool-BOX - www.d-boxproject.eu/index.html), on humanitarian clearing of large scale areas from anti-personnel landmines and cluster munitions. The work package explored the feasibility of using aerial and satellite remote sensing imagery for mapping and localizing hazardous areas.

The following tasks and duties were accomplished in D-BOX:
▷ Developed & published two novel clustering algorithms used to automatically classify PolSAR and Multispectral images; very useful in mapping and localizing hazardous areas (see 2014 in Publications list)
▷ Literature review and requirements gathering of area reduction using remotely sensed data
▷ Coded, maintained, debugged, tested, and optimized the algorithms in MATLAB
▷ Supervised a Research Assistant on various technical assignments

In addition, contributed in writing new research project proposals on: 1) ocean oil-spill detection using PolSAR imagery, and 2) forestry applications of multi-frequency SAR imagery.

▷ *Research Assistant, Oct 2012–Oct 2013:*
Documented the novelties discovered during Ph.D. research and formalized the corresponding mathematics and software code.

Performed the following duties and responsibilities:
▷ Published two journal papers on new parameter estimation algorithms (see 2013 Publications)
▷ Maintained and commented the MATLAB code for parameter estimation algorithms of statistical distributions used to model PolSAR imagery
▷ Tested the code on real PolSAR imagery in X- and S-bands
▷ Corrected errors, fixed bugs, and optimized the code
▷ Performed Monte Carlo simulations to compare the accuracy and computational cost of various parameter estimation algorithms

M.Sc. & Ph.D. Studies   *Aug 2007–May 2013*

Software Engineer–CureMD Pakistan (Pvt.) Ltd.   *May 2006–Jul 2007*
CureMD (www.curemd.com) is a leading provider of innovative health information systems that transform the administrative and clinical operations of healthcare organizations.

Salman Khan worked on a software project in internet marketing (an emerging business area of CureMD), developing an integrated enterprise wide web-based solution for 24/7 Real Media, a client specialized in digital marketing. The project team consisted of eight people. The following duties were performed:
▷ Designed and developed parts of the web-based application using Microsoft .Net technologies (ASP.Net, C#) and SQL Server
▷ Designed and implemented user workflows
▷ Unit tested the implemented work, performed debugging and bug-fixing
▷ Identified technical problems and provided their solutions

▷ Researched and evaluated a variety of software products

Fulbright Scholarship Preparation Period *Dec 2005–Apr 2006*

Break taken to prepare for standardized tests of TOEFL & GRE in order to apply for the prestigious Fulbright Scholarship for M.Sc. studies in U.S.A. The Scholarship was successfully awarded in Dec 2006, and the M.Sc. commenced in Aug 2007 at University of Central Florida.

Software Engineer–Ciklum, Pakistan *Aug 2005–Nov 2005*

Ciklum (www.ciklum.com/contact-us/) is an expert in providing software development teams managed by clients themselves. It also specializes in expanding the online presence of businesses through its technical expertise in content management systems and digital media.

Salman Khan carried out the following tasks during his short stay at Ciklum:
▷ Maintained and developed websites built on Microsoft Content Management Server integrated with Visual Studio .Net and programming in C#
▷ Analyzed and fixed software bugs and issues
▷ Proposed rapid and viable solutions of technical problems

Software Engineer–Avanceon, Pakistan *Jun 2004–Aug 2005*

Avanceon (www.avanceon.com) is a leader in industrial control automation, information management systems and energy optimization, enabling its clients to optimize their manufacturing processes.

Salman Khan performed the following duties at Avanceon:
▷ Built and modified code for various web-based applications using Microsoft .Net framework technologies (ASP.Net, C#), and SQL server
▷ Maintained, debugged, unit tested the code of a desktop based ERP application in Visual Basic
▷ Developed reporting tools using Crystal Reports for real-time analysis and decision-making
▷ Performed analysis, design, and requirements gathering for different software applications
▷ Evaluated and proposed third-party software components and products to improve existing systems
▷ Documented end-user manuals and workflows

Skills

Software & Programming Skills
Programming: C/C++, C#, Java, VB, Microsoft .Net Technologies, VS.NET
Web Programming: HTML, XML, ASP.NET, JavaScript
Databases: SQL server, Oracle, Microsoft Access
Mathematics: MATLAB, Maple, GSL, UNU.RAN
Documentation: LaTeX, Microsoft Office, Adobe Acrobat Pro
Remote Sensing: PolSARPro, Satellite Toolkit, LASTools, ENVI/IDL
GIS: Google Earth, ArcGIS, QGIS
Operating Systems: Windows, Linux/Unix
Others: Crystal Reports, Inkscape, Easy-PC

Remote Sensing Skills
SAR, PolSAR, Optical/Multispectral/Hyperspectral imagery, LIDAR, Radar Polarimetry, Microwave Radiometry, Satellite and Aerial Earth Observation

Other Skills
Image and Signal Processing, Algorithms, Software Engineering, Object Oriented Programming, Probability & Statistics, Simulation, Mathematical Modeling, Machine Learning, Data Analysis, Numerical Analysis, Optimization, Pattern Recognition

Conference & Seminar Presentations

2014	Seminar at Universidade Federal de Alagoas & Universidade Federal do Ceará, Brazil
2013	IEEE IGARSS (Symposium), Melbourne, Victoria
2012	▷ European Synthetic Aperture Radar (EUSAR) conference, Nuremberg, Germany
	▷ IEEE IGARSS, Munich, Germany
2011	Joint Urban Remote Sensing Event (JURSE), Munich, Germany

Professional Affiliations & Activities

IEEE Member since 2011
Peer Reviewer:
▷ IEEE GRSS Journals of TGRS, JSTARS, and GRSL
▷ Brazilian Journal of Probability & Statistics
▷ IET Journal of Radar, Sonar, & Navigation
Follower of IEEE Geoscience & Remote Sensing Magazine

Other Work Experience

Teaching Assistant–University of Surrey, U.K.   *Spring Term 2010–2012*
Assisted the instructor in undergraduate module of Engineering Design & Presentation Skills:
▷ Easy-PC software (PCB design software) demonstrator and project report evaluator
▷ Facilitator in leadership & team building activities

Referees

Dr. José Iriarte	*Position:*	Associate Professor, University of Exeter, U.K.
	Relationship:	Current line manager
	Contact:	J.iriarte@exeter.ac.uk , : +44 1392 264513
Dr. Raffaella Guida	*Position:*	Senior Lecturer, University of Surrey, U.K.
	Relationship:	Ph.D. supervisor and previous line manager
	Contact:	r.guida@surrey.ac.uk , +44 1483 682227
Dr. Anthony Paul Doulgeris	*Position:*	Associate Professor, University of Tromsø, Norway
	Relationship:	Research collaborator
	Contact:	anthony.p.doulgeris@uit.no, +47 776 45177

Publications

Journals

2013	▷ Khan, S. and Guida, R. (2013). Application of Mellin-Kind statistics to polarimetric G distribution for SAR data. *IEEE Trans. Geosci. Remote Sens.*, 52(6):3513–3528
	▷ Khan, S. and Guida, R. (2013). On fractional moments of multilook polarimetric whitening filter for polarimetric SAR data. *IEEE Trans. Geosci. Remote Sens.*, 52(6):3502–3512
2012	Khan, S. and Guida, R. (2012). On single-look multivariate $\mathcal{G}$ distribution for Pol-SAR data. *IEEE J. Sel. Topics Appl. Earth Observations Remote Sens.*, 5(4):1149 –1163

Conferences

2014	▷ Khan, S., Doulgeris, A.P., Savastano, S., and Guida, R. (2014). Automatic clustering of multispectral data using a non-Gaussian statistical model. In *Proc. IGARSS*, pp. 4276–4279. Quebec City, Canada
	▷ Khan, S. and Doulgeris, A.P. (2014). Unsupervised clustering of PolSAR data using polarimetric G distribution and Markov Random Fields. In *Proc. EUSAR*. Berlin, Germany
2013	▷ Khan, S. and Guida, R. (2013). Single-look PolSAR statistical analysis using fractional moments of polarimetric whitening filter. In *Proc. IGARSS*, pp. 3187–3190. Melbourne, VIC
	▷ Guida, R., Brett, P.T.B., and Khan, S. (2013). Remote sensing and crowd-sourcing. In *Proc. IGARSS*, pp. 3942–3945. Melbourne, VIC
2012	▷ Khan, S. and Guida, R. (2012). The new dual-texture $\mathcal{G}$ distribution for single-look PolSAR data. In *Proc. IGARSS*, pp. 22–27. Munich, Germany
	▷ Khan, S. and Guida, R. (2012). The new form of $\mathcal{G}$ distribution for single-look PolSAR data. In *Proc. EUSAR*, pp. 523–526. Nuremberg, Germany
2011	Khan, S. and Guida, R. (2011). Feasibility of time-frequency urban area analysis on TerraSAR-X fully polarimetric dataset. In *Proc. JURSE*, pp. 265–268. Munich, Germany
2010	Biswas, S.K., Jones, L., Khan, S., Gallo, J.C., and Roca, D. (2010). MWR and WindSat inter-satellite radiometric calibration plan. In *Proc. MicroRad*, pp. 266–271. Washington, DC
2005	Sheikh, L.M., Hassan, I., Sheikh, N.Z., Bashir, R.A., Khan, S.A., and Khan, S. (2005). An adaptive multi-thresholding technique for binarization of color images. In *Proc. WSEAS*, pp. 104:1–104:6. Athens, Greece