

Curriculum Vitae - Zubair Khalid

CONTACT AND PERSONAL INFORMATION

Position: Assistant Professor
Department of Electrical Engineering
Lahore University of Management Sciences
Lahore, Pakistan

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Web: zubairkhalid.org
Date of Birth: October 20, 1984
Nationality: Pakistani/Australian

HIGHLIGHTS

- 52 Publications – 16 Journals and 36 Conference proceedings
- Research collaboration with researchers from UCL, ANU, Princeton and EPFL
- 9 million PKR (~ 80,000 US) Research and Development Funding since June 2015 from HEC, Industries and LUMS
- Active collaborations with leading industries

EDUCATION

Australian National University (ANU), Canberra, Australia

Ph. D. Engineering, Apr. 2013

– Thesis Topic: *Spatio-spectral Analysis on the Unit Sphere*

University of Engineering and Technology, Lahore, Pakistan

B. Sc. (Hons.) Electrical Engineering, Aug. 2008

– Rank: 1/300 in Electrical Engineering (Awarded 5 Gold medals)

WORK EXPERIENCE

Lahore University of Management Sciences

Jul. 2015-Current

Assistant Professor of Electrical Engineering

Australian National University

Apr. 2013-Feb. 2015, May 2016-Aug-2016

Research Fellow with Research School of Engineering

Tetra Pak Pakistan

Jun. 2008-Feb. 2010

Project Engineer

FUNDING AND AWARDS

- Tetra Pak project for the development of applications for logistic optimization and traceability of quality parameters (PKR 1440,000)
- LUMS Travel Grant and HEC Travel Grant PKR to attend ICASSP 2018 (PKR 400,000)
- Tetra Pak Project on the development of high-resolution surface profiler (PKR 1,400,000)
- Center of Water Informatics and Technology, LUMS seed grant award (PKR 338,000)
- LUMS Travel Grant and HEC Travel Grant PKR to attend ICASSP 2017 (PKR 741,625)
- Research Grant under HEC National Research Program for Universities (NRPU) 2016 for project titled "Development of Anisotropic, Fast, Robust and Sparse Spherical Signal Processing Methods with Application to Hydrology and Diffusion Tensor Imaging" (PKR 1,991,883)

Before joining LUMS:

- Dean's travel grant, ANU for a research visit to UCL (\$8.4K), 2012
- ANU Vice Chancellor's travel grant (\$1.5K), 2011
- Endeavour International Postgraduate Research Scholarship, 2009
- ANU PhD Scholarship (Withdrawn), 2009
- ANU Higher Degree by Research Scholarship (Withdrawn), 2009
- Certificate of Merit for 1st Position out of 300 in Bachelor of Electrical Engineering
- University of Engg. and Tech., Lahore Gold Medal for best performance in EE, 2008

- NESPAK Gold medal for best performance during my undergraduate in Engineering, 2008
- SIEMENS Gold medal (Awarded to 1 student in overall Punjab State), 2008
- 2008 - NEWAGE Gold medal for overall best performance in Electrical Engineering, 2008
- Merit Scholarships - Bachelor of Electrical Engineering, 2004-2008
- Government of Pakistan National Talent Scholarship, 2001-2003

TEACHING
EXPERIENCE

Assistant Professor

- Fall 2018, Circuits 1
- Spring 2018, Feedback Control Systems
- Fall 2017, Circuits 1
- Spring 2017, Feedback Control Systems
- Spring 2017, Convex Optimization (Graduate course)
- Fall 2016, Signals and Systems
- Spring 2016, Feedback Control Systems
- Spring 2016, Convex Optimization (Graduate course)
- Fall 2015, Signals and Systems
- Spring 2015, Signals and Systems

Lecturer

- Semester 2, 2014, Signal Processing, with Prof. Rodney A. Kennedy, ANU
- Semester 1, 2014, Probability and Stochastic Processes in Engg. (Graduate course), ANU
- Semester 2, 2013, Signal Processing (Undergraduate course), with Prof. Rodney A. Kennedy, ANU
- Semester 1, 2013, Probability and Stochastic Processes in Engg. (Graduate course), ANU
- Semester 2, 2012, Business Decision Models (Graduate course), University of Canberra (UC)

SUPERVISION
EXPERIENCE
(RESEARCH
STUDENTS)

- **Adeem Aslam** (Ph.D. student), Jul. 2016 - Present
 - Qualifier completed.
 - Topic: Signal Processing Applications in Cosmology
 - Research output: 1 Conference papers
- **Wajeaha Nafees** (Ph.D. student), Jan. 2016 - Present
 - Topic: Development of Novel Signal Processing Methods for Signal Analysis on Spherical Manifolds
 - Research output: 3 Conference papers, 1 journal paper
- **Atiqa Kayani** (Ph.D. student), Jul. 2018 - Present
 - Topic: Spatial Correlation in Massive MIMO Systems
 - Co-supervision with Ijaz Haider Naqvi
- **Usama Elahi** (Ph.D. student), Nov. 2015 - Present
 - Topic: Optimal Dimensionality Sampling for Spin Functions on Sphere
 - Co-supervision with Prof. Rodney A. Kennedy
 - Research output: 1 Journal papers, 6 Conference papers
- **Alice P. Bates** (Ph.D. student), Feb. 2014 - Oct. 2016
 - Topic: Anisotropic spherical signal processing with applications in medical imaging
 - Co-supervision with Prof. Rodney A. Kennedy
 - Research output: 4 Journal papers, 6 Conference papers
- **Yibeltal F. Alem** (Ph.D. student), Apr. 2013 - Jun. 2015
 - Topic: Compressive sampling on the sphere
 - Co-supervision with Prof. Rodney A. Kennedy
 - Research output: 2 Journal articles and 2 conference papers
- **Muhammad Osama Tarar** (MS Electrical Engineering), 2017 - Present

- Topic: Spherical Convolutional Neural Networks Functions
- **Safa Ashraf** (MS Electrical Engineering), 2017 - Present
 - Topic: Use of MODIS Data for the Localization of Air Pollution Sources Functions
- **Asad Ali** (MS Electrical Engineering), 2017 - Present
 - Topic: Optimal Adaptive Placement of Drones for Power Minimization in a Dynamic User Environment Functions
- **Naima Munir** (MS Electrical Engineering), 2016 - 2017
 - Topic: Reconstruction of Sparse Signals on the Sphere Using Overcomplete Dictionary of Slepian Functions
- **Sameul Stefopolous** (B. Eng. R&D student), Semester 1, 2014 - Semester 2, 2014
 - Topic: Optimal sampling on the rotation group
- **Yundong Zhang** (B. Eng. R&D student) - Current
 - Topic: Fast conjugate gradient extrapolation on the sphere
- **Kaihao Wang** (B. Eng.) - Semester 1, 2015
 - Topic: Sparse Reconstruction on the Sphere
- **Jing Guo** (B. Eng. R&D student), Semester 1, 2012
 - Topic: Connectivity of ad-hoc networks distributed in a finite region
 - Co-supervision with Dr. Salman Durrani
 - Research output: 1 journal paper
- **Victoria Zhong** (B. Eng. student), Semester 2, 2013
 - Topic: Spatial correlation from multipath with 3D power distributions having rotational symmetry
 - Co-supervision with Prof. Rodney A. Kennedy
- **Weiyu Huang** (B. Eng. R&D student), Semester 2, 2011
 - Topic: Efficient computation of spherical harmonics transform using CUDA
 - Co-supervision with Prof. Rodney A. Kennedy
 - Research output: 1 conference paper

RESEARCH INTERESTS

- Signal analysis on the sphere
- Spatio-spectral signal processing
- Convex Optimization
- Development of computationally efficient algorithms
- Spherical signal processing applications in Acoustics, Medical Imaging, Cosmology
- Connectivity of ad-hoc networks

TECHNICAL SKILLS

- **Programming skills:** C, Verilog, Assembly Language.
- **Simulation Tools:** Electric VLSI design, PSpice, Proteus, ETAP5.5.6, Keil uVision3
- **Application Packages:** Ansoft, ADS, MATLAB, Mathematica
- **Measurement:** Spectrum Analyzer, vector signal generator, vector analyzer

EXPERTISE

Mathematics:

- Applied Mathematics, Real and Complex Analysis, Differential Geometry, Stochastic Geometry, Graph Theory

Communications and Signal Processing:

- Signal Analysis, Harmonic Analysis, Advanced Signal Processing, Probability Theory, Stochastic Processes, Information Theory, Estimation, Wireless Networks

Research Application Areas:

- Cosmology, Acoustics, Geophysics, Astrophysics, Medical Imaging

RESEARCH
COLLABORATION

- Dr. Jason D. McEwen, Newton Fellow and Assistant Professor at Mullard Space Science Laboratory, University College London (UCL), UK
- Dr. Frederik J. Simons, Associate Professor at Department of Geosciences, Princeton University
- Dr. Yves Wiaux, Senior Researcher at Signal Processing Laboratory at Ecole Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland and Associate Professor, Biomedical and Astronomical Signal Processing (BASP) Research Group, at University of Edinburgh, UK
- Dr. Wen Zhang, Research Fellow, Research School of Engineering, Australian National University, Australia

TALKS OR
PRESENTATIONS
(SELECTED)

- May 2011, Proc. IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), Prague, Czech Republic
 - On the construction of low-pass filters on the unit sphere (Poster presentation)
- Mar. 2012, Proc. IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), Kyoto, Japan
 - Concentration uncertainty principles for signals on the unit sphere (Poster presentation)
 - Conjugate gradient algorithm for extrapolation of sampled bandlimited signals on the 2-sphere (Poster presentation)
 - Ambiguity function and Wigner distribution on the sphere
- Apr. 2012, Australian National University
 - Spatio-spectral Analysis on the Sphere Using Spatially Localized Spherical Harmonics Transform
- Jan. 2013, University College London
 - Spatially varying spectral filtering of signals on the sphere
- Aug. 2013, Australian National University
 - Spatio-spectral formulation and design of spatially varying filters for signal estimation on 2-Sphere
- Apr. 2014, Australian National University
 - An Optimal-Dimensionality Sampling Scheme on the Sphere for Fast Spherical Harmonic Transforms
- Jun. 2014, Proc. Workshop on Statistical Signal Processing (SSP), Gold Coast, Australia
 - Minimum Mean Square Error Equalization on the 2-Sphere
 - Adaptive Multi-Resolution Windowing Technique For Localized Spatio-Spectral Analysis
- Mar. 2017, Proc. IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), New Orleans, USA
 - Robust Reconstruction of Spherical Signals with Finite Rate of Innovation
 - Improving the Spatial Dimensionality of Gauss-Legendre and Equiangular Sampling Schemes on the Sphere (Poster presentation)
- Apr. 2018, Proc. IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), Calgary, Canada
 - An improved iterative algorithm for band-limited signal extrapolation on the sphere
 - W. Nafees, Z. Khalid and R. A. Kennedy, “Spatially-limited sampling of band-limited signals on the sphere
 - A. Aslam, Z. Khalid and R. A. Kennedy, “Efficient sampling on healpix grid

PROFESSIONAL
SERVICE

Membership

- IEEE (2010-present)
- IEEE ACT Section (2011-2015)
- IEEE Signal Processing Society (2010-present)
- Khwarizmi Science Society (Life Membership)

Referee Service

- IEEE Transactions on Signal Processing
- IEEE Signal Processing Letters
- IEEE Transactions on Vehicular Technology
- ACM Transactions on Sensor Networks
- Proc. IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)
- International Conference on Signal Processing and Communication Systems (ICSPCS)
- International Symposium on Biomedical imaging (ISBI)

JOURNAL
PUBLICATIONS

- [1] Z. Khalid, S. Durrani, P. Sadeghi, and R. A. Kennedy, "Spatio-spectral analysis on the sphere using spatially localized spherical harmonics transform," *IEEE Trans. Signal Process.*, vol. 60, no. 3, pp. 1487–1492, Mar. 2012.
- [2] P. Sadeghi, R. A. Kennedy, and Z. Khalid, "Commutative anisotropic convolution on the 2-sphere," *IEEE Trans. Signal Process.*, vol. 60, no. 12, pp. 6697–6703, Dec. 2012.
- [3] Z. Khalid, P. Sadeghi, R. A. Kennedy, and S. Durrani, "Spatially varying spectral filtering of signals on the unit sphere," *IEEE Trans. Signal Process.*, vol. 61, no. 3, pp. 530–544, Feb. 2013.
- [4] Z. Khalid, R. A. Kennedy, S. Durrani, P. Sadeghi, Y. Wiaux, and J. D. McEwen, "Fast directional spatially localized spherical harmonic transform," *IEEE Trans. Signal Process.*, vol. 61, no. 9, pp. 2192–2203, 2013.
- [5] Z. Khalid and S. Durrani, "Distance distributions in regular polygons," *IEEE Trans. Veh. Technol.*, vol. 62, no. 5, pp. 2363–2368, Jun. 2013.
- [6] Z. Khalid, S. Durrani, and J. Guo, "A tractable framework for exact probability of node isolation and minimum node degree distribution in finite multi-hop networks," *IEEE Trans. Veh. Technol.*, 2013 (Accepted).
- [7] Z. Khalid, R. A. Kennedy, and J. D. McEwen, "An optimal-dimensionality sampling scheme on the sphere with fast spherical harmonic transforms," *IEEE Trans. Signal Process.*, vol. 62, no. 17, pp. 4597–4610, Sep. 2014.
- [8] Z. Khalid, R. A. Kennedy and J. D. McEwen, "Slepian spatial-spectral concentration problem on the ball," *Applied Computation. and Harmonic Analysis*, vol. 40, no. 3, pp 470,504, May 2016.
- [9] A. Bates, Z. Khalid, and R. A. Kennedy, "Novel Sampling Scheme on the Sphere for Head-Related Transfer Function Measurements," *IEEE Trans. on Audio, Speech and Language Processing*, vol. 23, no. 6, pp. 1068,1081, Jun. 2015.
- [10] Y. F. Alem, Z. Khalid and R. A. Kennedy, "3D Spatial Fading Correlation for Uniform Angle of Arrival Distribution," *IEEE Communication Letters*, vol. 19, no. 6, pp 1073,1076, Jun. 2015.
- [11] Y. F. Alem, Z. Khalid and R. A. Kennedy, "Spherical Harmonic Expansion of Fisher-Bingham Distribution and 3D Spatial Fading Correlation for Multiple-Antenna Systems," *IEEE Trans. Veh. Technol.*, vol. 65, no. 7, pp 5695,5700, Jul. 2016.
- [12] A. Bates, Z. Khalid, and R. A. Kennedy, "An Optimal Dimensionality Sampling Scheme on the Sphere with Accurate and Efficient Spherical Harmonic Transform for Diffusion MRI," *IEEE Signal Processing Letters*, vol. 23, no. 1, pp 15,19, Jan. 2016.

- [13] Z. Khalid, R. A. Kennedy, S. Durrani, Y. Wiaux and J. D. McEwen "Gauss-Legendre Sampling on the Rotation Group," *IEEE Signal Processing Letters*, vol. 23, no. 2, pp 207,211, Feb. 2016.
- [14] A. Bates, Z. Khalid, and R. A. Kennedy, "Slepian Spatial-Spectral Concentration Problem on the Sphere: Analytical Formulation for Limited Colatitude-Longitude Spatial Region," *IEEE Trans. Signal Process.*, vol. 65, no. 6, pp. 1527–1537, Mar. 2017.
- [15] A. Bates, Z. Khalid, and R. A. Kennedy, "Efficient Computation of Slepian Functions for Arbitrary Regions on the Sphere," *IEEE Trans. Signal Process.*, vol. 65, no. 16, pp. 4379–4393, Aug. 2017.
- [16] U. Elahi, Z Khalid and R. A. Kennedy "An Optimal-Dimensionality Sampling for Spin-s Functions on the Sphere," *IEEE Signal Processing Letters*. (Accepted: August 2018).
- [17] Alice P. Bates, Zubair Khalid, Jason D. McEwen Rodney A. Kennedy, Alessandro Daducci and Erick J. Canales-Rodríguez, "Optimal-Dimensionality Sampling and Robust 3D Diffusion Signal Reconstruction," *IEEE Trans. Signal Process.* (submitted)

CONFERENCE
PUBLICATIONS

- [18] Z. Khalid, S. Durrani, R. A. Kennedy, and P. Sadeghi, "On the construction of low-pass filters on the unit sphere," in *Proc. IEEE Int. Conf. Acoust., Speech, Signal Process., ICASSP'2011*, Prague, Czech Republic, May 2011, pp. 4356–4359.
- [19] W. Huang, Z. Khalid, and R. A. Kennedy, "Efficient computation of spherical harmonic transform using parallel architecture of cuda," in *5th International Conference on Signal Processing and Communication Systems, ICSPCS'2011*, Honolulu, HI, Dec. 2011, p. 6.
- [20] Z. Khalid, S. Durrani, R. A. Kennedy, and P. Sadeghi, "Revisiting Slepian concentration problem on the sphere for azimuthally non-symmetric regions," in *5th International Conference on Signal Processing and Communication Systems, ICSPCS'2011*, Honolulu, HI, Dec. 2011, p. 7.
- [21] Z. Khalid, S. Durrani, P. Sadeghi, and R. A. Kennedy, "Concentration uncertainty principles for signals on the unit sphere," in *Proc. IEEE Int. Conf. Acoust., Speech, Signal Process., ICASSP'2012*, Kyoto, Japan, Mar. 2012, pp. 3717–3720.
- [22] Z. Khalid, R. A. Kennedy, S. Durrani, and P. Sadeghi, "Conjugate gradient algorithm for extrapolation of sampled bandlimited signals on the 2-sphere," in *Proc. IEEE Int. Conf. Acoust., Speech, Signal Process., ICASSP'2012*, Kyoto, Japan, Mar. 2012.
- [23] Z. Khalid, S. Durrani, P. Sadeghi, and R. A. Kennedy, "Ambiguity function and Wigner distribution on the sphere," in *Proc. IEEE Int. Conf. Acoust., Speech, Signal Process., ICASSP'2012*, Kyoto, Japan, Mar. 2012.
- [24] Z. Khalid, R. Kennedy, and P. Sadeghi, "Efficient computation of commutative anisotropic convolution on the 2-sphere," in *6th International Conference on Signal Processing and Communication Systems, ICSPCS'2012*, Gold Coast, Australia, Dec. 2012, p. 7.
- [25] Z. Khalid and S. Durrani, "Connectivity of three dimensional wireless sensor networks using geometrical probability," in *Proc. Australian Communications Theory Workshop (AusCTW)*, 2013, pp. 47–51.
- [26] R. A. Kennedy, Z. Khalid, and Y. F. Alem, "Spatial correlation from multipath with 3D power distributions having rotational symmetry," in *7th International Conference on Signal Processing and Communication Systems, ICSPCS'2013*, Gold Coast, Australia, Dec. 2013, p. 7.
- [27] R. A. Kennedy, P. Sadeghi, Z. Khalid, and J. D. McEwen, "Classification and construction of closed-form kernels for signal representation on the 2-sphere," in *Wavelets and Sparsity XV, SPIE international symposium on optics and photonics, San Diego, CA*, 2013. (invited contribution)
- [28] Z. Khalid, R. A. Kennedy, P. Sadeghi, and S. Durrani, "Spatio-spectral formulation and design of spatially-varying filters for signal estimation on the 2-sphere," in *Wavelets and Sparsity XV, SPIE international symposium on optics and photonics, San Diego, CA*, 2013. (invited contribution)

- [29] Z. Khalid and R. A. Kennedy, "On the Choice of Window for Spatial Smoothing of Spherical Data," in *Proc. IEEE Int. Conf. Acoust., Speech, Signal Process., ICASSP'2014*, Florence, Italy, May 2014.
- [30] Y. F. Alem, Z. Khalid and R. A. Kennedy, "Band-Limited Extrapolation on the Sphere for Signal Reconstruction in the Presence of Noise," in *Proc. IEEE Int. Conf. Acoust., Speech, Signal Process., ICASSP'2014*, Florence, Italy, May 2014.
- [31] P. Sadeghi, R. A. Kennedy and Z. Khalid, "Minimum Mean Square Error Equalization on the 2-Sphere," in *Proc. Workshop on Statistical Signal Processing., SSP'2014*, Gold Coast, Australia, Jun 2014.
- [32] R. A. Kennedy, Z. Khalid and P. Sadeghi, "Efficient Kernel-Based Formulations of Spatio-Spectral and Related Transformations on the 2-Sphere," in *Proc. IEEE Int. Conf. Acoust., Speech, Signal Process., ICASSP'2014*, Florence, Italy, May 2014.
- [33] Z. Khalid, R. A. Kennedy, S. Durrani and P. Sadeghi, "Adaptive Multi-Resolution Windowing Technique For Localized Spatio-Spectral Analysis," in *Proc. Workshop on Statistical Signal Processing., SSP'2014*, Gold Coast, Australia, Jun 2014.
- [34] Z. Khalid and R. A. Kennedy, "On the Placement of Latitudes in Iso-Latitude Optimal-Dimensionality Sampling Schemes on the Sphere," in *8th International Conference on Signal Processing and Communication Systems, ICSPCS'2014*, Gold Coast, Australia, Dec. 2014, p. 7.
- [35] Z. Khalid and R. A. Kennedy, "Iterative Method to Compute the Maximal Concentration Slepian Band-limited Eigenfunction on the Sphere," in *8th International Conference on Signal Processing and Communication Systems, ICSPCS'2014*, Gold Coast, Australia, Dec. 2014, p. 7.
- [36] Z. Khalid and R. A. Kennedy, "Spherical Harmonic Transform for Minimum Dimensionality Regular Grid Sampling on the Sphere," in *Proc. IEEE Int. Conf. Acoust., Speech, Signal Process., ICASSP'2015*, Brisbane, Australia, April 2015.
- [37] Z. Khalid and R. A. Kennedy, "Maximal Multiplicative Spatial-Spectral Concentration on the Sphere: Optimal Basis," in *Proc. IEEE Int. Conf. Acoust., Speech, Signal Process., ICASSP'2015*, Brisbane, Australia, April 2015.
- [38] A. P. Bates, Z. Khalid and R. A. Kennedy, "An Optimal Dimensionality Sampling Scheme on the Sphere for Antipodal Signals in Diffusion Magnetic Resonance Imaging," in *Proc. IEEE Int. Conf. Acoust., Speech, Signal Process., ICASSP'2015*, Brisbane, Australia, April 2015.
- [39] A. P. Bates, Z. Khalid and R. A. Kennedy, "On the Use of Antipodal Optimal Dimensionality Sampling Scheme on the Sphere for Recovering Intra-voxel Fibre Structure in Diffusion MRI," in *Workshop on Computational Diffusion MRI, International Conference on Medical Image Computing and Computer Assisted Intervention MICCAI'2015*, Munich, Germany, October 2015.
- [40] U. Elahi, Z. Khalid and R. A. Kennedy, "Comparative analysis of geometrical properties of sampling schemes on the sphere," 2016 10th International Conference on Signal Processing and Communication Systems (ICSPCS), Gold Coast, QLD, 2016, pp. 1-7.
- [41] A. P. Bates, Z. Khalid, R. A. Kennedy, and J. D. McEwen, "Multi-shell sampling scheme with accurate and efficient transforms for diffusion MRI," in *Biomedical and Astronomical Signal Processing Frontiers (BASP)*, 2017.
- [42] Z. Khalid, R. A. Kennedy and S. Durrani, "Improving the spatial dimensionality of Gauss-Legendre and equiangular sampling schemes on the sphere," 2017 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), New Orleans, LA, 2017, pp. 4531-4535.
- [43] Y. Sattar, Z. Khalid and R. A. Kennedy, "Robust reconstruction of spherical signals with finite rate of innovation," 2017 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), New Orleans, LA, 2017, pp. 4024-4028.

- [44] A. P. Bates, Z. Khalid, J. D. McEwen and R. A. Kennedy, "An optimal dimensionality multi-shell sampling scheme with accurate and efficient transforms for diffusion MRI," 2017 IEEE 14th International Symposium on Biomedical Imaging (ISBI 2017), Melbourne, VIC, 2017, pp. 770-77
- [45] W. Nafees, Z. Khalid and R. A. Kennedy, "Signal analysis on the ball: Design of optimal basis functions with maximal multiplicative concentration in spatial and spectral domains," 2017 International Conference on Systems, Signals and Image Processing (IWSSIP), Poznan, 2017, pp. 1-5
- [46] W. Nafees, Z. Khalid, R. A. Kennedy and J. D. McEwen, "Optimal-dimensionality sampling on the sphere: Improvements and variations," 2017 International Conference on Sampling Theory and Applications (SampTA), Tallin, 2017, pp. 87-91.
- [47] U. Elahi, Z. Khalid, R. A. Kennedy and J. D. McEwen, "Iterative residual fitting for spherical harmonic transform of band-limited signals on the sphere: Generalization and analysis," 2017 International Conference on Sampling Theory and Applications (SampTA), Tallin, 2017, pp. 470-474.
- [48] U. Elahi, Z. Khalid and R. A. Kennedy, "An improved iterative algorithm for band-limited signal extrapolation on the sphere," 2018 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), Calgary, Canada, 2018.
- [49] W. Nafees, Z. Khalid and R. A. Kennedy, "Spatially-limited sampling of band-limited signals on the sphere," 2018 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), Calgary, Canada, 2018.
- [50] A. Aslam, Z. Khalid and R. A. Kennedy, "Efficient sampling on healpix grid," 2018 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), Calgary, Canada, 2018.
- CONFERENCE
ABSTRACTS
- [51] R. A. Kennedy, P. Sadeghi, and Z. Khalid, "Optimal signal processing on the 2-sphere: A general operator approach to signal recovery," in *International Biomedical and Astronomical Signal Processing (BASP) Frontiers workshop*, 2013.
- [52] J. Guo, S. Durrani and Z. Khalid, "Exact Probability of Node Isolation in Finite Wireless Sensor Networks," in *14th Australian Communications Theory Workshop (AusCTW)*, 2013.
- OTHER
PUBLICATIONS
- [53] Z. Khalid, "Spatio-spectral analysis on the Unit Sphere," Ph. D. Thesis, ANU, 2013