Curriculum Vitae of Bubacarr Bah

Address

African Institute for Mathematical Sciences (AIMS) South Africa
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South Africa

Recent Employment History

Oct 2016 – present	German Research Chair (Senior Researcher) in Mathematics of Data Science, AIMS South Africa, & Senior Lecturer (Asst. Prof.), Stellenbosch University
Sep 2014 – Sep 2016	Postdoctoral Fellow, Mathematics Department, & Institute for Computational Engineering & Sciences, University of Texas in Austin
Sep 2012 – Aug 2014	Research Scientist (postdoc), Laboratory for Information and Inference Systems, Ecole Polytechnique Federale de Lausanne (EPFL)

Education

Sep 2008 – Aug 2012	PhD in Applied and Computational Mathematics, University of Edinburgh, UK
Sep 2007 – Sep 2008	MSc in Mathematical Modelling & Scientific Computing, University of Oxford, UK
Jan 2000 – Aug 2004	BSc in Mathematics and Physics, (*summa cum laude*), University of The Gambia

Honours

2020	Alexander von Humboldt Award of German Research Chair Mathematics at AIMS South Africa
2016	Alexander von Humboldt Award of German Research Chair Mathematics at AIMS South Africa
2015	NSF-funded SIAM ICIAM15 Travel Award
2013	Travel Grant for Matheon Workshop 2013 on Compressed Sensing & its Applications
2011	SIAM Certificate of Recognition
2010	SIAM Best Student Paper Prize
2008	Edinburgh University Principal's Scholarship for PhD studies
2007	Commonwealth Scholarship for MSc studies
2005	Overall Best Student (valedictorian) Award
2005	Best Student of the Faculty of Science & Agriculture Award
2005	Vice Chancellor's Award

Journal Publications

1. *Improved restricted isometry constant bounds for Gaussian matrices*; SIAM Journal on Matrix Analysis, Vol. 31(5) (2010) 2882–2898 (with J. Tanner).

2. *Bounds of restricted isometry constants in extreme asymptotics: formulae for Gaussian matrices*; Linear Algebra and its Applications, Vol. 441(1) (2014) 88–109 (with J. Tanner).

3. *Vanishingly Sparse Matrices and Expander Graphs, with application to compressed sensing*; IEEE Transactions on Information Theory, Vol. 59(11) (2013) 7491–7508 (with J. Tanner).

4. *The sample complexity of weighted sparse approximation*; IEEE Transactions on Signal Processing, Vol. 64(12) (2016) 3145–3155 (with R. Ward).

5. *On the construction of sparse matrices from expander graphs*; Frontiers in Applied Mathematics and Statistics: Mathematics of Computation and Data Science, Vol. 4(39) (2018) (with J. Tanner).

6. *Outcome Prediction with Serial Neuron-Specific Enolase and Machine Learning in Anoxic-Ischaemic Disorders of Consciousness*; Computers in biology and medicine, 107 (2019), 145–152 (with E. Muller, J. Shock, A. Bender, J. Kleeberger, T. Högen, M. Rosenfelder, and A. Lopez-Rolon).

7. *Discrete optimization methods for group model selection in compressed sensing*; accepted in Mathematical Programming, (2020) https://doi.org/10.1007/s10107-020-01529-7 (with J. Kurtz, and O. Schaudt).

8. *Learning deep linear neural networks: Riemannian gradient flows and convergence to global minimizers*; accepted at Information and Inference: A Journal of the IMA (with H. Rauhut, U. Terstiege, and M. Westdickenberg).

Refereed Conference Proceedings

1. *On construction and analysis of sparse random matrices and expander graphs with applications to compressed sensing*; 10th International Conference on Sampling Theory and Applications (SampTA), pages 5–8, 2013 (with J. Tanner).

2. *Energy-aware adaptive bi-Lipschitz embeddings*; 10th International Conference on Sampling Theory and Applications (SampTA), pages 360–363, 2013 (with A. Sadeghian and V. Cevher).

3. *Model-based Sketching and Recovery with Expanders*; 25th Annual ACM-SIAM Symposium on Discrete Algorithms, pages 1529–1543, SIAM 2014 (with L. Baldassarre and V. Cevher).

4. *Metric learning with rank and sparsity constraints*; 2014 IEEE International Conference on Acoustics, Speech, & Signal Processing, pages 21–25, (with S. Becker, V. Cevher, and G. Baran).

5. *Convex block-sparse linear regression with expanders, provably*; 19th International Conference on Artificial Intelligence and Statistics, pages 19–27, 2016, (with A. Kyrillidis, R. Hasheminezhad, Q. Tran-Dinh, L. Baldassarre, and V. Cevher).

6. *Weighted sparse recovery with expanders*; 5th International Workshop on Compressed Sensing applied to Radar, Multimodal Sensing and Imaging (CoSeRa), Siegen, Germany, 10 – 13 September 2018.

7. *Using neural networks to identify individual animals from photographs*; (extended abstract), South African Forum for Artificial Intelligence Research (FAIR 2019), Cape Town, South Africa, (2019) (with E. Kabuga, I. Durbach, and A. Clark).

8. *On Error Correction Neural Networks for Economic Forecasting*; 23rd International Conference on Information Fusion (FUSION 2020), Pretoria, South Africa, 6 – 9 July 2020 (with M. Mvubu, E. Kabuga, C. Plitz, R. Becker, and H-G. Zimmermann).

9. *An Integer Programming Approach to Deep Neural Networks with Binary Activation Functions*; ICML 2020 workshop on "Beyond First Order Methods in Machine Learning" (with J. Kurtz).

10. *A Riemannian gradient flow perspective on learning deep linear neural networks*; "Differential Geometry meets Deep Learning" Workshop at NeurIPS 2020 (with H. Rauhut, U. Terstiege, and M. Westdickenberg).

11. *Towards the Localisation of Lesions in Diabetic Retinopathy*; accepted at Computing Conference 2021, London, (with S. Mensah, and W. Brink).

Book Chapters

1. *Designing Data-driven Learning Algorithms: a necessity to ensure effective post-genomic medicine and biomedical research*; Artificial Intelligence–Applications in Medicine and Biology, IntechOpen, (2019) (with G. Mazandu, I. Kyomugisha, M. Seuneu, and E. Chimusa).

Recent Conference Participation

- Panellist at the Next Einstien Forum (NEF) Global Gathering panel discussion on "The contribution of Mathematical Sciences in supporting robust disease prevention and modelling in Africa" , Online, December 2020.
- Paper accepted at the 34th Conference on Neural Information Processing Systems (NeurIPS) Workshop on "Differential Geometry meets Deep Learning", Online, November 2020.
- Paper accepted at the 37th International Conference on Machine Learning (ICML) Workshop on "Beyond First Order Methods in Machine Learning", Online, July 2020.
- Paper presentation at the 23rd International Conference on Information Fusion (FUSION), Pretoria, South Africa (but held Online), July 2020.
- Plenary speaker at the 1st Workshop on Artificial Intelligence for Health, the Medical Research Council Unit The Gambia at the London School of Hygiene and Tropical Medicine, Fajara, October 2019.
- Paper accepted at the inaugural South African Forum for Artificial Intelligence Research (FAIR), Cape Town, South Africa, December 2019.
- Lecturer at the Spring School on Mathematics of Data Science, AIMS South Africa, September 2019.
- Lecturer at the Data Analysis, Theory and Applications (DATA) Workshop, AIMS Ghana, July 2019.
- Plenary speaker at the 13th International Conference on Sampling Theory and Applications (SampTA), Bordeaux, July 2019.
- Plenary speaker at the 43rd South African Numerical & Applied Mathematics (SANUM) Conference, Pretoria, April 2019.
- Paper presentation at the 5th International Workshop on Compressed Sensing applied to Radar, Multimodal Sensing and Imaging (CoSeRa), Siegen, Germany, September 2018.
- Plenary speaker Allotey Workshop organised by University of Liverpool & AIMS Ghana, held in Liverpool, May 2018
- Invited speakers at the Wavelets and Sparsity XVII, SPIE Optical Engineering + Applications, San Diego, August 2017.
- Plenary speakers at the Southern Africa Mathematical Sciences Association (SAMSA) Conference, Pretoria, November 2016.
- Paper accepted at the 19th International Conference on Artificial Intelligence and Statistics (AISTATS), Cadiz, Spain, May 2016.
- Poster presentation at the February Fourier Talks (FFT), Norbert Wiener Center, University of Maryland, College Park, February 2016.
- Invited speakers at the Nonsmooth Optimization Session on Fast Algorithms for Compressed Sensing and Matrix Completion, the 22nd International Symposium on Mathematical Programming (ISMP), Pittsburgh, PA, July 2015.
- Invited speakers at the Workshop on Mathematical & Statistical Analysis of Spatial Data, Aalborg University, Denmark, June 2015.
- Invited speakers at the American Mathematical Society (AMS) Special Session on Frames and Their Applications, at the Joint Mathematics Meeting (JMM), San Antonio, TX, January 2015.
- Contributed talk at the Joint Mathematics Meeting (JMM), Baltimore, Maryland, January 2014.
- Paper presentation at the 25th ACM-SIAM Symposium on Discrete, Algorithms (SODA), Portland, Oregon, January 2014.
- Paper presentation at the 10th International Conference on Sampling Theory & Applications (SampTA), Jacobs University, Bremen, July 2013.