Syed Muhammad Kazim

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Education

- **University of Siegen, Germany** — Jul. 2023 – Present
  PhD in Engineering
  Department of Electrical Engineering and Computer Science
  Supervisor: Prof. Ivo Ihrke

- **Kyung Hee University, Korea** — Sep. 2019 – Feb. 2022
  Master of Engineering
  Department of Electronic Engineering
  Supervisor: Prof. Hyundong Shin
  GPA: 4.21/4.30

- **National University of Sciences and Technology, Pakistan** — Sep. 2014 – Jul. 2018
  Bachelor of Engineering
  Department of Electrical Engineering
  GPA: 3.51/4.00

Projects

- **Coded wavefront sensing: Modeling, optimization, and prototyping (ongoing).**
  1. Modeled scalar wave propagation through thin scatterers to analyze speckle field variations and establish relationships with structure size and arrangement of the scatterers.
  2. Devoloping a differentiable optimization framework for tuning microstructured phase elements and identifying effective design parameters.
  3. Conducting experiments with phase structures of varying refractive indices and sizes to characterize speckle behavior and validate physical simulation models.

- **Refractive index tomography using coded wavefront sensing.**
  1. Recorded speckle fields of a rotating HEK cell at $30\,\mathrm{fps}$, with a single system reference for phase retrieval using coded wavefront sensing.
  2. Estimated the scattering potential of the HEK cell to assess the feasibility of the Fourier diffraction theorem for refractive index tomography.
  3. Applied spatial filtering techniques to mitigate specimen jitter and pose uncertainty, enabling tomographic reconstruction using standard algorithms.

- **Experimental performance validation of coded wavefront sensor.**
  1. Simulated a $10\,\mu\mathrm{m}$ spherical silica bead immersed in PBS to create a ground truth for measurements using the beam propagation method.
  2. Mapped the retrieved wavefields to the object space and propagated them to the same focus plane, enabling comparison of digital holographic microscopy, coded wavefront sensing, and simulation.
  3. Performed comparitive analysis by accurately overlaying wavefields retrieved by different methods and quantifying pixel-wise distances in their optical path differences.

Publications

1. **S. M. Kazim**, F. Strasser, M. Løvmo, A. Nehrych, S. Moser, M. Ziemczonok, W. Heidrich, I. Ihrke, and M. Ritsch-Marte, "Coded wavefront sensing for video-rate quantitative phase imaging and tomography: validation with digital holographic microscopy," *Submitted to Opt. Express*, Apr. 2025.

2. **S. M. Kazim**, F. Strasser, M. Løvmo, A. Nehrych, S. Moser, M. Ziemczonok, W. Heidrich, I. Ihrke, and M. Ritsch-Marte, "Performance validation of coded wavefront sensing for quantitative phase imaging of static and dynamic Specimens using digital holographic microscopy," *International Symposium on Computational Sensing (ISCS)*, Mar. 2025.

3. N. Agarwal, J. Schneider, K. Gandikota, **S. M. Kazim**, J. Meshreki, I. Ihrke, and M. Moeller, "Direct image classification from Fourier ptychographic microscopy measurements without reconstruction," *International Symposium on Computational Sensing (ISCS)*, Mar. 2025.

4. J. Meshreki, **S. M. Kazim**, and I. Ihrke,"Optical system characterization in Fourier ptychographic microscopy," *Opt. Continuum*, Dec. 2024.

5. K. Bäuerle, P. Müller, **S. M. Kazim**, I. Ihrke, and M. Keuper,"Learning the essential in less than 2k additional weights - a simple approach to improve image classification stability under corruptions," *Transactions on Machine Learning Research*, Jun. 2024.

6. **S. M. Kazim**, A. Farooq, J. ur Rehman, and H. Shin, "Adaptive quantum state tomography with iterative particle filtering," *Quantum Inf. Process.*, Sep. 2021.

7. **S. M. Kazim**, A. Farooq, J. ur Rehman, and H. Shin, "Applied Bayesian Qubit State Tomography," *Proc. Korea Information and Communications Society (KICS) Summer Conference*, pp. 190-192 Korea, Aug. 2020.

Talks and Oral Presentations

1. **(3$^{\text{rd}}$ Prize)** S. M. Kazim, "Refractive index tomography of biological cells with coded phase camera," *ZESS PhD. Forum*, Siegen, May 2025.

Poster Presentations

1. S. M. Kazim, "Exposition: Wavefront sensing for quantitative phase imaging," *88th Heidelberg Image Processing Forum - ZESS Open Day*, Siegen, Nov. 2024.

2. **(Best Poster Award)** S. M. Kazim, J. Meshreki, and I. Ihrke, "Roadmap: Super-resolution of phase objects," *ZESS PhD. Forum*, Siegen, May 2024.

Co-supervised Projects

1. S. L. Bussu, S. M. Kazim, and I. Ihrke, "Python-based GUI for real-time digital holography system optimization," *Studienarbeit Project*, University of Siegen, Nov. 2024.

Work Experience

- **University of Siegen, Siegen, Germany**   Jul. 2023 – Present
  Graduate Research Assistant
  Chair of Computational Sensorics/Communication Engineering
  Experimental and algorithmic design, and optimization of quantitative phase imaging methods with special focus on *coded wavefront sensing*.

- **Endress+Hauser, Maulburg, Germany**   Oct. 2021 – Jun. 2023
  External AI Consultant
  Vision-based automation to preclude human intervention in quality control tasks in industry

- **Kyung Hee University, Yongin-si, Korea**   Sep. 2019 – Feb. 2022
  Graduate Research Assistant
  Communications and Coding Theory Laboratory

- **National University of Sciences and Technology, Karachi, Pakistan**   Aug. 2018 – Aug. 2019
  Research Engineer

Theses

1. S. M. Kazim, "Adaptive Learning of Quantum Digits," Master's thesis, Department of Electrical and Information Convergence Engineering, Kyung Hee University, Yongin-si, Korea, Feb. 2022, Thesis Advisor: Professor Hyundong Shin.

2. S. M. Kazim, "Frequency Reconfigurable Patch Antenna using Liquid Crystals," Bachelor's thesis, Department of Electrical Engineering, National University of Sciences and Technology, Islamabad, Pakistan, Jul. 2018, Thesis Advisor: Professor Zubair Ahmed.

References

1. Prof. Ivo Ihrke
   Designation: Chair of Computational Sensing/Communication Engineering
   Affiliation: University of Siegen
   Email: ivo.ihrke@uni-siegen.de

2. Prof. Margret Keuper
   Designation: Chair of Computer Vision and Machine Learning Group
   Affiliation: University of Mannheim
   Email: margret.keuper@uni-mannheim.de