EKRAM HOSSAIN KHAN

Scientific Researcher & PhD Student | M.Sc. Micro- and Nanotechnologies

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PROFESSIONAL SUMMARY

Passionate electrical and electronic engineer with deep expertise in MEMS technologies, acoustic bio-sensing, neuromorphic computing, and model order reduction systems. Proven track record conducting complex finite element method (FEM) simulations and high-precision physical characterization. Currently working as a Scientific Researcher & PhD Student at TU Ilmenau, focusing on contact resistance evolution in electrical switching devices, aiming to bridge micro-scale materials science with macro-scale engineering applications.

CORE RESEARCH & TECHNICAL COMPETENCIES

MEMS & Sensors: Transducers, Vibrometry, Oscilloscope, Acoustic Sensors, Bio-sensing

Simulation & CAD: COMSOL Multiphysics, OriginLab, Multisim, KLayout, AutoCAD, KiCAD

Languages & Scripting: MATLAB, Verilog HDL, C, Python

Scientific Tools: LaTeX, MS Office, Data Analysis, Signal Processing

PROFESSIONAL EXPERIENCE

Scientific Researcher / PhD Student

TU Ilmenau, Germany

2023 – Present | Department of Electrical Engineering

- Conducting advanced research on electrical contacts, switching behavior, and contact resistance evolution in contactors.
- Designing model switch experiments to analyze micro-scale electrical phenomena and mechanical degradation mechanisms.
- Using simulation and data modeling to predict contactor lifetime and electrical switching performance.

Master Thesis Student

Fraunhofer Institute for Digital Media Technology (IDMT) & TU Ilmenau, Germany

Aug 2022 – Mar 2023 | Ilmenau, Germany

- Utilized advanced simulations to analyze MEMS transducer designs of bio-inspired acoustic sensors, achieving significant increases in sensitivity.
- Conducted precise acoustic measurements of bio-inspired micro-sensors inside anechoic chambers.
- Performed extensive matching between FEM simulation models and experimental measurements to optimize physical prototypes.

Research Assistant

Department of Micro- and Nanoelectronics Systems, TU Ilmenau, Germany

Feb 2022 – Dec 2022 | Ilmenau, Germany

- Conducted Finite Element Method (FEM) simulations to model the electro-thermo-mechanical response of microcantilevers.
- Measured microcantilever vibrations under electrical excitation using a Laser Doppler Vibrometer (LDV).
- Successfully analyzed discrepancies between simulated mechanical modes and experimental vibrometry data.

Research Assistant

Department of Mathematics and Physics, North South University, Bangladesh

Jan 2017 – Aug 2019 | Dhaka, Bangladesh

- Developed and implemented custom mathematical algorithms for Model Order Reduction (MOR) of large-scale dynamic control systems.
- Conducted literature reviews on state-of-the-art descriptor systems, improving reduction accuracy and lowering computational cost.
- Applied dynamic system reductions to simplify large electrical circuit problems, optimizing simulation runtimes.

PROJECTS

Analysis of Microcantilevers using FEM Simulations COMSOL Multiphysics

Jun 2021 – Dec 2021 • Conducted finite element analysis to examine electro-thermo-mechanical behaviors of MEMS cantilevers, achieving parametric excitation modeling.

Optimization of the Computational Cost of Large Control Systems MATLAB

Jan 2017 – Aug 2019 • Implemented model order reduction techniques for descriptor control systems, successfully accelerating computing times.

Innovative Design of a Multi-Featured Health Monitoring Device Arduino

Jan 2017 – Aug 2017 • Designed and prototyped an IoT health collar integrating heart-rate, temperature, GPS, and GSM modules for real-time crisis notifications.

PUBLICATIONS & RESEARCH ARTICLES

- **[2024]** Model switch experiments for determining the evolution of contact resistance of electrical contacts in contactors. (Research Paper)
- **[2023]** Influence of the Sensor Design on Bio-Inspired, Adaptive Acoustic Sensing. *49th Jahrestagung für Akustik (DAGA)*. DOI: 10.24406/h-440425
- **[2020]** An Efficient Algorithm for Reduce Order Modeling of Discrete-time Descriptor Systems. *22nd ICCIT, IEEE*. DOI: 10.1109/ICCIT48885.2019.9038479
- **[2020]** Comparative Analysis of Model Reduction Strategies for Circuit based Control Problems. *Asian Journal of Control, Wiley*. DOI: 10.1002/asjc.2312C
- **[2019]** An Efficient Model Reduction Strategy for Discrete-time Index-2 Descriptor Control Systems. *2nd ECCE, IEEE*. DOI: 10.1109/ECACE.2019.8679509
- **[2018]** K-cyclic Smith Iterative Method for Model Reduction of Index-2 Periodic Control Systems. *2nd Page / IEEE*. DOI: 10.1109/ICISET.2018.8745602
- **[2017]** Efficient system reduction modeling of periodic control systems with application to circuit problems. *4th ICAEE, IEEE*. DOI: 10.1109/ICAEE.2017.8255363

EDUCATION

M.Sc. in Micro- and Nanotechnologies Technische Universität Ilmenau, Germany

Oct 2019 – Mar 2023 | CGPA: 2.2

Coursework: Micro and Nano Sensor Technology, Neuromorphic Engineering, GHz & THz Technology, Microsensors and Microactuators.

B.Sc. in Electrical and Electronic Engineering North South University, Bangladesh

Jan 2013 – Dec 2017 | CGPA: 1.8

Coursework: Control Engineering, Microwave Engineering, VLSI, Communication Systems, Microcontroller and Microprocessor.

ADDITIONAL INFORMATION & LANGUAGES

Languages: Bangla (Native), English (Fluent), German (Basic / B1 conversational).
Interests & Hobbies: Cycling, Hiking, Tennis, Football, Science and Tech Outreach.
Personality Attributes: Analytical, Team-oriented, Self-motivated, Curious about emerging micro-scale tech.