

Md Zesun Ahmed Mia

Specialist in IC Design for Logic, Memory, & Mixed-Signal Systems

Expert in translating system requirements into robust IC designs for logic, memory, and mixed-signal applications.
Adept at leveraging EDA tools for design, verification, and layout.

Education

- 08/2022–05/2027 **Ph.D. in Electrical Engineering**, *Pennsylvania State University*, University Park, PA, USA, *CGPA: 4.00/4.00*
(Expected) Advisor: Dr. Abhronil Sengupta
- 08/2022–08/2024 **M.S. in Electrical Engineering**, *Pennsylvania State University*, University Park, PA, USA, *CGPA: 4.00/4.00* | Thesis: Neuromorphic Computing for Lifelong Learning
- 02/2015–04/2019 **B.Sc. in Electrical and Electronic Engineering**, *Bangladesh University of Engineering & Technology (BUET)*, Dhaka, Bangladesh, *CGPA: 3.81/4.00*

Industrial Experience

- 05/2025–07/2025 **Graduate Technical Intern**, *Intel Corporation*, Hillsboro, OR
- Optimized thin film deposition processes affecting microprocessor circuit performance and electrical characteristics for advanced logic devices.
 - Designed DOE to control critical dimensions (CD) impacting yield and electrical parameters in next-generation processors.
 - Applied statistical modeling to predict process impact on circuit performance metrics and device reliability.
- 09/2020–07/2021 **R&D Engineer**, *SEMWAVES Ltd.*, London, UK, part-time
- Delivered a 50 kW hybrid renewable system (solar + smallscale hydro) for an offgrid Bangladeshi site, supporting reliable community power.
 - Owned technical leadership and coordination (vendors, field teams, stakeholders); directed device selection, integration, QA/safety procedures, and optimization against load profiles and uptime targets.

Technical Skills

- Digital/ASIC RTL design and verification, Verilog/VHDL, Digital circuit simulation (Gate-level, RTL, transistor-level), FPGA prototyping, Synthesis, P&R, DFT, Static timing analysis, Timing closure, CMOS/FinFET circuit design, SRAM/DRAM design and optimization, SRAM circuit fundamentals, sense amplifier design, memory peripheral circuits, Systolic Arrays, PIM, memory controller design, VLSI/IC design, ASIC design flow, Digital logic design, Testbench development
- EDA/Sim. Cadence Virtuoso, Spectre, HSPICE, TCAD, COMSOL, ModelSim (digital simulation), Quartus (FPGA development), Vivado, Synopsys (Design Compiler, PrimeTime, VCS), CIM (Compute-In-Memory) Systems
- Analog Des. Op-amp and comparator design, Bandgap reference, Biasing circuits, Current mirrors, Differential pairs, Amplifiers, Filters, ADC/DAC, Noise analysis
- Programming Python, CUDA, MATLAB, Verilog, Shell, C/C++, Bash, Linux/Unix
- ML/AI Tools PyTorch, TensorFlow, TensorRT, Data Visualization (Matplotlib, Seaborn, Plotly), Pandas, NumPy, JMP, Jupyter, LaTeX, AI accelerator development, HPC applications, parallel computing architectures
- AI Dev. Generative and agentic AI tools (Cursor, Copilot, etc.) for research, design, and code development
- Hardware Device-circuit co-design, PCB design, Oscilloscope, Signal Generator, Spectrum Analyzer, LabVIEW, Circuit debugging and characterization
- Collaboration Git, Microsoft Office, Google Workspace

Academic Research and Teaching Experience

- 08/2022– Present **Graduate Research Assistant**, *Penn State*, University Park, PA
- Engineered and validated compact models for emerging Ferroic devices (e.g. FeFETs) in MATLAB and Verilog-A for integration into standard cell and memory design workflows.
 - Analyzed device-level characteristics of spintronic and FeFET devices to inform the design of robust, low-power logic and memory circuits.
- 08/2024– 05/2025 **Graduate Teaching Assistant**, *Penn State*, State College, PA
- Taught Cadence Virtuoso (schematic/layout), PDK usage, DRC/LVS, and analog/digital design flows; created hands-on lab modules and guided tool/debug workflows.
 - Supervised Capstone projects for 90+ undergraduate students across communications, electronics, and firmware: supported Raspberry Pi/Arduino development, software-defined radio experiments, PCB design, and system integration end-to-end.
- 02/2021– 08/2022 **Lecturer**, *University of Liberal Arts Bangladesh (ULAB)*, Dhaka, Bangladesh
- Taught Digital Circuit Design including Verilog, logic synthesis, FPGA implementation.
 - Developed hands-on lab modules for digital system design, RTL coding and verification.
 - Supervised student projects on digital circuit implementation and FPGA prototyping.
 - Taught undergraduate courses: Solid State Devices, Digital Circuit Design, Semiconductor Device Physics, Power Electronics.

Projects

- Astromorphic Transformer** Lead Student Researcher, 2022–2025. Developed a bioplausible transformer architecture leveraging neuron-astrocyte interactions to emulate self-attention mechanisms. Incorporated Hebbian and presynaptic plasticities with non-linearities and feedback, achieving superior accuracy and faster convergence on sentiment classification (IMDB), image classification (CIFAR-10), and language modeling (WikiText-2) tasks. See publication: [IEEE TCDS 2025].
- Ultra Low Cost Electronic Braille Device** First Author, 2022–2024. Designed and fabricated a portable, solenoid-based electronic Braille device using 3D printing and Arduino microcontroller. Achieved ultra-low cost (\$20) and lightweight design (338g) with 100 frames/s refresh rate, enabling real-time text-to-braille translation. Implemented PWM control for low power consumption and USB/Bluetooth connectivity. See publication: [iACCESS 2024].
- MIPS Microprocessor Design** Lead Student Researcher, 2018–2019. Designed and implemented a 5-stage pipelined MIPS microprocessor in Verilog with instruction/data memory, forwarding, and hazard detection. Verified functionality through comprehensive simulation and synthesized for FPGA deployment.

Select Publications

- [1] **Md Zesun Ahmed Mia**, Malyaban Bal, and Abhronil Sengupta. “Delving deeper into astromorphic transformers”. In: *IEEE Transactions on Cognitive and Developmental Systems* (2025).
- [2] Arnob Saha, **Md Zesun Ahmed Mia**, Jiahui Duan, Kai Ni, and Abhronil Sengupta. “Toward Variation-Tolerant Ferroelectric Neural Computing: Special Session Paper”. In: *2025 IEEE 68th International Midwest Symposium on Circuits and Systems (MWSCAS)*. IEEE. 2025, pp. 583–587.
- [3] **Md Zesun Ahmed Mia** and Kazi Toukir Ahmed. “Ultra Low Cost, Low Power, High Speed Electronic Braille Device for Visually Impaired People”. In: *2024 International Conference on Advances in Computing, Communication, Electrical, and Smart Systems (iACCESS)*. IEEE. 2024, pp. 1–6.
- [4] Tao Zhang, Mingjie Hu, **Md Zesun Ahmed Mia**, Hao Zhang, Wei Mao, Katsuyuki Fukutani, Hiroyuki Matsuzaki, Lingzhi Wen, Cong Wang, Hongbo Zhao, et al. “Self-sensitizable neuromorphic device based on adaptive hydrogen gradient”. In: *Matter* 7.5 (2024), pp. 1799–1816.

Recognitions

- The Wormley Family Graduate Fellowship, Harry G. Miller Fellowships in Engineering (2025)
- Arthur Waynick Graduate Scholarship (2024), Milton and Albertha Langdon Memorial Fellowship (2023), Melvin P. Bloom Memorial Fellowship (2022)

Professional Affiliations

- Reviewer, IEEE TNNLS (2025), Design Automation Conference (DAC) (2025), IEEE MWSCAS (2025)
- Student Member, IEEE (2015-Present), Executive Member, EDS, IEEE BD (2021-2022)