

AARYAN OBEROI

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EDUCATION

- **Diefenderfer Fellow**, Penn State College of Engineering **August 2022 – December 2023**
- PhD, Engineering Science and Mechanics, Pennsylvania State University, University Park, PA **August 2019 – August 2024**
PhD Thesis: <https://etda.libraries.psu.edu/catalog/20700auo337>
- Bachelor of Technology, Electronics and Communication Engineering **July 2015 – July 2019**
Amrita Vishwa Vidyapeetham, Bangalore (KA), India

SKILLS

- **Data Analysis:** Statistical Data Analysis, Mathematical Interpretation and Modeling, Model Evaluation and Implementation, Model-based Problem Segmentation, Mathematical Optimization and Operations Research based on industry-standard analysis tools such as JMP, MATLAB (also signal/image processing), heavily implemented Python and VBA for scripting and automation
- **Nanofabrication, Materials Characterization and Processing:** Electronic Beam Lithography (EBL), Optical Lithography, Electron Beam and Thermal Evaporation, Reactive Ion Etching (RIE), Atomic Layer Deposition (ALD), Chemical Vapor Deposition (CVD), Plasma-enhanced Atomic Layer Deposition (PEALD), Rapid Thermal Annealing (RTA), Direct Etching, UV Ozone Cleaning; Atomic Force Microscopy (AFM), Scanning Electron Microscopy (SEM), X-ray Photoemission Spectroscopy (XPS), Profilometry; Transmission Electron Microscopy (TEM) Analysis, Energy Dispersive Spectroscopy (EDS), Selective Area Electron Diffraction (SAED) Analysis; Micromechanical Exfoliation, Thin Film Transfer, Spin Bench, Develop Bench, Lift-off
- **Electrical Characterization of Semiconductors and Devices:** Cryogenic Probe Station Lakeshore CRX-VF, Cascade Summit 12000 Semi-Automatic Prober, MPI Semi-Automatic Prober, Keysight B1500A Parameter Analyzer, Keithley 4200SCS, LCR E4980, Lock-in Amplifier, Low-Noise Pre-Amplifier, Virtual Source/Landauer Based Device Modeling
- **Wafer Patterning, Device Simulation, Circuit Layout Design:** Raith GDSII Toolbox, Cadence Virtuoso; kLayout; TCAD Sentaurus; CMOS Layout Design (MicroWind DSCH2), Circuit Simulation (NI Multisim; LTspice; Proteus)

EXPERIENCE

Advanced Device Development Engineer, Intel (OR) August 2024 – Present

- Development and pathfinding of advanced CMOS logic and backside power delivery solutions to scaled transistors and driving device efforts for performance and yield improvement on low-resistivity backside contact
- Strategizing and driving electrical test analysis for wafer bonding, grinding, and below-logic performance impact to ultra-scaled transistors and circuits
- Research and development of novel solutions for advanced high-bandwidth, area-efficient computing and memory technologies
- Supporting transistor development as a data scientist and electrical engineer
- Training new hires, and technicians on processes and in-house tools for end-of-line characterization
- Automating non-intellectual tasks with large language models for greater efficiency and productivity within the team

Research Intern at TSMC Corporate Research Exploratory Devices and Materials (CA) February 2023 – August 2023

Advised by Dr. Iuliana Radu, Director, and Dr. Matthias Passlack, Deputy Director, Corporate Research, TSMC CREDM

- Gate Quality Analysis and Improvement with low-dimensional channel materials, especially aligned CNTs
- Developed a) Automated GDS File Generator Application, b) Easy-Expert lookalike software for LCR Meter
- Post-fabrication Processing for interface trap reduction and performance improvement (Included in IEDM 2023 Submission from TSMC CR)

Graduate Research Assistant, Penn State (PA) August 2019 – August 2024

Advised by Dr. Saptarshi Das, Engineering Science and Mechanics, Pennsylvania State University

- Characterizing Dielectric Interface Quality for improving p-type FET Performance (Current)

- Layer Number Dependence of WSe₂ on p-type FET Performance (Current)
- Yield and Performance Improvement of p-type WSe₂ FET by Preventing Process-Induced Damage (Current)
- Doping Strategies on Ultra-scaled 2D Transition Metal Dichalcogenide (TMD)-based FETs
 - Contact Engineering on WSe₂ for Advancing 2D CMOS Integration
 - Studying metal-semiconductor interface to develop damage-free metal contacts for high performance logic
 - Charge-transfer Doping of 2D TMDs
 - Substitutional Doping of monolayer MoS₂
 - Electrostatic Doping of large area ambipolar TMD FETs
- Characterizing the reliability of a charge trapping analog memory on Al₂O₃/Pt/TiN substrate
- Steep-slope Mott phase transition (VO₂) devices complemented with TMD FETs for spike generation circuits
- Ultra-low power and high speed photodetection in monolayer MoS₂
- Established a collaboration with Institute of Microelectronics (ime) at TU Wien, Austria, to study the ultra-thin defect-free dielectric CaF₂ for improved reliability and power efficiency in TMD based FETs
- Established a collaboration with Dr. Bharat Jalan's group at University of Minnesota to study the van der Waals, perovskite based ultra-high k STO dielectric for monolayer TMDs
- Software programs developed on MATLAB: Color Palette, Noise-enhanced Photodetection

Research Intern, Penn State (PA)

January 2019 – June 2019

Advised by Dr. Saptarshi Das, Engineering Science and Mechanics, Pennsylvania State University

- Artifact Classification in raw EEG using DNN
- Analog Circuits for Spike Generation

Industry Internships

- Tech-Intern | [CoWrks](#) | Feb 2018 – Jun 2018 | [Module143](#) | Sept 2016 – Dec 2016 | [Sonim Technologies](#) | Jun 2016 – Aug 2016

LEADERSHIP EXPERIENCE

- **Device Performance Lead | Backside Power Direct Solutions | February 2025**
- **Entrepreneurial Lead | NSF I-Corps program | Sept 2023**
- **Summer Camp Mentor | Penn State Aerospace Engineering | June 2022**
- **President | EGSC: Engineering Graduate Student Council | Ex-officio Member of Engineering Alumni Society and Faculty Council | Jul 2020 – May 2021**
- **Core Member | EduNano | Spin-off NSF I-Corps Short Course Program | Worked under Dr. Saptarshi Das | October 2020**
- **Vice-Chair | ESMGSC: Engineering Science and Mechanics Graduate Student Council | Aug 2019 – January 2022**
- **Chairperson | IEEE Student Branch, Amrita School of Engineering, Bengaluru | 2018-19**
- **Founder & CEO | Sculplt | 3D printing student start-up pre-incubated at Amrita | Dec 2016 – Sept 2017**

SELECT PUBLICATIONS

- Statistics Based Modeling and Analysis of Ultra-Low Impedance Carbon Nanotube MOS Capacitors, [IEDM](#) (2024). **Accepted**
- High-performance and low parasitic capacitance CNT MOSFET: 1.2 mA/μm at VDS of 0.75 V by self-aligned doping in sub-20 nm spacer, [IEDM](#) (2023). DOI: [10.1109/IEDM45741.2023.10413827](#)
- **Oberoï, A.** et al. Toward High-Performance p-Type Two-Dimensional Field Effect Transistors: Contact Engineering, Scaling, and Doping (2023). DOI: [10.1038/s41467-020-18195-0](#), IF: **17.1**
- **Oberoï, A.**, Dodda, A., Liu, H. et al. Secure Electronics Enabled by Atomically Thin and Photosensitive 2D Memtransistors. ACS nano (2021). DOI: [10.1021/acsnano.1c07292](#), **Impact Factor (IF): 17.1**
- **Oberoï, A.***, Jayachandran, D.*, Sebastian, A. et al. A low-power biomimetic collision detector based on an in-memory molybdenum disulfide photodetector. Nature Electronics 3, 646–655 (2020). DOI: [10.1038/s41928-020-00466-9](#) ***Equal**, IF: **33**
- **Oberoï, A.***, Dodda, A.*, Sebastian, A. et al. Stochastic resonance in MoS₂ photodetector. Nature Communications 11, 4406 (2020). DOI: [10.1038/s41467-020-18195-0](#) ***Equal**, IF: **16.6**
- Schranghamer, T.F., **Oberoï, A.** & Das, S. Graphene memristive synapses for high precision neuromorphic computing. Nature Communications 11, 5474 (2020). DOI: [10.1038/s41467-020-19203-z](#), IF: **16.6**

OTHER PUBLICATIONS

- Monolithic three-dimensional integration of complementary two-dimensional field-effect transistors. Nature Nanotechnology 19, 970–977 (2024). DOI: [https://doi.org/10.1038/s41565-024-01705-2](#)
- Step engineering for nucleation and domain orientation control in WSe₂ epitaxy on c-plane sapphire. Nature Nanotechnology

1-8 (2023). DOI: [10.1038/s41565-023-01456-6](https://doi.org/10.1038/s41565-023-01456-6)

- A biomimetic neural encoder. Nature communications 12.1 (2021): 2143 DOI: [10.1038/s41467-021-22332-8](https://doi.org/10.1038/s41467-021-22332-8)
- Low-Power and Ultra-Thin MoS₂ Photodetectors on Glass. ACS nano 14.11 (2020): 15440-15449 DOI: [10.1021/acsnano.0c06064](https://doi.org/10.1021/acsnano.0c06064)

AWARDS AND ACHIEVEMENTS

- Departmental awards for performance improvement from backside contact development while serving as lead device representative and an advocate for high performance | June 2025
- Recognition in staff meeting among device team members for automating device task fetch and assignment | December 2024
- Diefenderfer Fellowship in Entrepreneurship | August 2022 – August 2023
- 2nd Place Team Prize in MRI Safety Olympics | Penn State Materials Research Institute | October 2021
- **Student Leader Scholarship** | Penn State Office of Student Associations | December 2020
- 1st (2019); 3rd (2022) Place in Oral Presentation | Penn State ESM Today
- 2nd Place in GEICO Programming Challenge | Penn State HackPSU | March 2019
- **Secured funding from Module143** to build a 4WD Mobile Robot | Regional Level World Skills India | 2018
- **Secured funding from Amrita University and IEEE ComSoc R10** to build a 4WD Omni Robot with 2 DoF Arm and Vision for warehouse management task | National Level World Skills India | 2018

CONFERENCES AND POSTERS

- **Obero, A., Dodda, A., Das, S., "Stochastic Resonance: Seeing the invisible using random noise" | (EES Building, Penn State ESM Today 2020)**
- **Dodda, A., Oberoi, A., Das, S., Sebastian, A., Schulman, D. S., Buzzell, D., & Das, S., "Ultra low power biomimetic sensors" | (Nittany Lion Inn, Penn State IndustryXchange 2019)**
- **Obero, A., Das, S., "p-type Doping Strategies for Advancing CMOS Integration on Ultra-thin 2D Transition Metal Dichalcogenides" | (Cambridge, Massachusetts Institute of Technology, Advanced Epitaxial Free-standing Membrane AEFM 2022)**
- **Attended Device Research Conference (DRC) 2021 | (Online)**
- **Attended International Electron Devices Meeting (IEDM) 2021, 2023**
- **Attended Device Research Conference (DRC) 2022 | (Columbus, Ohio State University)**
- **Attended Electronic Materials Conference (EMC) 2022 | (Columbus, Ohio State University)**
- **Attended Advanced Epitaxial Free-standing Membrane (AEFM) Workshop 2022 | (Cambridge, MIT)**

SPECIAL COURSES

- **Semiconductor Devices and Packaging Fundamentals**, Organized by Prof. Rao R. Tummala (Georgia Tech), and Prof. Madhavan Swaminathan (Penn State)
- **Electrically Detected Magnetic Resonance in Solids**, Prof. Patrick Lenahan (Penn State)
- **Semiconductor Devices**, Prof. Thomas Jackson (Penn State)

OTHER CONTRIBUTIONS

- Academic Reviewer for Nature Publishing Group, mdpi, IEEE EDL, and Advanced Wiley journals