

Wedyan Babatain

Postdoctoral Fellow, Media Lab, Massachusetts Institute of Technology
75 Amherst St, E14 -348R, Cambridge, MA 02139
wedyan@mit.edu

[Google Scholar](#) | [LinkedIn](#) | [wedyan.xyz](#)

Areas of Interest:

Microfabrication, Wearables, Soft Electronics, Soft Robotics, Liquid Metals

Education

King Abdullah University of Science and Technology (KAUST), Thuwal, Saudi Arabia

Ph.D. in Electrical and Computer Engineering

2019- 2022

Master of Science in Electrical Engineering

2017- 2019

MMH Labs - Futuristic Electronics and Integrated Nanotechnology Laboratories

PI: *Muhammad Mustafa Hussain*

University of Delaware, Newark, DE, USA

Bachelor of Biomedical Engineering

2013-2017

Minor: Bioelectrical Engineering

Experience

Postdoctoral Fellow, Massachusetts Institute of Technology (MIT), Cambridge, MA, USA

MIT Media Lab, Tangible Media Group

Sep 2022 – present

Developing actuation platforms for interactive electronics and robotics using soft programmable materials

Teaching Assistant, Massachusetts Institute of Technology (MIT), Cambridge, MA, USA

Sep 2023 – present

MAS.863 How to Make (Almost) Anything & MAS.834 Tangible Interfaces

Research Assistant, King Abdullah University of Science and Technology (KAUST), Thuwal, Saudi Arabia

MMH Labs

Aug 2017 – July 2022

- Gained extensive hands-on nano/microfabrication and process integration skills
- Developed sensors and actuators for flexible electronics and microfluidics platforms
- Applied research skills in the field of wearables devices for healthcare and environmental applications
- Mentored internship students by providing research feedback and tools training

Instructor, IEEE EDS Virtual Workshop

Nov 2021 – Dec 2021

Online Workshop on prototyping of sustainable materials-based Electronics

- Conduct online interactive sessions for 12 engineering students from Malaysia
- Mentor students on ideation, design, building, and integration of interactive electronic systems

Teaching Assistant, KAUST

Aug 2020 – Dec 2020

EE-303 (Integrated Circuits Course at KAUST)

- Assist with course materials where students learn about the semiconductor device physics
- Hold office hours to answer students' questions and proctor quizzes and exams

Teaching Assistant, KAUST Virtual Young Talent Academy

June 2020- July 2020

Virtual Learning on Manufacturing of Electron Devices

- Assist with course materials of fabrication processes in interactive virtual laboratory environment

- Customize learning experiences to help students progress through learning goals in the course
- Support the students, Lead Tutor, and all other tutors for targeted course completion

Teaching Assistant, KAUST

Jan 2020 – May 2020

EE-203 (Solid State Devices Fabrication Course at KAUST)

- Introduce students to tools and processes available at KAUST nanofabrication core lab
- Develop and execute a required processes for the fabrication and characterization of MOSCAP devices

Research Intern, King Abdullah University of Science and Technology (KAUST), Thuwal, Saudi Arabia

Integrated Nanotechnology Laboratory, MMH Labs

Mar 2017 – July 2017

- Worked independently on the development of a wearable personalized microfluidics drug delivery platform

R&D Student Intern, DePuy Synthes of Johnson & Johnson, West Chester, PA

Aug 2016 – Dec 2016

Under the supervision of Dr. Jennifer Buckley

- Developed a less invasive cerclage cable system for periprosthetic fractures.
- Applied engineering knowledge and skills to the process of concept generation, design, modeling, building, testing, and prototyping.

Undergraduate Research Assistant, University of Delaware, Newark, DE

Sep 2015 – June 2016

Naomedicine Research Laboratory, Dr. Arun Kumar Group

- Synthesized and characterized curcumin nanoparticles
- Performed cell culturing, protein analysis for inflammatory breast cancer cell lines

Science Workshop Leader, University of Delaware, Newark, DE

Aug 2014 – July 2015

- Conducted workshop sessions for freshman year students
- Explained material to students and encouraged active participation

Research Mentorship:

- Mentored 4 students at MIT : 3 undergraduates and 1 high school student.
- Mentored 6 visiting students at KAUST: 5 undergraduates and 1 master's student.

Publications

US Patents

-
1. **Wedyan Babatain**, Muhammad M. Hussain, 2022. Graphene Coated Liquid Metal Droplet-Enabled Dual-Axis Integrated Accelerometer (*Patent filed*)
 2. Muhammad M. Hussain, **Wedyan Babatain**, Lana Joharji, Aljohara Alsharif, Haneen Alamoudi, 2021. An adaptive tangible system for remote human sensation. U.S. Application No. 63/142,123
 3. Muhammad M. Hussain, **Wedyan Babatain**, 2020. Cylindrical Tube and Rolling Ball Based Accelerometer for Fall Detection. U.S. Application No. 17/153,377
 4. Muhammad M. Hussain, **Wedyan Babatain**, Nazek El-Atab, 2020. Reusable N-95 Masks Using Disposable Recyclable Flexible Materials. U.S. Application No. 17/233,792
 5. Muhammad M. Hussain, A. Gumus, **Wedyan Babatain**, 2021. Wearable Personalized Medicinal Platform. U.S. Patent International Application No. PCT/IB2017/052425

Journal Papers

1. **Wedyan Babatain**, Min Sung Kim, and Muhammad M. Hussain “From Droplets to Devices: Recent Advances in Liquid Metal Droplet Enabled Electronics” *Adv. Funct. Mater.* 2023 [**Accepted**]
2. **Wedyan Babatain**, Ulrich Buttner, Nazek El-Atab, Muhammad M. Hussain “Graphene and Liquid Metal Integrated Multi-Functional Wearable Platform for Human Machine Interfacing” *ACS Nano*, 2022 [**Cover Article**]
3. **Wedyan Babatain**, Nazek El-Atab, Muhammad M. Hussain “Graphene Coated Liquid Metal Droplet-Enabled Dual-Axis Integrated Accelerometer” *Adv. Mater. Technol.*, 2022 [**Cover Article**]
4. **Wedyan Babatain**, Sumana Bhattacharjee, Aftab M. Hussain, Muhammad M. Hussain “Acceleration Sensors: Sensing Mechanisms, Emerging Fabrication Strategies, Materials, and Applications” *ACS Applied Electronic Materials*, 2021 [**Cover Article**]
5. **Wedyan Babatain**, Abdulrahman Gumus, Irmandy Wicaksono, Ulrich Buttner, Nazek El-Atab, Mutee Ur Rehman, David Conchouso, Muhammad M. Hussain “Expandable Polymer Assisted Wearable Personalized Medicinal Platform” *Adv. Mater. Technol.*, 2020 [**Cover Article**]
6. **Wedyan Babatain**, Rishabh B. Mishra, Lana Joharji, Huda Badghaish, Aftab M. Hussain, Muhammad M. Hussain “Tubular Accelerometer Based on Angular Variation Enabled Capacitive Sensing” (Submitted)
7. Yi Lu, Shibin Krishna, Xiao Tang, **Wedyan Babatain**, Mohamed Hassine, Che-Hao Liao, Na Xiao, Zhiyuan Liu, Xiaohang Li “Ultrasensitive Flexible κ -phase Ga_2O_3 Solar-blind Photodetector” *CS Applied Materials & Interfaces*, 2022
8. Xiao Tang, Yi Lu, Rongyu Lin, Che-Hao Liao, Yue Zhao, Kuang-Hui Li, Na Xiao, **Wedyan Babatain**, and Xiaohang Li “Flexible self-powered DUV photodetectors with high responsivity utilizing Ga_2O_3/NiO heterostructure on buffered Hastelloy substrates” *Applied Physics Letters*, 2023
9. Xiao Tang, Yue Zhao, Kuang-Hui Li, Dongxing Zheng, Chen Liu, Hendrik Faber, **Wedyan Babatain**, Jose Taboada, Che-Hao Liao, Na Xiao, Saravanan Yuvaraja, Shibin Krishna, Chuanju Wang, Mingtao Nong, Yubin Huang, Thomas Anthopoulos, Xixiang Zhang, and Xiaohang Li “In-situ Growth of $\{-201\}$ Fiber-textured β - Ga_2O_3 Semiconductor Tape for Flexible Thin-Film Transistor” (under review)
10. Rishabh B. Mishra, Fhad Al-Modaf, **Wedyan Babatain**, Aftab M. Hussain, Muhammad M. Hussain, Nazek El-Atab “Structural engineering approach for designing foil-based flexible capacitive pressure sensors” *IEEE Sensors*, 2022
11. Xiao Tang, Kuang-Hui Li, Yue Zhao, Yanxin Sui, Huili Liang, Zeng Liu, Che-Hao Liao, **Wedyan Babatain**, Rongyu Lin, Chuanju Wang, Yi Lu, Feras S Alqatari, Zengxia Mei, Weihua Tang, Xiaohang Li “Quasi-Epitaxial Growth of β - Ga_2O_3 -Coated Wide Band Gap Semiconductor Tape for Flexible UV Photodetectors” *ACS Applied Materials & Interfaces*, 2021
12. Mutee Ur Rehman, **Wedyan Babatain**, Sohail Shaikh, David Conchouso, Nadeem Qaiser, Muhammad M. Hussain, Jhonathan Rojas “Stress concentration analysis and fabrication of silicon (100) based ultra-stretchable structures with parylene coating” *Extreme Mechanics Letters*, 2020
13. Nadeem Qaiser, Sherjeel Khan, **Wedyan Babatain**, Maha Nour, Lana Joharji, Sohail Shaikh, Nazek Elatab, Muhammad M. Hussain “A Thermal Microfluidic Actuator Based on a Novel Microheater” *J. Micromech. Microeng.*, 2023
14. Nazek El-Atab, Nadeem Qaiser, **Wedyan Babatain**, Rabab Bahabry, Rana Shamsuddin, and Muhammad M. Hussain “Nature-Inspired Spherical Silicon Solar Cell for Three-Dimensional Light Harvesting, Improved Dust and Thermal Management” *MRS Communications*, 2020.
15. Nazek El-Atab, **Wedyan Babatain**, Rabab Bahabry, Reem Alshanbari, Rana Shamsuddin and Muhammad M. Hussain “Ultra-flexible Corrugated Monocrystalline Silicon Solar Cells with High Efficiency (19%), Improved Thermal Performance and Reliability Using Low-Cost Laser-Patterning” *ACS Appl. Mat. Int.* 2019
16. Nazek El-Atab, Reema Almansour, Alhanouf Alhazzany, Reema Suwaidan, Yara Alghamdi, **Wedyan Babatain**, Sohail F. Shaikh, Sherjeel M. Khan, Nadeem Qaiser and Muhammad M. Hussain “Heterogeneous Cubic Multi-Dimensional Integrated Circuit (MD-IC) for Water and Food Security in Fish Farming Ponds” *Small*, 2019.

In preparation:

17. **Wedyan Babatain**, Ozgun Kilic Afsar, Cedric Honnet, Jean-Baptiste Labrune and Hiroshi Ishii “*Liquid Metal Droplet Manipulation Platform for Reconfigurable Electronics Applications*”
18. **Wedyan Babatain**, Christine Park, and Neil Gershenfeld “*Additive fabrication approach of PCBs via copper plating of laser-induced graphene patterns*”
19. **Wedyan Babatain**, Ozgun Kilic Afsar, and Hiroshi Ishii “*Feedback Sensing Platforms for Actuated Liquid Metal-Enabled Soft Robots*”

Conference Papers

1. **Wedyan Babatain**, Ozgun Kilic Afsar, Fabian Velasquez and Hiroshi Ishii “*Selective Patterning of Liquid Metal-Based Soft Electronics via Laser-Induced Graphene Residue*” IEEE-EMBS International Conference on Body Sensor Networks: Sensor and Systems for Digital Health 2023 **[Accepted]**
2. **Wedyan Babatain**, Ozgun Kilic Afsar and Hiroshi Ishii “*Graphene-Enabled Selective Wetting of Liquid Metal on Polyamide Substrate for the Fabrication of Soft Wearable Electronics*” MRS 2023 Fall Meeting. **[Accepted]**
3. Nazek El-Atab, Rishabh Mishra, Fhad Al-Modaf, Wedyan Babatain, Aftab Hussain, “Structural engineering methods to combine the diaphragm and cantilevers for flexible capacitive pressure sensor” Bulletin of the American Physical Society 2023
4. Nazek El-Atab, **Wedyan Babatain**, Muhammad M. Hussain, “Wrinkled Polydimethylsiloxane for Enhanced Light Trapping and Anti-Reflection in Flexible Corrugated Silicon Solar Cells” The 2021 IEEE 48th Photovoltaic Specialists Conference (PVSC), Virtual 20-25 June, 2021
5. Muhammad M. Hussain, **Wedyan Babatain** “Wearable Personalized Medicinal Platform” The 20th IEEE International Conference on Nanotechnology (IEEE-NANO), Montreal July 28- 31, 2020.
6. Rishabh B. Mishra, **Wedyan Babatain**, Nazek El-Atab, Aftab M. Hussain, Muhammad M. Hussain “Polymer/paper-based double touch mode capacitive pressure sensing element for wireless control of robotic arm” The 15th IEEE Int'l Conference on Nano/Micro Engineered & Molecular Systems (IEEE-NEMS 2020), San Diego, CA, April 20-24, 2020.
7. Nazek El-Atab, **Wedyan Babatain**, Nadeem Qaiser, Rabab Bahabry and Muhammad M. Hussain “Crystalline solar cells with atypical architecture for wide ranging deployment” SPIE, Anaheim, CA, April 26-30, 2020.
8. Nazek El-Atab, **Wedyan Babatain**, Nadeem Qaiser, Rabab Bahabry, Reem Alshambari, Rana Shamsuddin and Muhammad M. Hussain “Ultra-flexible, Ultra-stretchable, Lightweight and High efficiency Silicon Solar Cells for Unmanned Aerial Vehicles Application” VSESA, Al Qassim, Saudi Arabia, April 1-3, 2020.
9. Cedric Honnet, Ozgun Kilic Afsar, Yiyue Luo, **Wedyan Babatain**, Sarah Nicita, Yunyi Zhu, Eric Gallo, Andreea Danielescu, Wojciech Matusik, Hiroshi Ishii, Joe Paradiso, and Stefanie Mueller “*FiberCircuits: Miniature Flexible Circuits with Microcontrollers, Sensors and Actuators for Interactive Fiber*” **[Submitted]**

Honors and Awards

- Forbes 30 Under 30 – Middle East **2023**
- KAUST Ibn Rushd Postdoctoral Fellowship **2023**
- MIT Technology Review Innovators Under 35 MENA **2023**
- Rising Star in EECS, UT Austin **2022**
- KAUST CEMSE Dean’s List Award **2022**
- 2022 SXSW Innovation Awards Finalist **2022**
- MIT Ibn Khaldun Fellowship (Postdoctoral) **2021**
- KAUST Graduate Fellowship (Ms/PhD) **2017**
- The Biomedical Engineering Senior Design Award, University of Delaware **2016**
- King Abdullah Scholarship Program (KASP), Ministry of Higher Education (BS) **2012**

Professional Memberships

- Biomedical Engineering Society (BMES) **2015-present**
- Institute of Electrical and Electronics Engineers (IEEE) **2014-present**
- IEEE Women in Engineering (WIE) **2014-present**

- The Society for Collegiate Leadership & Achievement (SCLA)

2014-present

Technical Skills

Nano/Micro Fabrication Processes

UV Photolithography, Mask Writing, Atomic Layer Deposition (ALD), Electroplating, Plasma Enhanced Chemical Vapor Deposition (PECVD), Sputter Deposition (PVD), Reactive Ion Etching (RIE & DRIE), Wet Etching, 3D printing (STL and FMD), Laser micromachining, CNC machining, PCB Milling

Characterization and Metrology Tools

Profilometer, Reflectometer, Zygo 3D Profiler, Scanning Electron Microscopy (SEM), Atomic Force Microscopy (AFM), Electrical Probe station Infrared microscopy, UV/VIS/Infrared Spectroscopy.

Design, Simulation and Programming

COMSOL, CorelDraw, L-Edit, Solidworks, Fusion 360, Eagle PCB Design, MATLAB, Arduino, Embedded programming, OriginLab, Python, MATLAB, C/C++, Adobe Illustrator, Adobe Photoshop, Cinema 4D