

# Shubham Yadav

## Curriculum Vitae

PhD - Media Lab, MIT  
B.S./M.S. (Dual), EE, IIT Kanpur  
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### Education

PhD, MIT Media Lab, Massachusetts Institute of Technology, Cambridge, MA	2021-'25
M.S, Media Lab, Massachusetts Institute of Technology, Cambridge, MA	2019-'21
M.Tech, Electrical Engineering, Indian Institute of Technology Kanpur, India	2017-'18
B.Tech, Electrical Engineering, Indian Institute of Technology Kanpur, India	2013-'17

### Positions

Postdoctoral Fellow, Institute of Neuroinformatics, Zurich Switzerland	Dec'25 - Present
Academic Visitor, Institute of Neuroinformatics, Zurich, Switzerland	Jul'25 - Dec'25
Visting Student, Marine Biological Laboratories, Woods Hole	2024-'25
Research Assistant, MIT Media Lab, Cambridge, MA	2019-'25
SoC Design Engineer, Intel Technologies, Bangalore, India	2018-'19
Research Assistant, Electrical Engineering, IIT Kanpur, India	2017-'18

### Research Vision

My research vision is to democratize precision neuroengineering by developing minimally invasive, scalable bio-electronics that seamlessly integrate nanoelectronics, neuroscience, and applied physics. I will create adaptive neurotechnology platforms that serve fundamental neuroscience research, evolutionary biology investigations, clinical therapeutic applications, and brain-machine interface development. Through evolutionary-inspired computational architectures and bio-compatible electronic systems, my work will enable researchers globally to conduct multi-species neural studies, advance translational medicine, and develop next-generation brain-machine interfaces for neurological restoration. By bridging fundamental discovery with equitable technology transfer, I aim to build accessible, scalable tools that empower researchers and clinicians worldwide to unlock the mysteries of neural evolution, treat neurological disorders, and create a more connected and healthier world.

### Research Interests

- Applied Physics
- Adaptive biocomputation
- Early stage disease detection
- Evolutionary Neuroscience
- Neurotechnology
- Neurodegenerative diseases

### Select Research Achievements

- ✓ Developed a non-invasive, wireless and surgery-free method for autonomous self-implantation of nanoelectronic devices for early disease detection and therapeutic intervention
- ✓ Developed optoelectronic devices for minimally-invasive, wireless bi-directional electrical control of neurons with sub-cellular resolution and millisecond precision
- ✓ Built "Injectable Electronics" for minimally invasive sub-cellular neuromodulation of tissues
- ✓ Developed nanoelectronic devices for cell-type specific electric modulation at single cell resolution
- ✓ Developing unique cell-electronics interfaces to control neural dynamics of 3D human organoids
- ✓ Developed the highest efficiency sub-cellular-sized substrate-free photovoltaic technology

### Publications

13. M. J. I. Airaghi Leccardi\*, B. X. E. Desbiolles\*, **Shubham Yadav**, Y. Yu and Deblina Sarkar; Advancing neural interfaces: A framework for the fabrication and characterization of freestanding micro-nanodevices; **Nature Microsystems & Nanoengineering**, 2026 (\*equal contribution)
12. **Shubham Yadav**, J. Mondal, and M. Saha; Systems biology approaches for multi omics integration using artificial intelligence; **Academia Biology**, 4(1) 2026
11. **Shubham Yadav**, Ray Lee, Shivam Nitin Kajale, Bajju Joy, Monochura Saha, Preet Patel, Loey Bull, Sarah Cao, David Bono and Deblina Sarkar; A nonsurgical brain implant enabled through a cell-electronics hybrid for focal neuromodulation; **Nature Biotechnology** (2025)
10. Yubin Cai, Bajju C. Joy, B. X. E. Desbiolles, Viktor Schell, **Shubham Yadav**, David Bono and Deblina

Sarkar; Low-Frequency sub-0.5mm magnetoelectric antenna for wireless power harvesting in injectable deep-tissue implants; **IEEE Transactions on Antennas & Propagation**, **73(10)** (2025): 7134-7146

9. **Shubham Yadav**, *Ahitagni Das, M.T. Islam*, and Deblina Sarkar; Prediction of Onset of Action Potentials in Spontaneous Neuron Firings; **MARC Conference**, 2024

8. *Shivam Nitin Kajale\**, **Shubham Yadav\***, *Yubin Cai, Bajju Joy* and Deblina Sarkar; 2D material based field effect transistors and nanoelectromechanical systems for sensing applications; – **iScience** **24**, 103513 (2021)(\*equal contribution)

7. **Shubham Yadav**, *Soumya Tripathy* and Deblina Sarkar; NEMS Sensors Based on Novel Nanomaterials; **Advanced MEMS/NEMS Fabrication and Sensors** (2021), 133-185

6. **Shubham Yadav**: Self-standing sub-cellular sized Photovoltaic devices for minimally-invasive and precise neuronal stimulation; 2021. MIT, M.Tech. Thesis.

5. **Shubham Yadav**; Optimizing solar cells for a microfabrication class; **MARC Conference 2020**

4. **Shubham Yadav** and S. Sundar Kumar Iyer; Building a planar single and binary blend stack ternary organic solar cells; **Flexible and Printed Electronics**, **4(3)** (2019): 034003

3. **Shubham Yadav** and Sushobhan Avasthi; Grain Boundary analysis in IBC Perovskite Solar Cells; – 2018 4th **IEEE International Conference on Emerging Electronics (ICEE)**. IEEE, 2018.

2. **Shubham Yadav**: A Systematic Approach to Designing Ternary Organic Solar Cells; 2018. IIT Kanpur, M.Tech. Thesis.

1. **Shubham Yadav** and S. Sundar Kumar Iyer; Ternary Organic Solar Cells with active layer of P3HT:PCBM and PCPDTBT material; **IWPSD**, 2017.

## Patents

2. Patel, P., Sarkar, D., and **Yadav, S.**; **Wireless optical bioelectronics** — US Patent, filed, June'25

1. Joy, B. C., Patel, P., Sarkar, D., and **Yadav, S.**; **Nanoelectronic devices and methods of manufacture and use thereof** — US Patent, filed, March'25

## Talks

Autonomous Implantation of Bioelectronics for Surgery-Free Neuromodulation, <b>GRS Seminar, Italy</b>	2026
Non-surgical Bioelectronic Implant for Targeted Focal Brain Stimulation, <b>IISc Bangalore</b>	2025
Non-surgical Bioelectronic Implant for Targeted Focal Brain Stimulation, <b>IIT Bombay</b>	2025
<b>Guest Speaker</b> , Johns Hopkins TNT Neurotech Industry Roundtable, <b>John Hopkins University</b>	2025
Species-Agnostic Wireless Optoelectronic Neural Interface Platform, <b>IISER, Pune</b>	2025
Non-surgical Bioelectronic Implant for Targeted Focal Brain Stimulation, <b>ETH Zürich</b>	2025
Monopolar Injectable Electroceuticals for bidirectional neuromodulation, <b>MIT Media Lab</b>	2024
Sub-cellular sized injectable nanoelectronics for focal neuromodulation, <b>MIT Media Lab</b>	2023
Self-standing micron sized photovoltaic devices for focal neuronal stimulation, <b>MIT Media Lab</b>	2022
Grain Boundary analysis in IBC Perovskite Solar Cells, <b>IEEE-ICEE, Bangalore</b>	2019

## Grants and Funds

Awarded <b>Research budget</b> from (UZH/ETH Board) of 75K USD, Zurich	2025-'27
Awarded <b>Travel Grant</b> for presenting at Cephalopod Neuroscience Conference GRC, Texas	2026
Awarded <b>Travel Grant</b> for presenting at Neuroethology conference, India	2025
Awarded <b>Travel Grant</b> for presenting at FACE symposium, Stanford	Fall 2025
Secured <b>seed funding</b> from MIT Sandbox Innovation Fund, MIT	Fall 2025
Secured <b>seed funding</b> from MIT Sandbox Innovation Fund, MIT	2024-'25
Awarded <b>Travel Grant</b> for presenting at IWPSD conference	2017
Received <b>Graduate Research Award</b> for Masters' Research, Government of India	2017
Received <b>Merit Scholarship</b> for all four years of undergraduate	2013–17

## Awards and Achievements

<b>Grass Fellow</b> , Marine Biological Laboratories (MBL), Woods Hole, MA	2026
Postdoctoral Fellow <b>Institute of Neuroinformatics</b> , UZH and ETH Zurich	2025-'27
Member, <b>Sigma Xi</b> , The Scientific Research Honor Society	2025
<b>Fellow</b> , Define Ventures AI Fellows Program	Spring 2025
<b>Finalist</b> at Startup Stadium, Bio International Convention	2025
<b>Finalist</b> at Tufts New Ventures Competition	2025
Selected for <b>MIT DHIVE program</b> focused on healthcare innovation	Summer 2024
Research got a perfect score of 10 for <b>NIH Director's New Innovator Award proposal</b>	2022
Department <b>Rank 1</b> in IIT Kanpur Electrical Engineering batch of 2018	2018
Received <b>Academic Excellence Award</b> for the Academic Year 2016–17	2017
Secured an All India Rank <b>1574</b> in IIT-JEE (Advanced) among 1.5 million students	2013
Secured an All India Rank <b>16</b> in UPSEE among 0.2 million students	2013
International rank of <b>935</b> in International Mathematics Olympiad	2008

## Teaching Experience

Teaching Workshop – <b>The Kaufman Teaching Certificate Program</b>	Spring '25
Teaching Assistant – <b>Next generation devices for Nanoelectronics and Biotechnology</b>	Fall '21
Teaching Assistant – <b>Life Nanomachine Symbiosis</b>	Spring '21
Teaching Assistant – <b>Microelectronics II (EE311)</b>	Spring '18
Teaching Assistant – <b>Electronics Circuit Laboratory (EE380)</b>	Fall '17
Academic Mentor – <b>Counselling Service, IIT Kanpur</b>	2014–15

## Mentorship

- o Trained and mentored sixteen undergraduate students through MIT's Undergraduate Research Opportunities Program (UROP)
- o Mentee won the prestigious **Best UROP award**
- o Mentee got selected for the prestigious **Neo scholar** fellowship
- o Trained and mentored seven Masters students and three of them enrolled for PhD at MIT
- o Trained and mentored three PhD students, and two Postdoctoral researchers on various projects

## Outreach

- o Organizing committee member, MARC conference MTL-MIT, 2026
- o Reviewed articles for journals including npj Biosensing, ACS AMI, IEEE JHBI, IEEE URTC
- o Organised a symposium on the CephNeuroAI initiative at MIT, 2025
- o Serving as the Environment and Health Safety (**EHS**) **representative** to create a safe and organized working lab environment for research labs.
- o Serving as a process technical committee (**PTC**) **reviewer** to guide the user community at MIT.Nano (nanofabrication facility at MIT serving >1500 active researchers)
- o Serve as Committee on Animal Care (**CAC**) **representative**, facilitating effective communication between CAC staff and the lab to ensure optimal animal facility usage and welfare
- o Contributor at Smile Foundation, NGO empowering underprivileged children, youth and women.
- o Organizing workshops for local schools in Boston-Cambridge region to build scientific curiosity and share exciting opportunities among children from underrepresented communities.
- o Organizing online seminars for high school children from developing countries to motivate students to undertake careers in STEM.

## Technical Expertise

- o **Equipments built**: Probe station, Glovebox, 2P with ephys, in-vivo ephys, in-vivo optical stimulation setup
- o **Nanofabrication**: Lithography (photo, e-beam), Deposition (CVD/PVD, thermal), sputtering, Etching (RIE/Wet), GloveBox, spin-coating, nano-particle synthesis
- o **Characterization**: XRD, XPS, VSM, Raman/UV-Vis-spectroscopy, ICP-MS, FTIR, Potentiostat, fluorescence & confocal microscopy, 2P-microscopy, Light sheet microscope, SEM, TEM, AFM, STM, FIB-SEM
- o **Molecular Biology**: Murine and human tissue culture, MTT or WST, Western blot analysis, DNA-RNA extraction and purification, RT-PCR, Microtome, Vibrotome, Cryotome, parafinization, Embedding, Preparing cryofrozen section, IHC, IFC, ELISA, Separation of cells from Tissue-MACS, FACS, Virus handling

- **Electrophysiology:** whole-cell patch clamp, single unit recording, MEA recording for 2D and 3D cultures, ex-vivo patch clamping, Calcium & voltage-sensitive dye recording, GECI/GEVI, LFP recording
- **In-vivo experience:** BALB/c, C57BL/6, SCID, transgenic mouse handling and breeding; RO, Tail Vein, IP, Subcutaneous, Cisterna-magna injection; Orthotopic and heterotopic Tumor induction; Stereotactic surgery, peripheral nerve injection, peripheral nerve ligation, IVIS, Optogenetics, TDS, tES, Perfusion
- **Languages:** C/C++, Python, MatLab, VerilogA, labVIEW, VHDL, HTML, L<sup>A</sup>T<sub>E</sub>X
- **Softwares:** SilvacoAtlas, ICCAP, MentorGraphics, Cadence, Virtuoso, Microcap, COMSOL, SolidWorks