

CURRICULUM VITAE

ARJUN B S

Doctoral Student and Prime Minister's Research Fellow (PMRF)

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EDUCATION

Qualification	Department/Specialization	Institution	Score	Duration
Doctor of Philosophy (Ph.D.) (Ongoing)	Department of Electronic Systems Engineering (DESE), Division of EECS	Indian Institute of Science (IISc), Bangalore	9.1/10	August 2019 – December 2023
	Thesis Topic: Development of an Intraoperative Probe for Brain Tumour Delineation Combining Multimodal Tissue Characterization and Soft-Robotics Supervisor: Dr. Hardik J. Pandya, Thesis Submission: December 15, 2023			
Bachelor of Technology (B.Tech.)	Mechanical Engineering	Government Engineering College, Barton Hill, Trivandrum, India	8.64/10	August 2014 - June 2018
	Thesis Topic: Automated Brick Assembly Robot for LEGO House Construction			
Higher Secondary Education	Science Stream – Computer Science	VSSC Central School, Trivandrum, India	90.8%	April 2014

WORK EXPERIENCE (Before Ph.D.) - 1 year

BEES LAB, Department of Electronic Systems Engineering, IISc Bangalore - July 2018 - July 2019

Project Assistant

- Modeling and prototyping of mechatronics systems for biomedical applications.
 - High-throughput apparatus for antibiotic susceptibility testing.
 - Automated soil testing machine for quantifying mineral content.
 - Cytocentrifuges or cytopins for concentrating cells in fluid specimens onto a microscope slide.
 - Machine-learning integrated slide scanner for tele-cytology.

SKILLS

- Grant Writing (NIH R01, DBT India Alliance, DST, ICMR, SERB, BIRAC, ICPH, Centre of Excellence (CoE), etc.), Research Methodology, and Project Planning and Execution
- Hands-on Experience in Microfabrication Technology in Clean Rooms (Class 1,000 and 10,000)
 - Material Deposition: E-beam and Thermal Evaporation, Sputtering, PECVD and Sol-gel
 - Patterning: Soft and Optical Lithography (KARL SUSS MJB4 and MIDAS-MDA-400M-6 Mask Aligners)
 - Micromachining: Wet-etch and Dry-etch Processes (DRIE, RIE and Plasma Cleaning)
 - Material Characterization: Optical Profilometry, SEM, XRD Thin Film, Dektak Surface Profilometry, Four-Probe Measurement, Nano-Indentation, and Electrical Impedance Spectroscopy
- Electronic and MEMS Packaging: Wire Bonding, Wafer Dicing, Laser Cutting, and MEMS Sensor Calibration
- Mechanical Product Design (SolidWorks and Fusion 360), Parametric Modelling (Rhinoceros 3D and Grasshopper Plugin), and Prototyping (3D Printing (FDM and SLA), Laser Cutting)
- Electronic Product Design ((PCB Designing - Altium) and Fabrication (Soldering and Testing)

- FEM, Mathematical Modelling and Data Analysis - COMSOL Multiphysics, MATLAB, OriginPro and Excel
- Graphical Rendering Tools - KeyShot
- Rapid Prototyping Platforms - Arduino IDE and IAR Workbench
- Graphical Programming Language - LabVIEW
- Scripting - MATLAB, Python, and C++
- Teaching Assistantship and Mentoring
- Website Design

SELECTED PROJECTS

- Development of an Intraoperative Probe for Brain Tumour Delineation Combining Multimodal Tissue Characterization and Soft-Robotics (Ph.D. Thesis)
- An Intubation Catheter Integrated with Flow Sensors and Smart Actuators for Characterizing Airflow Patterns and Tissue Stiffness in Stenosed Trachea (MEMS-based Microforce Sensor Fabrication and Packaging, Test Bench Development for Sensor Calibration and Tissue Characterization)
- Micro-Engineered Force Sensors for Cardiac Ablation Catheters (MEMS-based Tri-axial Force Sensor Fabrication and Packaging, Test Bench Development for Sensor Calibration and Tissue Characterization)
- Flexible Electrode Array for Rodent ECoG Monitoring (Sensor Design, Fabrication and Characterization, Animal Experimentation, Head Stage Design and Fabrication)
- EpiSHOT: A Reusable Epinephrine Autoinjector (Mechanism Design, Fabrication and Testing)
- Development of LED-based Time-domain Near-IR Spectroscopy System for Delineating Breast Cancer from Adjacent Normal Tissue (Mechanical Design and Fabrication, and Experimentation)

PUBLICATIONS

1. Chowdhury, A., Sharma, S.S., **Arjun B S**, Pandya, H.J., Rao, B.S. and Laxmi, T.R., "Risky decision-taking task: A novel paradigm to assess the risk-taking behavior in rats predisposed to early-life stress." *Journal of Neuroscience Methods*, 2023. DOI: <https://doi.org/10.1016/j.jneumeth.2023.109864>.
2. **Arjun B S**, Alekya B, Hari R. S., Vikas V., Anita Mahadevan, and Hardik J. Pandya, "Electromechanical Characterization of Human Brain Tissues: A Biomarker for Tumor Delineation." *IEEE Transactions in Biomedical Engineering.*, 2022. DOI: <https://doi.org/10.1109/tbme.2022.3171287>.
3. **Arjun B S**, Anil Vishnu G. K., Shilpa Rao, Manish Beniwal, and Hardik J. Pandya, "Electrical Phenotyping of Human Brain Tissues: An Automated System for Tumor Delineation." *IEEE Access*, 2022. DOI: <https://doi.org/10.1109/ACCESS.2022.3149803>.
4. Suman Chatterjee, Tushar Sakorikar[#], **Arjun B S**[#], Rathin K. Joshi, Abhay Sikaria, Mahesh Jayachandra, Vikas V, Hardik J. Pandya, "A flexible implantable microelectrode array for recording electrocorticography signals from rodents." *Biomedical Microdevices*, 24(31), 2022. [[#] Equal contribution] DOI: <https://doi.org/10.1007/s10544-022-00632-0>.
5. V S N Sitaramgupta V, **Arjun B S**, Uttam M. Pal, and Hardik J. Pandya, "Design and Analysis of MEMS-based Force Sensors for Catheter Contact Force Measurements." *IEEE Sensors Journal*, vol. 22, no. 13, pp. 13451-13461, 2022. DOI: <https://doi.org/10.1109/JSEN.2022.3177166>.
6. Alekya B, V S N Sitaramgupta V, **Arjun B S**, and Hardik J. Pandya, "Sensor for Meso-scale Tissue Stiffness Characterization." *IEEE Sensors Journal*, 2022. DOI: <https://doi.org/10.1109/JSEN.2022.3154533>.
7. V S N Sitaramgupta V, **Arjun B S**, Bhagaban Behera, Deepak Padmanabhan, and Hardik J. Pandya, "A Ring-Shaped MEMS-based Piezoresistive Force Sensor for Cardiac Ablation Catheters." *IEEE Sensors*, 2021. DOI: <https://doi.org/10.1109/JSEN.2021.3118298>.
8. Arif Mohd Kamal, Uttam M. Pal, Ashika Nayak, Tejaswi Mediseti, **Arjun B S**, and Hardik J. Pandya, "Towards Development of LED-based Time-Domain Near-IR Spectroscopy System for Delineating Breast Cancer from Adjacent Normal Tissue." *IEEE Sensors*, 2021. DOI: <https://doi.org/10.1109/JSEN.2021.3082850>.
9. B Alekya, V S N Sitaramgupta V, **Arjun B S**, V Bhushan, Kevin Abishek, Sanjay Rao, Yeongjin Kim, and Hardik J Pandya. "An intubation catheter integrated with flow sensors and smart actuators for characterizing airflow patterns in stenosed trachea: an objective guide for CAO management." *Journal of Micromechanics and Microengineering*, 2021. DOI: <https://doi.org/10.1088/1361-6439/abf335>.

PATENTS

1. **Arjun B S**, Ajay Krishnan A, Hari R S, Pushkraj Anil Janwadkar, and Hardik J. Pandya, "Method and system for real-time monitoring of fluids," **Indian**: 202321003674 (January 18, 2023)
2. **Arjun B S**, Anil Vishnu G K, Gokul A M, Arun Baby, Shilpa Rao, Manish Beniwal, Vikas V, Anita Mahadevan, and Hardik J. Pandya, "An in-vivo, intraoperative probe for brain tumor margin delineation and methods thereof," **Indian**: 202041022728 (June 09, 2020), **PCT**: PCT/IB2021/055027 (June 08, 2021)
3. **Arjun B S**, Ajay Krishnan A, Adithya Kumar, Paramesh H, and Hardik J. Pandya, "Reusable drug delivery device," **Indian**: 202241018326 (June 06, 2022), **PCT**: PCT/IN2022/050795 (September 06, 2022)
4. **Arjun B S**, Ajay Krishnan A, Pushkraj Anil Janwadkar, and Hardik J. Pandya, "A Reusable Multiangle Intradermal Drug Delivery Device," **Indian**: 202241033770 (June 27, 2022)
5. **Arjun B S**, Aswin S, Hari R S, Akhil M, and Hardik J. Pandya, "An apparatus for attaching a camera to a microscope," **Indian Design**: 367940-001 (Granted: July 19, 2022)
6. Arif Mohd. Kamal, **Arjun B S**, Uttam M. Pal, Manu K. S., Anil Vishnu G. K., and Hardik J. Pandya, "A multimodal intraoperative probe for breast cancer margin assessment and methods thereof," **Indian**: 202241012649 (March 15, 2022)
7. Alekya B, V S N Sitaramgupta, **Arjun B S**, Bhushan V, S Siddesh Shenoy, Sanjay Rao, Mayur Bhuva, Kevin Abhishek, and Hardik J. Pandya, "A handheld diagnostic tool for grading stenosis in pediatric upper airway and methods for characterizing the same," **Indian**: 202041027223 (May 22, 2021), **PCT**: PCT/IB2021/054690 (May 28, 2021)
8. Hardik J. Pandya, Jagannathan Gopalakrishnan, Sonal Asthana, Vishnu Kurpad, Anil Vishnu G. K., Midhun C. Kachappilly, **Arjun B S**, Sudarshan Jagannathan, "A smart wearable device for real-time and continuous monitoring of body temperature and blood oxygen saturation," **Indian**: 202041027011 (June 25, 2020)
9. Hardik J. Pandya, Anil Vishnu G. K., Bhagaban Behera, Alekya B., Arun Baby, Saeed Rila, **Arjun B S**, Midhun C. Kachappilly, Prathik B.H., Nagasuma Chandra, Dipshikha Chakravorty, "Apparatus for high-throughput rapid antibiotic susceptibility testing and methods thereof," **Indian**: 202041024394 (June 08, 2021)

CONFERENCE PROCEEDINGS AND PRESENTATIONS

1. **Arjun B S**, Varun Canamedi, Sharmila Sree Vandurangi, and Hardik J. Pandya, "Brain Biopsy Imaging using Electrical Impedance Tomography (BBI-EIT)." *IEEE-EMBS International Conference on Biomedical and Health Informatics (BHI'23)*, Pittsburgh, Pennsylvania, USA, October 15 – 18, 2023.
2. **Arjun B S**, Ajay Krishnan A, and Hardik J. Pandya, "MRI-Compatible Patient-specific Continuum Robots using Parametric Modelling." *IEEE-EMBS International Conference on Body Sensor Networks: Sensor and Systems for Digital Health (IEEE BSN 2023)*, Boston, Massachusetts, USA, October 9 – 11, 2023.
3. **Arjun B S**, Ajay Krishnan A, and Hardik J. Pandya, "Soft-Robotic Probe for Tissue Characterization using TinyML." *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2023)*, Detroit, Michigan, USA, October 1 – 5, 2023.
4. **Arjun B S**, Ajay Krishnan A, and Hardik J. Pandya, "3D Printable Application-Specific Continuum Robots using Parametric Modelling." *2023 International Conference on Robotics and Automation, London, UK, April 29 - June 2, 2023.*
5. **Arjun B S**, and Hardik J. Pandya, "Towards an Indigenous Smart Intraoperative Probe for Brain Tumour Delineation." *14th EECS Research Students Symposium 2023, Bangalore, India, April 3-4, 2023.*
6. **Arjun B S**, Anil Vishnu G K, Uttam Pal, Arif Mohd. Kamal, and Hardik J. Pandya, "Multimodal Technologies for Augmenting Breast Cancer Diagnosis." *IndoUK Breast Forum Annual Scientific Meeting, Windermere, Lake District, UK, March 26-27, 2023.*
7. **Arjun B S**, and Hardik J. Pandya, "Towards an Indigenous Intraoperative Probe Integrated with MEMS-based Sensors for Brain Tumour Delineation." *PMRF Annual National Research Symposium 2023, Chennai, India, February 17-18, 2023.*
8. **Arjun B S**, V S N Sitaramgupta V, Aswin S, Shilpa Rao, and Hardik J. Pandya, "A System-based Approach for the Evaluation of Electromechanical Properties of Brain Tumors." *44th IEEE EMBC International Engineering in Medicine and Biology Conference, Glasgow, Scotland, July 11-15, 2022.*
DOI: <https://doi.org/10.1109/embc48229.2022.9871879>.
9. Hardik J. Pandya and **Arjun B S**, "Towards a MEMS-based mechano-acoustic probe for soft tissue characterization", *3rd International Conference on Materials Science & Engineering, Boston, USA, April 18-22, 2022.*

10. Ayush Tripathi, Atigadda Ramchandra Reddy, **Arjun B S**, and Hardik J. Pandya, "Low-Cost IoT Device for Chronic Medication Adherence", *9th IEEE R10 Humanitarian Conference 2021, Bangalore, October 1, 2021*. DOI: <https://doi.org/10.1109/R10-HTC53172.2021.9641693>.
11. Anil Vishnu G. K., Tamasa De, **Arjun B S**, Annapoorni Rangarajan, Hardik J. Pandya, "Towards the development of a table-top system for tumor delineation using electro-thermal characterization", *IEEE CONECCT 2021, July 9, 2021*. DOI: <https://doi.org/10.1109/CONECCT52877.2021.9622646>.
12. Anil Vishnu G K, Bhagaban Behera, Alekya B, **Arjun B S**, Suman Chatterjee, Arun Baby, Saeed Rila, Misal Khan, Arpitha R, Prathik B H, and Hardik J. Pandya, "A Novel Microengineering-based Portable Platform for Rapid Real-time Antibiotic Susceptibility Testing," *International Conference on Nanoscience and Materials World, Barcelona, Spain, November 18-19, 2019*.
13. Anil Vishnu G K, Bhagaban Behera, **Arjun B S**, Arun Baby, Niranjana Sreekumar, Saeed Rila, Prathik B, and Hardik J. Pandya, "A point-of-care platform for rapid antibiotic susceptibility testing using electrical sensing," *Sensors in Medicine, London, the United Kingdom, September 22-23, 2019*.

ACHIEVEMENTS

- **Best-Poster Award** IEEE-EMBS International Conference on Biomedical and Health Informatics (BHI'23).
- IEEE-EMBS International Conference on Body Sensor Networks: Sensor and Systems for Digital Health (IEEE BSN 2023) **Travel Award**.
- IEEE/RAS Member Support Program **Travel Award** for attending IROS 2023.
- Prime Minister's Research Fellowship Annual Review 2022 and 2023 - "**Top Ten Commendable Research by PMRFs under the Electrical Engineering, Electronics Engineering domain**" listed on the PMRF website.
- **Best Poster Award**, Electrical and Electronics Engineering, Annual National PMRF Symposium 2023.
- **Sun Pharma Foundation Science Scholar Awards 2022 - Winner Biomedical Sciences**
- **James Dyson Design Award 2022, National Winner**.
- **Featured article** in the **IEEE Transactions on Biomedical Engineering (TBME)** November Issue, 2022, "Electromechanical Characterization of Human Brain Tissues: A Potential Biomarker for Tumor Delineation."
- **SERB International Travel Grant** for attending the 44th IEEE EMBC International Engineering in Medicine and Biology Conference, Glasgow, Scotland, July 11-15, 2022.
- **BIRAC SITARE (Students Innovations for Translation & Advancement of Research Explorations)- (Gandhian Young Technological Innovation) GYTI 2021**. Research funding support of INR 15 Lakhs.
- **Prime Minister's Research Fellowship**, May 2020.
- **Best Student Award**, ISTE Kerala Section 2018.
- **Best Outgoing Student**, Government Engineering College, Barton Hill 2018.
- **Pre-Finalist** National Team Selection for World Skills 2017 (Skill: Mobile Robotics).
- **Runner-up Robothon 4.0 and 2.0**, National Level Robotic Hackathon.
- **Finalist NIYantra 2016**, Annual Design Competition by National Instruments.

TEACHING ASSISTANTSHIP

Course	Faculty	Platform	Term
Advanced Neural Science for Engineers	Prof. Vikas V and Prof. Hardik J. Pandya	NPTEL	January-April 2023
Advanced Manufacturing Technology	Prof. Santhosh Kumar	Government Engineering College, Barton Hill	2022-2023
Neural Science for Engineers	Prof. Vikas V and Prof. Hardik J. Pandya	NPTEL	January-April 2022
Microelectromechanical Systems (MEMS)	Prof. Santhosh Kumar	Government Engineering College, Barton Hill	2021-2022 and 2020-2021
Introductory Neuroscience & Neuro-Instrumentation	Prof. Hardik J. Pandya and Dr. Mahesh Jayachandra	NPTEL	July-October 2021

Op-Amp Practical Applications: Design, Simulation, and Implementation	Prof. Hardik J. Pandya	NPTEL	July-October 2021, July-October 2020
Process Technology and System Engineering for Advanced Microsensors and Devices	Prof. Hardik J. Pandya	Department of Electronic Systems Engineering, IISc Bangalore	January-April 2023, January-April 2022, January-April 2021
Integrated Circuits, MOSFETs, OP-Amps and Their Applications	Prof. Hardik J. Pandya	NPTEL	January-April 2021, January-April 2020
Sensors and Actuators	Prof. Hardik J. Pandya	NPTEL	July-October 2019, January-April 2019
Fabrication Techniques for MEMS-based Sensors: Clinical Perspective	Prof. Hardik J. Pandya	NPTEL	July-October 2019, January-April 2019

REFEREES

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