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EDUCATION:

Qualification	Department/Specialization	Institution	Score	Duration
Doctor of Philosophy (Ph.D.)	Department of Electronic Systems Engineering (DESE), Division of EECS	Indian Institute of Science (IISc), Bangalore	7.9/10	2018-2024
	Thesis Topic: Event-Related Potential Interpretation Approaches for Neonatal Hearing Screening Thesis Submission Date: 29 December 2023 Thesis Defense Date: 22 April 2024			
Master of Technology (M.Tech.)	VLSI and Embedded Systems	Dhirubhai Ambani Institute of Information and Communication Technology, Gandhinagar	7.55/10	2013-2015
Bachelor of Engineering (B.E.)	Electronics and Communication	Government Engineering College, Bhavnagar	7.99/10	2008-2012
Higher Secondary Education (12th Std)	Science Stream – Engineering Group	B. M. Commerce High School, Bhavnagar	82.20 %	2008
Secondary Education (10th Std)		B. M. Commerce High School, Bhavnagar	90.14%	2006

WORK EXPERIENCE (Prior to Ph.D.):

- Research Work Experience – 1 Year 4 Months (January 2024 – Present)

BEES Lab, DESE, IISc

Position: Post-Doctoral Research Associate

Contribution: I contributed towards technology transfer for my doctoral research, including neonatal headband development, neural signal extraction, application development, and experimentation. Additionally, I am supporting the invasive neural engineering research by drawing neural inferences from rodent models. Moreover, I am mentoring four researchers, including doctoral and M.Tech students.

- Industry Work Experience – 2 Years 4 Months (August 2015 – December 2017)

Company: Tata Consultancy Services, Pune

Client: Ford Motor Company, Detroit

Position: System Engineer

Contribution: I contributed towards embedded modular system design and relevant logic development and verification. I supported model-based design using MATLAB. Additionally, I worked on car safety and a power optimization module. I coordinated with the onsite testing team to update the existing logic, mature it, and incorporate new requirements.

KEY RESEARCH PROJECTS EXECUTED:

1. Design and development of an affordable, portable neonatal hearing screening system combining cortical and brainstem responses ([Ph.D. Project, Manuscript accepted, One Patent Granted](#)).
2. Design and validate an algorithm to detect and classify epileptic seizures by quantifying Interictal Epileptiform Discharges (IED) from human EEG ([Ph.D. Project, One Manuscript accepted, One patent Granted](#)).
3. Design, development, and validation of a wearable headband for single event extraction for attention and working memory assessment using P300 Event-Related Potentials ([Presented at BIOCAS 2022, Taipei, Taiwan](#)).
4. Design, development, and validation of a wearable sleep band to improve sleep quality by customized stimuli ([selected for incubation by MedTech & Geriatric Healthcare Technology Business Incubator \(CPDMED TBI\) at Indian Institute of Science, Bengaluru](#)).
5. Design and Development of Implantable Electrode Arrays for neurophysiological signature extraction from rodents to assess AED efficacy ([co-authored publication with a Ph.D. colleague](#)).
6. Design and fabricate Micro-engineered electrodes for surface and deep brain stimulation for Parkinson's disease ([Manuscript under progress, One Patent Filed](#)).
7. Design, Development, and Validation of a Phone as a Key module feature for GEN I models ([at TCS for Ford](#)).
8. Comparative analysis of SET CMOS Hybridization and existing CMOS technology for a 4-bit ALU ([M.Tech Major Project, Presented at IEEE INIS 2017](#)).
9. Design, Simulation, and Validation of a delay-balanced multistage 8-bit multiplier ([M. Tech. Project](#)).
10. Design, Develop and Validate a variable power supply ([B.Tech. Project](#)).

SKILLS

- Biomedical Electronic System Design
- Biomedical Signal Processing
- Automation
- Artificial Intelligence
- Scripting: MATLAB, Perl, Python
- EEG/ERP Experimentation
- Feature Extraction and Classification of physiological signals

- Neural System Development and Validation
- Mathematical Modelling of Biomedical Systems
- Wearable Brain-Computer Interface Design
- Basics of Image processing, Machine Learning
- Invasive and Non-Invasive Neural Experimentation
- Component selection and hardware design for given product specifications.
- Technical and Scientific Writing and Presentation Skills
- Good Communication Skills

PATENT GRANTED/FILED

1. **Invention Title:** A Novel Headband For Sensory Pathway Scanning
Inventors: Hardik J. Pandya, **Rathin K. Joshi**, Ajay Krishnan A, and Hari R S.
Indian patent application filing number: 388085-001 (June 9, 2023)
Current Status: Granted
2. **Invention Title:** A device and method for EEG Pattern extraction for neurological disorder detection, epileptic seizure detection, and classification
Inventors: Hardik J. Pandya, **Rathin K. Joshi**, Varun Kumar M., Megha Agarwal, Latika Mohan, Mahesh Jayachandra
Indian patent application filing number: 202241045754 (August 10, 2022)
Current Status: Granted
3. **Invention Title:** A Neonatal Headgear for an interface with a biological subject
Inventors: Hardik J. Pandya, **Rathin K. Joshi**, Ajay Krishnan A, and Hari R.S.
Indian patent application filing number: 202541007632 (January 29, 2025)
Current Status: FER Responded
4. **Invention Title:** L-shaped Surface Neural Implant (SNI) for brain stimulation and electrophysiological signal acquisition from the secondary motor area (M2) of a rat's brain.
Inventors: Sreenivas Bhaskara, Saravanan M, **Rathin K. Joshi**, Hardik J. Pandya, Shabari Girishan K. V., Nitu Bhaskar
Indian patent application filing number: 202441027639 (April 03, 2024)
Current Status: Application Filed

PUBLICATIONS

- *Peer Reviewed Journal Articles*
1. **Rathin K. Joshi**, Varun Kumar, Megha Agrawal, Avinash Rao, Latika Mohan, M. Jayachandra, and Hardik J. Pandya. "*Spatiotemporal analysis of interictal EEG for automated seizure detection and classification.*" Biomedical Signal Processing and Control 79 (2023): 104086. ([Link](#))

2. **Rathin K. Joshi**, Manu K S, Hari R S, Mahesh Jayachandra, Manjunath Dandi, Hardik J. Pandya “*Automated ABR and MMN Extraction using Customized Headband for Hearing Screening.*” Biomedical Signal Processing and Control (Accepted – Production in progress)
 3. Suman Chatterjee, **Rathin K. Joshi**, Tushar Sakorikar, Bhagaban Behera, Nitu Bhaskar, Shabari Girishan K V, Mahesh Jayachandra, and Hardik J. Pandya. “*Design and fabrication of a microelectrode array for studying epileptiform discharges from rodents.*” Biomedical Microdevices 25, no. 3 (2023): 31. ([Link](#))
 4. Suman Chatterjee, Tushar Sakorikar, Arjun Bs, **Rathin K. Joshi**, Abhay Sikaria, Mahesh Jayachandra, Vikas V, and Hardik J. Pandya. “*A flexible implantable microelectrode array for recording electrocorticography signals from rodents.*” Biomedical Microdevices 24, no. 4 (2022): 31. ([Link](#))
 5. Bhagaban Behera, **Rathin K. Joshi**, GK Anil Vishnu, Sanjay Bhalerao, and Hardik J. Pandya. “*Electronic nose: A non-invasive technology for breath analysis of diabetes and lung cancer patients.*” Journal of Breath Research 13, no. 2 (2019): 024001. ([Link](#))
 6. Suman Chatterjee, **Rathin K. Joshi**, Sreenivas Bhaskara, Hari RS, Shubham Datta, Shabari Girishan KV, and Hardik J. Pandya. “Design and fabrication of flexible biodegradable microelectrode array for recording electrocorticography signals.”. bioRxiv, 2023-11. ([Link](#))
- *Conferences/Symposiums (In Reverse Chronological Order):*
 1. **Rathin K. Joshi**, Hardik J. Pandya “*Design and Development of a Bimodal, Auditory event-related Potential Extractor System for Neonatal Hearing Screening.*” In EECS Research Student Symposium, IISc, 2024. ([Link To the Book of Abstracts](#))
 2. Suman Chatterjee, **Rathin K. Joshi**, Shabari Girishan K V, and Hardik J. Pandya “*Flexible Microelectrode Array for Chronic Electrocorticography Recording under Different Neurophysiological Conditions.*” In 2023 IEEE EMBS Conference on Neural Engineering (NER 2023). ([Link to The Paper](#))
 3. **Rathin K. Joshi**, K. S. Manu, R. S. Hari, Mahesh Jayachandra, and Hardik J. Pandya. “*Design, Development, and Validation of a Portable Visual P300 Event-Related Potential Extraction System.*” In 2022 IEEE Biomedical Circuits and Systems Conference (BioCAS), pp. 409-413. IEEE, 2022. ([Link to the Paper](#))
 4. **Rathin K. Joshi**, Hema Hariharan, K. Srinivasan, A. Tak, S. Kubakkadi, Hardik J. Pandya, and Mahesh Jayachandra “*Teaching Cognitive Neuroscience: Neuro-Instrumentation, an Indian perspective.*” Society for Neuroscience (SfN, 2022). ([Link to the Abstract Page](#))
 5. Hema Hariharan, A. Tak, **Rathin. K. Joshi**, Bhargavi Budhial, Suzzane Thomas, K. Srinivas, Hardik J. Pandya, and Mahesh Jayachandra. “*Dynamic variations in P300 Attention and*

Working Memory components in Males and Females, in an Indian cohort.” Society for Neuroscience (SfN, 2022). ([Link to the Abstract Page](#))

6. **Rathin K. Joshi** and Hardik J. Pandya, “*Design and Development of a Headband for Cortical Response Extraction*,” EECS Research Student Symposium, IISc, 2021. ([Link To the Book of Abstracts](#))
7. **Rathin K. Joshi**, Rutu Parekh, and Yash Agrawal. “*Design and optimization of single electron transistor based 4-bit arithmetic and logic unit at room temperature operation.*” In 2017 IEEE International Symposium on Nanoelectronic and Information Systems (iNIS), pp. 34-39. IEEE, 2017. ([Link to the Paper](#))

AWARDS AND RECOGNITIONS

1. **SITARE – GYTI appreciation** for the project on “Neonatal Hearing Screening headband for brainstem and cortical response extraction.”. SITARE-GYTI is Students Innovations for Translation & Advancement of Research Explorations - Gandhian Young Technological Innovation Award to promote and encourage young students to embrace translational research.
2. **Winners of the SHIFT Health Hackathon** for the prototype “Affordable Neonatal Deafness Screener,” SHIFT Health Hackathon is a national-level hackathon. Out of 2051 registered teams, 16 were invited for a 24-hour in-person Hackathon. After two rounds of pitch presentations, the five teams were shortlisted to present for a grand jury round, and three groups were declared winners.
3. First runners-up award in **SmartX Health Hackathon 2022** for the cortical response extraction prototype on “Cognitive Screener for Geriatric Applications.” Organized by Siemens. Subsequently, the team emerged as the winner of 45 days and 90 days of challenges and was selected for incubation through CPDMed for the healthcare startup (Current status: The Easescan Medtech Private Limited is incorporated at TBI-CPDMed, IISc.)

DEMONSTRATIONS

1. Demo Title: Event-Related Potential Extraction System Development and Applications.
Event Type: Brain, Cognition, Computation, and Learning (BCL-2023) Workshop,
Date: January 09-13, 2023
Venue: Faculty Hall, Indian Institute of Science, Bangalore.
2. Demo Title: Towards single Event P300 Extraction.
Event Type: Project Completion Demonstration
Date: June 08-09, 2022
Venue: Defence Institute of Physiology & Allied Sciences (DIPAS), DRDO, Delhi

RESEARCH WORK COVERED IN MEDIA:

1. <https://iisc.ac.in/events/detecting-seizures-and-interpreting-eegs-the-direct-algorithmic-way/>
2. <https://timesofindia.indiatimes.com/city/bengaluru/epilepsy-iisc-aiims-algorithm-to-help-detect-seizures/articleshow/94593229.cms>
3. <https://www.thehindu.com/sci-tech/science/researchers-develop-algorithm-that-can-help-identify-type-of-epilepsy/article65949888.ece>
4. <https://eecs.iisc.ac.in/events/student-awards-sitare-gyti-and-sristi-gyti-awards-2021/>
5. <https://ecosystem.siemens.com/researchandinnovation/smartx-health-hackathon>
6. <https://dese.iisc.ac.in/1st-runner-up-award-in-shift-2022-hackathon/>

OTHER ACHIEVEMENTS

1. I represented my college in several intercollegiate chess competitions during my undergrad and post-grad studies.
2. Currently at 313th rank out of 158264 active members of MATLAB Cody – an online platform to solve coding problems.
3. Obtained a Score of 709/1000 (AIR 1667 - 99.35%tile) in GATE 2013 – National Level Postgraduation Entrance Exam.
4. Secured All India Rank - 40 in CSIR JRF NET (Engineering Science) 2012 – National Level Exam to assess technical knowledge and aptitude..

TEACHING ASSISTANTSHIP DETAILS

- **Offline Courses (During Ph.D., Course Instructor: Dr. Hardik J. Pandya)**
 1. Design for Analog Circuits
Topics taught: Basic Properties of OpAmp, Arithmetic Circuits with Op Amp, ADC, DAC, Clippers, and Clampers.
 2. Process Technology and System Engineering for Advanced Microsensors and Devices
Topics taught: Basics of Lithography, Optics in Lithography, Resolution, Depth of Focus and Resolution Enhancement Techniques, Laboratory demonstration on basics of Biopotential Acquisition, and ERP Experimentation.
- **NPTEL Online Courses (During Ph.D., Course Instructor: Prof. Hardik J. Pandya)**
 3. Introductory Neuroscience & Neuro-Instrumentation (Co-instructor: Dr. Mahesh Jayachandra)
Topics taught: [Basics of BCI Experimentation](#), [Microstructures of Neural Engineering](#), [EEGLAB/ERPLAB](#), [Epilepsy: Introduction, and Seizure Classification](#).
 4. Neural Science for Engineers Instrumentation (Co-instructor: Dr. Vikas V)

Topics taught: [Introduction and Applications of Event-Related Potentials](#), [ERP Extraction Demonstration](#).

5. Mathematical Aspects of Biomedical Electronic System Design Instrumentation (Co-instructor: Prof. Chandramani Singh)

Topics taught: [Basics of Signal Types](#), [Basics of Signal Acquisition](#), and [Nyquist Rate](#)

6. Advanced Neural Science for Engineers

Topics taught: [Lithography Basics](#), [Fourier Optics](#), [Role of Microfabrication in Neural Engineering](#), [Basics of EEG/ERP Experiment Design](#), [EEG/ERP Applications](#)

- **Offline Courses (During M.Tech.)**

7. Engineering Mathematics [Course Instructor: Dr. Sunitha V]

Topics taught: Assignment and doubt-solving sessions on Calculus, Linear Algebra.

8. Design for Analog Circuits [Course Instructor: Dr. Rutu Parekh]

Topics taught: Lab Experiments on Op Amp and rectifier experiments

REFEREES

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