

SANKAR BALASUBRAMANIAN

Design Researcher — XRAI Developer — Mechanical Engineer

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VR Space,
SCALE Lab,
Department of Design and Manufacturing (DM),
Indian Institute of Science (IISc), Bangalore,
Karnataka, India. Pin: 560012

1. Career Objective

A Dynamic Mechanical Engineer and Dedicated Design Researcher specialising in Computational Product Design, Artificial Intelligence and Extended Reality. With a strong commitment to continuous learning & constantly exploring opportunities to expand my skill set and evolve as an expert in human-computer interaction. Captivated by & currently en route in using Generative AI for enhancing the conceptual phase, which is the early stages of the engineering design process. A firm believer in a future envisioned through XRAI (Extended Reality (XR) and Artificial Intelligence (AI), which will revolutionise human perception and our everyday activities.

2. Academic Information

Ph.D. in Product Design & XR (CGPA: 8.30/10) (2020-present)

- Applied Geometry & Mechanisms Lab (AGML), Mechanical Engineering, Indian Institute of Science (IISc), Bangalore.
- *Title of Thesis:* GEMINI: An Active Ideation System using Creative Machines
- *Supervisor:* Prof. Dibakar Sen

M.E. in Engineering Design (CGPA: 9.34/10) (2015-2017)

- Department of Mechanical Engineering, Government College of Engineering (GCE), Tirunelveli.
- *Title of Thesis:* Experimental Study on the Mechanical Behaviour of *Prosopis juliflora* Fibres as a Potential Reinforcement for Fibreglass Boat Hull
- *Supervisor:* Prof. Selwin Rajadurai

M.B.A. in Professional Management (*Part Time*) (2015-2017)

- Department of Management Studies, M.S. University, Tirunelveli.

B.E. in Mechanical Engineering (CGPA: 8.91/10) (2010-2014)

- Department of Mechanical Engineering, Government College of Engineering (GCE), Tirunelveli.
- *Title of Project:* CFD Analysis to Understand the Performance Enhancement of a Newly Designed Helical Coil Heat Exchanger in the Tuticorin Thermal Powerplant
- *Supervisor:* Prof. Selwin Rajadurai

HSC (94.33%) & SSLC (93.80%) (2008-2010)

- A.V.Rm.V. Matriculation Higher Secondary School, Tirunelveli.
- *Stream:* Mathematics, Physics, Chemistry, and Biology

3. Work Experience

Assistant Professor — Mechanical Engineering (Jul 2017 - Aug 2020)

- *Institute:* Thiagarajar College of Engineering, Madurai - 625015
- *Courses Taught:* Machine Design, Design Thinking, Product Design and Development, Lateral Thinking, Engineering Mechanics, Kinematics and Dynamics, Solid Mechanics, Finite Element Analysis

Teaching Assistant

(Jan 2023 - Apr 2023)

- *Institute:* Indian Institute of Science (IISc), Bangalore - 560012
- *Course:* PD235 - Mechanism Design

Teaching Assistant

(Jan 2024 - Apr 2024)

- *Institute:* Indian Institute of Science (IISc), Bangalore - 560012
- *Course:* ME200 - AI Assisted Programming

4. Skills:

4.1. Technical Skills

- Unity Game Engine & C# Programming
- Graphics - OpenGL & C++ Programming
- Computer Vision - OpenCV & Python Programming
- UI & Graphics Design - Figma & Blender
- CAD Modelling & Simulation - Solidworks & Fusion 360
- Scientific Computation - Matlab

4.2. Fields of Interest

- Human-Computer Interaction
- Product Concept Sketching
- eXtended Reality(VR/AV/MR/AR)
- Creative Engineering Design
- Computer Graphics
- Product Design
- Computer-Aided Design
- Computational and Applied Geometry
- Computer Vision

4.3. Soft Skills

- Work Ethics
- Leadership
- Consistency
- Self Discipline

4.4. Other Skills

Git, Gravity Sketch, ShapesXR, Sketchbook Pro, Concepts, Meshroom, Meshlab, Grasshopper, Processing, Rhino, Qt Design Studio, Tableau, Photoshop

4.5. Courses Credited

Computer Graphics and Scientific Visualisation, Human-Computer Interaction, Data Structures and Algorithms, Computer-Aided Design (CAD), Creative Engineering Design (CED), Robotics, Algorithmic Art and Visualisation, Dynamics and Control of Mechanical Systems, Engineering Mathematics

5. Projects:

5.1. Design Projects

Product Design & Development:

- *An Automated Device for Removal of 3D-Printed Parts from Build Platforms*
- *Resistive Stretch Sensor (RSS) Band for Interaction in Virtual Environments*
- *GAITMATE: A Portable Device for In-place Locomotion in Virtual Environments*
- *3DTTT: A 3-Dimensional Tic Tac Toe Game that never ends in a draw*
- *An Upper Limb Exoskeleton for Stroke Patients*

Application Design & Programming:

- *Ghost Basketball: A VR-based Basketball Simulation Game with a Ghostly Twist*
- *ZenVR: A VR-based Game for Anxiety Management, First Prize in IEEE SSH24*
- *HerbVRium: A VR-based Simulation for Understanding Medicinal Plants in AYUSH*
- *AuraTouch: An App for 3D Model Navigation using IMU and Flex Sensor.*
- *Typing Signature: A Novel Biometric-based authentication system using piezoelectric sensors*
- *GENIE: A Moodboard-cum-Sketching Application for designers using Generative AI to generate new ideas and develop concepts*
- *EUPHORIA: A VR-based Application for automated selection of form elements using Eye-tracking and Implicit attention mechanism*
- *MAGICS: An Idea Evaluation Application using Vector Embeddings and Clustering Techniques*
- *DIMES: A Version Management Application for recording the sketch strokes and the thoughts of the designer during concept sketching*
- *Ballet Sketch: A Virtual Reality-Based Application for Mid-Air Direct 3D Sketching*
- *RoboSense: A Matlab-based Application for Controlling a Virtual Robotic Serial Manipulator using Mobile Phone Sensors*
- *SenseiAI: A Web application for evaluating and enhancing sustainability of products*
- *LoadGenX: An Application for Automatic Generation of CAD Models and Drawings of Standard Joints, Shafts and Couplings based on external loading conditions*
- *HAMOT: A Matlab-based App to Understand the Effect of Position and Velocity Control Modalities for a Bionic Device*
- *FAMOT: An Open-Source Virtual Reality Application for Target Achievement Control Evaluation of Upper Limb Motor Functions*
- *An Augmented Reality-Based Application for tracking outlines of real-world objects into 3D sketches*
- *Visualization of Vortex Shedding in 3D Flow Around a Confined Square Cylinder using Tracking Graphs*

- 5.2. Research Projects**
- Application of Knowledge-Based Engineering (KBE) for Rapid Design of Right Angled Valves and Heat Exchangers** (2019-2020)
- *Skills used:* Product Design, Python, Solidworks
- Evaluation of Honeycomb Layer as a Reinforcement in the Design and Fabrication of a Novel Foldable Helmet** (2019-2020)
- *Skills used:* Fusion 360, Composites, Generative Design
- An Inquisitive Study on the Mechanical Behaviour of Al6061-SiC Metal Matrix Composite Using Conventional and Microwave Heating** (2018-2019)
- *Skills used:* Comsol, Stir Casting, Heat Treatment
- Experimental Investigation and Numerical Simulation of Anti-vibration Gloves to Prevent HAVS in Human Labour Handling Industrial Power Tools** (2017-2018)
- *Skills used:* Product Design, Comsol, Arduino
- Experimental Validation and Numerical Simulation of Residual Stresses in Rotary Friction Welding** (2017-2018)
- *Skills used:* Rotary Friction Welding, Ultrasonic Diffraction Method, Comsol
- 6. Publications**
- Sankar B et al. (2025), "**FAMOT: An Open-Source Virtual Reality Application for Target Achievement Control Evaluation of Upper Limb Motor Functions**", *International Society for Virtual Rehabilitation (ISVR) - RehabWeek 2025*, (Book Chapter Name), Chapter No., DOI.:
 - Joe Thomas, Muzammil Bagewadi, Sankar B, Rajath S and Vishal Singh (2025), "**Design Principles as a Lens for Dimensions of User Experience: A Case Study using a New 3D Tic Tac Toe Game**", *25th International Conference on Engineering Design (ICED)*, (Book Chapter Name), Chapter No., DOI.:
 - Sankar B et al. (2025), "**From h-index to AIMS: A Multi-dimensional Model for Comprehensive Research Impact Assessment**", *10th International Conference on Research into Design (iCoRD)*, (Book Chapter Name), Chapter No., DOI.:
 - Sankar B et al. (2024), "**Semantic Characterization and Expert Validation of AI-Ideation using Vector Embeddings**", *Journal of Engineering Design*, Taylor & Francis, (Submitted & Awaiting Revision)
 - Sankar B et al. (2024), "**A Novel Mathematical Framework for Objective Characterization of Ideas through Vector Embeddings in LLM**", *arXiv*, Cornell University, DOI: 10.48550/arXiv.2409.07578
 - Sankar B et al. (2024), "**A Novel Idea Generation Tool using a Structured Conversational AI (CAI) System**", *Artificial Intelligence for Engineering Design, Analysis and Manufacturing (AIEDAM)*, Cambridge University Press, (Accepted & Awaiting Publication)
 - Sankar B et al. (2024), "**A Novel Automated Device for Removal of 3D Printed Parts from Build Platforms**", *15th International Conference on Industrial Problems on Machines and Mechanisms (IPRoMM)* - Best Paper Award
 - Sankar B et al. (2024), "**Design and Characterization of a Novel, Low-Cost Resistive Stretch Sensor Band for Interactions in HCI Applications**", *15th International IEEE Conference on Computing, Communication and Networking Technologies (ICCCNT)*, DOI: 10.1109/ICCCNT61001.2024.10724103

- Sankar B et al. (2023), "**A Novel Version Control Scheme for Supporting Interrupted Product Concept Sketching**", *9th International Conference on Research into Design, Design in the Era of Industry 4.0*, Volume 3, Chapter 33, DOI: 10.1007/978-981-99-0428-0-33 - Best Paper Award
- Sankar B et al. (2023), "**Overcoming Ideation Bottlenecks using Conversational AI**", *9th International Conference on Product Lifecycle Modelling, Simulation & Synthesis* - Best Paper Award
- Dubbaka Siri, Sankar B (2023), "**Ethical Decision Making for Social Robots in Elderly Care Scenario: A Computational Approach**", *ICSR 2023, Lecture Notes in Computer Science*, Vol 14453, Springer Nature, Singapore, DOI: 10.1007/978-981-99-8715-3-13
- B. Sankar, M. Saravanan, K. Kumar and S. Dubakka (2023), "**Transforming Pixels into a Masterpiece: AI-Powered Art Restoration using a Novel Distributed Denoising CNN (DDCNN)**", *International Conference on Emerging Techniques in Computational Intelligence (ICETCI)*, Hyderabad, India, 2023, pp. 164-175, DOI: 10.1109/ICETCI58599.2023.10331299
- Supriya S., Selwin Rajadurai J., Sankar B (2015), "**A Numerical Study of Interface Effect on the Effective Thermal Conductivity of Glass Microsphere Filled Polymer Composites**", *International Journal of Applied Engineering Research* 10(4)2015: pp. 8967 – 8980
- Sankar B et al (2013), "**Powering the Car by using Carbon Fibres**", DOI:10.13140/RG.2.1.1451.9926

7. Patents

- Patent (Utility) - A Motorized Device for removal of the 3D printed part from 3D printers - *202441015992*
- Patent (Utility) - Collapsible, Adaptable, Modular and Portable Hangar System for Aircrafts - *202441093394*
- Patent (Utility) - A Protective Covering for Helicopters - *202341080816*
- Patent (Utility) - Biometric Authentication System using Novel Typing Signatures - *202521020306*
- Patent (Utility) - Interactive Recovery Equipment, Device, System and Method for Forearm Rehabilitation using a Gamified Approach - *202521026225*
- Patent (Design) - Interactive Recovery and Rehabilitation Device -
- Patent (Design)- Resistive Stretch Sensing (RSS) Band - Granted - *420267-001*
- Patent (Design)- An Electric Vehicle with a Single Carbon Fibre Body - Granted - *372034-001*
- Patent (Design) - 3D Tic Tac Toe - Granted - *401762-001*
- Patent (Design) - Electric Tic Tac Toe - Granted - *40211-001*
- Patent (Design) - Longitudinal Folding Hangar for Aircrafts - Granted - *411971-001*

8. Achievements & Awards & Recognition

- First Prize in NPCI Pravega Hackathon 2025, IISc Bangalore (For SereneVR)
- Runner-up in Idea Pitch Hackathon at HIVE Conclave 2025, IIT Mandi (For GAITMATE)
- Best Performance Award, Best Innovation Award and Best Coding Award—IEEE SSH 2024 (For ZenVR)
- Second Position in NVIDIA Art Restoration Hackathon at ICETCI 2023 (For DDCNN)
- National Level First Prize in Siemens Healthineers Innovation Think Tank Program (ITTCP), 2021 (For Portable Insulin Unit)

- Best Poster Award at IUCEE EPICS Conference at Hyderabad (For Foldable Helmet)
- Conferred as an Elite Academician from DST and TI Inc.
- University First Rank Holder & Best Outgoing Student (PG)
- University Eleventh Rank Holder (UG)
- GATE-ME Merit Scholarship (2015-17)
- Central Sector Merit Scholarship Scheme for graduate studies

9. Trainings & Programs

- Eminent Resource Person
 - *Workshop:* A One-Day Workshop on "Engineering Design"
Location: iHub, Indian Institute of Technology (IIT), Mandi
Outcome: Participants from industries learnt the process of Engineering Design
 - *Workshop:* A One-Day Workshop on "A Crash Course in Product Design"
Location: Indian Institute of Technology (IIT), Mandi
Outcome: Eight Teams of 4 students each conceptualized and created mock-up prototypes for various design problems
 - *Workshop:* A One-Day Hands-On Workshop on "AR-based Mobile App Development using Unity"
Location: RIPPLES, Open Day 2024, Indian Institute of Science (IISc), Bangalore
Outcome: Participants were taught to develop a Pokemon-Go AR App
 - *Workshop:* A One-Day Hands-On Workshop on "Creative Learning using AR and VR"
Location: Santhanam Vidhyalaya Senior Secondary School (CBSE), Trichy
Outcome: Teachers were given hands-on training on developing AR apps using unity for creative classroom education
- Summer Faculty Research Program (SFRF)
 - Indian Institute of Technology (IIT), Delhi
 - *Project Topic:* Numerical Simulation of Microwave Processing of Metal Matrix Composites using Comsol
- Faculty Development Programs & Short Term Courses
 - Design Thinking Course - Dr William Oakes, EPICS, Purdue University
 - Topper in Python Programming Course - NPTEL
- Certifications
 - Distinguished Paper Award at iCoRD' 23, PLMSS '23, IPRoMM '24
 - Certified Solidworks Professional (CSWP) - Dassault Systems
 - Freehand Outline and Model Drawing - DOTE, Tamilnadu
 - National Level First Prize in Essay Writing Competition - Ministry of Shipping, India
 - Won a Fellowship Grant for PG Project from Tamilnadu State Council for Science and Technology (TNSCST)

10. Roles & Responsibilities

- Life Member - Association for Designers of India (ADI)
- Student Member - ACM (Association for Computing Machinery) (1734505)
- Student Member - AMM (Association for Machines and Mechanisms) (A20240027)
- Associate Member - The Design Society (DS02828)
- Student Member - Design Research Society
- IEEE Member (99648614)
- Founder - Team Eureka - Electric Mobility Design Club
- Secretary - College Science Club (GCE)
- Editor-In-Chief - College Magazine (GCE)

11. Beyond Curriculum

Software Design: Development of applications using AR and VR
Hardware Design: Design and develop products that cater to the needs of society

12. Personal Snippet

Father's name: S. Balasubramanian
Mother's name: S. Angels Rajamani
Date of Birth: 04 Nov 1992
Languages Known: English, Tamil, Hindi

13. References:

- Dr. Dibakar Sen
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Department of Design and Manufacturing (erstwhile CPDM)
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- Dr. Selwin Rajadurai
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