Joel Morris Raaj M

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Summary

Results-driven Product Development Engineer with expertise in developing and optimizing medical imaging technologies, collaborating with cross-functional teams to align product design with clinical needs, and driving research and development initiatives to enhance diagnostic accuracy and surgical navigation solutions.

Experience

Healthcare Technology Innovation Center – IIT Madras
Project Engineer | Feb 2025 – Present

- Developing advanced 2D-3D image registration algorithms to enhance the accuracy of medical imaging alignment for diagnostic applications.
- Implementing Digitally Reconstructed Radiographs (DRR) for cross-verification of 2D images, ensuring precise validation in radiology workflows.
- Creating Multi-Planar Reconstruction (MPR) views to improve visualization and clinical decision-making in imaging-based diagnostics.

Perfint Healthcare, Chennai, India
Engineer - New Product Development | 2022 – 2024

- Led the development of the Spine Navigation System, collaborating with cross-functional teams to enhance precision in surgical navigation.
- Worked closely with product managers and stakeholders to gather VOC insights, fine-tune PRDs, and align product features with clinical needs.
- Developed advanced 3D space navigation algorithms for improved accuracy and efficiency in spine surgery procedures.
- Designed and prototyped the "Active Markers" tool using IR LEDs, enabling seamless integration with Optical Tracking Systems in medical imaging.
- Engineered robust LED communication algorithms in Python and Embedded C for precise data transmission with STM controllers in surgical devices.
- Established and managed rigorous software and hardware testing frameworks, ensuring compliance with IEC 60601 and EMI/EMC medical standards.
- Led Optical Tracking System accuracy validation, ensuring compliance with ASTM standards to meet regulatory requirements.
- Collaborated with UX and development teams to refine system usability, ensuring smooth clinician interaction with navigation software.
- Defined and maintained sprint backlogs, prioritizing development tasks to align with product roadmaps and clinical needs.
- Provided critical support in verification, validation, and regulatory compliance, ensuring safe and effective product deployment in hospitals.
- Translated customer and tender requirements into actionable product specifications, optimizing design for business and user needs.

Research Papers
- Co-authored the paper "**Design and Analysis of Calibration Method for Universal Navigation Accessory in Image-Guided Spine Surgeries,**" presented at the 2024 IEEE International Symposium on Medical Measurements and Applications (MeMeA). This paper highlights advancements in surgical navigation.
- Authored the research paper "**Patient Monitoring System using NodeMCU,**" published on IEEE Xplore in 2020, demonstrating expertise in IoT technologies and healthcare applications.
- Co-authored the paper "**Automatic Speed Controlling System,**" published on IEEE Xplore in 2020, showcasing contributions to control systems and automation.

Workshops
ITTCP, India (Siemens Healthineers)   1 month

- Presented innovative ideas aimed at reducing radiation exposure in CT rooms, demonstrating a commitment to improving patient safety and healthcare standards.
- Developed a comprehensive workflow outlining optimal practices for cancer center hospitals, contributing valuable insights to enhance efficiency and patient care within the healthcare system.

Projects
Undergraduate (UG) Projects:
- Developed and explored quadcopter technology, gaining expertise in aerial vehicle design and control systems.
- Researched Pulsated Laser Deposition (PLD) techniques for thin film deposition and material science applications.
- Built a patient monitoring system using Nodemcu, integrating IoT for real-time healthcare monitoring.
- Designed an Android-based oxygen level monitoring and alarm system for patients with Chronic Obstructive Disease.

Postgraduate (PG) Projects:
- Implemented IoT-based foot flexion monitoring for athletes to enhance training performance.
- Designed and developed a robotic wheelchair with advanced control and assistive technologies.
- Researched AI-based breast cancer detection using machine learning for improved diagnostic accuracy.
- Developed an IoT-based SPO2 and pulse monitoring system with neural analysis for real-time healthcare tracking.

Certificates

Completed the "**Biomedical Nanotechnology**" course offered by NPTEL, demonstrating proficiency in the interdisciplinary field of nanotechnology applied to biomedical sciences.

Academics
Karunya University, Coimbatore   2017-2021
B. Tech - Electronics and Communications
VIT University, Vellore   2021-2023
M.Tech - Biomedical Engineering

Skills and Abilities
- Linear Algebra
- Tool Navigation for spine navigation
- Python Coding
- Hardware and Circuit Designing
- Product development
- MATLAB
- Keil Software
- Algorithm Development
- Computer Vision