

Jerrin Bright

SPORTS ANALYTICS · REALTIME PERCEPTION · AUTONOMOUS SYSTEMS

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Summary

I am a versatile and self-motivated Master's student at UWaterloo focusing on human pose estimation and video analysis. As a researcher at the Vision and Image Processing Lab, I'm working jointly with the Baltimore Orioles of Major League Baseball (MLB) towards developing robust monocular human pose estimation solutions for quantitative analysis of baseball players to improve player performance, enable better strategic decisions, and aid in injury prevention.

Education

University of Waterloo

Ontario, Canada

MASC IN SYSTEMS DESIGN ENGINEERING

Sept 2022 - Present

- **Research:** Robust Monocular 3D Human Pose Estimation for sports using CNN and Transformers.
- **Supervisor:** Dr. John S Zelek.
- **Courses:** Probabilistic Machine Learning, Graphical Deep Learning, Advanced Image Processing, Statistical Image Processing.

Vellore Institute of Technology

Chennai, India

B.TECH. IN MECHANICAL ENGINEERING

July 2018 - April 2022

- **Research:** An End-to-End Autonomous UAV System in GPS-Denied and Unstructured Environments.
- **Supervisor:** Dr. Arockia Selvakumar Arockia Doss.
- **Courses:** Mechatronics System Design, Machine Drawing, Instrumentation and Control Engineering, Complex Variables and Partial Differential Equations, Problem Solving and Object Oriented Programming.

Teaching Assistantship

BME 361

Biomedical Engineering Design

University of Waterloo

SUPERVISOR: DR. REEM ROUFAL

Jan 2023 - April 2023

BME 101L

Communications in Biomedical Engineering- Visualization

University of Waterloo

SUPERVISOR: DR. EWEN MACDONALD

Sept 2022 - Dec 2022

Bachelor's Thesis

Vellore Institute of Technology

Chennai, India

SUPERVISOR: DR. AROCKIA SELVAKUMAR AROCKIA DOSS

Nov 2021 - April 2022

- A robust learning-based obstacle avoidance method was proposed leveraging feature enhancing networks.
- An inspection module base on a novel sense-switch-act approach was designed and experimentation were done.
- Localization leveraging inertial data and sensor fusion via Extended Kalman Filters with ORB features were done.

Publication

ME-CapsNet: A Multi-Enhanced Capsule Networks with Routing Mechanism

IEEE INTERNATIONAL CONFERENCE ON ELECTRONICS, COMPUTING & COMMUNICATION TECHNOLOGIES

A Comprehensive Study on Autonomous Navigation using Learning Techniques for Robotic Systems

ELSEVIER- JOURNAL OF ROBOTICS AND AUTONOMOUS SYSTEMS

Optimization of quadcopter frame using generative design and comparison with DJI F450 frame

INTERNATIONAL CONFERENCE OF ROBOTICS, INTELLIGENT AUTOMATION AND CONTROL TECHNOLOGIES

Area of Expertise

Simulation Tools : **AirSim, Fusion360, SolidWorks, Proteus, Gazebo, RViz, MATLAB, SOFA**
Programming Tools : **Python, C++, Embedded System, HTML, CSS**
ML Tools : **TensorFlow, PyTorch, OpenCV, Matplotlib, NumPy, Keras, Scikit**
Operating System : **Linux Ubuntu, ROS, Raspbian OS, Window**
Languages : **English, Tamil**

Honors & Awards

International Master's Award of Excellence, University of Waterloo, Canada
Graduate Research Fellowship, University of Waterloo, Canada
Globalink Graduate Fellow, MITACS Canada
Outstanding Research Paper Award, RIACT International Conference, 2020
Best Outgoing Student, Atom Robotics, VIT Chennai, India, 2022.
Winner, IEEE Robotics Competition (Law Follower), IIITDM Kanchipuram, 2019
Top Ten Internationally, International Planetary Aerial Challenge, 2021
Runner-up, IEEE Hackathon on Autonomous Drone Applications, 2021
Best Club Award, Robotics Club, University Day 2021, VIT Chennai, India.
Best Club Award, National Service Scheme, University Day 2022, VIT Chennai, India.

Research Experience

Indian Institute of Science

Bangalore, India

RESEARCH INTERN, AI AND ROBOTICS PARK (ARTPARK)

July 2021 - April 2022

- Autonomous navigation of UAVs in uncluttered and unstructured environments using various sensor sub-systems.
- Implementation of Model Predictive Control, Control Barrier Functions, DL based Depth Estimation, etc.
- Hands on with Jetson boards, Realsense, Jevios components and turtlebot, DJI M600, Jetbots and custom UAVs
- Supervisors:** Mr. Badrinarayanan Rangarajan and Prof. Suresh Sundaram

McMaster University

Ontario, Canada

GLOBALINK RESEARCH INTERN

July 2021 - September 2021

- Designing of a 4 DoF soft robotic manipulator in PyBullet simulation engine using Soft Motion (SoMo) toolkit.
- Supplied sinusoidal torque to the actuators and plotted the velocity, position, acceleration, and input (torque) to analyze different actions.
- Supervisor:** Prof. Gary Bone

Arizona State University

Arizona, USA

SUMMER RESEARCH INTERN

May 2021 - July 2021

- Using laser scanning, and photogrammetry to digitize environments via visualizing data collected from sensors fusing into a unified system. DL algorithms are used for automated analysis.
- The digital representations made will be processed to provide insights to builders, and stewards.
- Supervisor:** Prof. Thomas Czerniawsk

Aero2Astro

Chennai, India

AUTONOMOUS SYSTEM DEVELOPER - INTERN

October 2020 - April 2021

- Developing ROS-based autonomous navigation firmware using Visual Inertial SLAM concepts for indoor environment.
- Implementation was based on Sensor Fusion techniques, Extended Kalman Filters and is aimed to eradicate the need for GPS thus making the system/ firmware more reliable.

BrainMagic InfoTech Pvt

Chennai, India

DATA SCIENCE INTERN

May 2020 - July 2020

- Automobile fault detection of more than 10 classes using vision techniques resulting in an IOU of 95%.
- Dimensional analysis was done to locate defects and monitor them.
- Performance was enhanced using transfer learning with residual networks and data augmentation.
- It was initially deployed in Heroku and finally deployed in AWS using Amazon Sagemaker and S3 Buckets.

Yuan-Ze University

Taoyuan City, Taiwan

PROJECT RESEARCH INTERN

April 2020 - June 2020

- Built a robust smart parking system using semantic segmentation with Convolutional Conditional Random Fields and Atrous Convolution enhance the visual capability of the system.
- Supervisor:** Prof. Wei-Tyng Hong

Projects

Autonomous UAV Navigation using Imitation Learning

May 2021 - July 2021

INDIAN INSTITUTE OF SCIENCE, BANGALORE

- Implemented a simple UAV navigation using imitation learning technique.
- The policy was trained using the dataset from RRT-MPC-based UAV navigation in cluttered environments using AirSim simulation environments.
- Attention-based networks were used as the base model to imitate the expert to find the policy.

SLAM embedded AGV for autonomous navigation

Sep 2020 – Oct 2020

VELLORE INSTITUTE OF TECHNOLOGY

- Implemented 3D mapping using Kinect and IMU sensors in an indoor environment.
- The Visual Inertial Navigation System was used to make the 3D map simulated in the Gazebo environment and visualized 2D in RViz.
- Feature extraction via Oriented fast and Rotated Brief (ORB) was used for extraction and tracking.

Robust Chest X-Ray Detection Architecture

Jan 2020 – April 2020

SELF

- Built a convolutional system for x-ray detection of 14 different chest diseases
- Some of the important tools used in the system are transfer learning fusing Residual Networks with UNet, Data Augmentation techniques, and autonomous cropping using contours and extrema.

Autonomous MAV enhanced with door-to-door delivery topographies

Jan 2020 – April 2020

EVANTRA- INDIAN INSTITUTE OF TECHNOLOGY, BOMBAY

- Developed a ROSpy based control system for a MAV to transverse to a set of GPS setpoints autonomously picking and delivering a package.
- The Control System has two modules, namely the Altitude (AC) and the position (PC) controller.
- AC stabilizes the UAV using a PID-based controller. PC takes in the target GPS coordinates and has setpoint values and navigates successfully.

Autonomous Planetary System for Mars Exploration

Jan 2020 – April 2020

ATOM ROBOTICS, VELLORE INSTITUTE OF TECHNOLOGY

- Designed a VTOL-UAV from scratch including CFD analysis for propellers and Aerofoil.
- Designed and tested PCBs using Fritzing. Communication using XBee 900MHz. ROS was used for Software systems (Visual SLAM and PID Control for rudder, elevator, and ailerons for horizontal and one for R-P-Y during lift).

Custom 3D Pose Estimation Toolkit for Robotic Systems

Jan 2020 – April 2020

AERO2ASTRO, INDIA

- Developed a toolkit to reconstruct ubiquitous environments using Oriented FAST and Rotated Brief feature detector and descriptor, FLANN for matching, RANSAC for outlier removal, Optical flow, PnP (DLT and Levenberg) for estimating the pose of the robot.

Competition-based Robots

Jan 2020 – April 2020

ATOM ROBOTICS, VELLORE INSTITUTE OF TECHNOLOGY

- Designed and built Intelligent Ground Vehicles, Planetary Aerial Systems, Law Following Robot, Obstacle Racer, Robo-Soccer, Maze Runner, Sumo Robot, BattleBots with my team, Atom Robotics.

Membership

Atom Robotics, Co-Founder and Senior Advisor

VIT- Robotics Club, Technical Head

IEEE, Robotics and Automation Society (RAS) Member

National Service Scheme, Active Volunteer

ValueML, Machine Learning Contributor

Madras Scientific Research Foundation, Research Fellow

Declaration

- I, Jerrin Bright, affirm that the aforementioned information is true to my knowledge, as of May 3rd, 2023.
- References available on request.