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github.com/Kzernobog [📍](#) Edinburgh, UK

Robotics and Machine Vision researcher. Broadly, my research interests lie in the field of Computer Vision, Vision based control and uncertainty estimation.

EXPERIENCE

Present January 2021	Graduate Research Student RAD Group, IPAB, UNIVERSITY OF EDINBURGH, Edinburgh, UK Estimation of soft body deformation using Event-driven Cameras ROS Tensorflow PyTorch
September 2020 February 2019	Research Assistant RRC, ROBOTICS RESEARCH CENTRE, IIIT-H, Hyderabad, India 🔗 RRC <ul style="list-style-type: none">> Small Obstacle Discovery project> GCRF and Mergenets papers implemented> Small Obstacle Dataset release ROS Camera-Lidar Calibration Lidar Range Image construction PyTorch
January 2019 March 2018	Team Lead Algorithms and Application Architect, ZEN TECHNOLOGIES LIMITED, Hyderabad, India 🔗 Zen <ul style="list-style-type: none">> Prototyped Perception and Robotics Module for the Generic Object Tracking System. NVIDIA Jetson TX2 CUDA PID Motor Control
March 2018 October 2017	AI Research Engineer Algorithms, ZEN TECHNOLOGIES LIMITED, Hyderabad, India 🔗 Zen <ul style="list-style-type: none">> Benchmarked Object Detection and Object Tracking frameworks> Data Pipeline for Simulator - Project in collaboration with Paladin AI
September 2017 August 2016	Software Engineer, ZEN TECHNOLOGIES LIMITED, Hyderabad, India 🔗 Zen <ul style="list-style-type: none">> Acoustic Event Triangulation> Indoor Tracking System> Motion Platform for the Air-Surface Missile simulator C++ Unreal Unity C#

ACADEMICS

2020-2021	Masters by Research : IPAB Robotics, University of Edinburgh; Supervised by Professor Subramanian Ramamoorthy
2009-2013	Bachelors in Engineering (B.E) (Honors) Civil Engineering, BITS Pilani, Pilani Campus
2009	Secured rank 2399 out of almost 500,000 students who appeared for the IIT-JEE engineering entrance test.
2009	Secured rank 437 out of almost 200,000 students who appeared for the BITSAT engineering entrance test.

PUBLICATIONS

IROS 2020	🔗 LiDAR guided Small obstacle Segmentation
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PROJECTS

SMALL OBSTACLE DISCOVERY ON ROAD SCENARIOS | RESEARCH ASSISTANT

RRC, IIIT-H

[Project Site](#) [ArXiv](#)

My work in RRC lied within the broader field of perception for autonomous vehicles. Our team's work on Lidar guided Small Obstacle Segmentation was accepted into IROS 2020 as part of the conference proceedings

- The project aims to detect drivable road spaces, particularly in India road scenarios, using Lidar and RGB camera
- Posing the problem as a computer vision semantic segmentation problem, we experimented with various sensor modalities - primarily Lidar and RGB Camera.
- Following threads of research were explored
 - Application of Uncertainty in Deep Learning to Computer Vision
 - Confidence propagation in a dual CNN framework
 - Sparse knowledge representation (particularly for Lidar) - Range Image representation of Lidar or the Image projections
 - Semi-Supervised/Self-Supervised training for Semantic Segmentation (GCRF Loss)
- GCRF loss paper implemented. GCRF loss tries to decrease the amount of supervision required for semantic segmentation tasks. [colab](#)
- Worked with Camera-Lidar calibration. Developed a Hausdorff distance based incremental technique for fine tuning the Lidar-Camera Calibration - we are working on summarising our work as an article.
- The Small Obstacle Discovery Dataset. This data aims to streamline research within the broader small obstacle discovery track. Will be released along with the paper submission. Examples can be found on the project website.

Research Project

GENERIC OBJECT TRACKING SYSTEM | TEAM LEAD

ZEN TECHNOLOGIES LIMITED

Led a multidisciplinary team to prototype and test a Perception Module and Robotics Module for a turret based Object Tracking System. The turret orients itself to track targets based on control from the perception module.

- Perception Module
 - Software Architect and Lead Programmer.
 - Developed the Computer Vision Module that detected and tracked user given objects of interest.
 - Employed Deep Learning Computer Vision techniques, primarily Convolutional Neural Nets, for object detection.
 - Deployed a Deep Learning based and traditional vision based trackers.
 - Engineered the model to be deployed it on the Nvidia Jetson TX2.
- Robotics Module
 - Interfaced motor control and the micro-controller to the Computer Vision Module. This was done via a combination of serial media and Socket communication (TCP/IP protocol) using Remote Procedure Call architecture.
 - Assisted in prototyping the basic PID motor control logic in Python.

Robotics Systems Project

OBJECT TRACKING AND DETECTION | AI RESEARCH ENGINEER

ZEN TECHNOLOGIES LIMITED

Bench-marked and profiled object detection and object tracking algorithms.

- Object Detection
 - YOLO, R-CNN, Faster R-CNN
- Object Tracking
 - Kalman Filter based tracking, Dlib tracker, ROLO, Track2Detect.
- Trained a person detector and installed it in Zen's Tactical Simulator.

Research Project

DATA PIPELINE FOR WEAPON'S SIMULATOR | AI RESEARCH ENGINEER

ZEN TECHNOLOGIES LIMITED

[Product Site](#)

Collect relevant data from simulator for future modelling. This project was in collaboration with [Paladin AI](#).

- › Programmed a C++ application to communicate sensor data from an accelerometer module, via serial media communication.
- › These accelerometer modules were used to collect recoil data from simulated weapons.
- › Programmed a .NET C# patch for the existing weapon's simulator, this module collected and automatically labeled the accelerometer data.
- › This data is used to model trainee abilities and develop training curriculum.
- › Deployed in many Army training sites across India, generates accelerometer data. This data is used for the Adaptive Learning module of the simulator.

Production Project

ACOUSTIC EVENT TRIANGULATION | SOFTWARE ENGINEER

ZEN TECHNOLOGIES LIMITED

[Product Site](#)

The aim of the project was to triangulate the position of an acoustic event on a test 2x2 sq. meter resealable rubber frame. Optimises Time-difference-on-arrival data from acoustic sensors for 2d coordinates of the point of entry.

- › Programmed a software library implementing the Levenberg-Marquardt optimisation algorithm in C and C++ with common API.

Production Project

INFRARED EVENT TRIANGULATION | SOFTWARE ENGINEER

ZEN TECHNOLOGIES LIMITED

[Product Site](#)

Used Image Processing to try and detect Infrared event location on a test 2x2 sq. meter resealable rubber frame. The infrared event takes the form of a ballistic piercing through the rubber.

- › Using an IR camera filter, tried to detect IR signatures on the frame using traditional blob detection algorithms.

Research Project

INDOOR TRACKING SYSTEM | SOFTWARE ENGINEER

ZEN TECHNOLOGIES LIMITED

[Product Site](#)

This project is an elaborate sensor setup to simulate tactical homeland security exercise scenarios. The tracking system triangulates the location of a trainee in real time.

- › Programmed an application in C++ that calibrated the internal Radio Frequency sensors.
- › Programmed a UI application in C++ that showed the position of trainee within the simulated environment.

Production Project

HARDWARE INTERFACE WITH SURFACE-AIR BALLISTIC SYSTEM SIMULATOR | SOFTWARE ENGINEER

ZEN TECHNOLOGIES LIMITED

[Product Site](#)

The simulator system is a game interface that the user interacted with while training to fire a short range Surface-to-Air missile.

- › Programmed a module of an interface application in C++ to communicate with the hardware of a simulator.
- › Used UDP Socket communication to relay hardware sensor data - Accelerometer, gyroscope - to the main Unreal based simulator application. Utilised the Remote Procedure Call architecture.

Production Project

SIMULATED GAME ROOM | SOFTWARE ENGINEER

ZEN TECHNOLOGIES LIMITED






Programmed a C# application using the Microsoft Kinect to calculate the percentage body exposure of a trainee. This information was used to virtualise teams in different rooms in a game like scenario.

Research Project

SKILLS

Programming	C Family (C++(Proficient), C#(Proficient)), Python(Advanced)), Microsoft .NET, CUDA (Beginner)
DL Frameworks	PyTorch (Experienced), TensorFlow/Keras (Experienced)
Robotics	ROS, Lidar Range image construction, Camera-Lidar Calibration (Zhang's Method), Socket Communication (TCP/IP), Serial Media Communication
Third Party Libraries	OpenCV, PCL (Point Cloud Library), open3d, django
Miscellaneous	SVN, git, Unreal, Unity, Realty

RELEVANT MOOCS

2017	Machine Learning  link
2017	Neural Networks and Deep Learning  link
2017	Improving Deep Neural Networks : Hyperparameter tuning, Regularization and Optimization  link
2017	Convolutional Neural Networks  link
2017	Structuring Machine Learning Projects  link
2018	CS50 edX - audit
2019	Nand to Tetris Coursera - audit
2019	Algorithmic Design and Techniques edX - audit