

# Deepak Kumar Singh

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## RESEARCH INTERESTS

Computer Vision, Deep Learning, Machine Learning, Life-long/Continual/Incremental Learning, Open World Learning

## EDUCATION

- 2018-Present **International Institute of Information Technology (IIIT), Hyderabad**  
M.S. by Research, Computer Science and Engineering, CGPA : 7.33/10  
Advisor : Dr. C V Jawahar
- 2010-2014 **Visvesvaraya Technological University**  
BE, Computer Science and Engineering, CGPA : 7.33/10 (First Class with Distinction)

## PUBLICATIONS

- > **ORDER: Open World Object Detection on Road Scenes**  
Deepak Singh\*, Shyam Nandan Rai\*, Joseph K. J., Rohit Saluja, Vineeth N Balasubramanian, Chetan Arora, Anbumani Subramanian, C. V. Jawahar  
*Machine Learning for Autonomous Driving(ML4AD) Workshop, NeurIPS, 2021*
- > **Evaluation of Detection and Segmentation Tasks on Driving Datasets**  
Deepak Singh, Ameet Rahane, Ajoy Mondal, Anbumani Subramanian, C. V. Jawahar  
*International Conference on Computer Vision and Image Processing (CVIP), 2021 (Oral)*

## EXPERIENCE

- Present**  
**January 2019** Graduate Research Scholar, Center for Visual Information Technology(CVIT) Lab, IIIT-H
- > **Vision For Mobility and Safety**
    - > Explore problems present in the domain of Autonomous Driving and road scene datasets where the knowledge of computer vision can be leveraged.
    - > Formulated open world object detection for road scene scenarios.
  - > **iHub Data**
    - > Created benchmarks on various computer vision tasks on India Driving Datasets(IDD) and extended it to other publicly available road scene datasets.
- September 2016**  
**September 2014** Software Engineer, Celstream Systems Pvt. Ltd., Bangalore, India
- > Built the product's main UI Console on JavaScript environment for improved accessibility and reach.
  - > Developed modules using IgniteUI Library to create dynamic data-visualization modules.
  - > Developed data-adapters for live data-visualization modules.
  - > Implemented libraries for multiple custom window management.
  - > Migrated the in-house application from Adobe Flash environment to JavaScript environment.
  - > Developed REST APIs in Java.
- Java HTML5 JavaScript IgniteUI Adobe Flex REST APIs

## PROJECTS

### FORMULATING OPEN WORLD OBJECT DETECTION(Life-long Learning) [Paper](#) [Poster](#)

*Vision for Mobility and Safety, CVIT, IIIT Hyderabad*

August 2020 - October 2021

- First work that formulates open-world object detection on road scene datasets.
- Identify and address two inherent issues in road scene datasets: intra-class scale variation and high distribution of small objects. This improved the detection metric from 31.26 mAP to 37.62 mAP.
- Decreased the false detection of unknowns from 14738 to 3353 by improving the feature representation on unknowns.

PyTorch Detectron2

## BENCHMARKING COMPUTER VISION TASKS ON ROAD SCENE DATASETS [Paper](#) [Code](#)

iHub, CVIT, IIT Hyderabad

Jan 2019 - August 2021

- Evaluated various computer vision tasks such as object detection, semantic segmentation, and instance segmentation on Cityscapes, India Driving Dataset(IDD), Berkeley Deep Drive(BDD) datasets.
- Extended the benchmarking and analysis on road scene datasets from 7 to 30. This provides a compilation of results to compare while building future works.
- We also proposed future approaches to be taken by deeplearning models on road scene datasets for improved domain generalization and domain adaptation.

PyTorch Detectron2 mmdetection

## ORIENTED EDGE FORESTS FOR BOUNDARY DETECTION [Code](#)

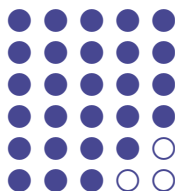
IIT Hyderabad

- Learns boundary detection based on a random forest classifier.
- Analyse local patches and outputs probability distributions over the space of oriented edges.
- The local predictions are calibrated and fused over an image pyramid to yield an oriented boundary map.

Python

## SKILLS

Python  
PyTorch, TensorFlow, fast.ai  
OpenCV, scikit-learn, SciPy  
NumPy, pandas  
C, Java  
Scripting, HTML, JS



## COURSE WORK

- > Computer Vision
- > Digital Image Processing
- > Statistical Methods in AI
- > Optimization Methods
- > Topics in Applied Optimization
- > Mobile Robotics

## RESPONSIBILITIES

<b>HPC Student Administrator</b>	Responsible for maintaining a smooth operation of 252 GPUs cluster using SLURM with various requirements of resource allocation policies, reservation policies, data storage, task management and day-to-day management of optimal usage of the cluster.
<b>CVIT Paper Reading Group</b>	Monthly paper discussions on popular papers, and also discussions on common Computer Vision and Machine Learning concepts, organized during 2019-2020.
<b>Moderator</b>	Moderated various keynote-speaker sessions during 5th Summer School on AI, 2021 at CVIT, IIT-H.
<b>Presenter</b>	Our work called "A Software Application to Navigate Using GPS and Google Maps" was one among the 425 selected projects across the entire state of Karnataka, and was sponsored by <b>Karnataka State Council for Science and Technology(KSCST), IISc, Bangalore</b> . It was presented at KLE Tech, Hubli, Karnataka in 2014.

## CO-CURRICULAR ACTIVITIES

<b>Marathon</b>	Winner in 5K winter marathon 2018.
<b>Volleyball</b>	Our team won the intramural PG volleyball 2018.