DISHANK BANSAL

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EDUCATION

Indian Institute of Technology (IIT) Kharagpur, India **Current CGPA: 8.24/10**
B.Tech. in Manufacturing Science and Engineering 2015 - 2019
Minor in Computer Science and Engineering

RESEARCH INTERESTS

Autonomous Robotics | Deep Learning | Computer Vision | Reinforcement Learning

PUBLICATIONS

Design, Analysis & Prototyping of a Semi-Automated Staircase-Climbing Rehabilitation Robot
Accepted at International Conference on Mechatronics and Robotics Engineering, France - 2018

RESEARCH EXPERIENCE

Autonomous Ground Vehicle (AGV) Research Group *Mar'16 - Present*
Guide: Prof. Debashish Chakravarty, Role: Research Assistant *IIT Kharagpur*

- Primarily developed the Perception and Controls module of lab's self-driving car and autonomous robot
- Carried out research to solve autonomous navigation challenges such as obstacle detection, road segmentation and traffic light detection using deep learning based models such as SegNet, YOLO, RCNN
- Built a CNN network derived from YOLO for object and traffic light detection, increasing the FPS by 10%
- Designed the ROS based embedded architecture which included Perception, Localization and Control Systems for lab's autonomous mobile robot which participated in Intelligent Ground Vehicle Competition 2016
- Working on implementation of Visual SLAM using monocular images, Sensor Integration and designing Control System for Mahindra E2O. Integrated CAN interface of Mahindra E2O with control unit and sensors

The Hi-Tech Robotic Systemz Ltd. *May'18 - Jul'18*
Guide: Gaurav Singh, Role: Deep Learning Research Intern *Gurugram, India*

- Developed a real-time image dehazing/defogging solution for autonomous vehicles for low end hardware
- Achieved 10X speed up than prior arts, runs at 200 FPS & 20 FPS on NVIDIA 1080 ti and Jetson TX1
- Increased the object detection accuracy by 65% in presence of dense fog using the designed GAN model
- Implemented 4 state-of-art image dehazing papers in tensorflow, creating open-source dehazing model zoo
- Created a synthetic foggy image dataset for Indian road scenes from clear images and depth maps

Bachelor's Project: Reinforcement Learning for Autonomous Vehicles *Aug'18 - Present*

- Modeled driving as RL problem employing suitable reward, state and action space.
- Agent used actor-critic network for deciding policy, along with Ornstein-Uhlenbeck method for exploration
- Formulated the problem for multiple vehicles using multi-agent reinforcement learning and game theory.

PROJECT EXPERIENCES

SKALA: A semi-autonomous stair climbing mobile robot *Jan'17 - Mar'17*

- Won Gold at Inter-Hall Hardware Modelling Competition at IIT Kharagpur 2017
- Built a large-scale stair-climbing robot to carry physically-challenged people, also being able to move on floors with capability to autonomously navigate through the mapped rooms while avoiding obstacles
- Developed vision based navigation package having real time object-tracking and obstacle avoidance
- Came up with Embedded Design of the bot which included control of actuators, EEG signal based control, voice control and touch interface

Deep Visual Odometry *May'17 - Jul'17*
Guide:- Prof. Debdoot Sheet, IIT Kharagpur

- Carried out research to evolve a deep learning based Visual Odometry pipeline to find Ego-Motion of a robot using successive images from a monocular camera
- Established model comprised of two parallel convolutional network in series with a recurrent network. Worked with specific models such as AlexNet, VGG-16 and LSTM

AF GAN: Auto focus foreground objects *Oct'17 - Dec'17*

- Focus the foreground objects in an image using GAN based network architecture
- GAN is used to predict depth map of image, depth map used as prior to focus object using other GAN network. The average SSIM for focused object measured to be 0.96.

Handwritten to Digital Text Conversion *Aug'16 - Nov'16*

- Developed an application which converts handwritten text to a digital document using deep learning, image processing, and python based GUI. The method worked with classification accuracy of 96%.
- Adaptive thresholding, Denoising and Histogram Analysis were executed on the handwritten text image to segment paragraphs into letters. Used deep neural network for letter classification into alphabets.

TECHNICAL SKILLS

Programming Languages	Python | C++ | C | Javascript | HTML | CSS
Deep Learning Frameworks	TensorFlow | PyTorch | Keras
Environments and Libraries	ROS | OpenCV | OpenMVG | MATLAB | Git
Sensors and Processing Units	3D LIDAR | Stereo Camera | Raspberry Pi | Arduino | CAN Bus

RELEVANT COURSEWORK

Robotics: Machine Learning · Artificial Intelligence · Adv. Digital Image Processing and Computer Vision · Deep Learning · Robots and Computer Controlled Machines · Electric Vehicles · Systems and Control · Reinforcement Learning by David Silver · Basic Electronics
Computer Science: Algorithms-I · Programming & Data Structures · Probability & Statistics ·

AWARDS & ACHIEVEMENTS

- Selected for **KVPY Fellowship Award** by Department of Science and Technology, India. *Apr'15*
  Securing All India Rank of 927 out of 50,000+ aspirants across India
- Ranked amongst the **top 2%** of 1.5 million students who appeared for JEE Advanced Examination. *Jun'15*
  (JEE Advanced is one of the world's toughest exam for entrance into India's premier engineering institutes)

COMPETITIONS

- Secured **2nd position** in autonomous navigation challenge at Intelligent Ground Vehicle Competition *Jun'18*
- Won **Gold** at Inter Hall Hardware Modelling Competition 2017, IIT Kharagpur. See SKALA *Mar'17*
- Won **Gold** at Inter Hall Data Analytics Competition 2017, our model analyzed the competitive strengths of three ATM providers in California *Feb'17*
- Won **Silver** at Open IIT Product Design Competition, IIT Kharagpur. Designed a product which converts hand gestures of voice disabled person to corresponding voice output *Aug'15*

WRITINGS

Pitfalls of Batch Norm in TensorFlow and Sanity Checks for Training Networks *Jul'18*
Reads: 2.2 Thousand, Views: 6.3 Thousand

EXTRA-CURRICULAR

- Maintain a tutorial blog on topics of Deep Learning, Computer Vision and Robotics.
- Conducted web development workshops as a member of educational service start up Edu Spectrum