KHUSHDEEP SINGH

Machine Learning & Data Science Engineer

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🐙 ksm26   R^G Khushdeep_Singh_Mann   👤 Khushdeep Singh

EXPERIENCE

Research and Development Engineer

INRIA

📅 Apr'21 - Present   📍 Grenoble, France

- Project 1: Developed spatio-temporal prediction network (LSTMs) pipeline for accurately forecasting future occupancy in dynamic urban environments, predicting 3-sec horizon, and releasing valuable occupancy grid dataset for research advancement. (IV'22)
  code, *video*, *website*
- Project 2: Designed a robust sensor fusion model combining event-based and frame-based cameras, to enhance object detection in challenging conditions, surpassing frame-based and event-based detections, with over 30% improvement in robustness to image corruptions, validated on the publicly released DSEC dataset. (ICRA'22)
  code, *video*, *presentation*
- Project 3: Deployment of 3D object detection and tracking module in ROS and TensorRT for test vehicle demonstration. Developed and deployed modules for closed-loop planning and trajectory generation, leveraging scalable machine learning solutions.
- Project 4: Tested model-free deep reinforcement learning algorithms in complex urban traffic scenarios using Carla simulator. Utilized variational auto-encoder (VAE) for dimensionality reduction.
- Project 5: Validated deep learning perception models in autonomous vehicles as part of *PRISSMA* project.

Master Thesis: SSL based Deep RL

AI research Centre, University of Tübingen

📅 July'20 - Jan'21   📍 Tübingen, Germany

- Investigated RL agents' response to morphological distribution shifts, specifically limb perturbations, in PyBullet-M setup. (ICLR'21 Workshop SSL-RL) *paper*, *Thesis*

Assistant: Autonomous Driving Hardware Testing

Forschungszentrum Informatik (FZI)

📅 Feb- May 2020   📍 Berlin, Germany

- Conducted hardware testing for a toy autonomous driving vehicle utilizing a single camera sensor to collect and transmit data, followed by data analysis and training of neural networks for object detection.

Internship: Low cost Manipulator

University of Plymouth

📅 May-July 2016   📍 Plymouth, United Kingdom

EDUCATION

M.Sc. *EIT Digital Autonomous Systems*

KTH Royal Institute of Technology, Sweden
Technische Universität Berlin, Germany

📅 Sept'18 – Jan'21   📍 Berlin, Stockholm

- Courses: Deep learning, machine learning, Object-oriented programming.

B.Tech. in Electronics Engineering

Visvesvaraya National Institute of Technology (VNIT)

📅 Sept'13 – May'17   📍 Nagpur, India

SKILLS

Data Science: PyTorch, Pandas, Numpy, ETL, ELT, ML (scikit-learn)
ML Deployment: ONNX, TensorRT SDK
Autonomous Driving: CARLA, Data engineering on KITTI, nuScenes, Argoverse datasets
Computer Vision: OpenCV
GPU accelerated software: CUDA
NLP: Generating AI prompts and reducing debugging time by 30% using *ChatGPT* LLMs.
Basics: Recommender Systems, SQL, MLOps

Programming: C++, Python, Embedded C
Productivity tools: MS Office, LaTeX, Visual Studio Code, PyCharm
CI/CD tools: GitHub Copilot, GitLab
Containerization tools: Docker
Cloud computing services: Google Colab
Project management: Slack, Notion

Robotics Software: ROS

SERVICE

- 🧍 **Co-founder of *IvLabs* Robotics org.**
  Key catalyst in Expanding the Organization into a thriving community of 100+ members in AI and Robotics.
  - Dynamic Governance and Inspirational Leadership
  - Strategic Fundraising and Efficient Management

- Developed an affordable teleoperated mobile manipulator under £2000, supporting up to 2kg payload, fostering community collaboration through shared design, influenced by feedback from a college for disabled young people. *website*

PROJECTS

Simulation: Autonomous warehousing system

DAI-Labor, TU Berlin

📅 Oct'19- Feb'20　　　　📍 Berlin, Germany

- Simulated a multi-agent robotic system in an industrial environment, focused on fetching and storing packages, with contributions including the development of motion planning and obstacle detection nodes. *video*

Development: Robotics

Visvesvaraya National Institute of Technology

📅 Sept'14- Apr'17　　　　📍 Nagpur, India

- **Bachelor's Thesis** Snake robot reconfigurable into Quad copter (Hybrid Robot) - imparting flying properties to a snake robot *video*
- Design and Control of Quad copter capable of doing standard maneuvers *video*
- Development of five fingered robotic hand suitable for sign language demonstrations and in-hand manipulation *video*
- Design and control of Biped robot capable of walking with six degrees-of-freedom *video*

PATENT

Hybrid Robot

Visvesvaraya National Institute of Technology

📅 June 2017　　　　📍 Nagpur, India

- Under review- Indian patent application number 201721020615

PUBLICATIONS

- Predicting Future Occupancy Grids in Dynamic Environment with Spatio-Temporal Learning was published at the 2022 IEEE Intelligent Vehicles Symposium (IV) *paper*
- Fusing Event-based and RGB camera for Robust Object Detection in Adverse Conditions was published at the 2022 IEEE International Conference on Robotics and Automation (ICRA) *paper*
- Out-of-distribution generalization of internal models is correlated with reward was published at ICLR 2021 Workshop SSL-RL *paper*
- An Open-Source Tele-Operated Mobile Manipulator: CHAP V1 was published at 2017 TAROS conference *paper*
- Design Analysis and Development of Low Cost Under actuated Robotic Hand was published at 2016 IEEE ROBIO International Conference *paper*
- **Master's Thesis**: Evaluating and Improving Robustness in Reinforcement Learning using Self-Supervised Representation Learning *Thesis*

🔴 **Academic**
Reviewer for IV'22, IROS'22.

🏆 **Meeting of National Innovation Club**
Invited twice to President's House of India for presentation of Robotic hand and Hybrid robot

🏆 **Excellence Award**
Innovative robotic projects at IvLabs, VNIT

REFEREES

Prof. Christian Laugier
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✉ Research Director: team CHROMA | Emeritus INRIA Grenoble Rhône-Alpes, France

Prof. Shital Chiddarwar
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✉ Associate Professor, FMS and Robotics Laboratory Department of Mechanical Engineering