Shuhang Tan

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Education

Rensselaer Polytechnic Institute(RPI) Troy, NY, USA

Ph.D. Student *August 2023 - Now*

- Advisor: Radoslav Ivanov
- Research interest: RL, Autonomy vehicle, AI
- Major classes: Reinforcement learning, Computational linear algebra, Programming language

University of Science and Technology of China(USTC) Hefei, Anhui, China

Master of Computer Technology *September 2020 - June 2023*

- GPA: 3.76/4.3
- **Award:** Master First Class Scholarship of USTC (2020,2021), Master Second Class Scholarship of USTC (2022)
- **Master thesis**: Risk Assessment Method Based on Driving Safety Field Model for Autonomous Vehicles

China University of Mining and Technology(CUMT) Xuzhou, Jiangsu, China

Bachelor of Electrical Engineering and Automation *September, 2016 - June, 2020*

- GPA: 4.12/5.0
- **Award:** Second Class Scholarship of CUMT (2019)

University of Wisconsin Madison Madison, WI, USA

Exchanged in Electrical Engineering *August, 2017 - May, 2018*

- GPA: 3.88/4.0

Academic Research Projects

3D Object Detection Model Research for Real Autonomous Vehicle (AV) System

September 2022 – December 2023

- **Technologies used**: C++,Python,ROS,Ubuntu18.04
- 1. Research SOTA 3D detection models and reproduced them;
  2. Change the model input to our lab own data, test the model performance;
  3. Using 3D LiDAR label tool to build our own dataset, and research multi-LiDAR fusion algorithms;
  4. Research on DL model deployment method on AV system, and set up the DL object detection model framework on the system.

A Quantification Risk Assessment Method Based on Driving Safety Field Model for AV

September 2021 – June 2022

- https://github.com/SH-Tan/AV_risk_model
- **Technologies used**: C++,Python,ROS,Ubuntu18.04,Matlab
- **Paper under review**: RCP-RF: A Comprehensive Road-car-pedestrian Risk Management Framework based on Driving Risk Potential Field
- 1. The proposed model considers the different characteristics of obstacles such as road structure, lane lines, vehicles and pedestrians, and adopts different mathematical models to construct risk models respectively;
  2. Compared with the previous works, the model algorithm estimated the relative motion trend between the ego and the obstacle car using cosine similarity to adjust the risk distribution;
  3. The CCDF probability curve was used to evaluate the risk relationship of each obstacle, total time complexity can be limited to $O(n^2)$.

3D Object Detection Research for Small Objects March 2021 – August 2021

- https://github.com/SH-Tan/voxel-rangenet
- **Technologies used**: Python, ROS, Ubuntu, Pytorch, OpenPCDet, KITTI3D
- **Goal**: To improve the detection accuracy of small targets such as pedestrians and bicycles in LiDAR point clouds.
- 1. Main references: Voxel-RCNN, Centerpoint, and RangeRCNN.
  2. Investigated the main point cloud object detection algorithms, the main way of point cloud feature expression.
  3. Test the voxelRCNN using Centerpoint head, pedestrian accuracy can be improved;
  4. Reproduced the backbone in RangeRCNN, combined the range and voxel feature in one network to improve the accuracy of small object.

Publications (Selected)

CMSG: Cross-Media Semantic-Graph Feature Matching Algorithm for Autonomous Vehicle Relocalization

- **Shuhang Tan**, Hengyu Liu, Zhiling Wang
- 2023 International Symposium on Intelligent Robotics and Systems (ISoIRS 2023)

RCP-RF: A Comprehensive Road-car-pedestrian Risk Management Framework based on Driving Risk Potential Field

- **Shuhang Tan**, Zhiling Wang, Yan Zhong
- Submitted to: IET Intelligent Transport Systems

A Fast and High-Performance Object Proposal Method for Vision Sensors: Application to Object Detection

- Chao Jiang, Zhiling Wang, , Huawei Liang, **Shuhang Tan**
- DOI: 10.1109/JSEN.2022.3155232

Community & Leadership

Paper Review Experience August 2023 – Now

Ph.D. student *RPI, USA*

- Journal: IET Intelligent Transport Systems
- Journal: IEEE Transactions on Intelligent Vehicles

Microsoft Learn Student Ambassadors (MLSA) November 2021 – June 2023

MLSA *China*

- Participate in quarterly social impact project from January 2022 to April 2022. Top one of 15 teams. https://github.com/vanshu25/Sanchaar

Internship

TA: Data Structure Fall 2023 August 2023 – Now

Morgan Stanley July 2022 – Sep 2022

- 2022 summer Tech intern IST department
- **Technologies used**: Angular, typescript, java..
- 1. Goal: building an onshore workbench for ITs to revise and modify the trade data, including a UI for criteria filter and id mapping display, and and backend about database interaction;
  2. Use the Ag Grid framework to edit table cells, and adjust other functions such as theme and popover;
  3. Learn Java and Spring, realize simple get and put API.

Engineering Projects

LiDar point clouds clustering optimization and target recognition algorithm design for autonomous driving

- May 2022 – Aug 2022
- **Technologies used**: C++, git, cmake, ROS, Ubuntu18.04
- 1. Learned code standardization, extracted and reconstructed laboratory codes of original point cloud clustering and Boundingbox calculation;
  2. To improve the performance of cloud clustering, 3D NMS module is added after the original Scaneline algorithm to filter out redundant boxes;
  3. Combined with high-precision map, the road ROI is extracted, and the point cloud of obstacles on the road is clustered;
  4. Reconstruct BoundingBox algorithm refers to Baidu's algorithm, and transplants it to adapt the input and output interface of our own code.

Technical Skills

Languages: Python, C/C++, Latex, Matlab, Typescript, Java, Scala, Haskell, SALSA
Technologies: Ubuntu, ROS, Pytorch, git, docker