Yupeng HAN

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Education

Purdue University, West Lafayette, IN, USA *Aug. 2016 - Dec. 2018*

Master of Science, Mechanical Engineering | GPA: **3.96**/4.0

Exchange Student, Mechanical Engineering | GPA: 3.85/4.0

- Courses: AI(A+), Algorithm Design(A), Robotic Manipulation(A), Statistical Methods(A+), Data Mining(A-), Programming in C(A).

Shanghai Jiao Tong University, Tsien Hsue-Shen Honor Program, Shanghai, China *Aug. 2013 - Jun. 2017*

Bachelor of Science, Mechanical Engineering | GPA: 3.75/4.30 (Top 15%)

- Received waiver for the National College Entrance Exam to enter SJTU, as 1st Prize in National Math Olympic (Jilin Area, top 0.01%)

Professional Experience

Robotics Institute, Carnegie Mellon University | Research Staff, Pittsburgh, PA *Oct. 2019 - Present*

Deptrum Co.Ltd. | Intern Computer Vision Engineer, Shanghai, China *Apr. 2019 - Jul. 2019*

Mechanical Eng Department, Purdue University | Teaching Assistant, West Lafayette, IN *Jan. 2018 - May. 2018*

Robert Bosch GmbH | Intern Mechanical Engineer, Shanghai, China *Jun. 2017 - Aug. 2017*

Publications & Patents

- **Yupeng Han**, Sandip Aine and Maxim Likhachev, "Real-time 3D Perception via Search for Vehicle Detection with No Pose Annotated Training Data." Submitted to *International Conference on Robotics and Automation (ICRA) 2021*.
- Aditya Agarwal, **Yupeng Han**, Maxim Likhachev, "PERCH 2.0: Fast and Accurate GPU-based Perception via Search for Object Pose Estimation." Published on *International Conference on Intelligent Robots and Systems (IROS) 2020*.
- Joseph. D. Thekinen, **Yupeng Han**, Jitesh H. Panchal, "Designing market thickness and optimal frequency of multi-period stable matching in CBDM." *ASME International Design Engineering Technical Conferences (IDETC) 2018*.
- **Yupeng Han**, Yexiang Xue, "Data-aware Algorithm to Solve Discrete Integration by Parity Constraints." In Manuscript.
- "Small Household Dumpling Machine," *China Innovation Patent, Patent No.CN105724504B*.

Research Experience

Outdoor 3D Vehicle Detection | Research Assistant *Nov. 2019 - Oct.2020*

Search-Based Planning Lab, Robotics Institute, Carnegie Mellon University Advisor: **Prof. Maxim Likhachev**

- Proposed Vehicle-PERCH, a novel 3D vehicle detection framework that can detect vehicle 3D pose through an analysis-by-synthesis manner. The algorithm effectively integrates 2D and 3D information, thus provides ***REAL-TIME*** capability.
- Applied unsupervised clustering method (Gaussian mixture models) to separate vehicles into twelve categories based on vehicle size information, then constructed a dozen vehicle 3D models (microcar, sedan, compact car, SUV, etc.).
- Experimented on the KITTI dataset. The results show that Vehicle-PERCH achieves ***ON PAR*** 3D detection & localization performance with the state-of-the-art learning-based methods, ***WITHOUT*** using 3D pose annotation data.

Indoor Object 6-DOF Pose Estimation | Research Assistant *Jan. 2020 - Mar. 2020*

Search-Based Planning Lab, Robotics Institute, Carnegie Mellon University Advisor: **Prof. Maxim Likhachev**

- Studied Perception Via Search (PERCH) is a class of algorithms that is first rendering scenes with different object poses, then search for the best explanation of the observed scene in the space of possible rendered scenes, thus predict the object pose while accounting for occlusion.
- Tested on the open dataset (YCB), results show that our algorithm ***SURPASSES*** state-of-the-art 6-DOF pose estimation methods with remarkable margins without need for any ground truth pose annotations.

2D and 3D Feature Fusion | Research Assistant *Jul. 2019 - Oct. 2019*

CS Department, Machine Vision and Intelligence Group, SJTU Advisor: **Prof. Cewu Lu**

- Explored 3D detection in multi-scale objects using a single model; generated ideas to strengthen the 3D point cloud and extracted features by utilizing 2D RGB extracted features and dynamic anchor boxes' size determined by 2D images.

- Built the fusion network pipeline, including extracting different features from point clouds and RGB images, transforming 2D information to 3D proposal boxes, cropped key points, and their 3D features inside the proposal boxes, concatenated 3D features with 2D features, and performed post-processing.

Data-Aware Algorithm to Solve Discrete Integration | Research Assistant *Aug. 2018 - Feb. 2019*
CS Department, Purdue University Advisor: **Prof. Yexiang Xue**

- Inspired by "Taming the Curse of Dimensionality: Discrete Integration by Hashing and Optimization," proposed a data-aware strategy to reduce the amount of computation by adjusting the sequence of steps in the algorithm.
- Proved that the adaptive strategy could reduce computation expectation without affecting the accuracy of the estimation results.

Modeling and Analysis of Complex System | Research Assistant *Aug. 2017 - May. 2018*
ME Department, DELP Lab, Purdue University Advisor: **Prof. Jitesh Panchal**

- Developed a stable matching system that matches the service seekers and service providers based on the utility theory.
- Studied the optimal matching frequency in line with different groups' interests in the system, where the service seekers arrive with a Poisson process; a fixed number of service providers offering resources; service providers can only serve one service-seeker at a time.

Project Experience

Face Detection on Depth Image | Intern Computer Vision Engineer *Apr. 2019 - Jul. 2019*
Face Detection Group, Deptrum Co. Ltd., Supervisor: Dr. Bo Wang (CTO, Stanford Ph.D. in EE)

- Independently developed a modified version of the multi-task cascade CNN based on Caffe and Python from scripts, which solved the problem of face detection on depth images; Obtained ***99.93% PRECISION*** and over ***97% RECALL***.
- Received the invitation of ***RETURN OFFER*** to work as a Computer Vision Engineer.

Ego-Splitting Framework Re-Accomplishment in Julia | Individual Project *Jun. 2018 - Aug. 2018*
Department of Computer Science, Summer Research Program, Purdue University

- Re-accomplished the Ego-splitting framework, which can reduce the overlapping clustering problem to a non-overlapping partitioning problem, in Julia. My implementation could handle a large graph (millions of edges) within 10 minutes.

Toxic Molecule Prediction | Individual Project *Apr. 2018 - May. 2018*
Department of Computer Science, Course CS57300 Data Mining, Purdue University

- Obtained a satisfying performance (over 84% accuracy on the unseen testing dataset, which is three times larger than the training dataset) of whether a molecule is toxic based on feature integration and data preprocessing on limited training data.

Database Design | Individual Project *Nov. 2017 - Dec. 2017*
Department of Electrical and Computer Engineering, Course ECE56200 Data Management, Purdue University

- Developed a database management system for the hospital to better manage and organize patients, doctors, equipment and rooms.

Autonomous Tennis Ball Collector | Member in Charge of Vision *Jan. 2017 - May. 2017*
Department of Mechanical Engineering, Course ME58800 Mechatronics, Purdue University

- Designed and manufactured a fully autonomous robot that could retrieve multiple randomly located tennis balls and put the tennis balls back in a randomly located container.
- Applied OpenCV to locate and track the tennis balls, randomly located containers, based on color and outline shape.

Selected Honors

- **The First Prize of National College Students Technology Contest** (Ranking 32/3600 in China) *Aug. 2014*
- **ZF Friedrichshafen AG Scholarship**, Shanghai Jiao Tong University (Top 3%). *Oct. 2014*
- **Merit Student**, Shanghai Jiao Tong University (Top 3%) *Sep. 2015*
- **ELE Scholarship**, Shanghai Jiao Tong University (Top 5%) *Oct. 2015*
- **Student Leader**, Shanghai Jiao Tong University (Top 2%) *Apr. 2016*
- **Outstanding Individual of Shanghai Jiao Tong University** (Top 1%) [Pressed by SJTU Academic News Website] *Jun. 2016*
- **Excellent Student Scholarship**, Shanghai Jiao Tong University (Top 10%) *Oct. 2016*
- **Dean's List and Semester Honors**, Purdue University *Fall 2017, Spring 2018, Fall 2018*

Technical Skills

- Programming Languages: C++/C, Python, CUDA, Pytorch, Caffe, MATLAB, SQL.
- Technical Capabilities: RGB-D Perception, Parallel Computing, Algorithm Optimization, Data Analysis, Graphics Rendering.
- Other Skills: English (proficient), Chinese (native), LaTeX, Video Production.