

Yupeng HAN

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EDUCATION

Purdue University

West Lafayette, IN, USA

■ *M.Sc in Mechanical Engineering* | GPA: **3.96/4.0**

Aug. 2017 - Dec. 2018

■ *ES in Mechanical Engineering* | GPA: 3.85/4.0

Aug. 2016 - May. 2017

- Courses: AI (A+), Algorithm (A), Robotic (A), Statistical Methods (A+), Data Mining (A-), Programming in C (A).
- Dean's List and Semester Honors (All Semesters).

Shanghai Jiao Tong University, Tsien Hsue-Shen Honor Program

Shanghai, China

■ *B.Sc in Mechanical Engineering* | GPA: 3.75/4.30 (Top 15%)

Aug. 2013 - Jun. 2017

- Received waiver for the National College Entrance Exam, as 1st Prize in National Math Olympic (Jilin Area, top 0.01%).
- Outstanding Individual of Shanghai Jiao Tong University (Top 1%) [[Pressed by SJTU Academic News Website](#)].
- The First Prize of National College Students Technology Contest (Ranking 32/3600 in China).
- Scholarships: ZF Friedrichshafen AG Scholarship(2014), ELE Scholarship(2015), Excellent Student Scholarship(2016).
- Honors: Merit Student of SJTU, Outstanding Student Leader of SJTU, 2nd Place in Shanghai Campus Soccer Cup.

PUBLICATIONS & PATENTS

[1] **Y Han**, S Aine and M Likhachev, "Real-time Indoor Object 6-DOF Pose Estimation Based on Occlusion Reasoning." In preparation for *International Conference on Intelligent Robots and Systems (IROS) 2021*.

[2] **Y Han**, S Aine and M 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*.

[3] A Agarwal, **Y Han**, M 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*.

[4] J. Thekinen, **Y Han**, J. Panchal, "Designing market thickness and optimal frequency of multi-period stable matching in CBDM." Published on *ASME International Design Engineering Technical Conferences (IDETC) 2018*.

[5] **Y Han**, Y Xue, "Data-aware Algorithm to Solve Discrete Integration by Parity Constraints." In manuscript.

[6] "Small Household Dumpling Machine," *China Innovation Patent*, Patent No.CN105724504B.

RESEARCH EXPERIENCE

Research Assistant (RA), Search-based Planning Lab

Robotics Institute, Carnegie Mellon University

Advisor: Prof. Maxim Likhachev (Associate Professor, School of Computer Science, Carnegie Mellon University)

■ Object 6-DOF Pose Estimation Based on Occlusion Reasoning (I1)

Nov. 2020 – Present

- Estimated indoor object poses by considering occlusion while maintaining **REAL-TIME** performance.
- Combined observed depth image with the ray-marching algorithm to accelerate rendering speed.

■ Outdoor 3D Vehicle Detection (J2)

Nov. 2019 - Oct.2020

- 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 (J3)

Nov. 2019 - Oct.2020

- 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.

■ **Modeling and Analysis of Complex System (J4I)**

Aug. 2017 - May. 2018

- 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.

PROJECTS

■ **2D and 3D Feature Fusion**

Fall 2019

- 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.

■ **Face Detection on Depth Image**

Spring 2019

- 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.

■ **Data-Aware Algorithm to Solve Discrete Integration (J5I)**

Fall 2018

- 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.

■ **Ego-Splitting Framework Re-Accomplishment in Julia**

Summer 2018

- 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**

Spring 2018

- 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**

Fall 2017

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

■ **Autonomous Tennis Ball Collector**

Spring 2017

- 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.

TEACHING EXPERIENCE

Graduate Teaching Assistant (GTA), ME Department, Purdue University

Jan. 2018 - May. 2018

Lecture: Prof. Gordon R. Pennock (*Associate Professor, School of Mechanical Engineering, Purdue University*)

■ **ME45200 Senior Machine Design**

- Constructed and Graded assignments and exams to facilitate materials covered in class.
- Held office hours to answer questions to increase understanding of mechanical design concepts.

TECHNICAL SKILLS

■ **Programming Skills:** C++/C, Python, CUDA, PyTorch, Caffe, MATLAB, SQL.

■ **Technical Capabilities:** RGB-D Perception, Object Detection, Pose Estimation, Parallel Computing, Algorithm Optimization, Data Analysis, Graphics Rendering.

■ **Other Skills:** English (proficient), Chinese (native), LaTeX, Video Production.

■ **Standardized Tests:** GRE: 324 (V155-Q169), TOEFL: 104 (R28-L27-S25-W24).