Yang Yang

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Education

Doctor of Philosophy, Computer Science *Expected 12/2021*
University of Minnesota (UMN), Minneapolis
Advisor: Changhyun Choi and Hyun Soo Park
Dissertation: Target-Driven Robotic Manipulation with Visual Attribute Reasoning
GPA: 3.94/4.0

Graduate student, Engineering Thermophysics *2015 - 2016*
Tsinghua University (THU), Beijing, China

Bachelor of Engineering, Energy and Power Engineering *2011 - 2015*
Huazhong University of Science and Technology (HUST), Wuhan, China
GPA: 91.4/100

Skills & Courses

Programming: **Python**, Matlab, C/C++, CMake, Linux, Bash, Git, SQL, Docker, LaTeX
Machine Learning: PyTorch, Tensorflow, Keras, scikit-learn, PyTorch Geometric, Ray, Spacy
Robotics: OpenCV, Open3D, PCL, ROS, Gym, MuJoCo, V-REP
Courses: Statistical and Deep Learning, Reinforcement Learning, Computer Vision, Natural Language Processing, Convex and Nonlinear Optimization, Operating Systems, Sensing and Estimation
Model Implementations: CNNs, RNNs, GNNs, Transformer, Classifier with BERT, Model-Free RL, POMDP, SVM, AdaBoost, Structure from Motion, visual tracking and mapping (SLAM), etc

Experience

Mitsubishi Electric Research Laboratories, Cambridge, MA *05/2020 - 08/2020*
Research Intern, Host: Dr. Siddarth Jain

- Developed deep reinforcement learning (RL) algorithms for contact-rich robotic manipulation
- Built a hierarchical RL-based policy of deep Q-learning (DQN) and soft actor-critic (SAC) models
- Applied a graph neural network (GNN) based visual state encoder (**GNN, deep reinforcement learning, computer vision**)

Google, Mountain View, CA *07/2018 - 08/2018*
Visual-Inertial System Engineer (contractor), Host: Dr. Stergios Roumeliotis

- Built a visual tracking and mapping (SLAM) system for Phone-based AR
- Wrote a C++ visual RANSAC library for camera pose estimation
- Implemented an image selection algorithm based on multiple RANSAC's (**3D computer vision, SLAM, C++**)

Choice Robotics Lab, Minneapolis, MN *02/2019 - Present*
Research Assistant, Advisor: Dr. Changhyun Choi

- Developed an interactive robotic grasping system with vision-and-language reasoning
- Investigated self-supervised deep learning for robotic perception and manipulation
- Proposed a deep RL-based approach to target-driven manipulations (**robot learning, deep reinforcement learning, natural language processing**)

Multiple Autonomous Robotic Systems Lab, Minneapolis, MN *09/2016 - 01/2019*
Research Assistant, Advisor: Dr. Stergios Roumeliotis

- Proposed a convex optimization-based approach for UAV motion planning
- Developed an attitude tracking system for gyro-less mobile devices
- Implemented a laser-based localization and mapping system with extended Kalman filter and

C++ (**robotics, SLAM, optimization**)

Selected Projects

One-Shot Target Object Detection

- Adapted Mask R-CNN to perform category-agnostic instance segmentation on RGB-D images; achieving 0.763 AP (Fine-tuned Mask R-CNN baseline: 0.385 AP)
- Implemented a Siamese Network trained with triplet loss for target template matching
- Visualized activation maps and t-SNE clustering for analysis (**CNN, object detection, metric learning, Tensorflow**)

Referring Expression Comprehension and Generation

- Fine-tuned Visual-Linguistic BERT on RefCOCO dataset to localize a language-referred image region; achieving 0.874 accuracy (SOTA performance: 0.886)
- Built a language generator to generate referring captions for the image region
- Experimented with different models (LSTM, GRU, Transformer) for image captioning; achieving 1.33 CIDEr score (**BERT, Transformer, RNN, natural language processing, PyTorch**)

Single-View Depth Prediction

- Built a fully convolutional Encoder-Decoder to predict depth from a single RGB image
- Trained the network by minimizing both the depth and surface normal consistency errors
- Experimented with different models (Feature Pyramid Network, Ordinal Regression Network, etc) on ScanNet dataset; achieving 0.21m MAE (**CNN, 3D computer vision, PyTorch**)

Publications

Yang Yang, Xibai Lou, Changhyun Choi, "Interactive Robotic Grasping with Attribute-Guided Disambiguation", under review [website]

Xibai Lou, **Yang Yang**, Changhyun Choi, "Learning Object Relations with Graph Neural Networks for Target-Driven Grasping in Dense Clutter", under review [website]

Yang Yang, Yuanhao Liu, Hengyue Liang, Xibai Lou, Changhyun Choi, "Attribute-Based Robotic Grasping with One-Grasp Adaptation", IEEE International Conference on Robotics and Automation (ICRA), 2021 [PDF, website]

Xibai Lou, **Yang Yang**, Changhyun Choi, "Collision-Aware Target-Driven Object Grasping in Constrained Environments", IEEE International Conference on Robotics and Automation (ICRA), 2021 [PDF]

Hengyue Liang, Xibai Lou, **Yang Yang**, Changhyun Choi, "Learning Visual Affordances with Target-Orientated Deep Q-Network to Grasp Objects by Harnessing Environmental Fixtures", IEEE International Conference on Robotics and Automation (ICRA), 2021 [PDF, website]

Yang Yang, Hengyue Liang, Changhyun Choi, "A Deep Learning Approach to Grasping the Invisible", IEEE Robotics and Automation Letters (RA-L), 2020 [PDF, website, code]

Xibai Lou, **Yang Yang**, Changhyun Choi, "Learning to Generate 6-DoF Grasp Poses with Reachability Awareness", IEEE International Conference on Robotics and Automation (ICRA), 2020 [PDF, website]

Tien Do, Leo Neira, **Yang Yang**, Stergios I. Roumeliotis, "Attitude Tracking from a Camera and an Accelerometer on Gyro-less Devices", International Symposium on Robotics Research (ISRR), 2019 [PDF]

Honors & Awards

UMII-MnDRIVE Graduate Fellowship, UMN *2020*
Departmental Fellowship, UMN *2016*
Merit Student Scholarship, HUST *2012 - 2014*
National Scholarship, Ministry of Education of P.R. China *2012 - 2014*