# Yefan Zhou

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## EDUCATION BACKGROUND

**University of California Berkeley (UCB), CA** 01/2019 – 05/2019
Exchange Student | Overall GPA: 4.0 / 4.0

**Southeast University (SEU), P.R.China** 09/2016 - 06/2020
B.E. in Information Engineering | Overall GPA: 3.71/4.0 | Ranking: 7/43

**Coursework (Math & Software):** Multivariable Calculus | Probability, Statistics & Stochastic Processes | Linear Algebra | Differential Equations | Artificial Intelligence | C++/MATLAB Programming | Data Structures | Big Data in Python | Database System | Cloud Computing | Computational Structural in Data Science | Comprehensive Course Design of Computer Science | Information Security

**Coursework (Hardware):** Microcontrollers | Embedded Linux System | Control Theory | Signals & Systems | Computer Architecture | Robotic Manipulation and Interaction | Electromagnetism | Digital/Analog Circuits | Communication Principles | Microwave Engineering | Microcomputer System & Interfaces | Mechanical Graphing

## RESEARCH EXPERIENCE

**3D Object Reconstruction from a Single Image**
**Information Science and Engineering Lab, SEU | Advisor: Prof. L.X. Yang** 07/2019 - Present

- Leveraged NumPy and PyTorch in Python to build a deep neural network model for 3D point cloud reconstruction; trained the model based on ShapeNet.
- Derived a mathematical model for transformation from point cloud coordinate to image raster space.
- Further improved the reconstruction workflow based on point cloud perceptual loss function via pretrained encoder and the optimization of local geometric feature represented by k-nearest neighbors covariance.

**Robotics Exoskeleton and Humanoid Trajectory Planning**
**Human-Assistive Robotic Technologies Lab, UCB | Advisor: Prof. R. Bajcsy** 06/2019 - 09/2019

- Applied Minimum Angle Jerk Algorithm and Minimum Hand Jerk Algorithm to wearable Upper Limb exoskeleton so as to realize Cartesian Space and Joint Space Humanoid Trajectory Planning; implemented the design in MATLAB simulation and embedded board.
- Developed a low-level PD controller for Upper Limb exoskeleton gaze-based active assistance, allowing joint angle and end effector position/velocity control; enabled joint angle sensing based on encoders and motion actuation based on servo motors and linear actuators.
- Built in MATLAB a GUI for exoskeleton system, allowing simulation and 3D visualization of planning algorithm, controller parameter tuning, real time hardware control and data analysis.
- Employed SolidWorks and 3D printing to design and manufacture the mechanical parts.

**Research on an Image-Based Algorithm for Automatic Detection of Wafer Surface Defect**
**Zhejiang University | Advisor: Dr. Z.Y. Yu** 09/2018 - 12/2018

- Designed an online detection and adaptive recognition model for automatic detection of wafer surface defect, covering
  - Employed OpenCV to preprocess wafer images.
  - Constructed Hidden Markov Model (HMM) for each normal and defective mode based on an optimized feature set.
  - Leveraged HMM dynamic integration for online detection and recognition.
  - Validated the model based on WM-811K database.
- A first-author paper: Yefan Zhou, "Research on Image-Based Automatic Wafer Surface Defect Detection Algorithm," Journal of Image and Graphics, Vol. 7, No. 1, pp. 26-31, March 2019. doi: 10.18178/joig.7.1.26-31

**Design and Implementation of a Software for Detecting Loose Nuts at Gezhouba Dam**
**Information Science and Engineering Lab, SEU | Advisor: Prof. L.X. Yang** 07/2018 - 08/2018

- Leveraged OpenCV and a field camera to build an image acquisition and preprocessing system, focusing on 1) denoising based on fuzzy, median and Gaussian filters and 2) foreground segmentation based on Gaussian mixture model, 3) object extraction based on Hough transform
- Built, trained and validated in Python a Region-based Fully Convolutional Networks (R-FCN) model for detecting the state of loose nuts for safety inspection purposes.
- Built in PyQt a GUI, allowing interactive and intuitive software control and result visualization.

**SEU Mathematical Modeling Contest** 05/2018

- Built a mathematical model in MATLAB, SPSS and Excel to characterize the current status and predict the future growth of taxi services market in China's city of Nanjing, covering logistic population dynamics model, grey system theory, network time series modeling, and control variable method.
- Proposed, based on analysis, a suite of recommendations for improving taxi market; garnered the 1st Prize.

## COURSE PROJECTS

***Robotic Manipulation and Interaction Course Projects*, UCB | Instructor: Prof. R. Bajcsy** 01/2019 - 05/2019

- Systematically studied robotic dynamics, grasping and manipulation, covering kinematics, dynamics, and control of robot manipulators, robotic vision, soft robotics and sensing, and multi-robot and robot-human interaction:
- **Project I**: Implemented closed-loop PD control on Baxter for trajectory tracking, and compared with the default controller, covering workspace/joint-space velocity, and joint-space torque control.
- **Project II**: Grasp planning with Baxter and Sawyer, focusing on object detection, stable grasp planning, motion planning, closing of grippers, and lifting
- **Project III**: Developed controllers for a 2nd order nonholonomic system based on 1) Lie algebra and 2) steering with sinusoids method for more efficient open loop control.
- **Project IV**: Conducted system identification of a soft robotic finger, followed by sensor calibration and parameter fitting to static/dynamics data for modeling the finger.
- **Final project:** Built and experimentally characterized a soft fingertip device based on pneumatic sealed soft silicone material and a depth camera as an add-on to the Baxter robot for scanning a 3D terrain and measuring the distribution of stiffness:
  - Applied Point Cloud Library in C++, ROS, and a RGBD camera to enable image segmentation, geometry recognition, and Baxter robot arm control
  - Built a software to enable real time 3D visualization of point cloud mapping including stiffness distribution information in probing
  - Completed a full testing and identified opportunities for future improvements.

***Intro. to Artificial Intelligence* Course Projects, UCB | Instructor: Prof. S. Levine & Prof. S. Russell** 01/2019 - 05/2019

- Systematically studied Markov decision processes, reinforcement learning, decision trees, HMM, particle filtering, game tree, etc, and their applications to probabilistic robotics and robotic inference.
- **Project I:** Implemented in Python multiple path search algorithms, covering DFS, BFS, UCS, A*
- **Project II:** Implemented in Python value iteration and Q-learning, apply them to a simulated robot controller (Crawler) and simulated game Pacman.
- **Project III:** Implemented in Python digits classification based on MNIST dataset, Language Identification based on Recurrent Neural Network (RNN), Perceptron, Non-Linear Regression.

**Design and Implementation of a Volunteer Management System**

***Comprehensive Course Design of Computer Science* Course Projects, SEU** 09/2018 - 10/2018

- Led a team of five to design, implement, and test an online volunteer management system using MFC library and C++, key accomplishments include:
  - Allowed volunteer registration, dynamic scheduling, liaison with sponsors, skill-driven grouping of volunteers, and automated report generation.
  - Leveraged Unified Modeling Language (UML) to guide software design; followed various software engineering principles and design patterns to streamline development processes, focusing on decent efficiency, modularity, extensibility, maintainability and robustness.
  - Developed a user-friendly GUI to allow interactive user control and intuitive data visualization.
  - Built an algorithm to allow optimal allocation of volunteers via dynamic programming.

**Development of an Optically Navigated Vehicle with Autonomous Maneuverability**

***Microcontrollers* Course Project, SEU** 11/2018 - 01/2019

- Designed and prototyped a vehicle with optoelectronic autopilot for navigating through a network of intersections and performing garage parking via automatically tracking road marks
- Designed an integrated navigation system incorporating CMOS camera, optical glass, photoelectric encoder and a programmable microcontroller (STM32).
- Significantly bolstered programming skill and reinforced understanding of analog & digital circuit and optical system.

**Implementation of a Flight Control System Based on Kalman and PID Controller**

***Control Theory* Course Project, SEU** 10/2018 - 12/2018

- Implemented in MATLAB an integrated flight controller based on Kalman filter and PID controller to allow the speed and roll/yaw/pitch angles control of a fixed-wing unmanned air vehicle (UAV) with short transition, decent stability and good anti-disturbance characteristics.
- Key steps include 1) derivation of flight dynamics model and transfer function of UAV; 2) PID controller design; 3) Kalman filter for UAV state estimation; and 4) simulation of PID controller and Kalman estimator using MATLAB Simulink.

## STANDARDIZED TESTS

**GRE General:** V: 152 / Q: 170 / AW: 3.5 / Total: 322 | **TOEFL:** R:29 / L:27 / S:24 / W:28 / Total: 108

## SKILLS

**Programming Languages:** C/C++ | Python | Java | MATLAB | SQL | Verilog | Assembly
**Libraries:** OpenCV | PyTorch | TensorFlow | Point Cloud Library | NumPy | SciPy | Panda | Scikit-Learn | Scrapy | Matplotlib | Selenium
**Software/Hardware:** LaTex | Altium Designer | SolidWorks | Android | Arduino | ARM | Multisim | Linux | Robot Operating System