

Shubo Liu

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EDUCATION BACKGROUND

Queen Mary University of London (QMUL) and Northwestern Polytechnical University (NPU), China 09/2017 – 06/2021
B.E. in Materials Science and Engineering | GPA: **3.426/4.0** | **84.68/100**
Northwestern Polytechnical University (NPU), China 09/2021 – 06/2026
Ph.D. in Machine Learning and Pattern Recognition | Supervisor: Chunhua Shen (University of Adelaide) and Peng Wang (NPU)
Coursework (Coursera): Robotics: Aerial Robotics, Computational Motion Planning, Mobility, Perception, Estimation and Learning, Capstone (6 Courses) | Advanced Data Structure and Algorithm | Embedded Software and Hardware Architecture

STANDARDIZED TESTS

IELTS: L: 7.0 / R: 7.5 / W: 6.0 / S: 6.5 / Total: 7.0

SKILLS

Programming Languages: C/C++ | C# | Python | Linux | MATLAB | SQL | Verilog

Software: Robot Operating System | Arduino | Altium Designer | UG/NX | LaTeX | ANSYS | ABAQUS | JMatPro | Proteus

Hobbies: Table Tennis | Badminton

AWARDS AND HONORS

China Computer Federation | Membership 10/2020-12/2021
Outstanding Student Scholarship, QMUL-NPU 2018 & 2019 & 2020
The 2nd Prize | National Conference on Undergraduate Innovation and Emperorship 10/2020
The 1st Prize | China National College Student "Innovation, Originality and Entrepreneurship" Challenge 08/2020
The 3rd Prize | National University Student Social Practice and Science Contest on Energy Saving & Emission Reduction 07/2020
The 1st Prize | Sanhang Cup Extracurricular Science and Technology Works Competition 04/2020
The 3rd Prize | iCAN International Innovation and Entrepreneurship Competition 12/2019
IOM3: The Institute of Materials, Minerals and Mining | Student Member 09/2019
Honorable Mention Award | Mathematical Contest in Modeling (MCM) 04/2019
The 2nd Prize | The China Undergraduate Mathematical Contest in Modeling (CUMCM) 10/2018
China Society of Automotive Engineers (SAE) 03/2018

ACADEMIC COMPETITIONS

Opioids Spread: More Counties Green or Red?

ICM/MCM (Problem C)

01/2019

- Led a team of three to build a series of mathematical models to analyze the spread pattern of opioids in five US states:
 - Built a graph network to simulate the drug spreading iteratively in discrete time domain; leveraged **Random Forest Combining Factor Analysis** (RFCFA) to cluster socio-economic data and identify high-priority areas for crime control.
 - Built a differential model with four independent factors to predict the crime rate trend.
 - Applied an **adjusted LASSO method** and a stepwise regression to analyze the relationship between opioid addiction and socioeconomic factors.
 - Proposed a strategy to mitigate the abuse of opioid, and defined the Crisis Index to evaluate the effectiveness.
 - Leveraged various geospatial data visualization techniques to facilitate pattern extraction and result presentation.
 - Composed a 20-page technical report; garnered the Honorable Mention Award.

Team Leader | China Undergraduate Mathematical Contest in Modeling (CUMCM)

09/2018

- Modeled heat conduction and convection through a thermal insulation suit based on a set of time-dependent partial differential equations (PDEs), with boundary and initial conditions properly defined.
- Numerically solved the **derived PDEs** in MATLAB for temperature field using **finite difference method**; tried an array of numerical schemes for optimal balance among computational overhead, truncation error, and numerical stability.
- Established a **multi-objective optimization model** for optimizing the material selection and thickness design; solved the problem using simulated annealing algorithm.

RESEARCH EXPERIENCES

Micro 5G Unmanned Aerial Vehicle (UAV) and its Cloud System

04/2019 – 04/2020

National Engineering Laboratory of Big Data Application Technology for Air, Space, Ground and Sea Integration, NPU

- Led a team of four to design, prototype and test an autonomous UAV system based on 5G communication for remote control; key components include:
 - **Computer Vision:** Implemented a set of deep learning and classical computer vision algorithms in Python (PyTorch) and OpenCV for object detection, tracking and aiming.
 - **Communication:** Enabled 5G broadband cellular communication for operating range exceeding 1K+ miles; measured packet loss for various heights, locations, and signal strengths for validating the system robustness.
 - **Control Platform:** Established a Cloud-based data storage and processing system for real-time flight monitoring and management.
 - **Navigation:** Implemented a Simultaneous Localization and Mapping (SLAM) algorithm in MATLAB for concurrent location tracking and map updating.
 - **Electronic Hardware:** Integrated an onboard microcontroller, a field camera, and a set of sensors and actuators to enable 6 degrees-of-freedom flight control; performed PCB design/testing using Altium Designer and Proteus.
 - **Software:** Built a control application in C# and Linux, allowing two-way real-time flight control and flight data

visualization.

- **Mechanical Hardware:** Conducted CAD design, material procurement, parts machining, and system assembly; performed computational fluid dynamics (CFD) simulation in ANSYS-Fluent to optimize the propeller geometry for noise reduction and efficiency enhancement.
- **A Chinese patent gained** (202020156197.9); **two software copyrights granted** (2020SR0135810) and (2020SR0838390)
- Technical merit and novelty recognized with **two national awards, three provincial awards, and eight university awards.**
- **Presented the work in the 2019 International Innovation and Entrepreneurship Exp** (国际创新创业博览会); summoned by the chairman of China Youth Federation; highlighted by multiple national newspapers including <China Youth Daily>; **selected into the National College Students' Innovation and Entrepreneurship Annual Exchange Program**; participated in the **proposal of Key R&D Projects of Shaanxi Province** (陕西省重点研发项目计划建议) **in 2020**
- Coordinated cross-departmental collaboration following divide-and-conquer strategy; organized numerous meetings to drive brainstorming, alignment and troubleshooting; spearheaded the liaison with external stakeholders and secured external financial support; significantly bolstered technical leadership and interpersonal skills.

“iGuada” Campus Life WeChat Mini Program

China College Computer Competition

01/2019-08/2020

- Joined a team of three effort to develop the WeChat mini program to help users to quickly check the class schedule, remind of courses, and share learning materials on campus
- “Seed Program for Innovation and Entrepreneurship” supported; **three software copyrights granted** (2020SR0993804) (2020SR0992659) and (2020SR0956715)

Development of an Autonomous Race Car, NPU

12/2017 - 12/2018

- Led a team of three to design and implement an autonomous racing car capable of navigating through a track with electromagnetic markers.
- Designed circuits and PCBs, including:
 - An array of electromagnetic wave detectors incorporating Operational Amplifiers, Inductor-Capacitor pairs, and modules for signal amplification and A/Q conversion.
 - An integrated controller incorporating NXP 32bit microcontroller, power supply, and drive circuits associated with steering servo and electric motor.
- Designed a suite of control algorithms to enable real-time steering, speed control, path-finding and road condition recognition based on sensor data.

China Collegiate Formula Race Car Challenge, NPU

10/2017 - 10 /2018

- Coordinated a team of four to design, prototype and test a single-seat, open-wheel, open-cockpit race car with excellent acceleration/deceleration performance and maneuverability.
- Designed the powertrain system; performed **finite element analysis (FEA)** in ANSYS software package on the engine, transmission, drive shafts, differentials, and the final drive, covering static, dynamic, and thermal analyses.

Development of a Pleurobot, NPU

11/2018 - 02/2019

- Designed and manufactured a biomimetic mechanoid “Pleurobot”, which imitates the locomotion of the salamander with its own articulated vertebrae, allowing it to slither along on land or in water.
 - Designed mechanical parts in UG/NX, followed by 3D printing for prototyping; leveraged an array of motion planning and inverse kinematics algorithms to optimize mechanical design.
 - Integrated an Arduino microcontroller, a Bluetooth module, and 30+ micro servo motors to enable motion actuation and remote control.

EXTRACURRICULAR EXPERIENCES

Translator | 2020 ArduPilot Developer Online Conference

04/2020

- Translated the presentation “Equivariant Visual Odometry” delivered by Pieter van Goor from Australia Center for Robotic Vision; gained exposure to the state-of-the-art advancement in robotic vision field.

Team Leader | Current Status and Future Reform of State-Owned Enterprises in China’s Shanxi Province

08/2018

- Conducted field survey on the reform of six major state-owned enterprises (SOEs) in China’s Shanxi Province, spanning energy, automobile, and heavy machinery sectors.
- Interviewed 100+ management personnel and government officials; collected first-hand data regarding the history, operational models, and development prospects of SOEs; generated recommendations for promoting health growth of SOEs.

Summer School at Queen Mary University of London, UK

08/2019

- Studied and practiced an array of materials analysis techniques and equipment, including bending tester, universal testing machine, etc.

Attendee | International Innovation and Entrepreneurship Competition, Osaka, Japan

11/2019

- Attended a series of seminars, forums and training sessions with fellowship students from 50+ countries.

Member | China Initiative in Developing English Courses (Linear Algebra)

07/2019

- Led a team effort to develop a comprehensive teaching plan and curriculum syllabus regarding the subject of Determinant; edited and proof-read course materials and assignments.

Data-Driven Poverty Diagnosis and Elimination, Shanxi Province, China

08/2018

- Led a team of four to develop a quantitative model to assess the effectiveness of relocation-based poverty elimination in China’s Shanxi Province, covering 1) data collection based on online questionnaires, phone interviews and in-person meetings; collectively applied hierarchical analysis, fuzzy evaluation and case study to build the model.

Summer School at Peter the Great St. Petersburg Polytechnic University (SPbPU), St. Petersburg, Russia

07/2018

- Systematically studied the principle, history and state-of-the-art technology of steam turbine, focusing on the advanced materials for manufacturing the turbine blades with excellent wear and corrosion resistance.
- Visited the Leningrad Nuclear Power Plant; systematically studied the Automatic Reactor Control Systems, including control algorithms, measurement instrumentation, and cutting-edge technology for improving control robustness.