Yuchen Song

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EDUCATION BACKGROUND

South China University of Technology, Guangzhou, China (985 Project)

Bachelor of Engineering (Expected graduation date: Jun. 2023)

- Concentration: Robotics Engineering｜GPA: 3.81/4.0
- Coursework includes: *Artificial Intelligence Technology and Applications, Machine Vision and Sensing System, Data Analysis and Modelling, Data Structure, Circuits, and Embedded System and Design etc.*
- Award: Third Prize merit scholarship & "Outstanding Student Leader"(1/45) in Sept. 2021

    "Zhizao Shunde" Scholarship (1/370) & "Outstanding Student Leader"(2/46) in Sept. 2020

    Second Prize merit scholarship (Top 2 out of 78 students) in Sept. 2019

University of California, Berkeley, Online

Summer Session Visitor (Jun. 2020-Aug. 2020)

- Concentration: Computer Science｜ Course: *Data Structure*

RESEARCH INTEREST

Deep Learning, Reinforcement Learning

PUBLICATION

- Yuchen Song and Xuejian Zhang "Lymph node sections detection based on deep convolutional neural networks", Proc. SPIE 12079, Second IYSF Academic Symposium on Artificial Intelligence and Computer Engineering, 120792F (1 December 2021); https://doi.org/10.1117/12.2622998

RESEARCH EXPERIENCE

Application of Continuous-Discrete Reinforcement Learning

Supervised by Professor Yuan Lin (Work in progress, since Sept. 2021)

Research purpose: Apply reinforcement learning to parameterized action space (traffic scenario -- merging).

- Used SUMO to build parallel type merging scenario, and registered it as a customized environment to gym.
- Used TraCI to interact self-defined agent (ego vehicle) with SUMO predefined driving models and deployed reinforcement learning approaches to explore a good control policy for parallel-type merging scenario.
- Made a customized policy for hybrid reinforcement learning.

Lymph Node Sections Detection Based on Deep Convolutional Neural Networks (CNN)

Online research seminar supervised by Professor Mark Vogelsberger, MIT (Jul. 2021-Aug. 2021)

Research purpose: Compare and explore novel approaches to achieve efficient cancer detection based on lymph node section photos.

- Applied various kinds of CNNs on the dataset from Kaggle and achieved high accuracy on making predictions.
- Conducted experiments and comparisons between VGG16, ResNet-18, and EfficientNet.
- Made a comparison to emphasize the importance of pre-trained weights of VGG16.
- Designed a user-interface based on **PyQt5**.
- Source code available at https://github.com/bqdqj/Cancer-detection-based-on-tensorflow-and-PyQt5.

Tools Applied: Deep learning framework, **TensorFlow** and **Keras**.

Image Inpainting Algorithms Improvement Based on Coherent Semantic Attention

Research Assistant supervised by Professor Patrick Chan (Sept. 2020-Jun. 2021)

- Filled in the missing values based on image defects; applied deep learning to train the model and then restored the image using an attention based encoder-decoder structure.
- Modified the weights for several factors which affected the order of inpainting
- Got familiar with the framework of computer vision (feature extraction, image refinement, and encoder-decoder structure) and sharpened the ability in coding.

<div align="center">**COURSE PROJECTS**</div>

Feature Detection and Matching

Group Leader (Nov. 2020)

➢ Used the Harris corner detection method to identify points of interest in the image for feature detection;

➢ Came up with two descriptors for the feature centered at each interest point;

➢ Implemented the matchFeatures function of SSDFeature Matcher and RatioFeature Matcher to conduct feature matching;

➢ Wrote codes to detect discriminating features in an image and found the best matching features in another image.

Developing a Detector to Spam (Aug. 2020)

➢ Collected data set from the spam database (1999) of UCI machine learning repository, which contains 4601 instances and 58 columns of attributes;

➢ Divided the data set into two parts, training set and testing set for data analysis;

➢ Used the scikit-learn library to develop four simple classifiers (DT, Bayes, MLP and KNN) and four ensemble classifiers (Random Forest, voting, boosting and bagging) to spams, comparing their training accuracy and testing accuracy to find the best classifier;

➢ Chose Random Forest ensemble classifier to detect the spams, with 1.0 training accuracy plus 0.945 testing accuracy.

Bearmaps

Group Leader (Aug. 2020)

➢ Created a navigation program with the A* algorithm/dijkstra algorithm;

➢ Built a web-mapping service application with the Java;

➢ Solved the map navigation problem near the city of Berkeley and got full marks for the program.

Design & Manufacturing of Robot Cars (Three semesters' project)

Group Leader (Jan. 2020 & Jun. 2021 & Dec. 2021)

*Research purpose: Design robot cars using **Arduino** or **STM32** as the main control board to effectuate the assigned tasks.*

➢ Took charge of the processes of pre-planning, cars design, mid-term manufacturing, post-improvement, and debugging, also distributed appropriate tasks to each team mates.

<u>Achievement:</u> Designed three cars to successfully conduct task implementation: the first one could achieve line tracking and deliver cargo; the second one could control and shoot the balls to a designated area; the third car was able to conduct wireless charging and capacitor storage during cruise.

<div align="center">**COMPETITION**</div>

Contemporary Undergraduate Mathematical Contest in Modeling

Third Prize (Provincial) (Sept. 2020)

Objective: Develop a mathematical model to study the credit strategies for MSMEs (Micro, small and medium enterprises).

➢ Conducted data screening of 425 data records in Excel and used deletion method and interpolation method to deal with missing data;

➢ Pored over dozens of documents to upgrade my ability in dealing with bugs in coding;

➢ Engaged in model construction and enhanced the model with matlab to find the best model parameters;

➢ Proposed credit strategies for the banks, such as the amount of loans, the interest rates and the term of loans, according to credit risk analysis of the enterprise.

<div align="center">**SKILL-SET**</div>

➢ Technical Skills: Be reasonably skillful in C++/C, MATLAB, Python, and Java.

➢ Language Skills: Chinese (Native), TOEFL 100, GRE 321+3.5.