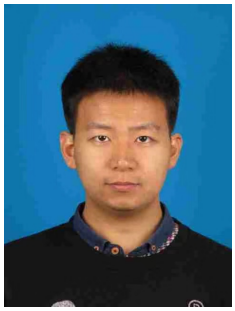

Zhengda Ma

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Education

- **Fudan University** *2021-2024*
  M.S. at the Department of Electrical Engineering
- **University of Turku** *2021-2024*
  M.S. at the Faculty of Technology
- **Donghua University** *2016-2020*
  B.S. at the Department of Electrical Engineering CGPA: 3.64

Research Interests

- **Super-Resolution and Blind Super-Resolution, Deep Learning**
- **Object Detection and Tracking, Computer Vision**
- **Graph Neural Networks**
- **Autonomous Driving and Robot Vision, Robotics**

Publications

- **Published & Forthcoming Papers**
  - **Super-Resolution of Underwater Sonar Image based on Generative Adversarial Network**
    with Jie Ding, Sensen Li, and Binbin Zou
    IECON 2023 - 49th Annual Conference of the IEEE Industrial Electronics Society
- **Major Revision Under Second Round Review**
  - **MHGAN: A Multi-Headed Generative Adversarial Network for Underwater Sonar Image Super-Resolution**
    with Sensen Li, Jie Ding and Binbin Zou
    IEEE Transactions on Geoscience and Remote Sensing (TGRS)
- **Paper under Submission**
  - **Multi-Scale Graph Channel Attention Detectors for Object Detection in Sonar Images**
    with Sensen Li, Yu Zhang, Binbin Zou, and Jie Ding
    IEEE Transactions on Geoscience and Remote Sensing (TGRS)
  - **Underwater Acoustic Image Object Detection Method Based on Bidirectional Fused Pyramid and Channel Attention**
    with Sensen Li, Jie Ding
    Acta Physica Sinica

Research Experience

- **Blind Super-Resolution on Underwater Sonar Images based on Degradation Model** *2023.06-Present*
  (Ongoing)
  - Existing research on blind super-resolution has mainly focused on simulating the degradation process of optical images, while the degradation process of sonar images differs from optical images, especially in terms of speckle noise in acoustic images. Due to the unsuitability of the existing degradation model for acoustic images, the current research results in poor restoration of underwater sonar images.
  - I am the principal researcher of this research project. Based on classical degradation models, this project involves constructing a degradation model for sonar images to simulate the degradation process, including speckle noise, in acoustic images. The ultimate goal is to achieve high-performance blind super-resolution on underwater sonar images.

- **Image Object Detection of Submerged Buried Objects** *2023.06-Present*

  Industry Research Project (Ongoing)

  – Currently, there is a lack of research on underwater buried object detection. This project involves constructing a sonar image object detection dataset specific to underwater buried objects and developing a highly accurate and real-time underwater buried object detection algorithm. This effort aims to provide robust support for advancements in this field.
  – As one of the principal researchers of this research project, I am focusing primarily on small-sample object detection using acoustic images. The ultimate goal is to devise an underwater buried object detection algorithm capable of real-time operation on a system.

- **Underwater Sonar Image Super-Resolution Reconstruction based on GAN** *2022.09-2023.05*

  – Due to the different texture details present in underwater sonar images compared to optical images, and the richer background details in sonar images, we designed a specialized model for underwater sonar images to achieve enhanced super-resolution results.
  – In this research, we designed a super-resolution model for underwater images, including a generator and a discriminator. Also, we made adjustments to the loss function. Finally, we achieved state-of-the-art results on both our Underwater Sonar Image Dataset for Super-Resolution (USDSR) and commonly used sonar image datasets.
  – As a result, two research papers were written to document our findings. (1 SCI and 1 Conference)

- **Underwater Sonar Image Object Detection Based on Deep Learning** *2022.09-2023.05*

  – Focused on images like submerged vessels, aircraft wreckage, and distressed individuals, we conducted research in underwater sonar image object detection using deep learning techniques. The aim was to support autonomous recognition and manipulation of underwater targets by underwater autonomous vehicles.
  – Utilizing Convolutional Neural Networks, Graph Neural Networks, and Transformer architectures, we developed a detector that achieves state-of-the-art accuracy for object detection on the widely used underwater sonar target detection dataset, Sonar Common Target Detection Dataset (SCTD).
  – Additionally, we wrote two SCI papers (currently under submission).

- **Teaching Assistant for the Graduate Course: Machine Learning** *2022.09-2023.01*

- **Waterborne Targets Detection** *2022.03-2022.06*

  – In this project, the dataset consists of real water surface images. This dataset encompasses various typical, similar targets within water surface scenes, such as waterborne vessels, buoys, underwater floats, cables, and more. Based on this dataset, a model is designed and trained to detect and predict the positions and confidence levels of different waterborne targets within the images.
  – As the team leader, I utilized the PyTorch deep learning framework and the MMDetection object detection framework. I implemented multiple image augmentation strategies, including haze removal techniques, and other operations. Furthermore, I employed approaches such as weighted image processing, and spatial and channel attention mechanisms. I also introduced a bidirectional fusion pyramid network. Through multiple regression stages, I successfully developed the detection algorithm and wrote the inference files.

- **Simulation of Tello Drone Automatically Passing Through Multiple Gates** *2022.03-2022.05*

  – Our drone successfully navigated through single or dual gates positioned at various initial locations and angles (90 degrees and 60 degrees). This was achieved by detecting the gates in captured images, drawing the smallest rectangular outline identifying the center of the gate, and subsequently calculating the outline's area to determine the flight direction;
  – Please refer to GitHub for detailed information about this project.

- **Turtlebot Waffle Autonomous Driving and Real-time Communicating with Tello Drone** *2022.03-2022.05*

  – In simulation experiments, we designed the turtlebot waffle to automatically drive along the drawn trajectory, and make the turtlebot waffle subscribe to the camera of the DJI Tello drone to broadcast the car in real-time;
  – Our Tello drone model and turtlebot waffle model need to be installed in ros1 and ros2 systems respectively, so let the two models run in different systems and communicate with each other by subscribing to topics.
  – Please refer to the GitHub for detailed information about this project.

- **Intelligent Gesture Recognition Based on Electromyographic Signals** *2021.11-2021.12*
  - Identified different gestures through electromyographic signals, using data collected from 10 different subjects over two separate days;
  - Performed data augmentation and feature extraction on the electromyographic signals (sliding window method: root mean square, wavelength, zero crossing rate, etc.; or utilizing neural networks) applying normalization and dimensionality reduction to speed model training;
  - Selected common classification models: SVM, KNN, decision trees/random forests, ensemble learning, MLP, and CNN. Achieved the best recognition accuracy with CNN+SENet, reaching 94.33%;

Skills

- **Languages (Standardized Tests)**:
  - GRE General: 322
  - TOEFL iBT: 102
- **Computer skills**:
  - Advanced Python Programming:
    - Developing Machine Learning Models and AI applications
    - Data Analysis and Visualization
    - Natural Language Processing
    - Geographic Information Systems
  - MATLAB Programming:
    - Machine Learning and Deep Learning
    - Image Processing and Computer Vision
    - Simulation and Modeling
    - Data Analysis and Visualization
  - Linux System Operating:
    - Embedded Systems
    - ROS and ROS2
  - Gazebo and RViz
  - HTML and Latex

Honors and Awards

- **Outstanding postgraduate scholarship** (ranking 7/85)
  2021-2022
- **Outstanding undergraduate scholarship for 3 consecutive years** (top 20%)
  2016-2017, 2017-2018, 2018-2019
- **Outstanding Engineer Scholarship for 2 consecutive years**
  2017-2018, 2018-2019