I have a strong interest in deep learning and regularly study related literature on artificial intelligence and generative AI to understand the latest technologies. Additionally, I am passionate about coding and learning new things to expand my knowledge and skills.

I am currently a fresh graduate and actively looking for a job.

Chung-Hao Fan

AI Engineer

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Kaggle: https://www.kaggle.com/followjohn

Education

National Chung Hsing University

Institute of Data Science & Information Computing (Master's Degree)

2022 - Now (Expected to graduate before the end of July 2024)

National Chung Hsing University

Department of Applied Mathematics (Bachelor's Degree)

2018 - 2022

Master's Thesis

Title:	**A Study of Developing Semantic Segmentation Based on Domain Generalization Framework on Crack Detection of Embankment Surface for Unmanned Aerial Vehicle Images**
Advisor:	Dr. Hung-Hsu Tsai
Graduate Student:	Chung-Hao Fan
Keywords:	Domain Generalization, Crack Detection, Semantic Segmentation, Class-imbalanced Problem, Deep Learning

Skills

Programming

- Python
- JavaScript
- C/C++
- MATLAB

Deep Learning

- PyTorch
- TensorFlow

Others

- Linux
- Git

Achievements

Crack Segmentation on Embankment Surface

Project of Agency of Rural Development and Soil and Water Conservation in 2022~2023.

The purpose of this project is to reduce the labor costs required for embankment inspections. First, images of embankments are collected by unmanned aerial vehicle (UAVs). Then, the deep learning techniques are employed to predict the crack segmentation in the collected images. Therefore, automatic embankment inspection can be realized.

Problems:

- Since most existing embankments are intact, it is difficult to collect images of **cracked** embankments.
- The number of crack pixels is small because cracks usually occupy only a small portion of the image. Therefore, this causes the **class-imbalance problem**.
- The captured **crack sizes are inconsistent** due to **fluctuations** in the distance between the UAV camera and the embankment. This results in reduced performance.
- There is a high risk of **misclassifying** non-crack objects in a **complex background** as cracks, such as tree branches, moss and the gaps between wave-absorbing blocks, etc.

Solutions:

- Images of **embankment with cracks are synthesized** using publicly available crack datasets and embankment images.
- Utilize **ARB Loss** to deal with class imbalanced problem.
- **Predict the distance** between the embankment and the camera. The crack size can then be ensured by **resizing the captured image** based on the predicted distance.
- **>Predict the crack and embankment segmentation concurrently**. The misclassified cracks can then be suppressed by the embankment segmentation.

Publication:

Chung-Hao Fan, Hung-Hsu Tsai*, and Yin-Tzer Shih, "Semantic Segmentation

Based on Domain Generalization Framework on Crack Detection of Concrete Embankments in Unmanned Aerial Vehicle Images," submitted to Engineering Applications of Artificial Intelligence.

BirdCLEF 2024

The object of this project is to use the audio signals of bird calls to classify their species.

The competition is provided by **Kaggle**.

Results:

- **Finished 26th place on the private leaderboard (final score) and received a silver medal.**
- Won a bronze medal (83rd place) on the public leaderboard.

Methods:

- Adpoting **semi-supervised learning** to utilize unlabeled data in the target domain. Increasing the generalizability of the trained model.
- Training multiple models on different **resampling factors**. The **ensemble** these trained models to produce the final prediction.
- Employing **openvino** to accelerate the inference. Therefore, the number of the ensembled models can be increased.
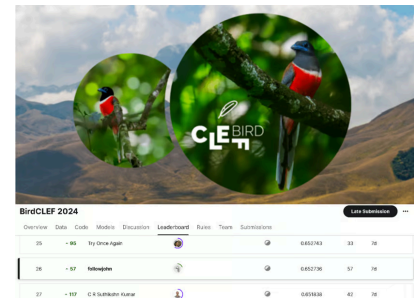
Chinese Character Image Generation

This work uses generative AI - diffusion model - to generate chinese character image.

Demo: https://kthfan.github.io/text-generator

Codes: https://github.com/kthfan/Kaiu-Text-Diffusion

Technologies used include:

- Use PyTorch framwork to train the diffusion model.
- Create a **Web UI** to provide generation services, and use Tensorflow.js to generate images on the client side.
- Refer to ILVR to implement the **image-to-image translation** feature [1].
- Implement **animation** feature.

Reference:

[1] J. Choi, S. Kim, Y. Jeong, Y. Gwon, and S. Yoon, "Ilvr: Conditioning method for denoising diffusion probabilistic models," arXiv preprint arXiv:2108.02938, 2021.
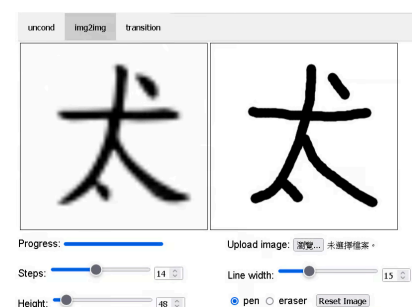
Prediction of Film Thickness on Paint Surface of Workpiece

2022 National Intelligent Manufacturing and Big Data Analytics Contest, held at Tunghai University.

Objective: Predict the film thickness of the painted surface of the workpiece using the sensor measurement data of the equipment in the four processes.

Methods:

- Use **XGBoost**, **Bagging**.
- A **dimensionality reduction method**, Correlation Matrix Thresholding, is developed. It clusters the similar features based on graph theory. Then, **PCA** is applied to the features in each cluster.

Results:

- Advance to the finals.

Tower of Hanoi

- This work is a web game.
- JavaScript, CSS, HTML and React.js are used.
- Codes: https://github.com/kthfan/TowerOfHanoi
- Demo: https://kthfan.github.io/hanoi-tower.html