Deep Learning Final Project Proposal
B104020006 莊子儀 B104020008 林冠儒 B104020037 董昱辰

For our final project, we have chosen to extend and enhance the research presented in the paper '*Olympic Games Event Recognition via Transfer Learning with Photobombing Guided Data Augmentation.*' This paper introduced an innovative framework for recognizing Olympic sports events by combining transfer learning combined with a novel photobombing-guided data augmentation technique, achieving an impressive 90% classification accuracy with ResNet-50. The dataset contains 10 categories, each represented by 100 images. The categories are athletics, badminton, basketball, football, handball, rugby, swimming, tennis, waterpolo and weightlifting.

Our project aims to explore and implement additional state-of-the-art data augmentation techniques to potentially improve the classification accuracy beyond the current benchmark. We will investigate modern augmentation strategies including:
1. **Mixup augmentation** - Creating virtual training examples by linearly interpolating both images and their labels
2. **CutMix** - Replacing parts of images with patches from other training samples.
3. **Style transfer augmentation** - Applying different artistic styles to training images while preserving content.
4. **Advanced color augmentation techniques** - Implementing color jittering, color dropping, and adaptive color transformations.
5. **Progressive augmentation** - Gradually increasing the intensity of augmentations during training to enhance robustness.

Additionally, we will expand the original dataset to 150 pictures and add new sports categories that are particularly relevant to Taiwan's Olympic strengths and emerging sports, including:

- Boxing (拳擊) - Highlighting Taiwan's historical Olympic medal events.
- Judo (柔道) - A traditional strength in Asian competitions.
- Table Tennis (桌球) - One of Taiwan's most competitive sports.
- Gymnastics (體操) - Growing prominence in international competitions.
- Breaking (霹靂舞) - A new Olympic sport in 2024, where Taiwan shows potential.

This expansion will not only increase the diversity of our dataset but also test the robustness of our model across a broader range of sports movements and environments. We will collect high-quality images for these additional categories, ensuring consistency with the original dataset.

We will use the enhanced dataset with multiple deep learning architectures including ResNet-50, VGG-16, and AlexNet through transfer learning. Our implementation will be evaluated using various metrics including accuracy, precision, recall, and F1-score, with particular attention to challenging cases where sports share similar visual characteristics (e.g., Soccer vs. Rugby, or dynamic movement sports like Gymnastics vs. Breaking).

The project will also explore the impact of combining different augmentation techniques and analyze their effectiveness across different sports categories. Through this comprehensive investigation, we aim to identify optimal augmentation strategies for sports event recognition and contribute to the broader field of computer vision in sports analytics, with a particular focus on recognizing sports that are significant to Taiwan's athletic achievements.

Reference:
1. OGED-Olympic Games Event Dataset
(https://www.kaggle.com/datasets/yousefidris/ogedolympic-games-event-dateset/data)

2. Olympic Games Event Recognition via Transfer Learning with Photobombing Guided Data Augmentation
(https://doi.org/10.3390/jimaging7020012)

3.Sports-Net18: Various Sports Classification using Transfer Learning
(https://doi.org/10.1109/STI50764.2020.9350415)