**Project Title:** Multiple Object Detection using YOLO Algorithm

**Name(s):** John Stephen Gutam (G#01413212), Roles: Dataset adaptation to the pretrained model.

Mingyo Jeong (G#01402966), Roles: CNN Model Implementation.

**Project description:** The proliferation of digital imagery in recent years has underscored the critical importance of advanced computer vision techniques in interpreting and understanding visual data. Among these techniques, object detection stands out for its ability to identify and locate multiple objects within an image, thereby facilitating numerous applications from autonomous driving to surveillance and beyond. This project seeks to harness the power of the You Only Look Once (YOLO) algorithm, renowned for its speed and accuracy in object detection tasks, to develop a system capable of detecting multiple objects in an image. Utilizing pre-trained models from the comprehensive COCO dataset (<https://cocodataset.org/#home>), we aim to implement the basic YOLO algorithm, adapting it to leverage the extensive annotations available within COCO. This approach not only provides a robust foundation for accurate detection across a wide range of object categories but also offers invaluable insights into the practical implementation and optimization of deep learning models for computer vision.

**Project goal:** The primary goal of this project is to develop a multiple object detection system using the YOLO algorithm, optimized to utilize pre-trained models from the COCO dataset. By doing so, we aim to achieve the following objectives.

1. Demonstrate the effectiveness of the YOLO algorithm in detecting multiple objects within diverse and complex images, highlighting its advantages in terms of speed and accuracy.
2. Explore the benefit of transfer learning by employing pre-trained models, thereby reducing the need for extensive computational resources and training time while maintaining high detection performance.
3. Facilitate a deeper understanding by implementing a commonly-used object detection algorithm without relying on the open source implementation.

**Project timeline:**

1. Week 1: Study data set and algorithm.
2. Week 2: Implementation of the Yolo algorithm using a pre-trained model with COCO (Common Objects in Context) dataset.
3. Week 3: Optimization and benchmarking.
4. Week 4: Writing report and presentation.

**Data:** COCO (Common Objects in Context) dataset and/or PASCAL dataset.

**Resources/Key references:**

1. Redmon, J., Divvala, S., Girshick, R., & Farhadi, A. (2016). You Only Look Once: Unified, Real-Time Object Detection. In Proceedings of the IEEE conference on computer vision and pattern recognition (CVPR).<https://arxiv.org/abs/1506.02640>
2. Lin, T.-Y., Maire, M., Belongie, S., Hays, J., Perona, P., Ramanan, D., ... & Zitnick, C. L. (2014). Microsoft COCO: Common Objects in Context. In European conference on computer vision (ECCV).<https://arxiv.org/abs/1405.0312>
3. Bochkovskiy, A., Wang, C.-Y., & Liao, H.-Y. M. (2020). YOLOv4: Optimal Speed and Accuracy of Object Detection.<https://arxiv.org/abs/2004.10934>