# Race Bib Number & Gender Recognition From Finish Video

This application is important because it can be hard for race managers to recognize the bib number and gender of hundreds of runners as they cross a race finish line. This could result in incorrect race results or placing. By creating this classification system, the number of errors made in race reporting could be decreased. Having an application do this classification process rather than a human can also streamline race management operations, producing finish results in a shorter amount of time.

- **Datasets:**
    - Bib numbers:
        - https://www.kaggle.com/datasets/trainingdatapro/ocr-race-numbers
        - https://people.csail.mit.edu/talidekel/RBNR.html
    - Gender recognition:
        - https://www.kaggle.com/datasets/maciejgronczynski/biggest-genderface-recognition-dataset
- **Steps:**
    - **Data Collection**: Using the linked datasets and/or others, I will gather two diverse datasets of images. One will contain runners with visible bib numbers, another will contain images of faces and their sex. These datasets will be used for training and testing the classification models.
    - **Object Detection**: I will utilize an object detection framework such as YOLO to localize the regions of the bib numbers in the images or video frames. This step involves training the object detection model to accurately identify and outline the areas where the bib numbers are located.
    - **Bib Number Recognition**: I will train a separate classification model (HF ViT), to recognize and classify the extracted bib numbers from the localized regions. This model should be trained on the dataset of annotated bib number images to accurately identify and classify the digits on the bibs.
    - **Sex Classification**: Similarly, I will train another classification model (HF ViT) to classify the sex of the runners in the images or video frames. This model can be trained on a dataset of annotated images with labels indicating the sex of the individuals.

- **Integration**: I will integrate the object detection model for bib number localization, the bib number recognition model, and the sex classification model into a unified pipeline for processing images or video frames. This integrated pipeline should be capable of detecting bib numbers, recognizing the digits on the bibs, and classifying the sex of the individuals.

- **Testing and Evaluation**: The performance of the integrated pipeline will be evaluated on a separate test dataset to ensure accurate and reliable classification results for both bib numbers and sex.

- **Flask API Development**: I will create a Flask application to serve as the API endpoint for the model. This involves setting up routes to handle video uploads, processing the video frames, and returning the list of bib numbers and genders. (One challenge could be also implementing a method of somehow knowing the race finish time for each gender-bib pair, although I think this would be much more complex of a task given the data).

- **Video Processing**: I will implement video processing logic within the Flask application to extract frames from the uploaded video, apply the integrated model pipeline to each frame to detect bib numbers and classify genders, and aggregate the results into a list.

- **API Deployment**: Finally, I will deploy the Flask application to Oracle Cloud to make it accessible over the internet.