Sheffield Hallam University

AI-Enhanced Equestrian Jump Analysis System

Siavash Mortaz Hejri
Ammar Ali
Javeria Munir

Agenda

1. Overview
    a. Dataset
2. Project Scope & Objective
3. Action Recognition Models & Results
4. Auto Annotation Exploration
5. Further work
6. Learnings

Overview

Background: Manual annotation of videos using DartFish software which creates .csv files to run further analytics.

Issues: Prone to human error, inefficient and costly

Ideal solution: Efficient, reliable and robust AI-enhanced system to assist coaches and athletes by tracking and analysing equestrian performances across multiple variables.

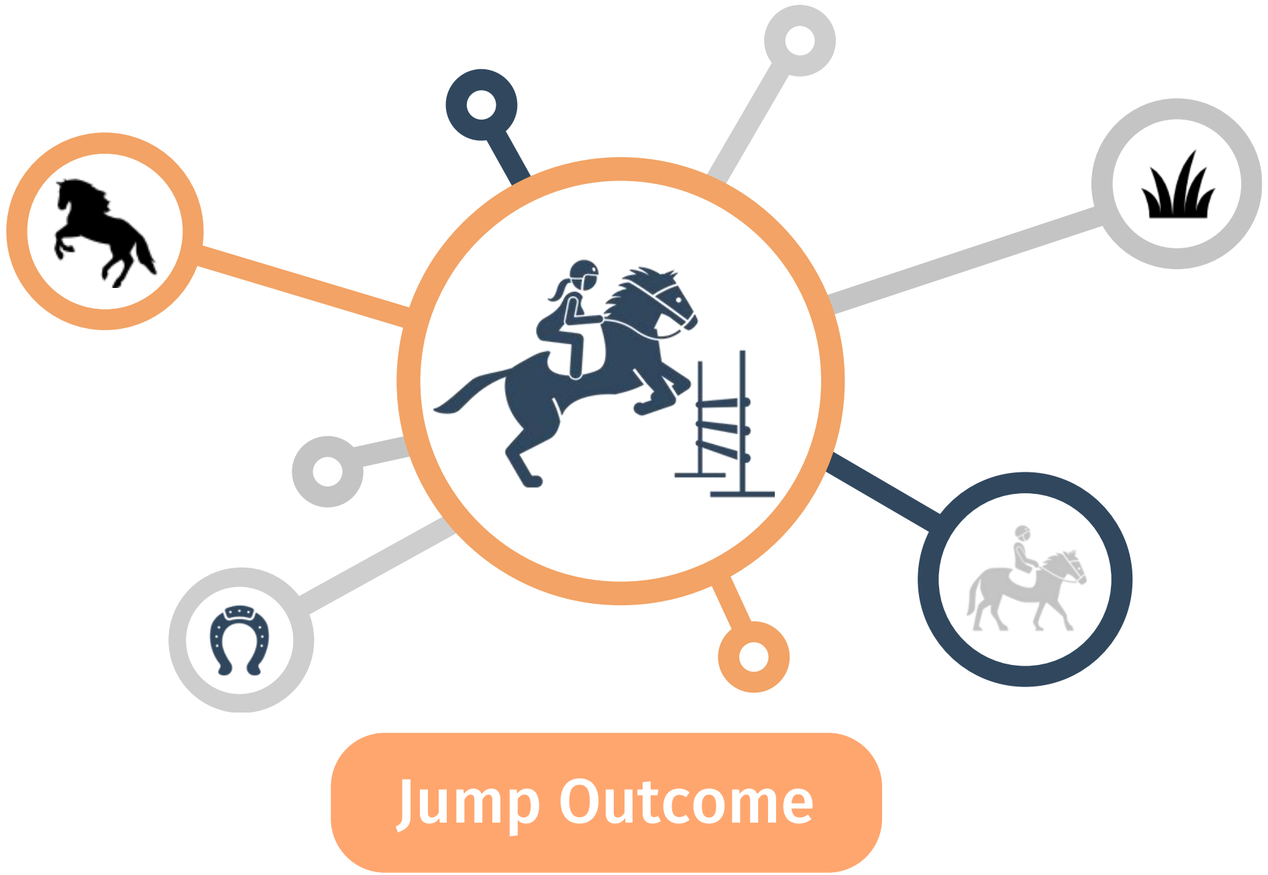
Dataset


Ben MAHER
EXPLOSION W
GBR
Breed: KWPN Gelding Sire: Chacco-Blue Age: 13
1.7

Project Scope & Objective

Rein
On which side the horse leans

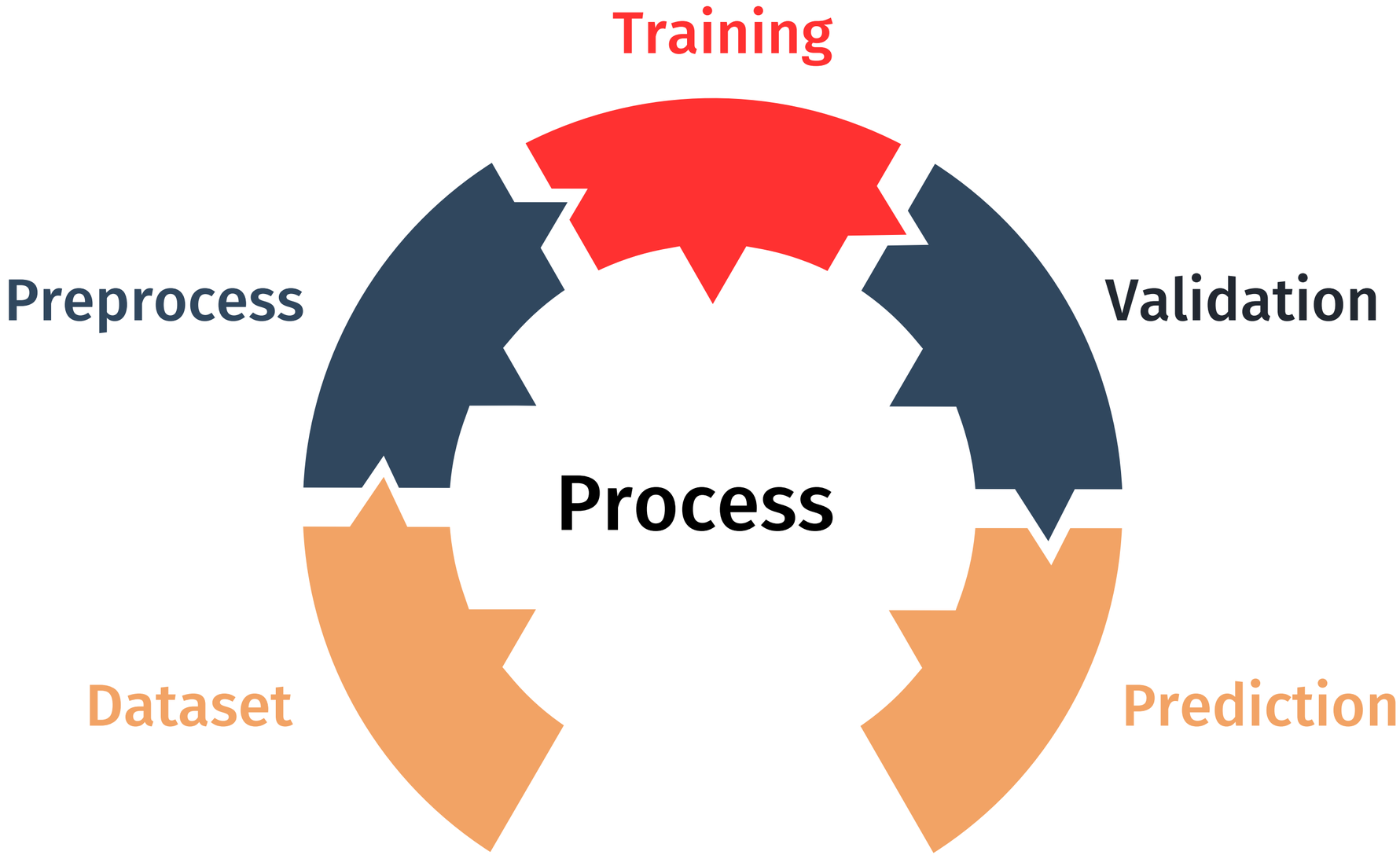
Leg
Takeoff and landing leg for each jump

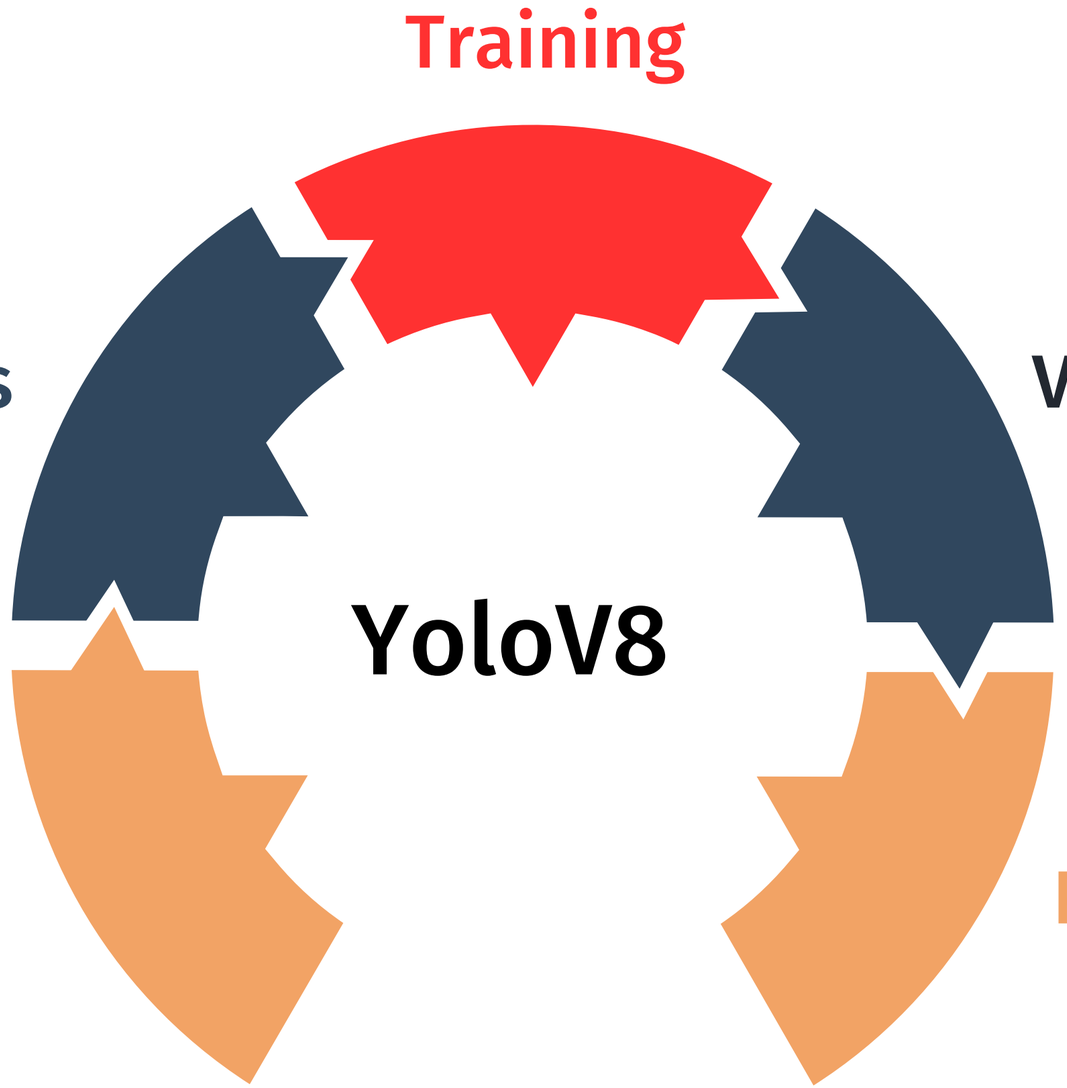


Surface
Either sand or grass

Jump Type
Parallel & upright

Strides
Number of strides between jumps


Training
Preprocess
Validation
Process
Dataset
Prediction



Dataset

Selenium

Download videos and csv from Dartfish

Preprocess

Extract Jumps

Split each video into clear, unclear and running

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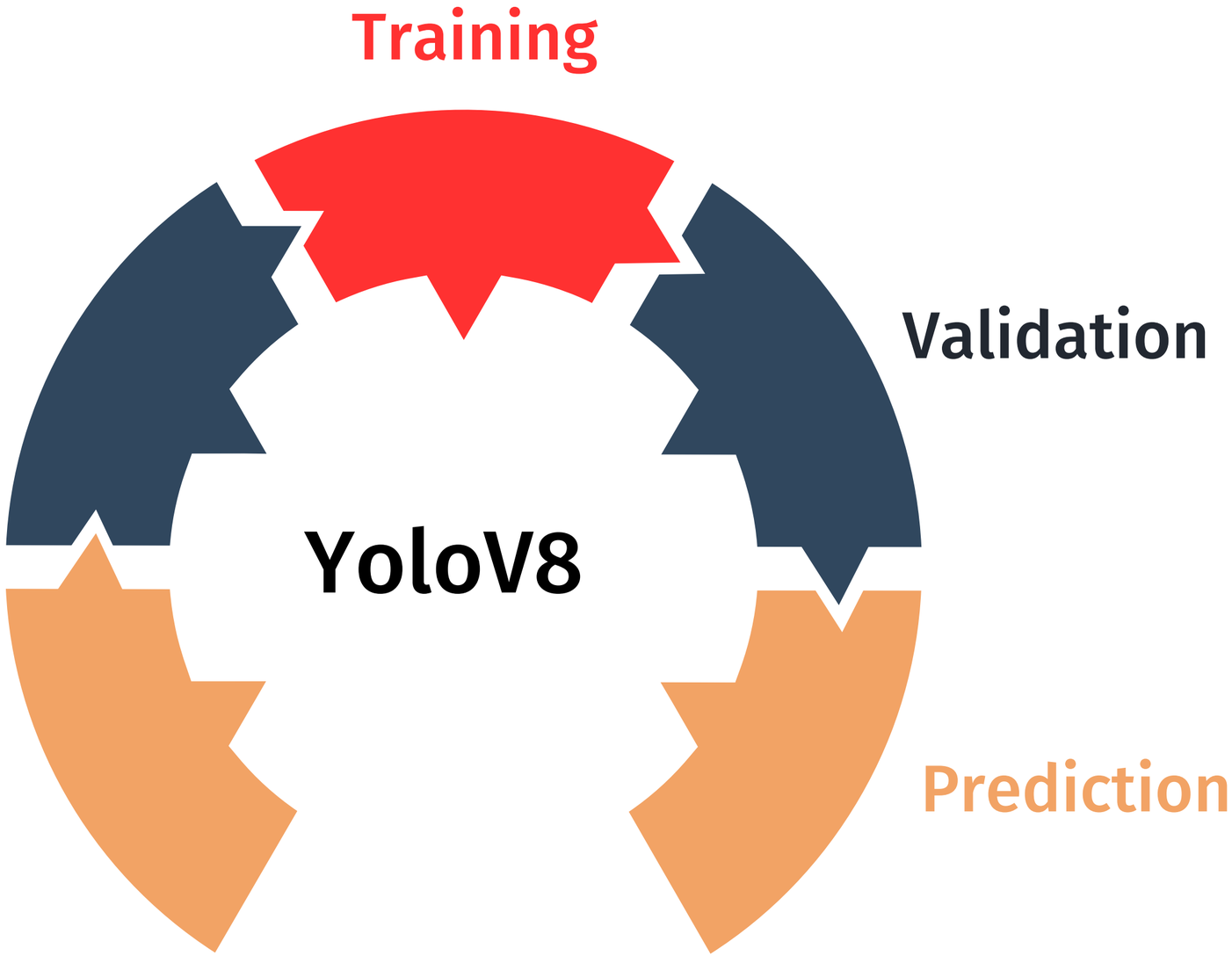

Trained

YoloV8

Runs only for human and horse classes

Preprocess

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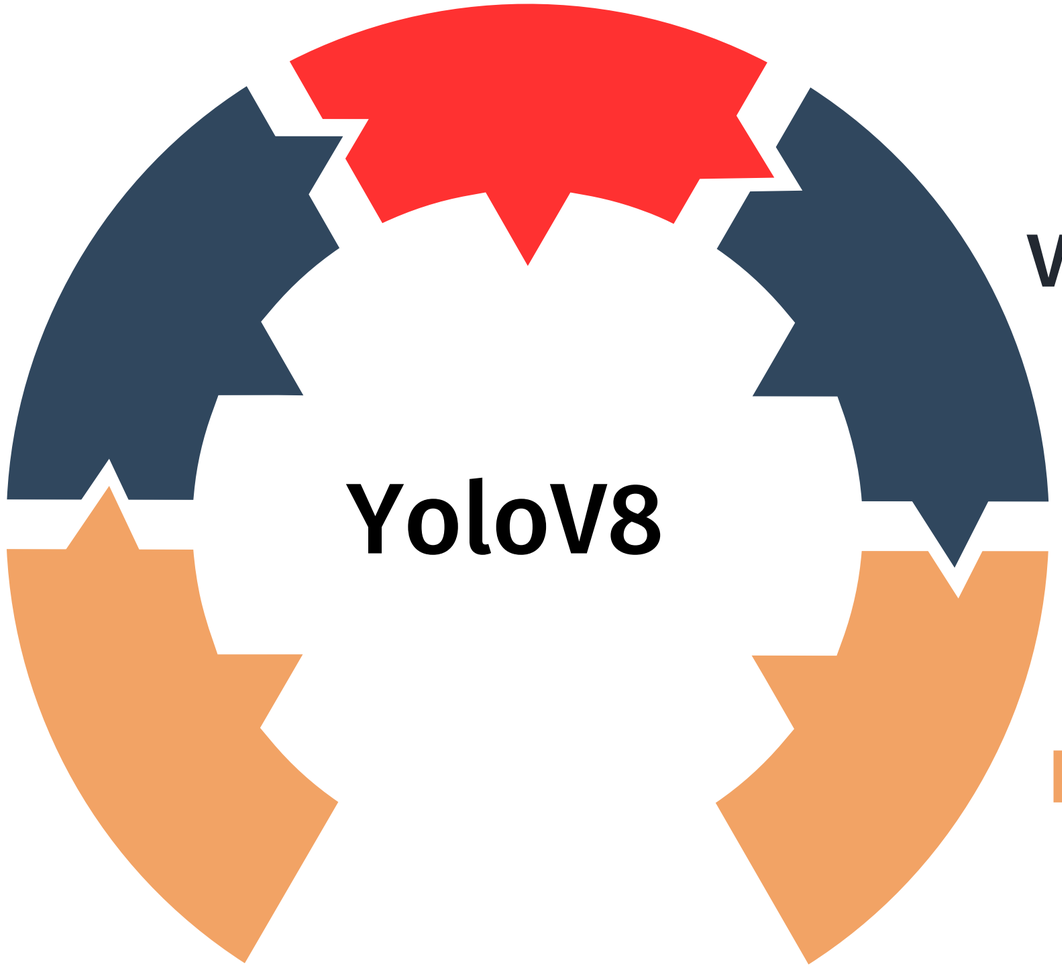
Split each video into clear, unclear and running



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Download videos and csv from Dartfish

Trained

YoloV8

Run on human and horse class only

Preprocess

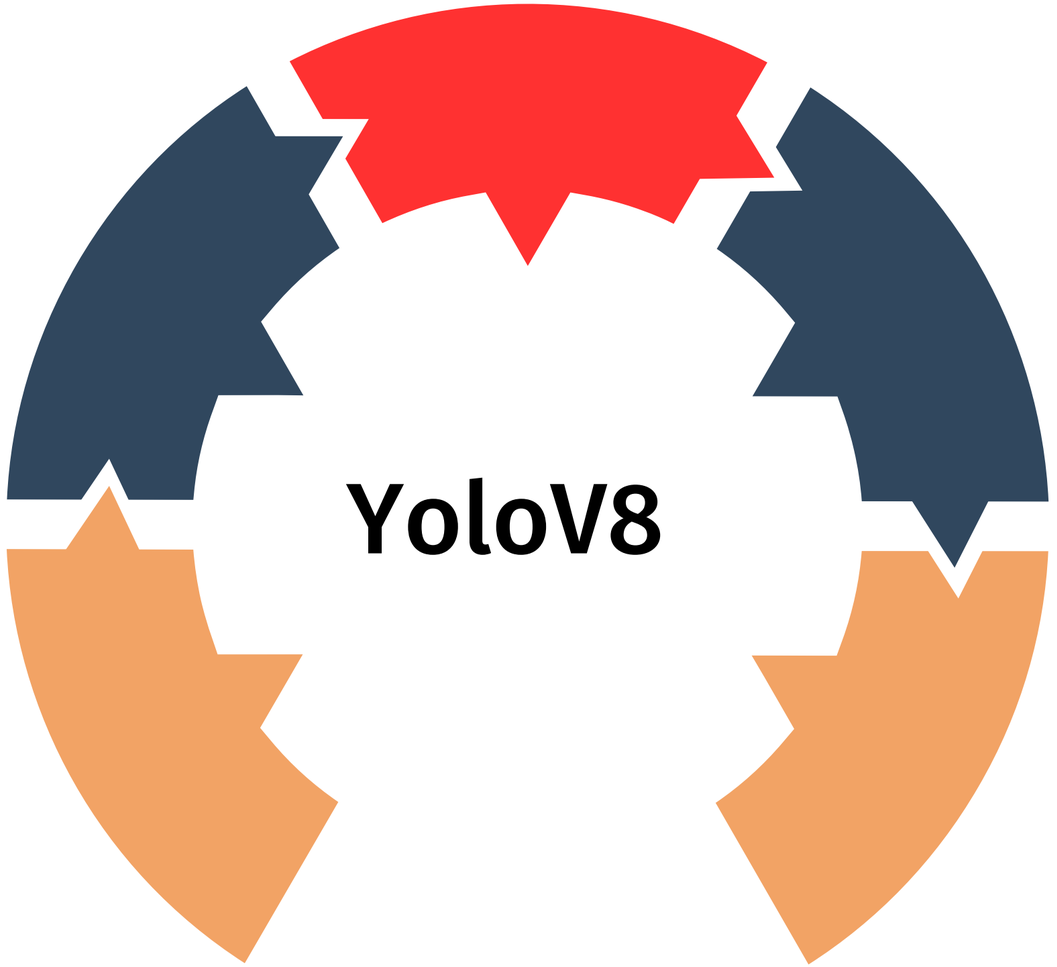
Extract Jumps

Split each video into clear, unclear and running

Validation

For Accuracy

The ratio of predicted output to the real data



Dataset

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Prediction

Segmentation

Got rider and the horse segmented as output

YoloV8 Result

Objective

Unsuccessful Jump

Exploring Action Recognition

Results

Training

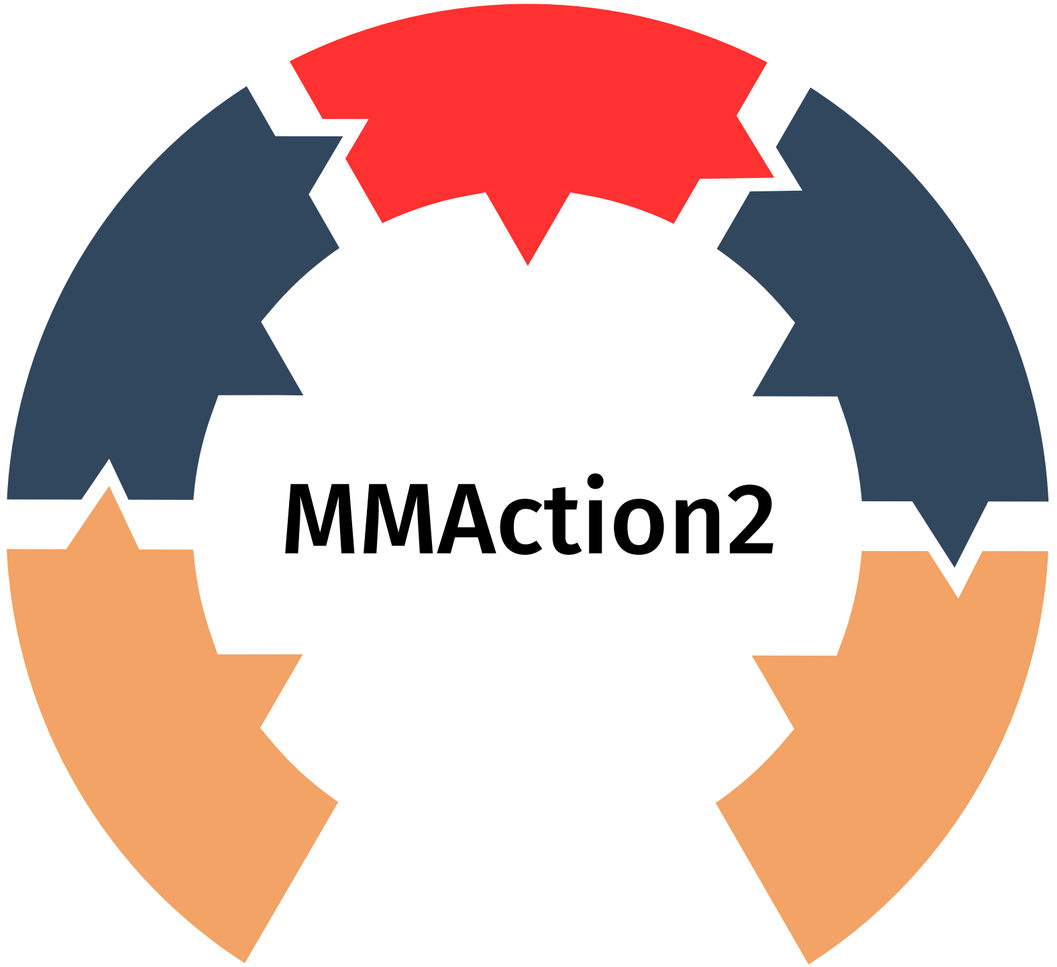
MMAction2

On carefully selected videos with suitable angles

Preprocess

Technique

Implementation and integration in the process.



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Prediction

Jump Outcome

Classifications using two classes weather clear or unclear

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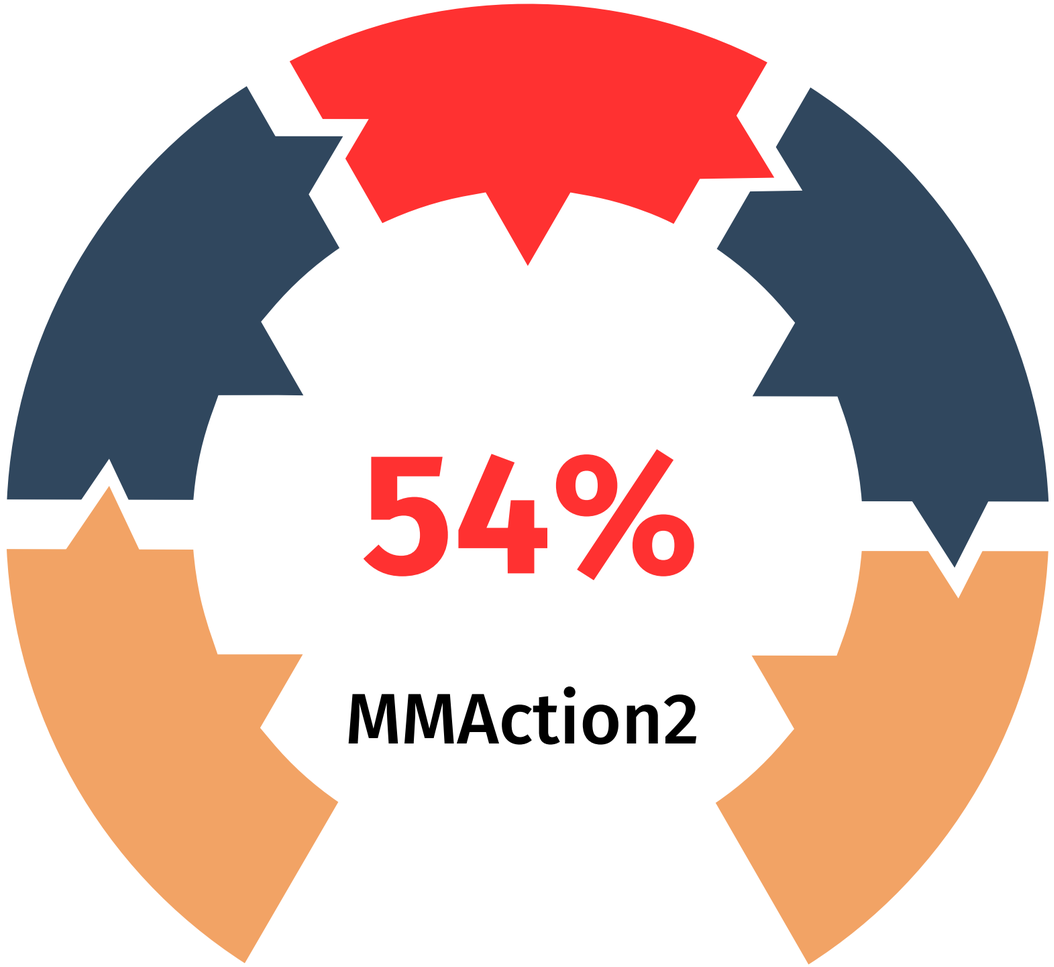

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3D-CNN

50 epochs on 300+ jumps

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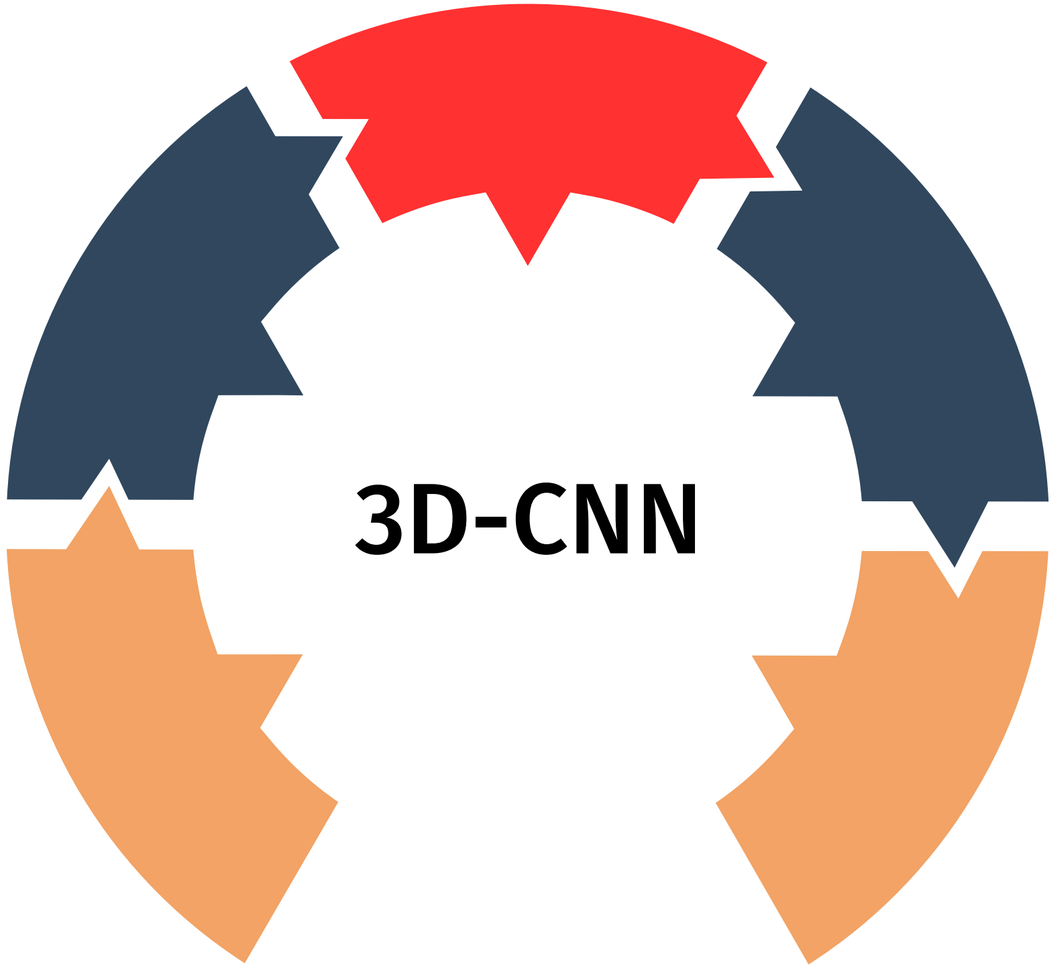

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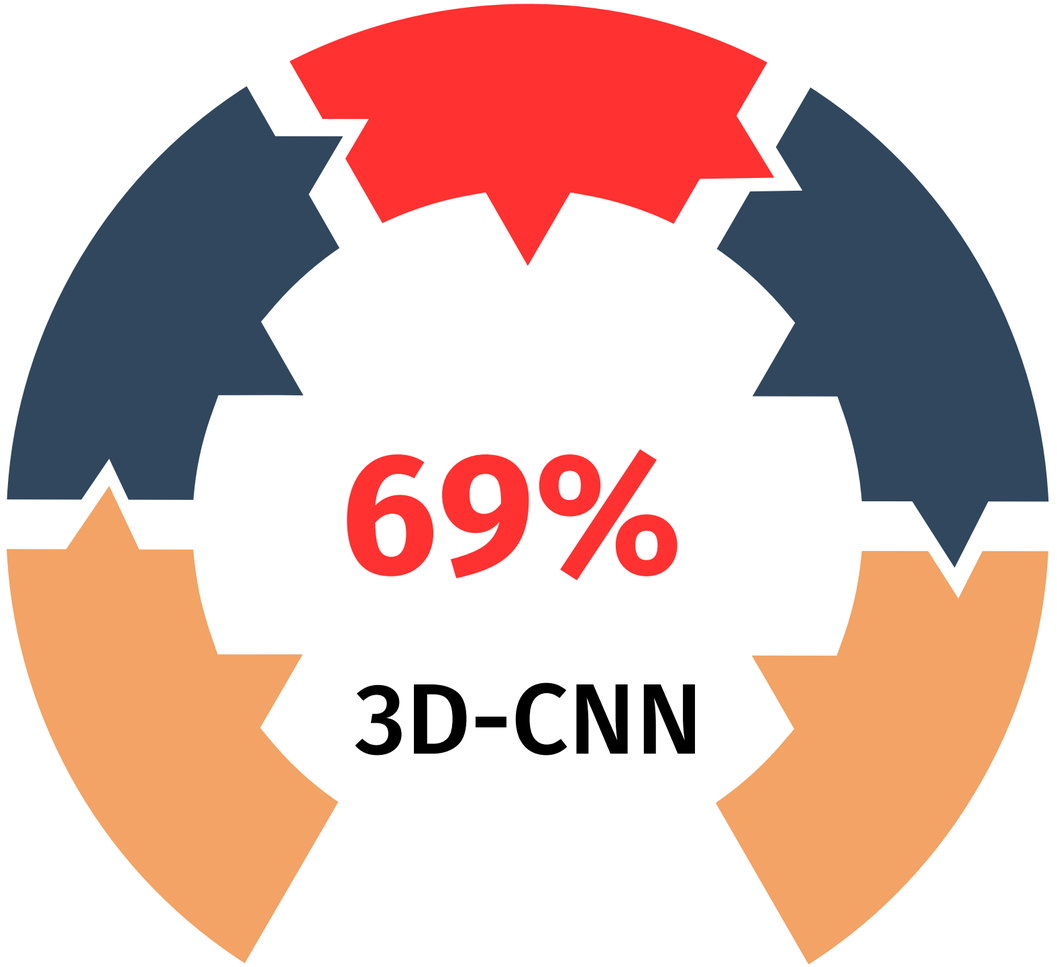

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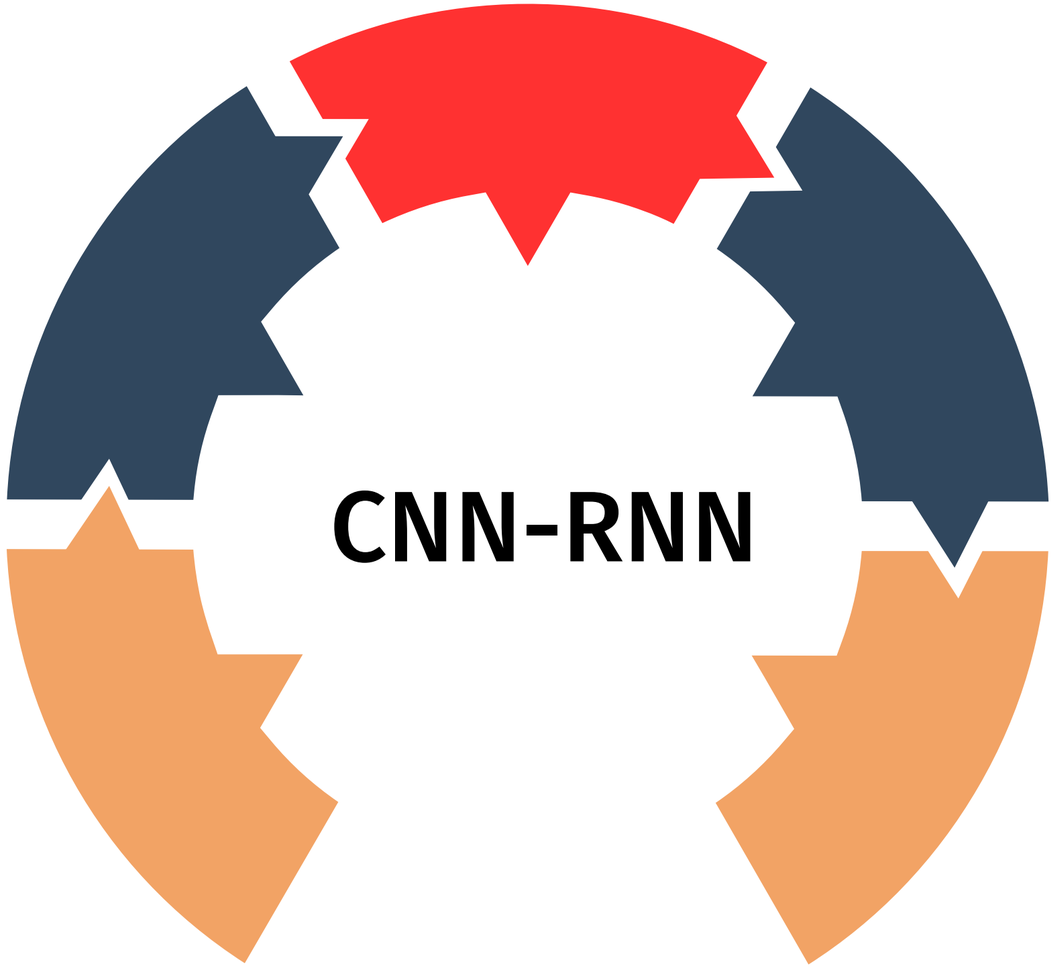
Training

CNN-RNN

50 epochs on 300+ jumps



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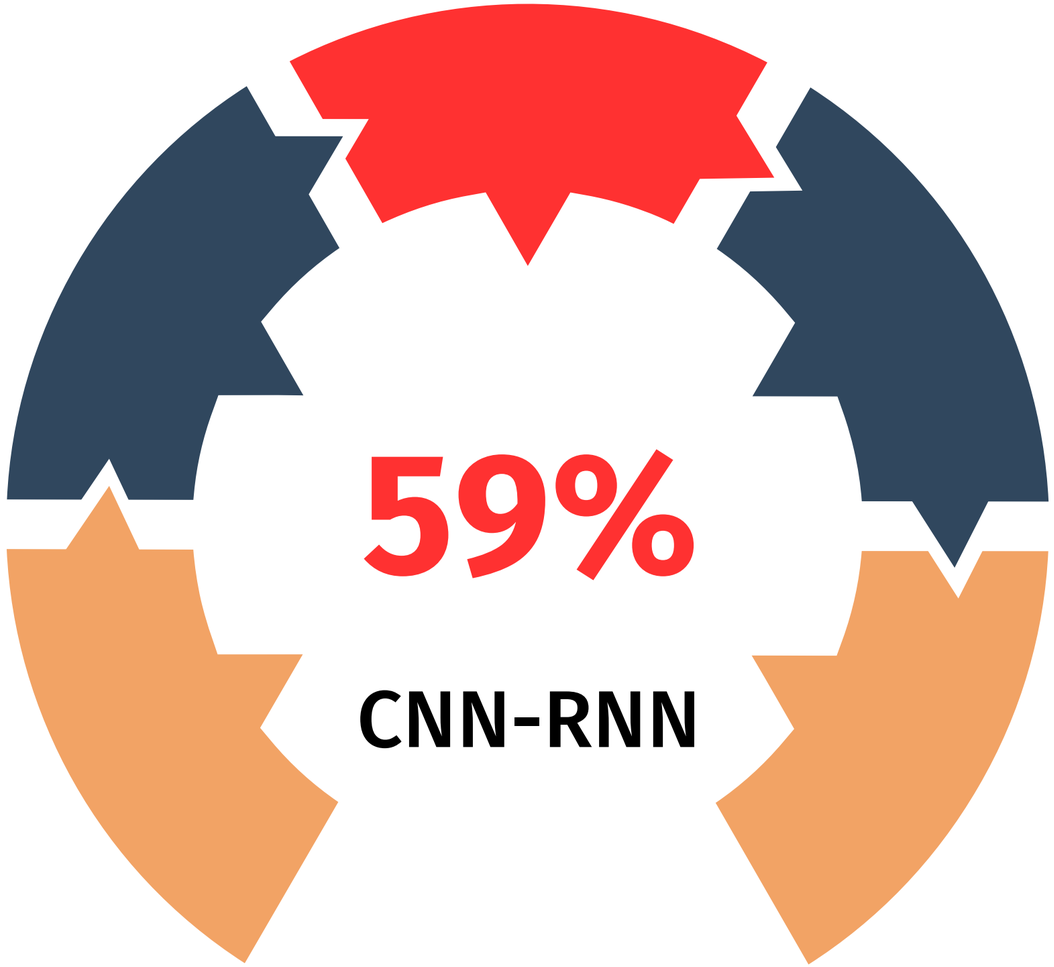

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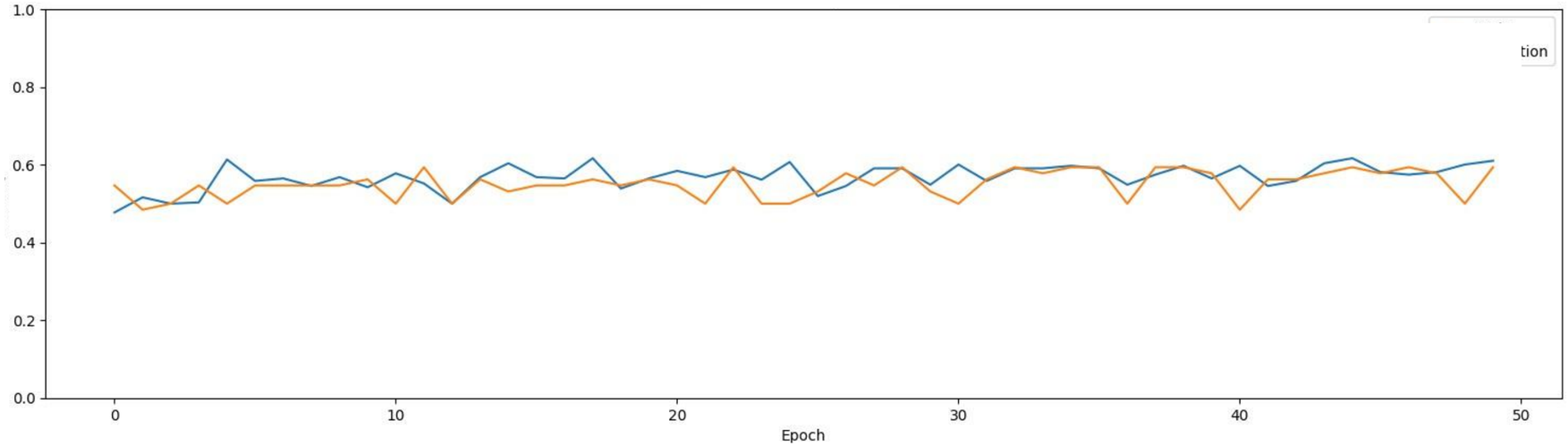
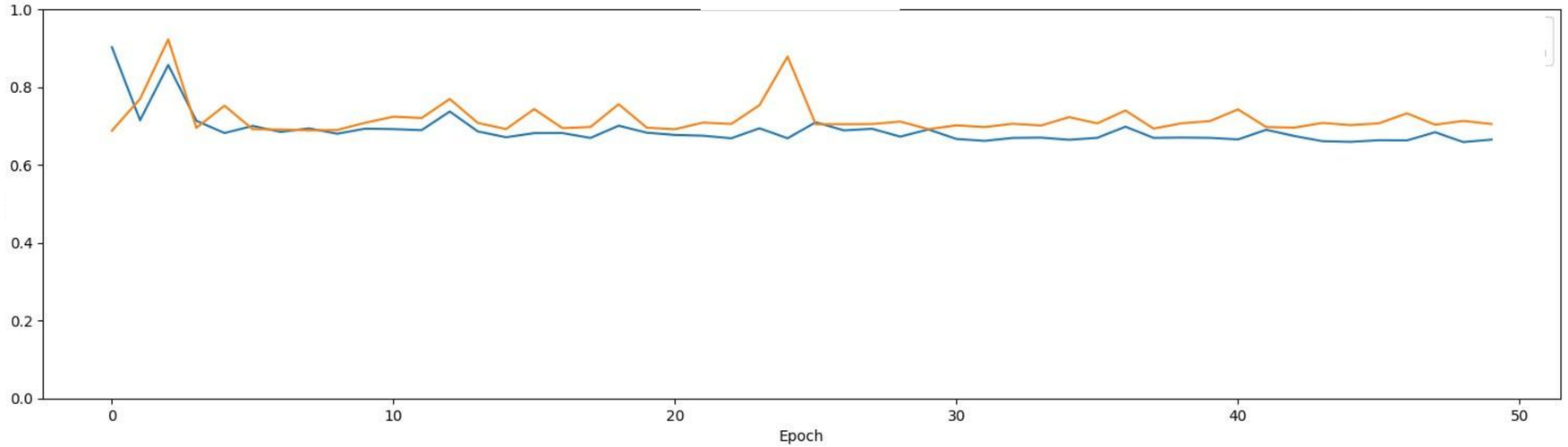
3D-CNN Result

Train
Validation

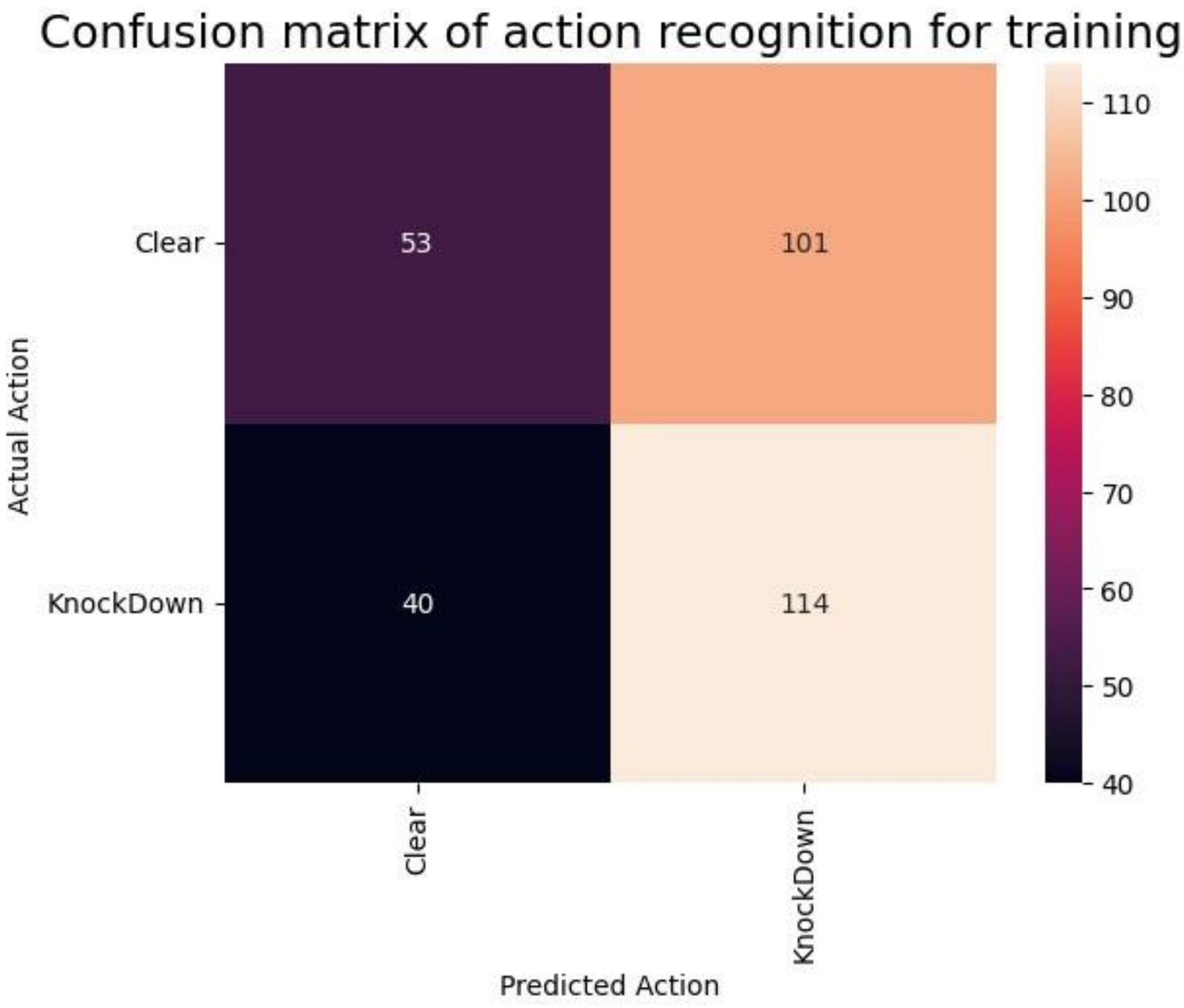
Accuracy

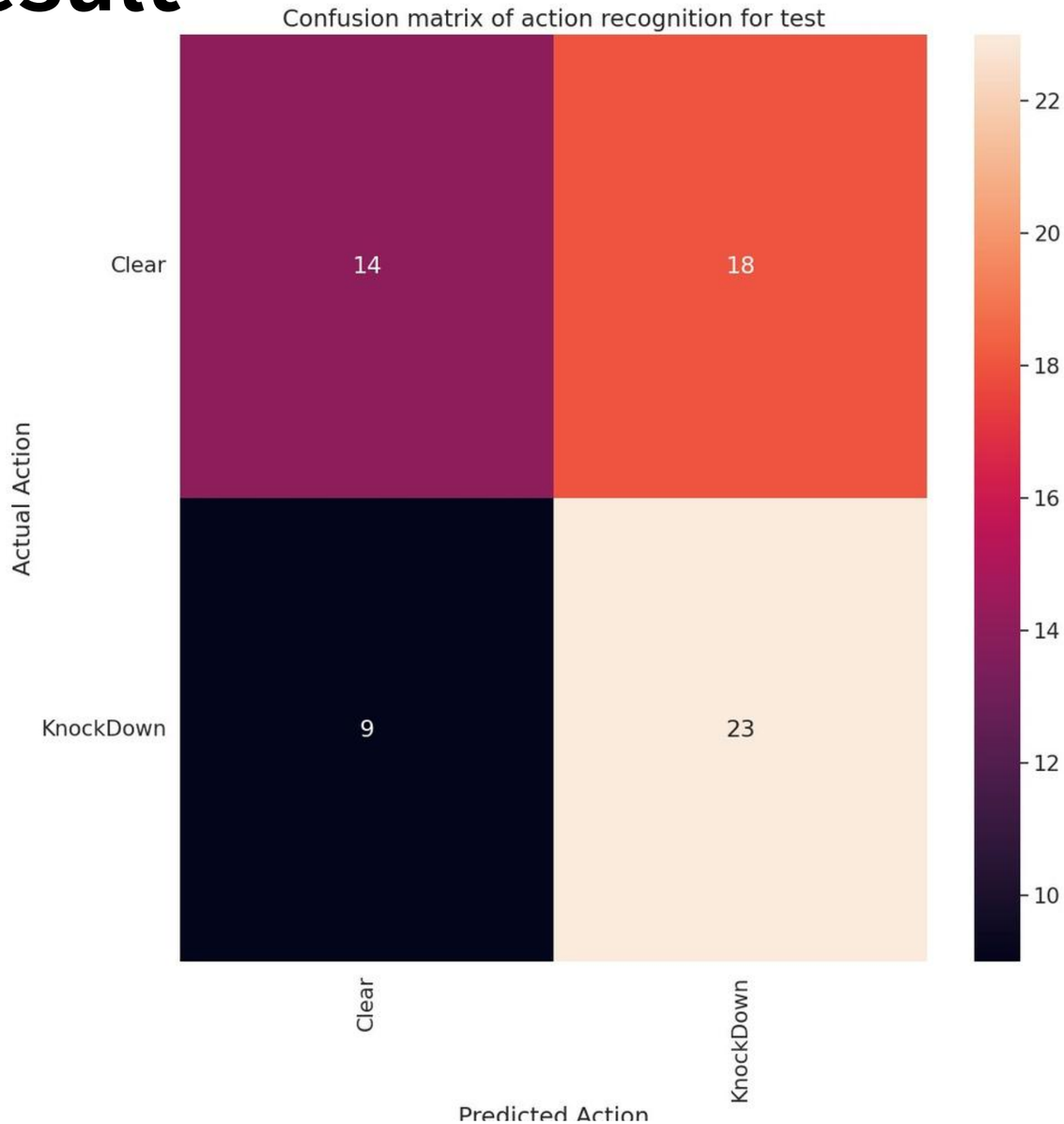


Loss



3D-CNN Result





Auto Annotation

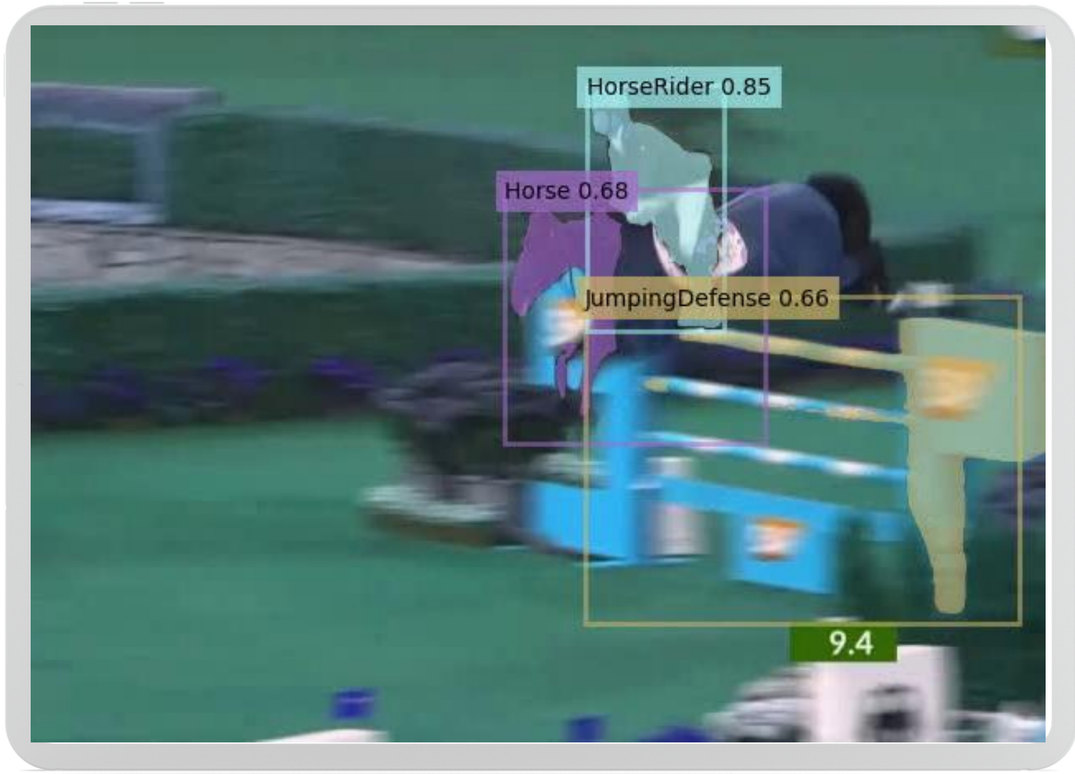
Auto Annotation

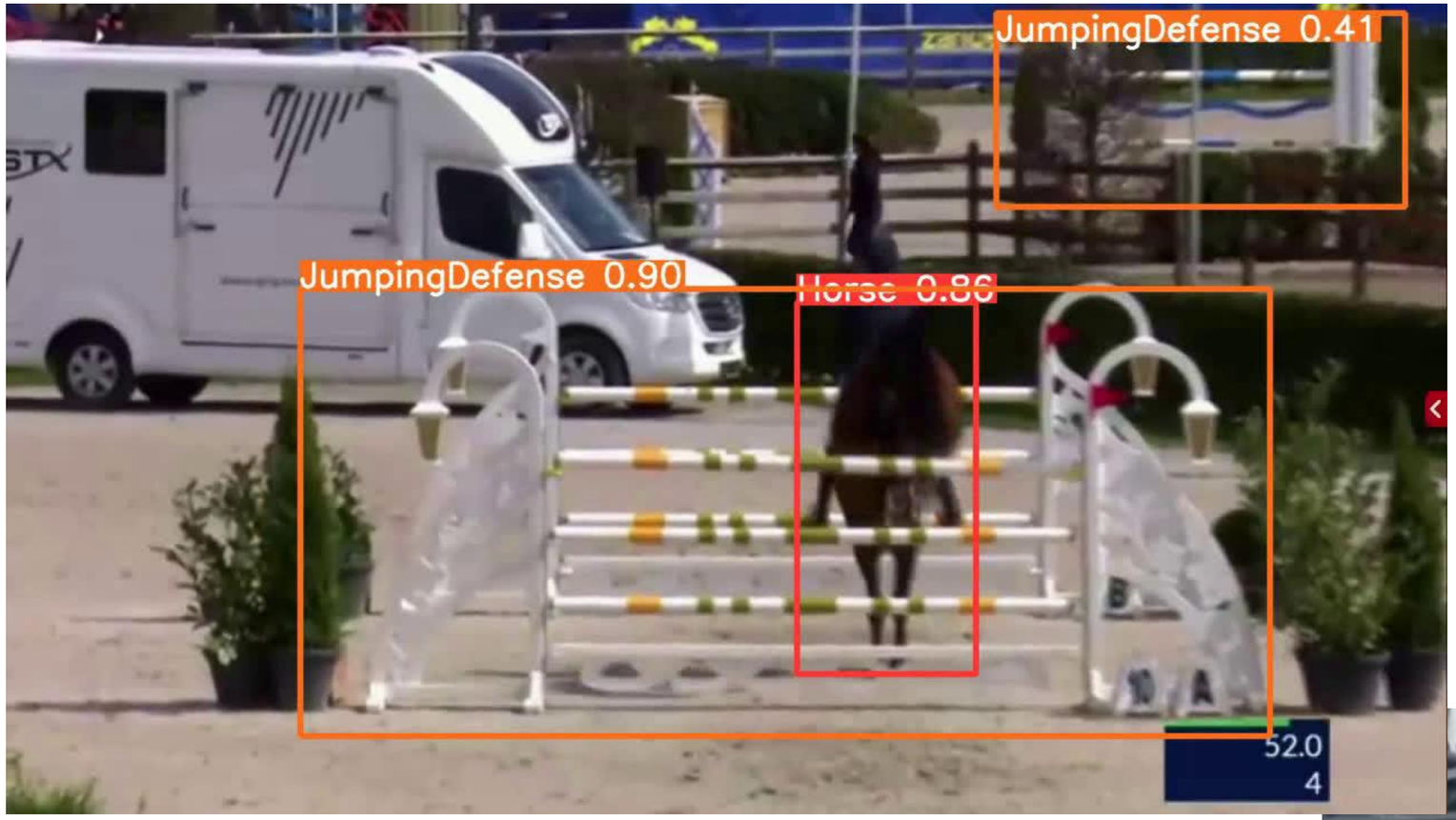
YoloV9

YoloV8 + SAM

SlowFast

Detectron2

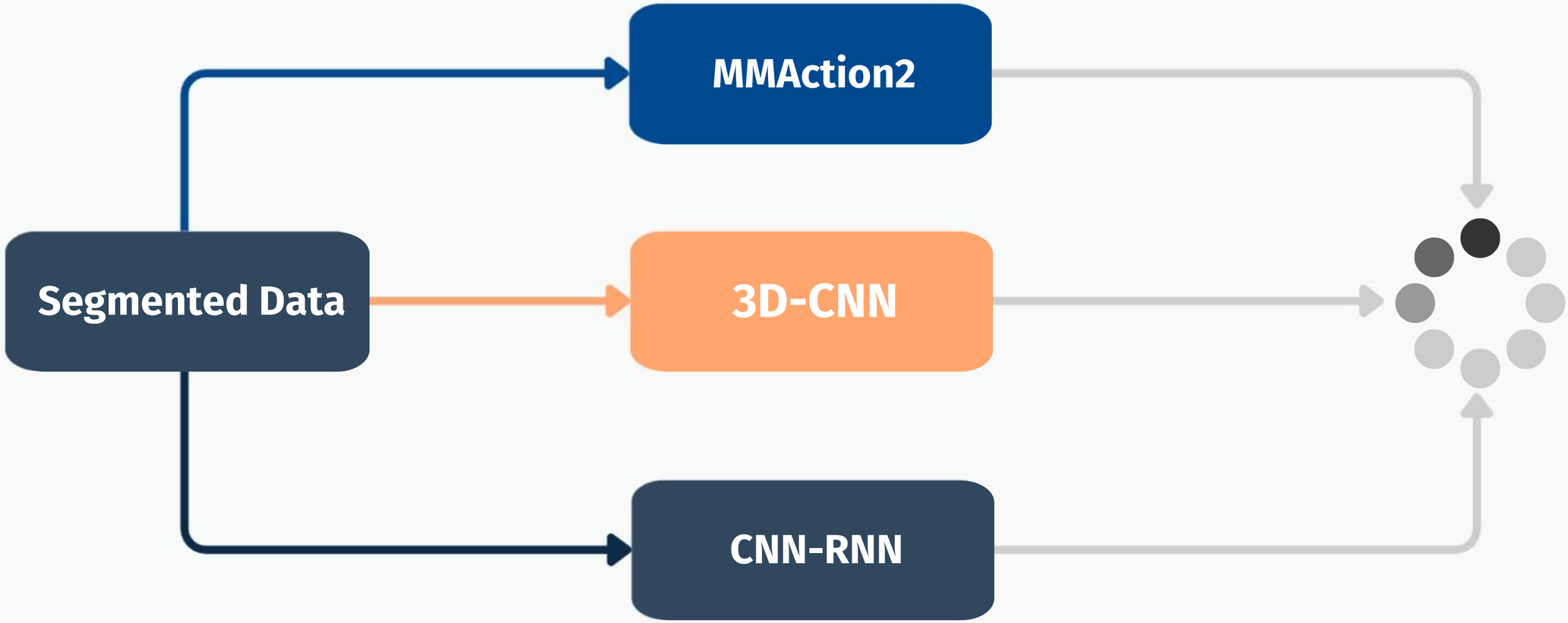




YoloV8

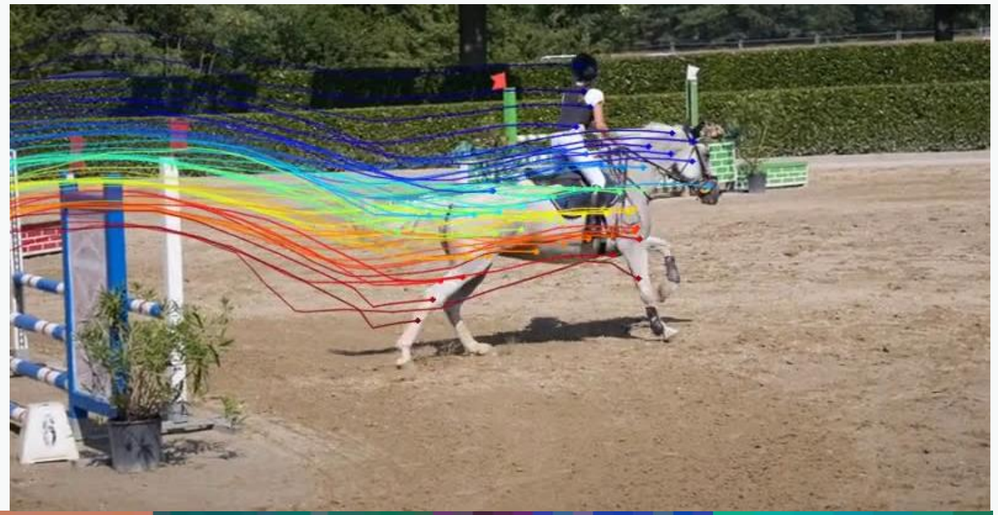
Segment Anything Model (SAM)

Further Work (before submission)

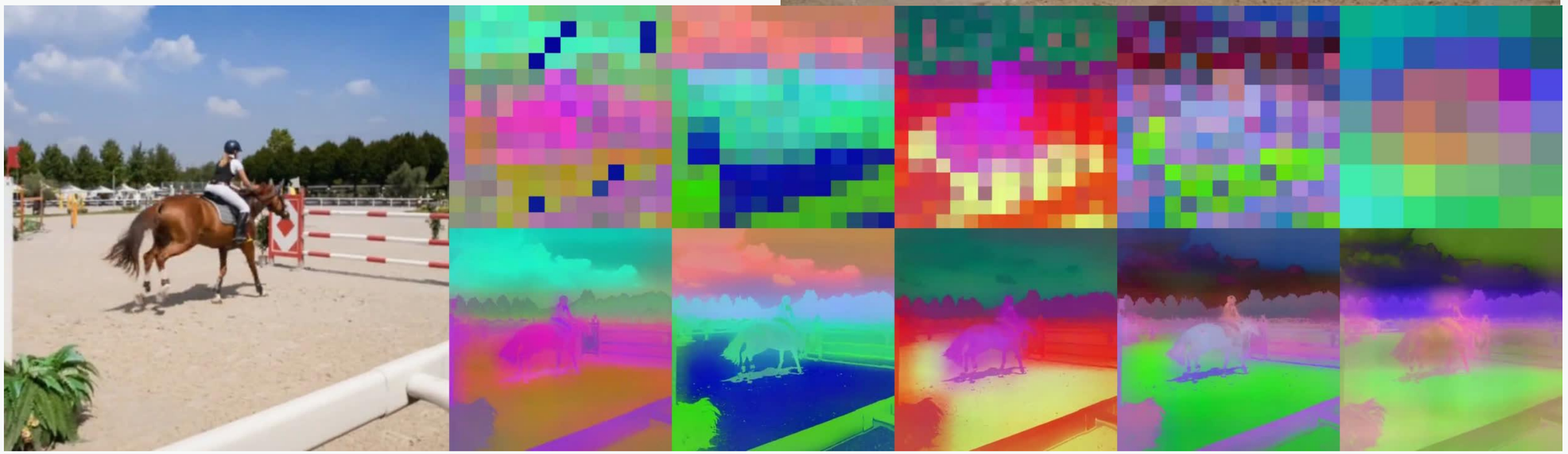


Future Work

OmniMotion: Tracking Everything Everywhere All at Once (2023)



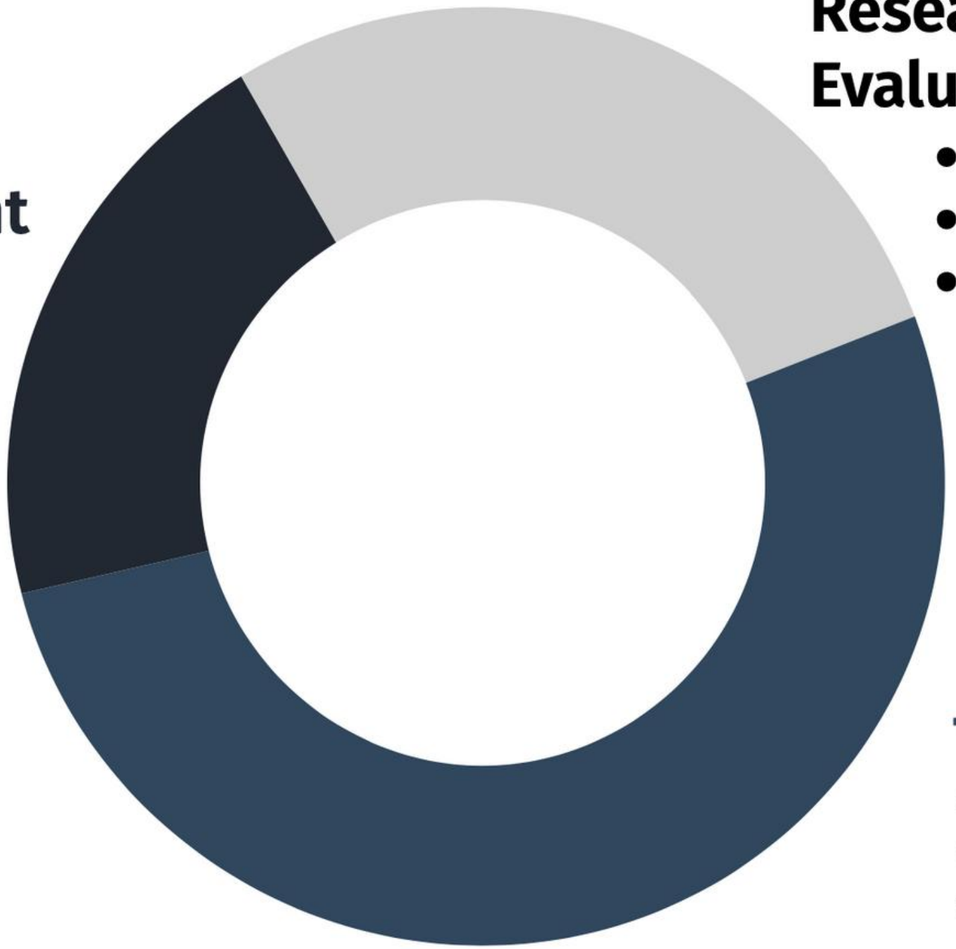
FeatUp: A Model-Agnostic Framework for Features at Any Resolution (2024)



Learnings

Project Management

- Planning & Scrum records
- Dashboards
- Documentation & Communication



Research, Monitoring & Evaluation

- AI Models' Research
- Technical Problem Solving
- Goals/Outcome/Output

Technical Acumen

- Programming/Debugging
- Azure/Linux/Colab/Jupyter
- Programming Documentation

Thank You