MATHÉMATIQUES ET INFORMATIQUE
Sciences
Université de Paris

Study and Modeling of Spatial Relations between Objects in Image Sequences or Videos

Master 1 Computer Vision and Intelligent Machine

Academic year 2022-2023

Yaghmoracen BELMIR

Supervised by: Mr. Laurent WENDLING, Mr. Camille KURTZ

Presentation Plan

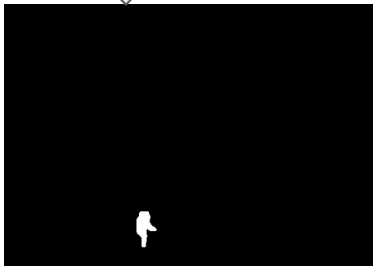
- Introduction
- Task
- Proposed Approaches
- Results
- Conclusion and Future Perspectives

Introduction

Introduction

Task

Task

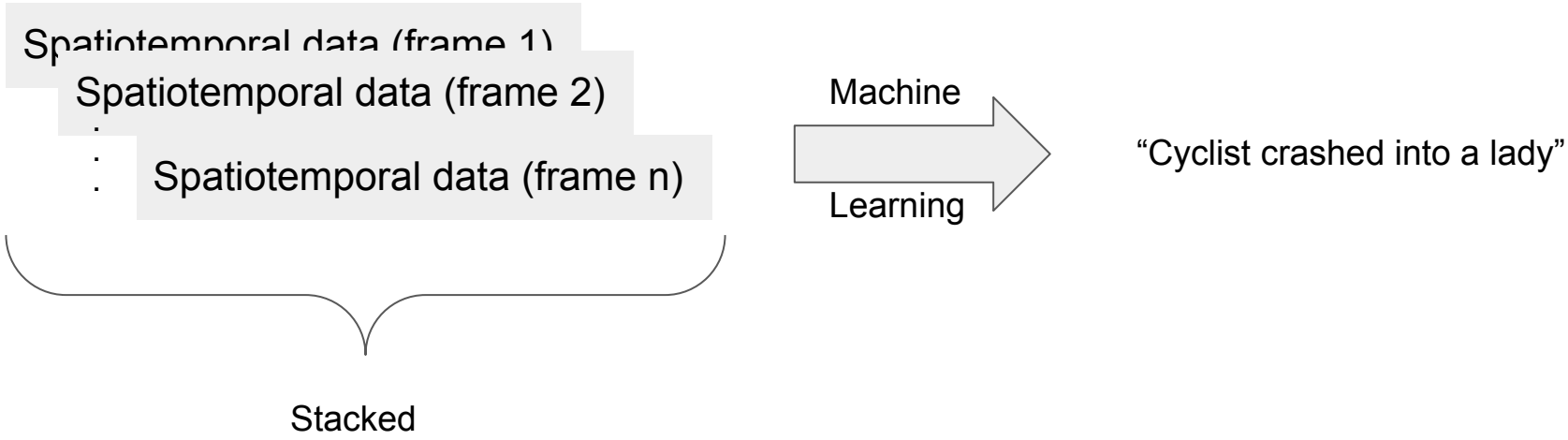


Spatiotemporal data (frame 1)

Spatiotemporal data (frame 2)

Spatiotemporal data (frame n)

Task


Spatiotemporal data (frame 1)
Spatiotemporal data (frame 2)
Spatiotemporal data (frame n)
Stacked
Machine
Learning
“Cyclist crashed into a lady”

Proposed Approaches

Proposed Approaches

Approach 1

Problems

- **Detection :** Ability to detect two objects

  Solved : Yolov8

- **Segmentation :** Ability to detect two objects

  Solved : Yolov8-based segmentation

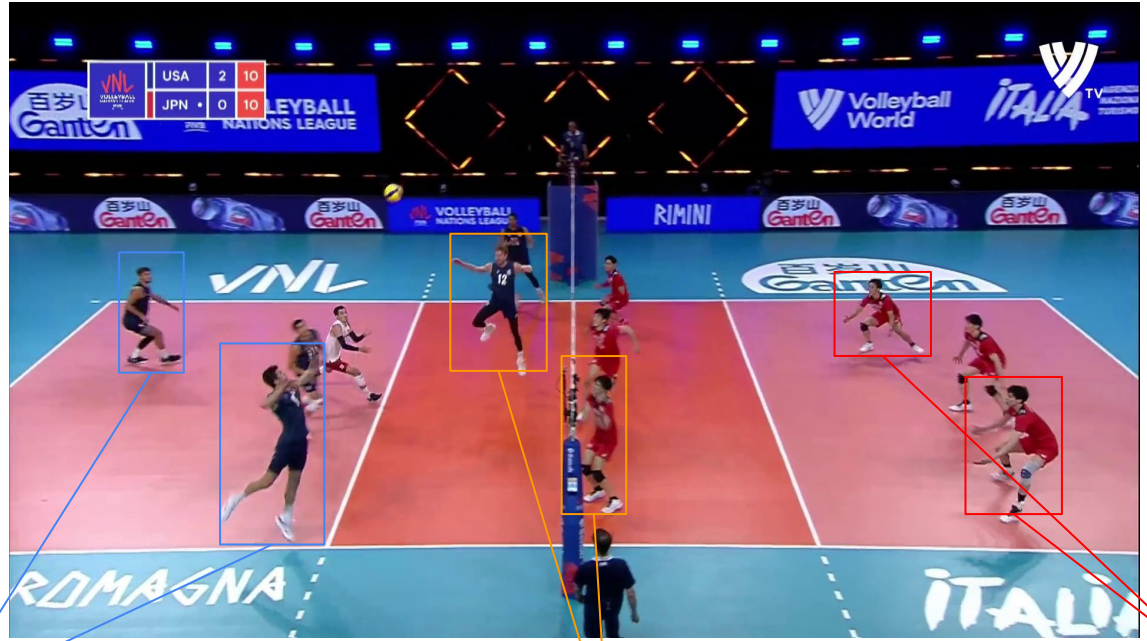
- **Tracking :** Ability to track two objects

  Solved : SORT algorithm

- **Comprehension :** Ability to understand the scene

  Solved : CNN model

Data construction

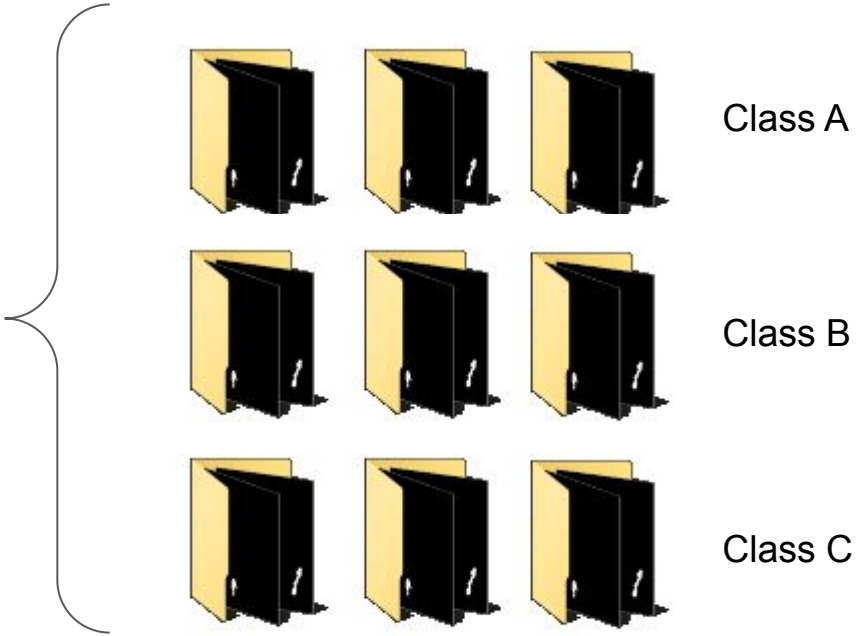


Class A : players from the team 1

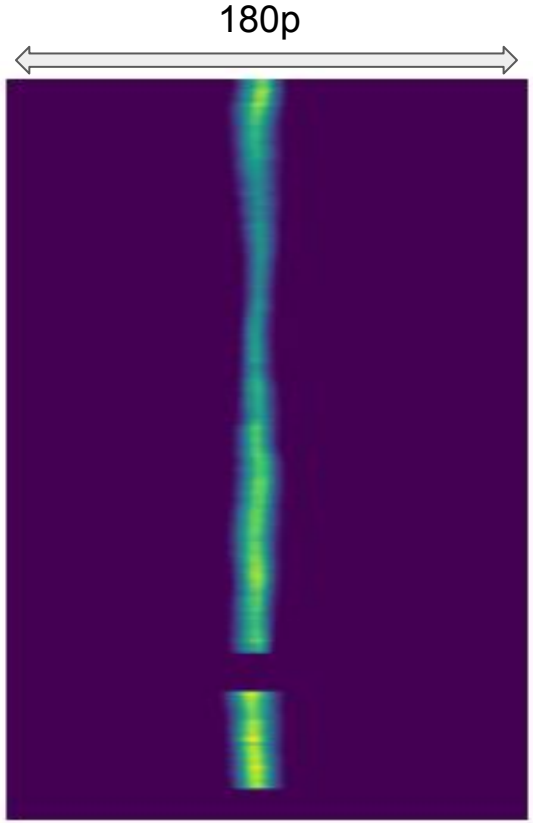
Class C: players being rivals

Class B : players from the team 2

Data construction



Force histogram banner



Characteristics:

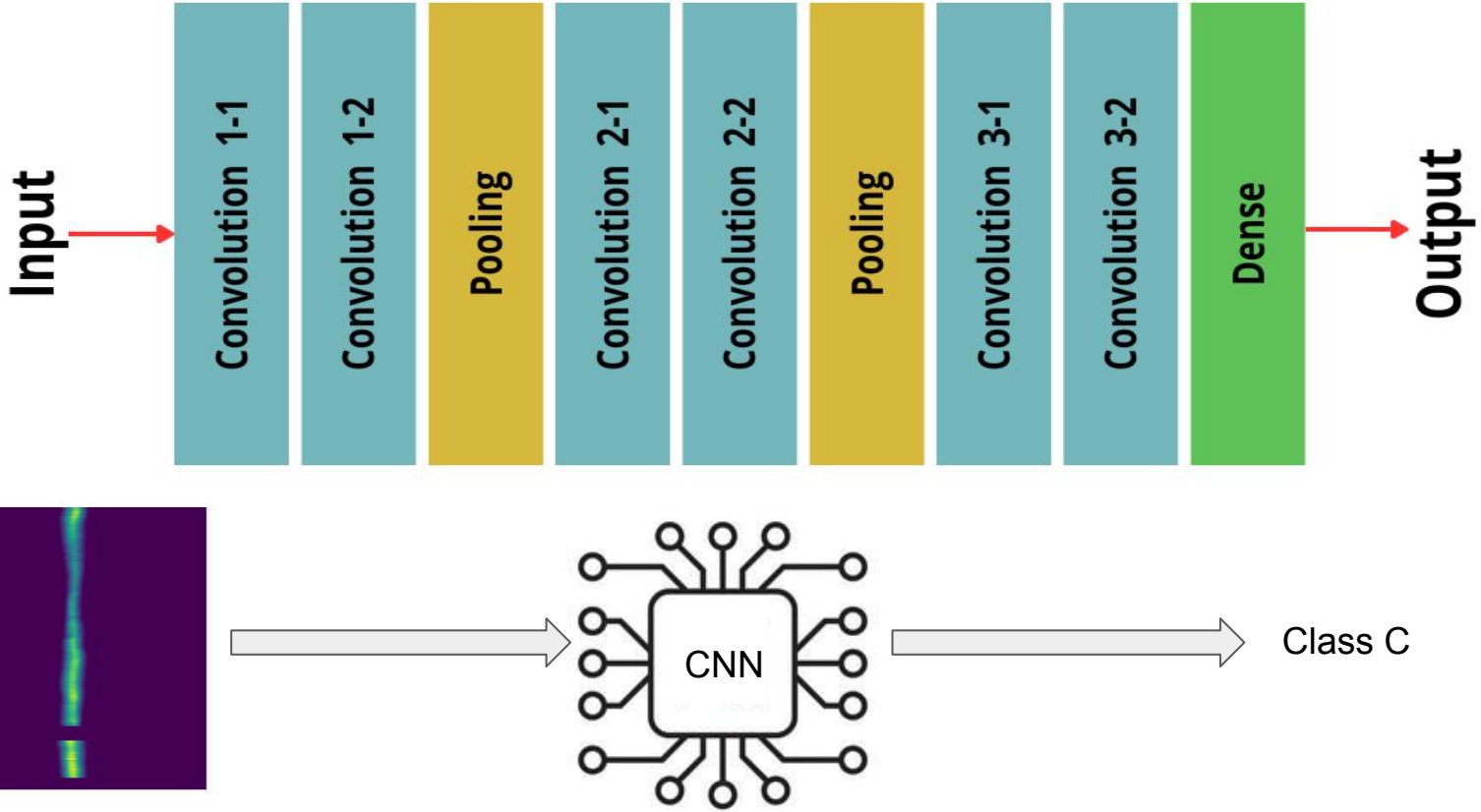
- Variable shapes.
- Variable range of values.

  Integer (-32768 to 32767)

Dtype = int16

Save image format .TIF

CNN


Input
Convolution 1-1
Convolution 1-2
Pooling
Convolution 2-1
Convolution 2-2
Pooling
Convolution 3-1
Convolution 3-2
Dense
Output
CNN
Class C

Evaluation metrics

On 12 banner images :

Metric	Precision	Recall	F1
Value	0.11	0.33	0.17

Confusion matrix

Class	A	B	C
A	0	5	0
B	0	4	0
C	0	3	0

Conclusion

- Not very optimal classification.
- Potential for improvement with larger data.
- Potential for improvement with a variety of architectures.
- Camera movements has a big impact on data.

Conclusion and Future Perspectives

Conclusion

Our project advances spatio-temporal analysis in videos through object tracking, force histogram computation, and supervised/unsupervised classification, with potential applications in various fields (actions prediction)

Perspectives

- Enhanced Object Tracking.
- YOLOv8 Model Expansion.
- CNN Data Expansion.

Updates

https://github.com/yaghmo/yolov8-sort-detection-tracking-segmentation-force-histogram-banner-cnn

- **Uploads :**
  - Code.
  - ReadMe.
  - Testing trims.
- **Corrections :**
  - Comment section.
  - CNN code.
- **Improvement :**
  - More interactive console.
  - Arguments.

THANK YOU