

The background image shows two male Ultimate Frisbee players in a crouched, ready position on a grass field at night. The player in the foreground is wearing a dark jersey with the number 11 and 'CUS BOLOGNA' on the back. The player behind him is wearing a light-colored jersey with 'ZACCAITI' and 'CUS BOLOGNA' visible. A frisbee is in the air between them. The entire image has a strong red color cast.

Ultimate Frisbee Tactical Dashboard

Adam Jasiński

Marc-Christoph Wagner



Ultimate Frisbee as a sport



Business mission



Product presentation



Technical insights



- 14 Players
- 2 Referees
- 2 Endzones
- 1 Disc

How to Score?

catch the disc in
opposite endzone

Most important rule!

Player in possession of the
disc is not allowed to
move!



First organized tournament
*Eight teams took part in the first
National Collegiate Championships
[Yale Univeristy]*

1975


World Games
*included as a
medal sport*

2001



???

1968

Joel Silver

*introduced his idea of Ultimate
Frisbee to the Columbia High
School student council*

1983

**First World
Ultimate Championship**
Gothenburg, Sweden

Ultimate USA:

- 100.000+ active players

Ultimate Germany:

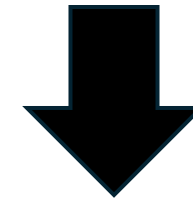
- 10.000+ active players

Problem we solved!

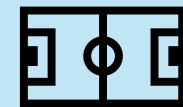
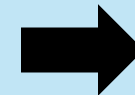
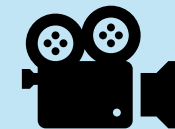


Source: <https://statto.app/>

Tactical positions of the players must be recorded manually by tapping on the corresponding location of the pitch.

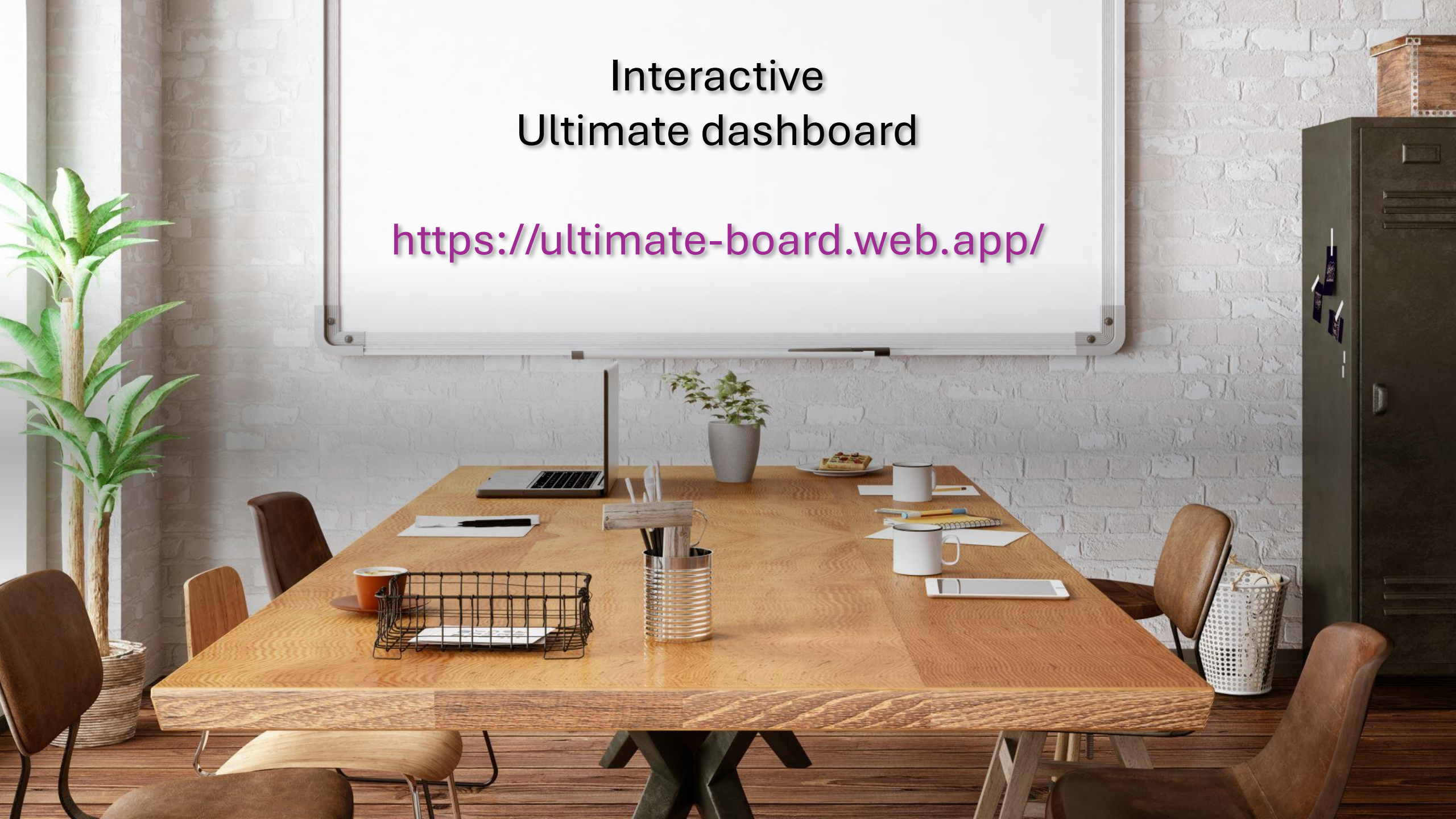


We automated this step using computer vision and AI



Interactive Ultimate dashboard

<https://ultimate-board.web.app/>





Technical Insights

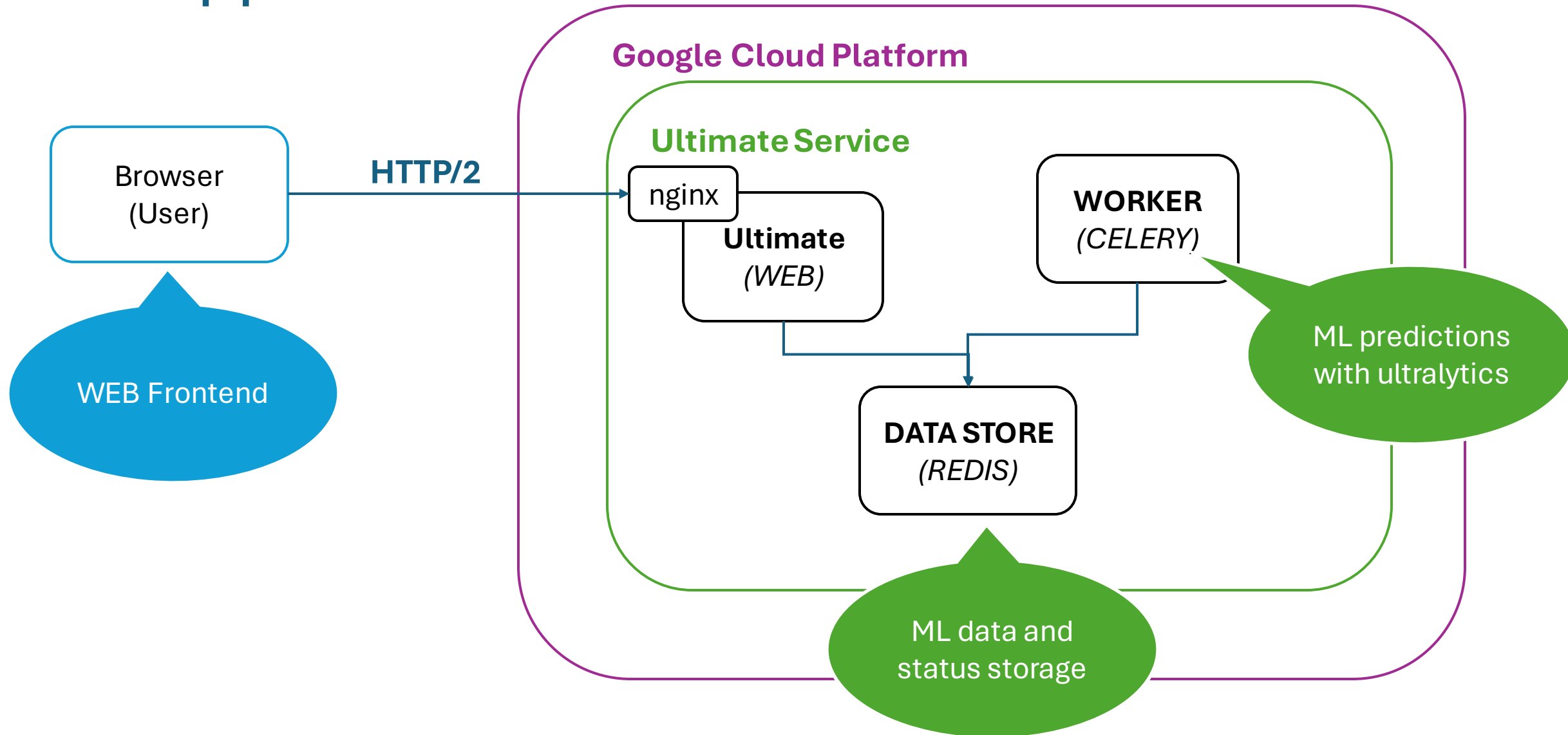
PART I: Web application:

- structure and deployment

PART II: Data Science/ML:

1. Player and disc detection
2. Field outline detection
3. Perspective transformation
4. Team detection

Web application



YOLOv8 object detector

Training data

- Video footage of 4 games
 - **Event:** Club nationals
 - **Year:** 2021
 - **Recorded by:** Benson
- Supervised Learning
 - 200 labeled training images
 - 40 labeled test images



Machine Vs Condors 2021 Club Nationals Pool Play



Sockeye Vs Rhino Slam 2021 Club Nationals Pool Play



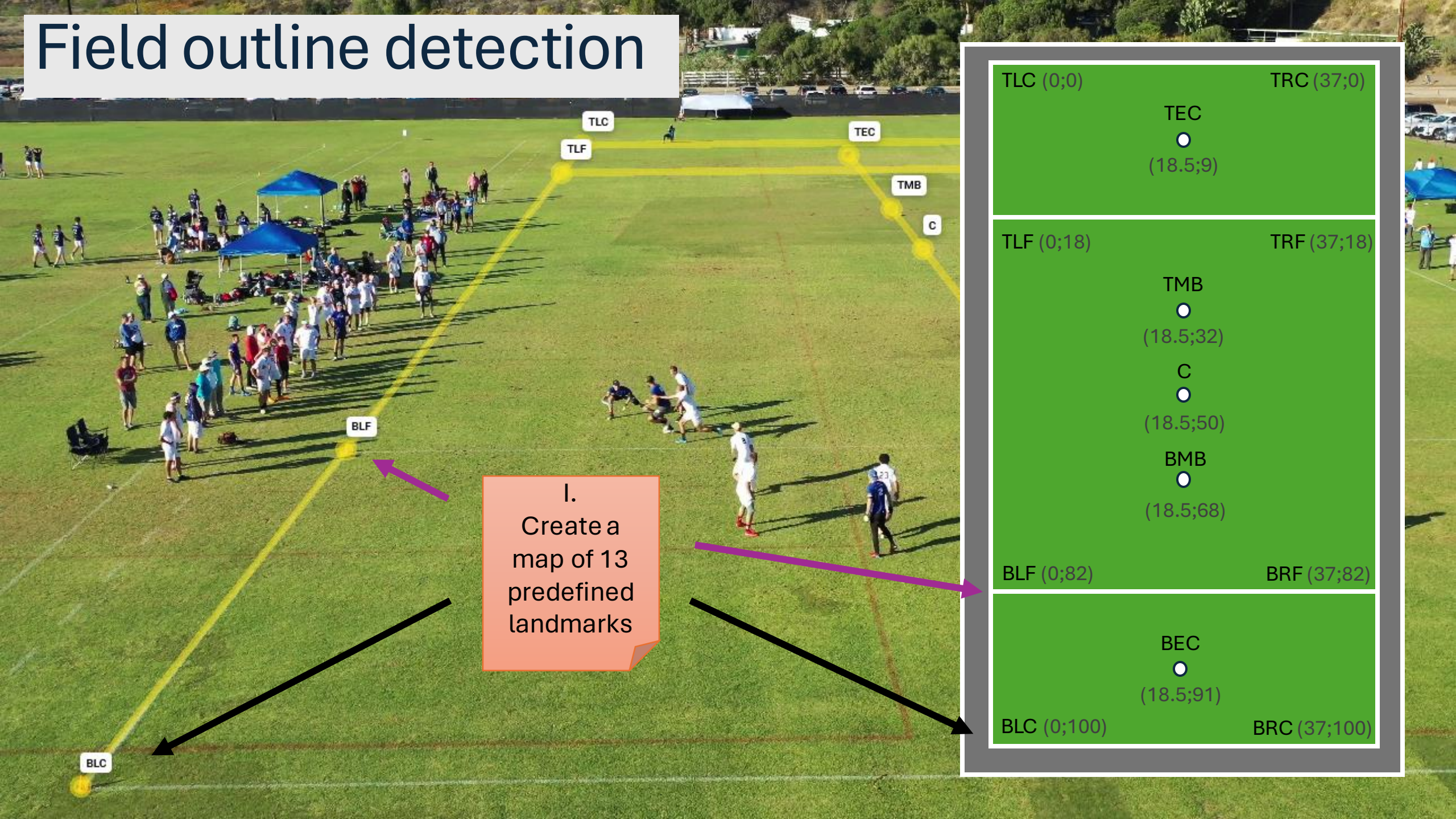
PoNY Vs The Killjoys 2021 Club Nationals Pool Play



Sub Zero Vs PoNY 2021 Club Nationals Pool Play

Source: <https://vimeo.com/user95184899>

Field outline detection



I.
Create a
map of 13
predefined
landmarks

TLC (0;0)

TEC
●
(18.5;9)

TRC (37;0)

TLF (0;18)

TMB
●
(18.5;32)

C
●
(18.5;50)

BMB
●
(18.5;68)

BLF (0;82)

BRF (37;82)

BEC
●
(18.5;91)

BLC (0;100)

BRC (37;100)

People and disc detection

II.
Disc
detection
(very small)



III.
People at the
sidelines of
the field are
not relevant

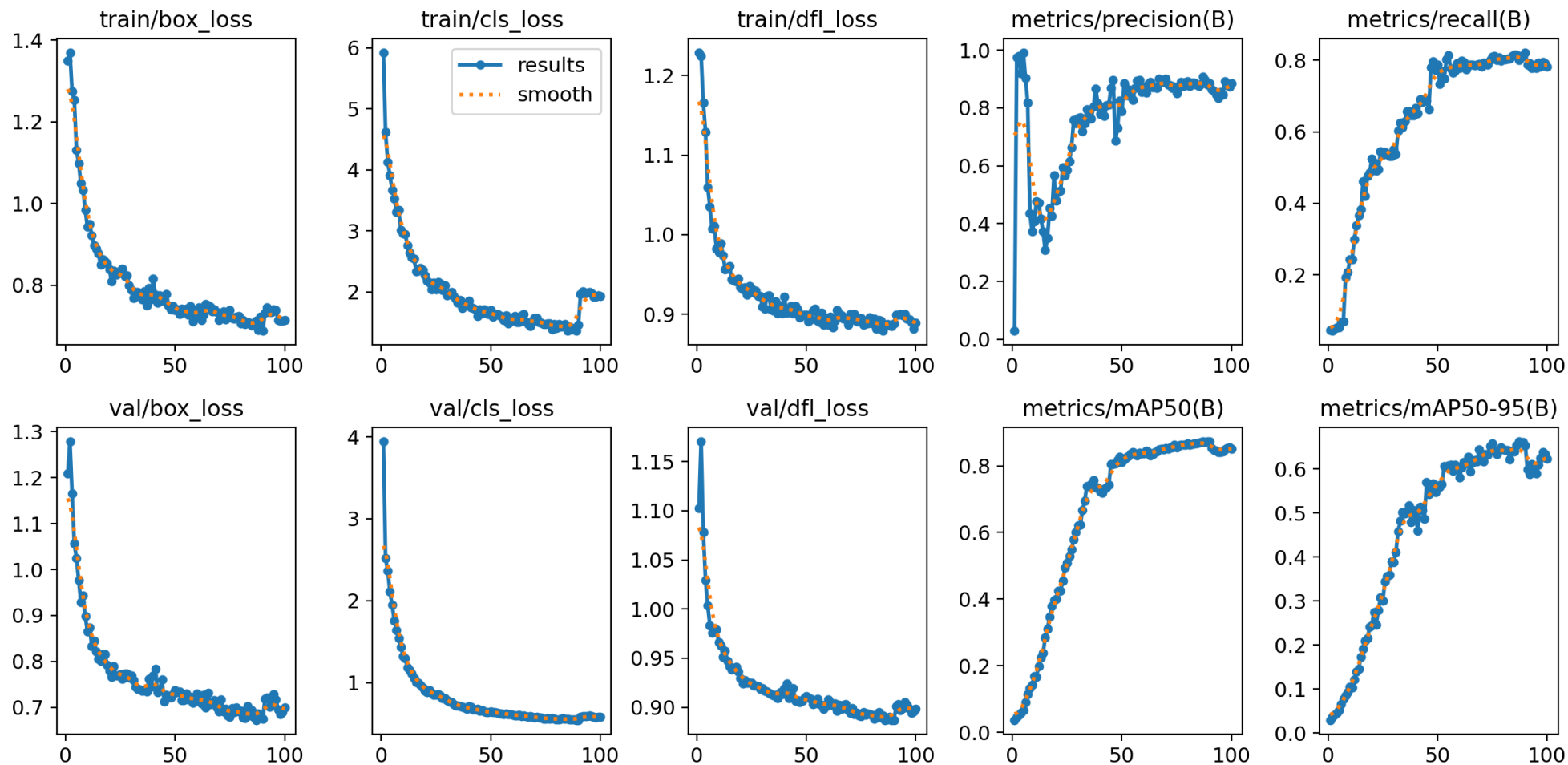


I.
Distinguish
between
players and
referees



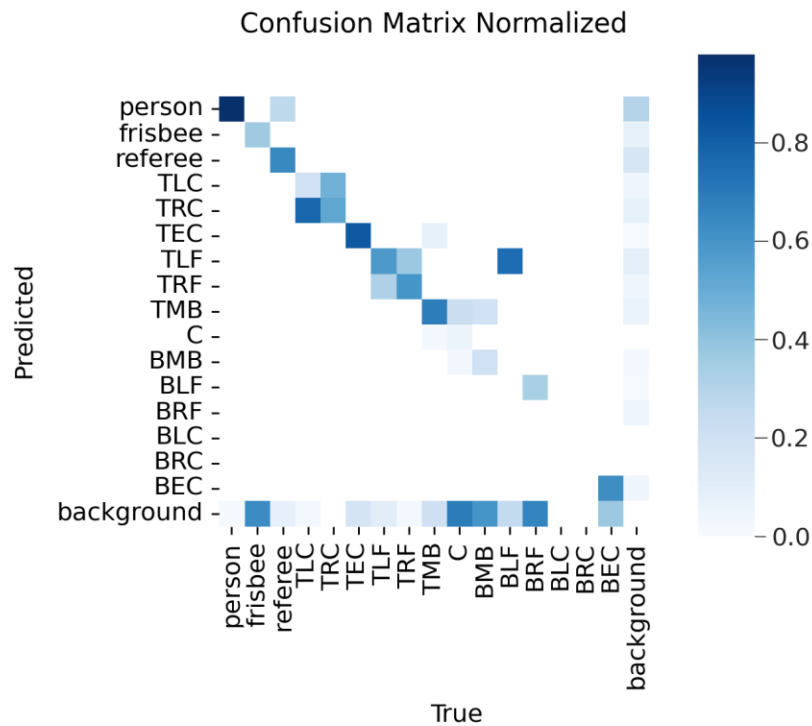
YOLOv8 object detector

Training - Losses and quality metrics

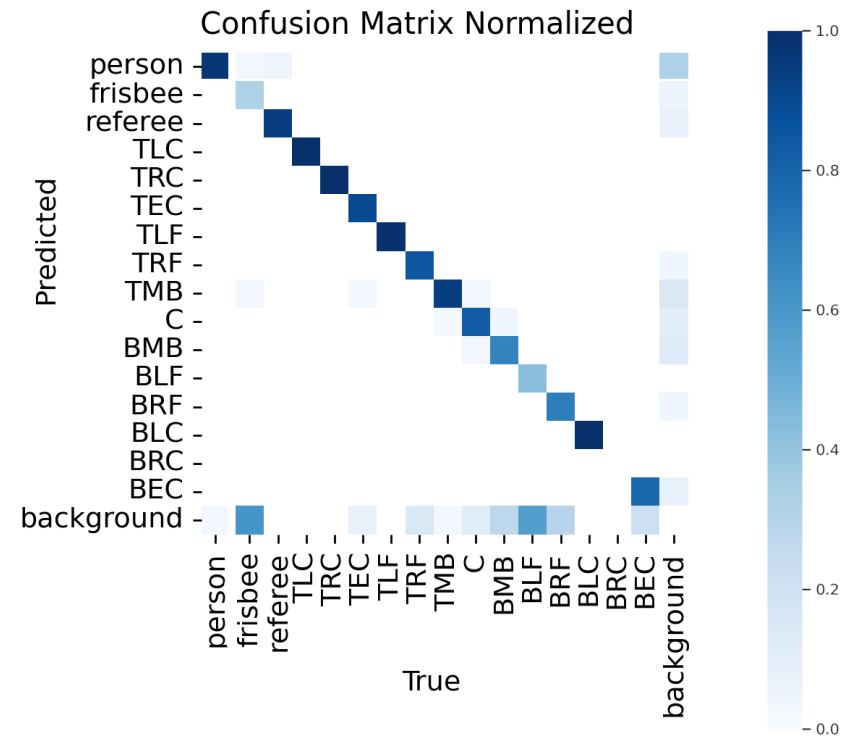


Results

Confusion matrix (test data)



Confusion matrix (validation data)

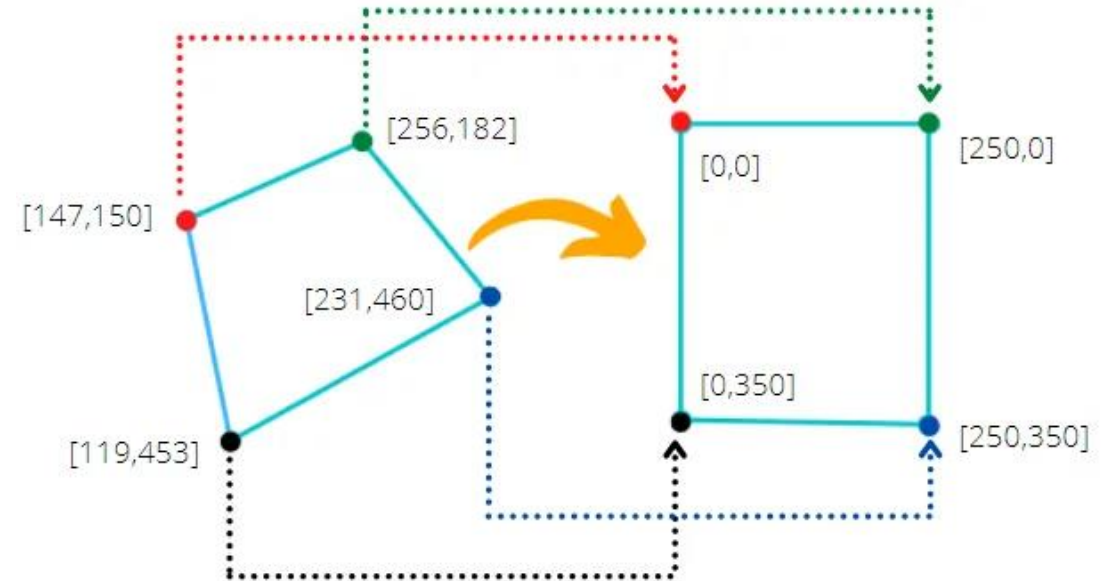


How to generate a bird's-eye view tactical map?

Perspective transformation

1. Select 4 best fitting landmarks
2. Get target coordinates for all selected landmarks
3. Calculate transformation matrix
4. Map all pixels on target space

Example



<https://thinkinfi.medium.com/warp-perspective-and-transform-opencv-python-fbfd12560158>

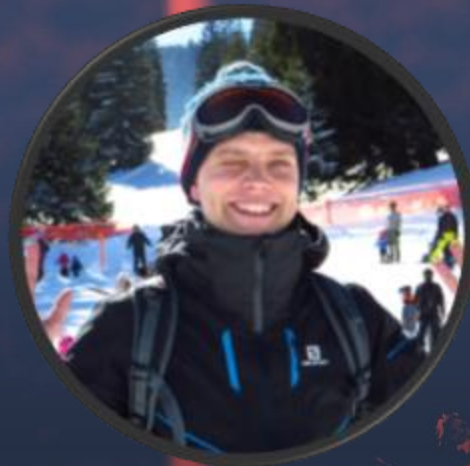
Summary



https://github.com/marcwagn/ultimate_analytics



Adam
Jasiński



Marc
Wagner

