

Capstone Project

Building a training development engine for Tracktics

Team G 22 | Project Q007

Antoine Fougous, Niklas Heist, Mark Kütemeyer, Amazir Nimgharen & Andrea Perl

The company & team

Tracktics – The Company



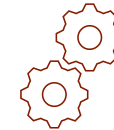
Founded in 2014



Based in Zurich and Frankfurt

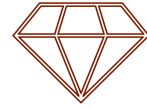


Operates in the
soccer industry

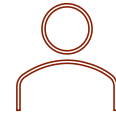


Wearable tracking device
with access to matching software

Tracktics – The Company



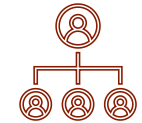
Analytics as a Service



18'000



Non-professional
players and coaches



20

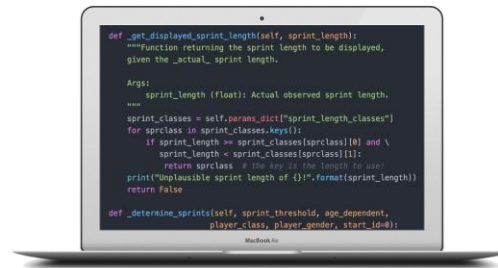
Tracktics – Product

Tracktics offers a tracking device & analytics platform for amateur soccer players



Hardware

Wearable technology
Includes GPS tracker, speed sensors, gyroscope and magnetometer



Software

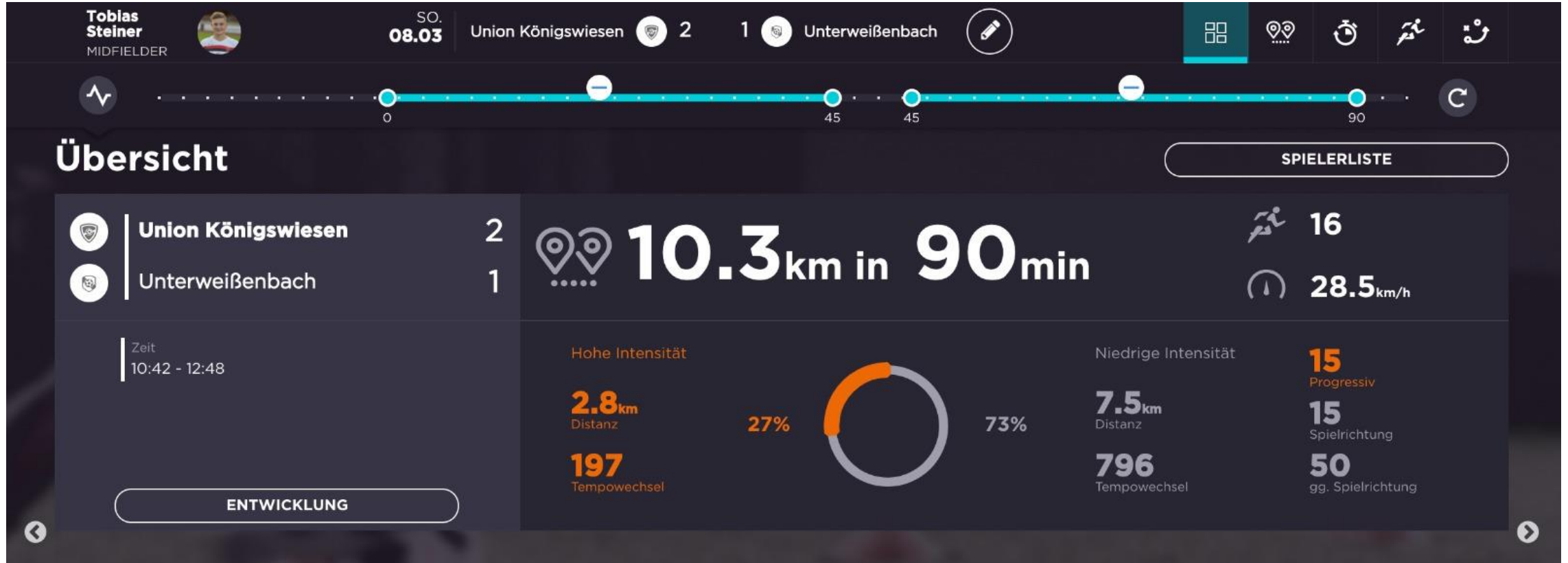
Based on tracking data,
calculates relevant metrics like
distance covered, speed and
positioning



Player analysis

Players & coaches can access the
analysis via an app. The data
driven insights help to improve
player performance.

Product Overview



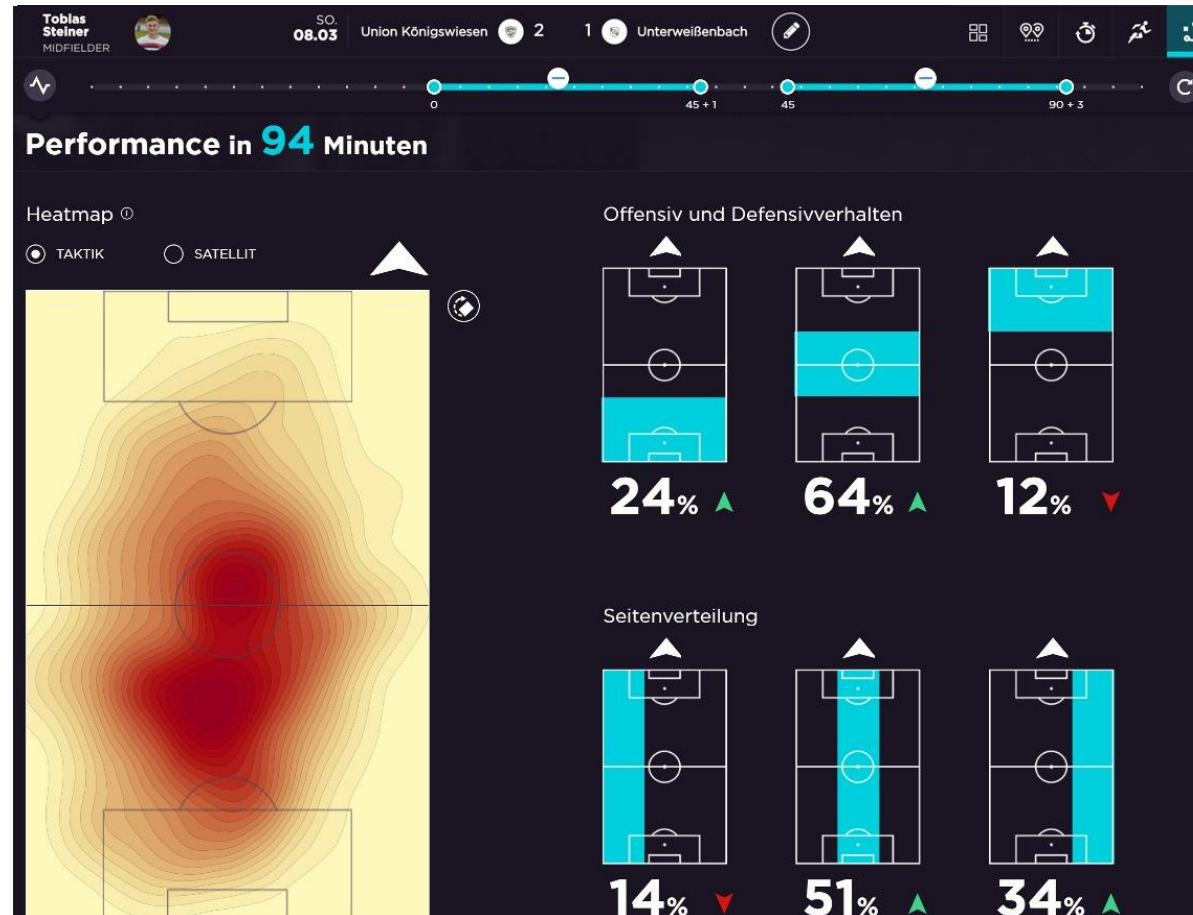
Product Overview



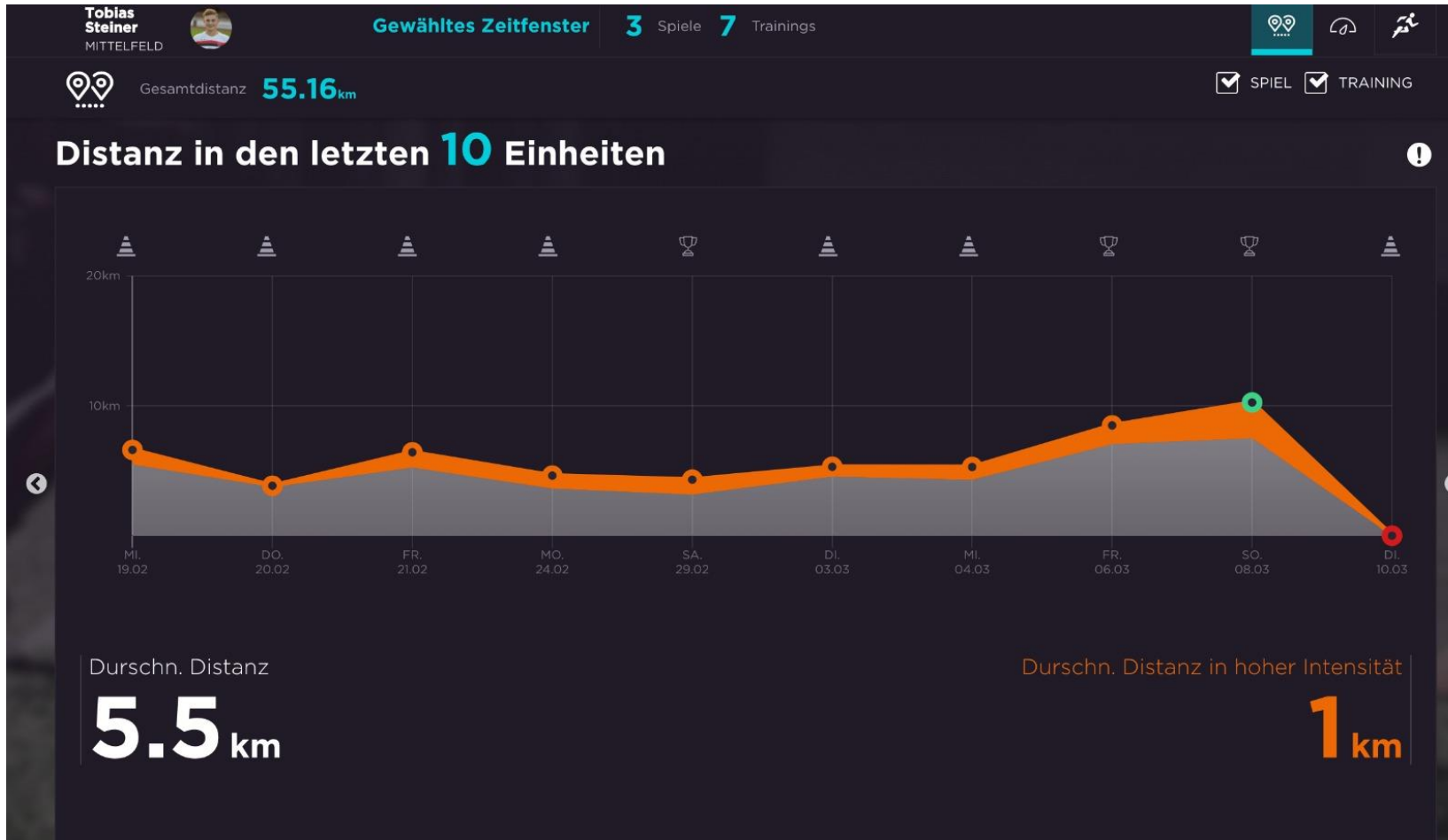
Product Overview



Product Overview




Product Overview
































Product Overview

Team Management

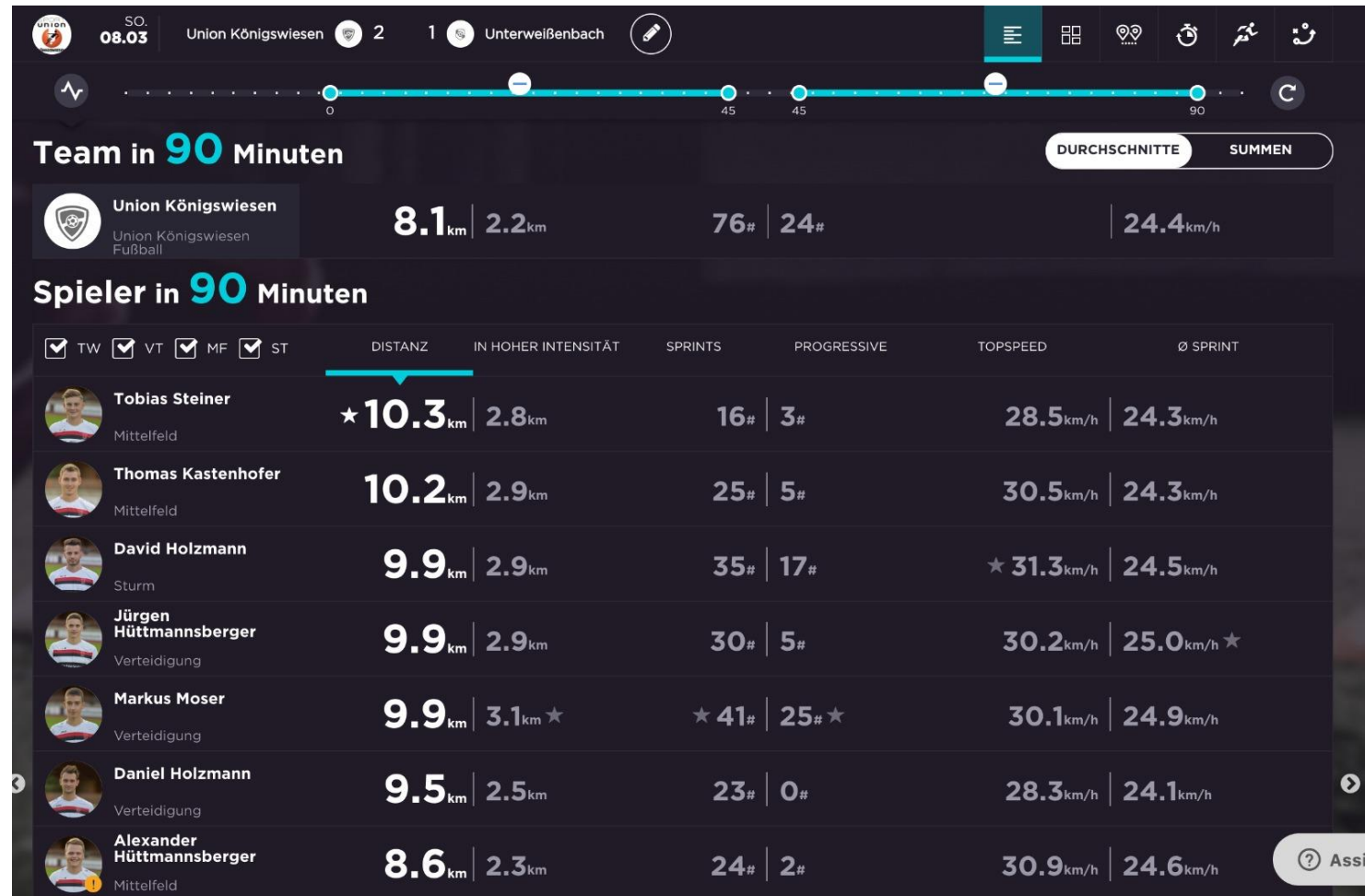
☒ TW ☒ VT ☒ MF ☒ ST

Suche nach Spieler 

 Ales Pavelec TORWART	 Alexander Hüttmannsberger MITTELFELD	 Clemens Scheuchenpflug VERTEIDIGUNG	 Daniel Holzmann VERTEIDIGUNG	 David Holzmann STURM
 Fabian Hennerbichler STURM	 Florian Häusler MITTELFELD	 GM MITTELFELD	 Hannes Klaus MITTELFELD	 Jan Chotovinsky VERTEIDIGUNG
 Jan Stoszek STURM	 Josef Baumgartner TORWART	 Jürgen Hüttmannsberger VERTEIDIGUNG	 Lukas Kastenhofer MITTELFELD	 Markus Moser VERTEIDIGUNG
 Markus Sigmund MITTELFELD	 Martin Pilz MITTELFELD	 Maximilian Karlinger VERTEIDIGUNG	 Patrick Fasching STURM	 Patrick Pilgerstorfer TORWART
 Peter Windhager VERTEIDIGUNG	 Robert Hackl MITTELFELD	 Sebastian Steiner MITTELFELD	 Simon Kastenhofer MITTELFELD	 Thomas Kastenhofer MITTELFELD
 Tobias Birklbauer MITTELFELD	 Tobias Steiner MITTELFELD	 YH MITTELFELD		

 **SPIELER HINZUFÜGEN**

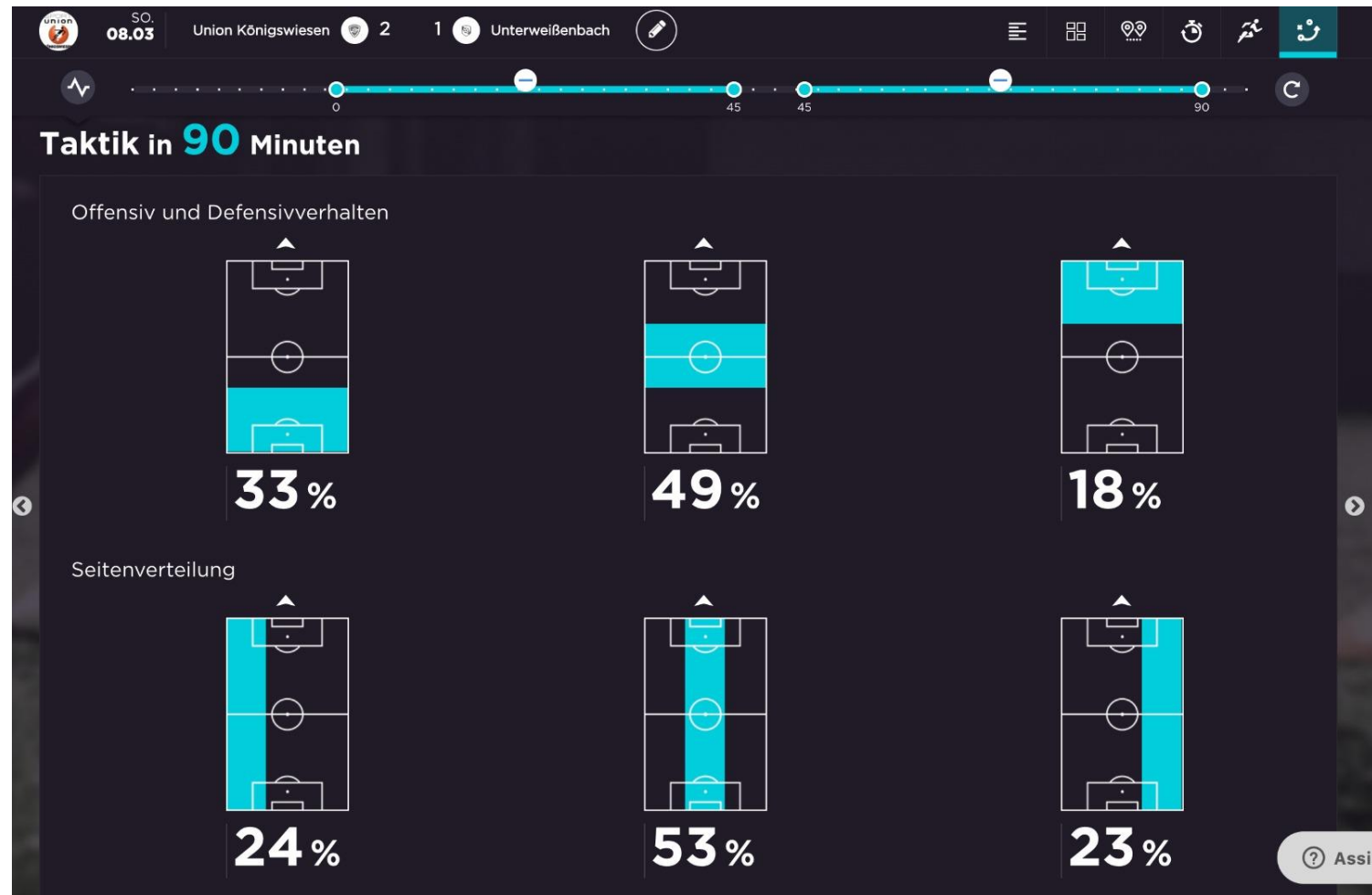
Product Overview



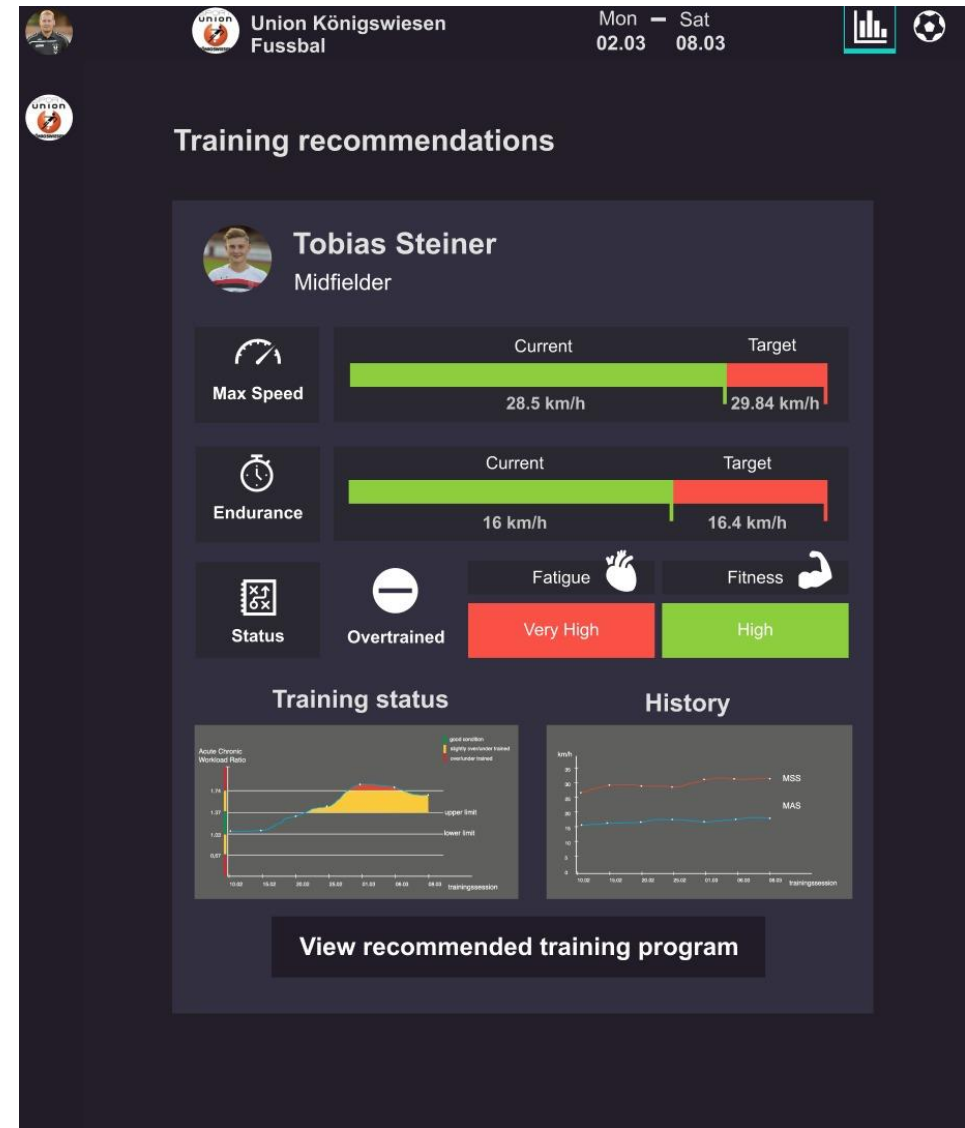
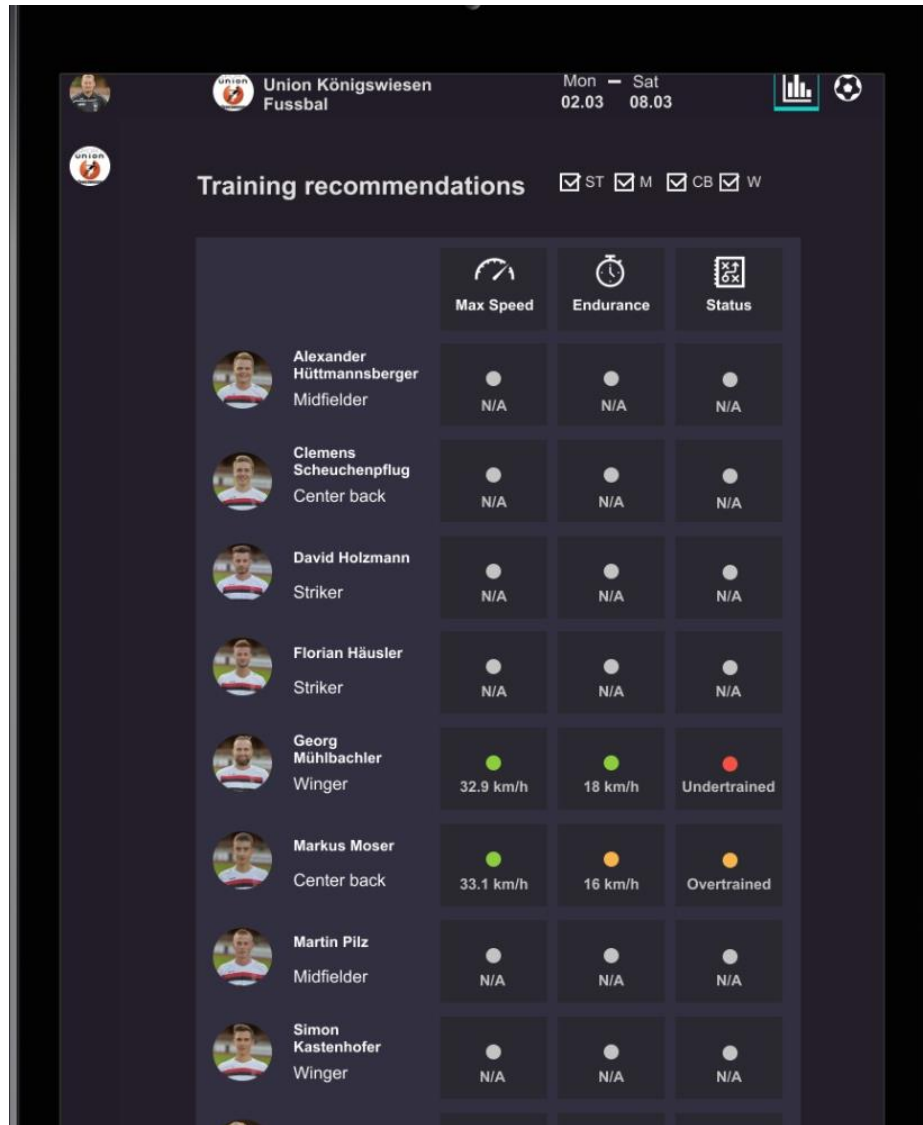
Product Overview



Product Overview



Project Outlook



The Team



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Economics & Management
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Economics & Philosophy
Frankfurt School



The challenge

The challenge - Overview



Problem to solve

Build a fitness exercise recommender
based on tracked player data

The goal of the project is to build a **training recommender**. This feature will help **players** to reach their target level of **performance**.



Goals to meet

Several sprint epics including a
finished MVP as final goal

We adopted a **sprint approach** for the project. We defined various **sub goals** (see next slide) that must be met in order to build the final MVP.

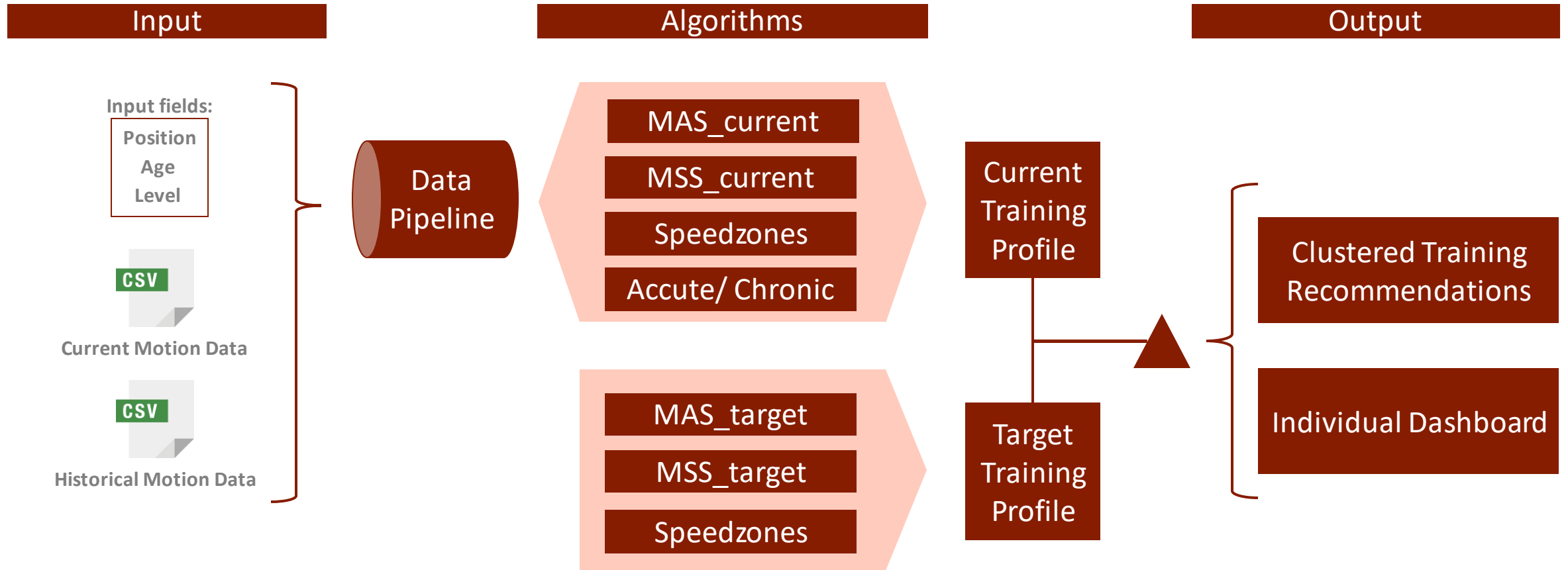


Added value

Tracktics: Additional app feature
Team: Engagement in development
cycle of a real data product

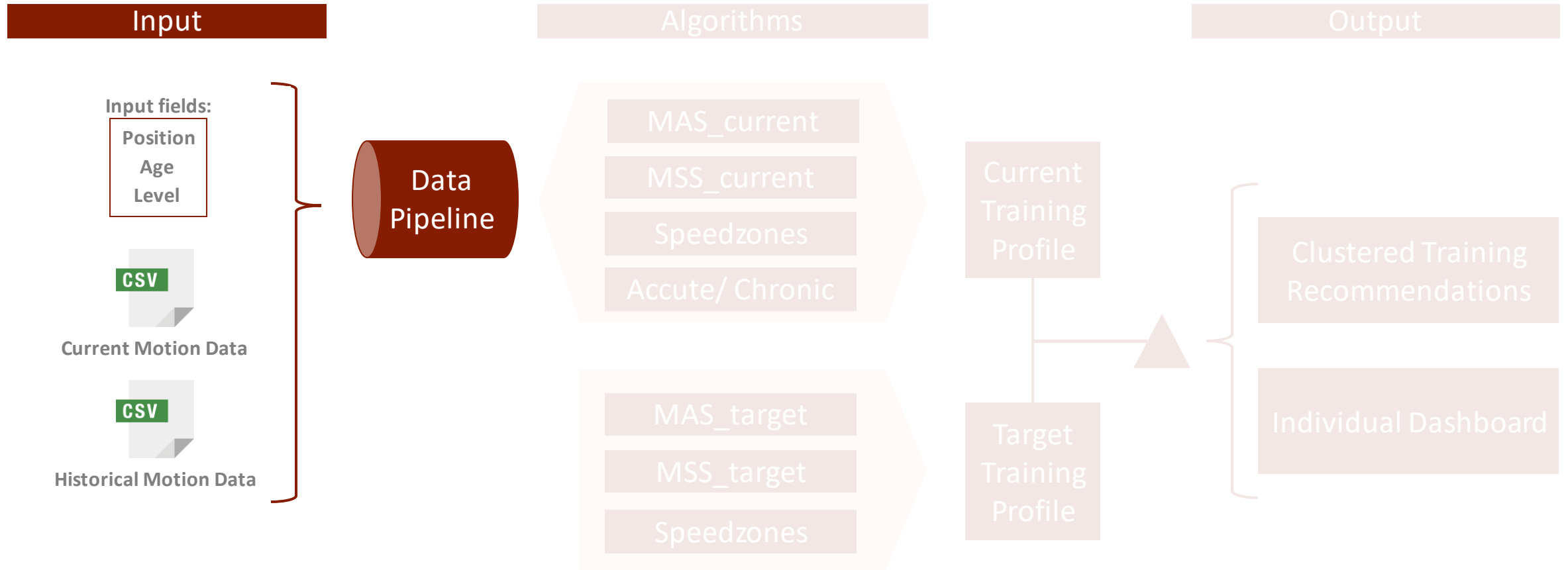
The product will add value to **Tracktics** in the form of a **new feature**. For the **team**, the values lies in the opportunity to **engage** in the real **development cycle** of a data product.

The challenge - Process

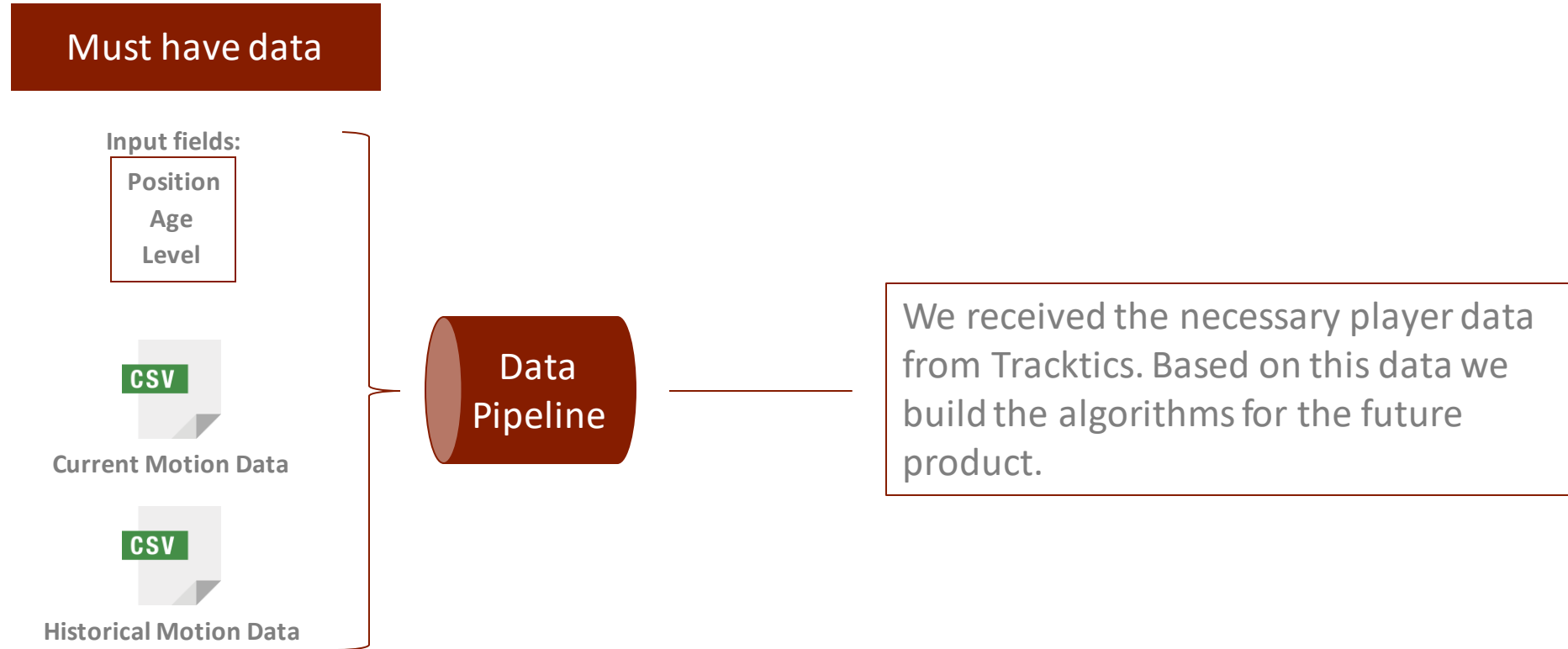


1. Input

Process – Input

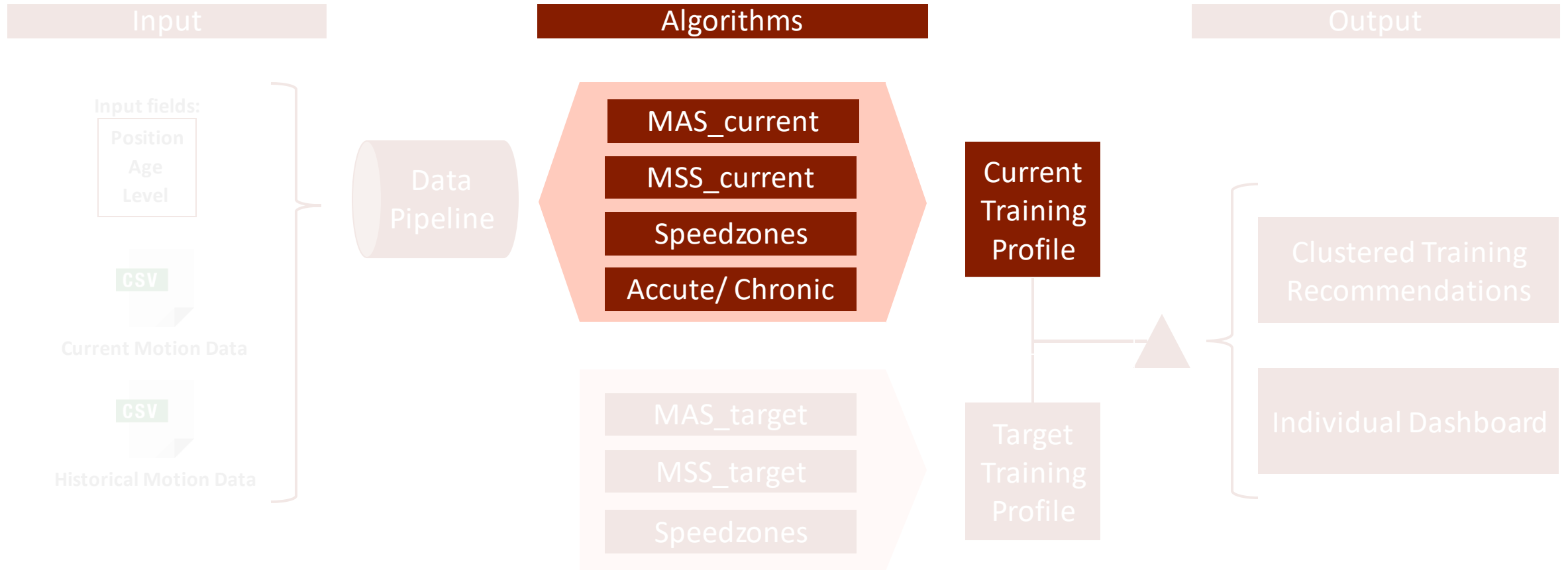


Input



2.1 Algorithms – Current training profile

Process – Algorithms (Current player profile)



Algorithms – Current player profile



Maximum Sprinting Speed

Calculates the maximum speed of each player based on his last ten games.



Maximum Aerobic Speed

Maximal aerobic speed (MAS) is the lowest running speed at which maximum oxygen uptake (V02 max) occurs



Speedzone calculation

Calculates in which speedzones (intensity of running) the player was for each moment of the game



Acute - to - chronic ratio

Calculates fatigue of each player. The ratio indicates how vulnerable the player is to injuries.

Maximum Sprinting Speed (MSS)



Calculates the maximum speed that the player reached during the last four games.

Maximum Sprinting Speed

Requirements

- File of the last four games
- Start and end of the first half and second half of the game

Assumptions

- Each row represents 0.2 seconds. But we want the person to sustain the sprint during at least 0.6 seconds to be eligible as a sprint.

Results

- We calculated the maximum speed for each of the last four games. Then we selected the highest value.

Maximum Aerobic Speed (MAS)



The lowest running speed at which maximum oxygen uptake ($\text{VO}_2 \text{ max}$) occurs.

Maximum Aerobic Speed

Goal

- The MAS was developed for the purpose of increasing the specificity of training and to enable coaches to monitor training loads more accurately.

Calculations

- The value is calculated by an algorithm of Tracktics that was given to us.
- We integrated the algorithm into our player profile.

Speedzones



Speedzone calculation

Describes the intensity of running the player achieved for each moment of the game

Speedzones are a function of the Maximum Aerobic Speed

< 0.5	Active recovery
0.5 – 0.7	GA 1
0.7 – 0.9	GA 2
0.9 – 1.1	Threshold performance
1.1 – 1.2	Development area
> 1.2	Peak area

Acute - to - chronic workload ratio (ACWR)



The ratio indicates fatigue in relation to fitness and shows how vulnerable he is to injuries.

Acute – to – chronic ratio

Acute workload (Fatigue)

Chronic workload (Fitness)

Rolling average model

- The RA model uses absolute (i.e. total) workload performed in 1 week (acute workload) relative to the 4-week chronic workload (i.e. 4-week average acute workload).

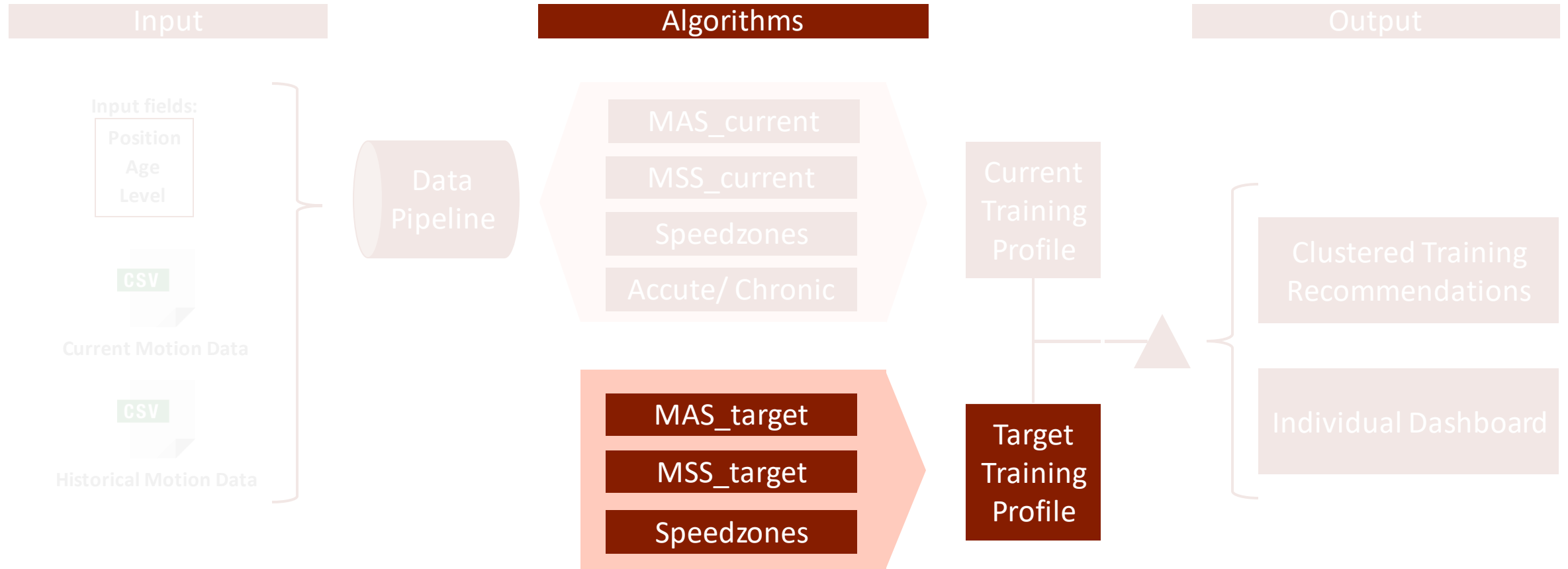
$$EWMA_{today} = Load_{today} \times \lambda_a + ((1 - \lambda_a) \times EWMA_{yesterday}) \quad \lambda_a = 2/(N + 1)$$

Exponentially weighted moving average model

- The EWMA model places a greater emphasis on the most recent workload an athlete has performed by assigning a decreasing weighting for each older workload value

2.2 Algorithms – Target player profile

Process – Algorithms (Target player profile)



Algorithms – Target player profile



Maximum Sprinting Speed

Calculates the maximum speed of each player based on his last ten games.



Maximum Aerobic Speed

Maximal aerobic speed (MAS) is the lowest running speed at which maximum oxygen uptake (V02 max) occurs



Acute - to - chronic ratio

Calculates fatigue of each player. The ratio indicates how vulnerable the player is to injuries.

Methodology

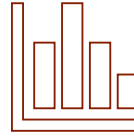
1. Researched sport science papers that contain values for professional athletes
2. Build target profiles bases on obtained values following a top-down approach
3. Developed an algorithm to calculate target profile based on age, player level & position

Algorithms – Target player profile



Age

Depending on the age of the player differs the average MAS and MSS of professional athletes



Player Level

Target MAS & MSS are derived from the professional values and toned down from there



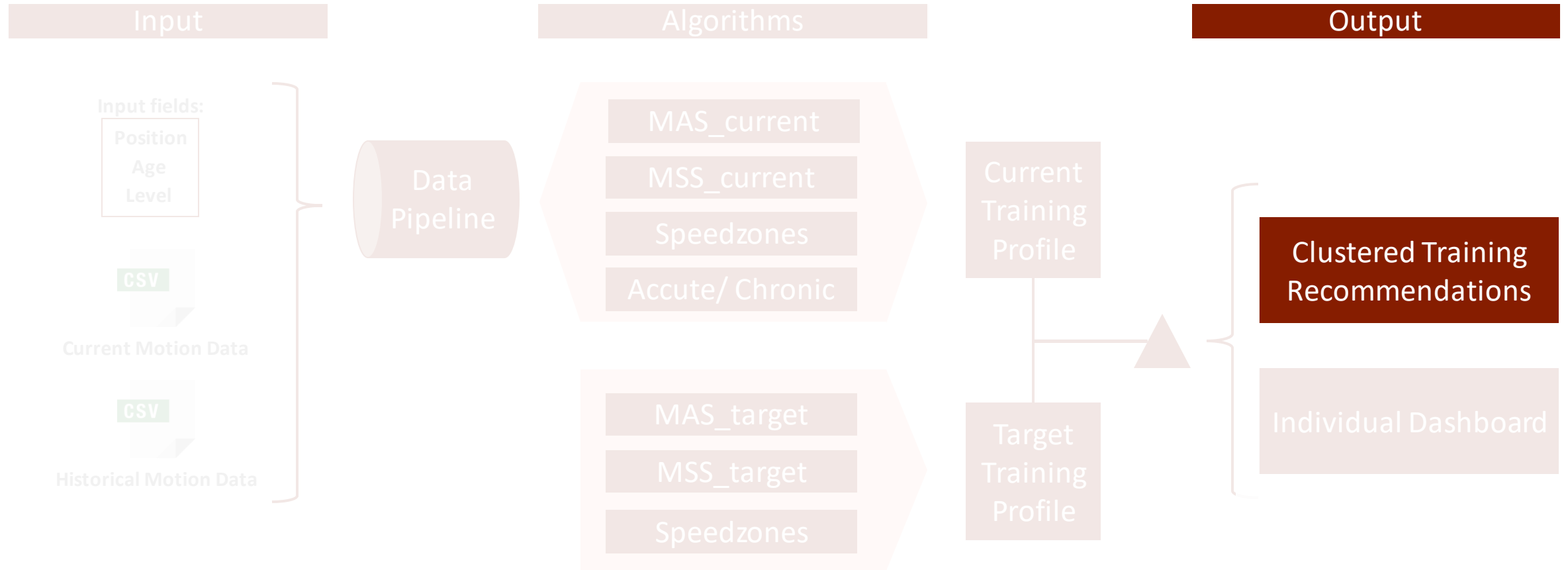
Position

Depending on the position of the player differs the average MAS and MSS of professional athletes

$$\text{Target MAS} = \text{Mean MAS}(\text{age}) - (\text{SD MAS}(\text{age}) * \text{level}) + (\text{Mean MAS}(\text{position}) - \text{Mean MAS}(\text{age}))$$

3.1 Product – Training recommendation

Process – Algorithms (Current player profile)



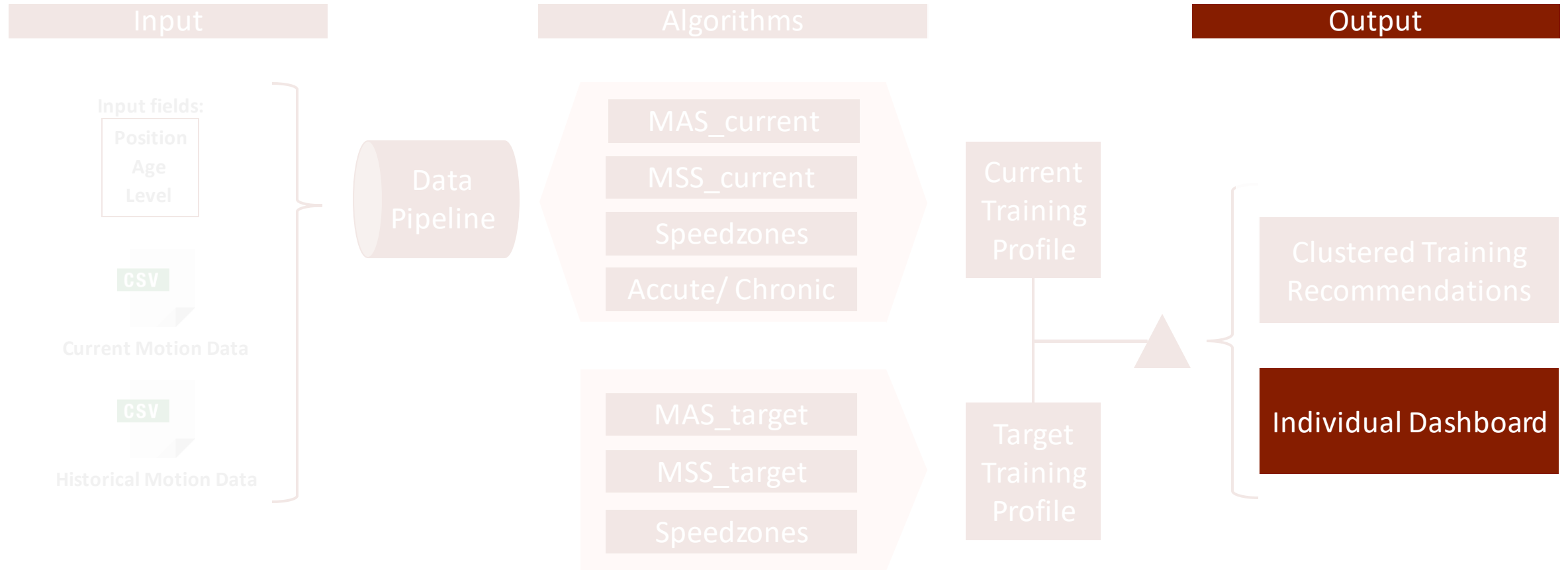
Clustered trainings recommendation

	Increase MAS	Increase MSS	Increase MAS & MSS
Undertrained	Endurance High intensity	Sprint High intensity	Endurance & Sprint High intensity
Perfectly trained	Endurance Medium intensity	Sprint Medium intensity	Endurance & Sprint Medium intensity
Slightly overtrained	Endurance Low intensity	Sprint Low intensity	Endurance & Sprint Low intensity
Overtrained	Recreational training or trainings pause		

Technical Demo

3.2 Product – Frontend

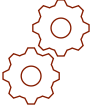
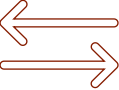
Process – Algorithms (Current player profile)






Dashboard Showcase

4. Key learnings

Key learnings – Technical

Potential Issue	Problem	Solution
 Product complexity	Underlying data and algorithms of Tracktics were very complex	We broke the path down into mini challenges and worked on the problem step-by-step . Furthermore we received great mentorship from Tracktics CTO
 API access issue	We were not able to access the Tracktics API in some cases	We made a fast pivot and found a workaround with Tracktics. Therefore we were able to ensure the project progress without losing to much time.

Key learnings - Project Management

Potential Issue	Problem	Solution
 Stakeholder expectation	Fully understanding stakeholders & knowledge transfer	Write everything down immediately, use Trello and actively involve everyone in the discussions and on the Trello board to ensure maximal knowledge transfer.
 Language barrier	Language barrier – Tracktics is designed in German	Install project manager with German skills, ensure Tracktics writes as many requirements as possible in English, have a regular call with Tracktics CTO to avoid misunderstandings
 3 rd party dependence	Dependence from external partners for critical information	Pivot as less as possible to reach goal. It was important to do as minimal changes as possible to the existing project and architecture to lose the least amount of time.

Key learnings - Project Management

Potential Issue

Problem

Solution



Process bottlenecks

Bottleneck issue - Single point of contact can lead to delay

Careful and detailed planning, the providing of all the necessary information of Tracktics and the EDASE team was able to independently overcome the challenges in the project and advance it to the final gate on time.



Slow kickoff

Initially slow project advancement due to minimal communication

After the initial slow phase we installed a **weekly call** with the Tracktics CTO as well as a Trello board. This has allowed us to stay in contact, diminish misunderstandings and have a **direct and fast communication**.



Project complexity

Global in-depth understanding of every project aspect

We had to learn, that it is OK not to know **everything** all the other team members do. At a certain project stage, it was simply impossible to do so due to the increased complexity in the **different workstreams**.

Conclusion

- 1.** | We were able to build a data product based on the existing Tracktics app. The product comes in the form of a training recommender.
- 2.** | We were able to improve our technical capabilities by using our coding knowledge on a real-life example.
- 3.** | We were able to improve our project management skills. Planning, delegation and communication were of paramount importance.
- 4.** | We were able to solve unforeseen issues during our work. We stayed adaptive and learned from mistakes and problems.

Thank you for your attention

Annex

Supporting Material

Due to confidentiality reasons we can't make our GitHub repository or Trello board accessible to public.

Please contact us in case you want access to it, as we are very happy to invite you.

