



# Cyclist's Performance Prediction

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# **BACKGROUND**

# **DATA ANALYSIS**

# **MODEL RESULTS**

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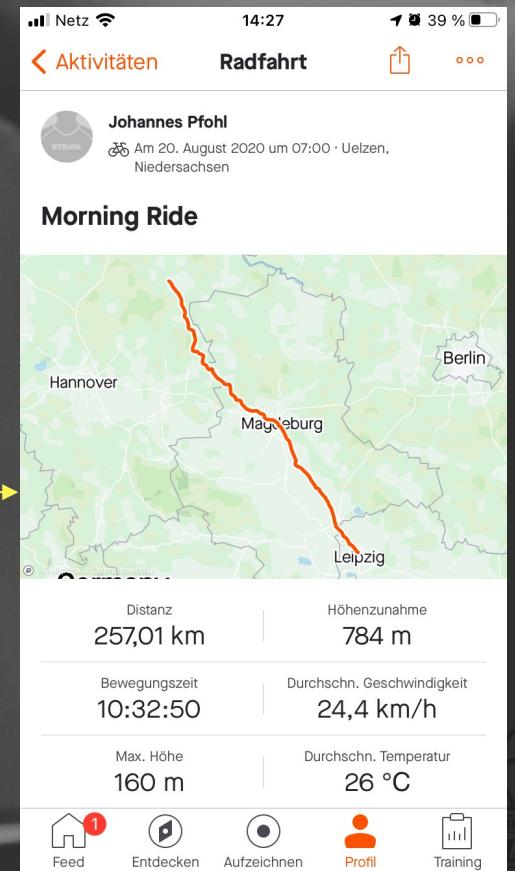
- Performance

- = The amount of energy transferred or converted per unit time
- = POWER [in Watt]

## WALKING VS. CYCLING



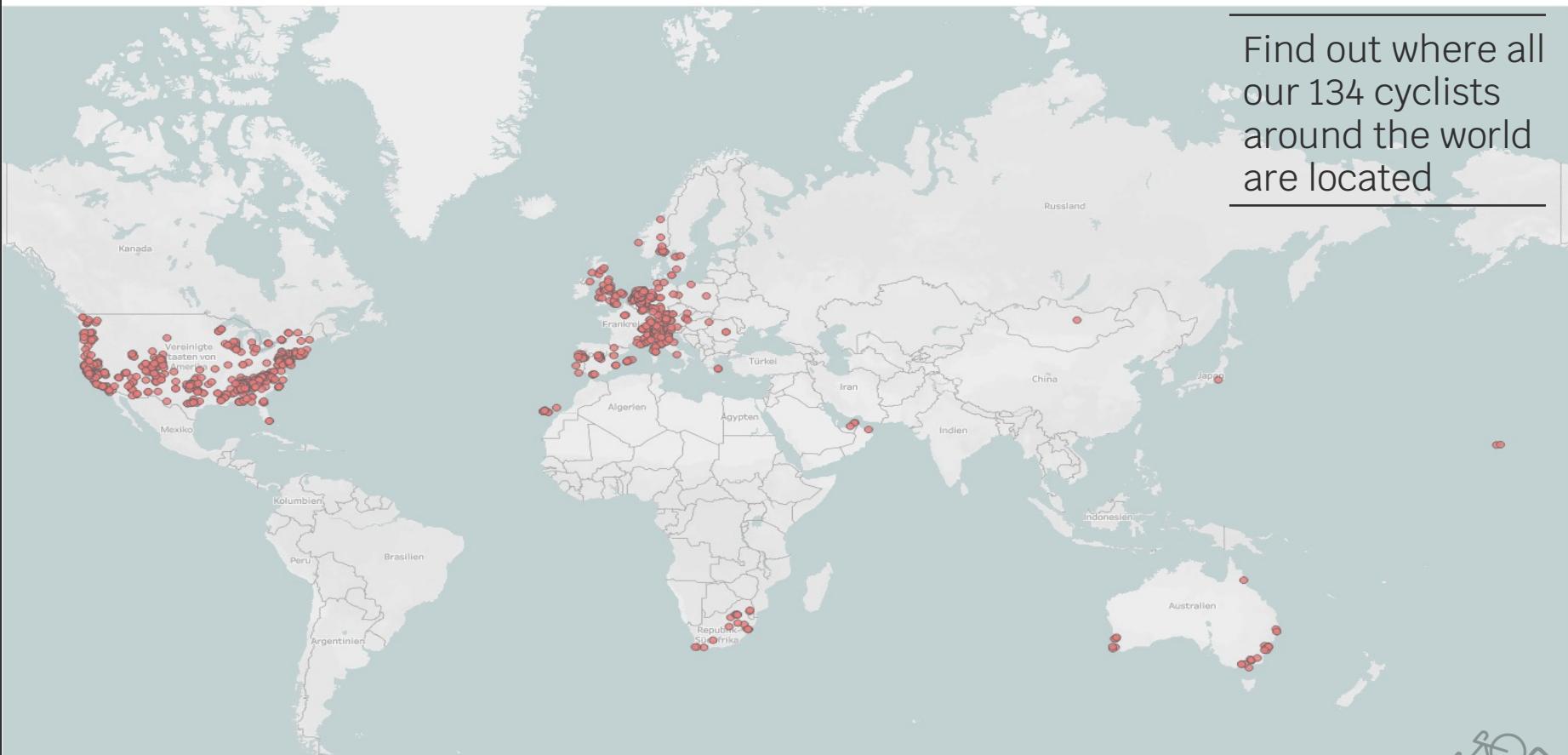
- Sports are developing towards increasingly scientific training methods with increasing amounts of data being collected from training sessions, bike packing trips, ultra races and competitions



# BACKGROUND DATA ANALYSIS MODEL RESULTS FURTHER WORK



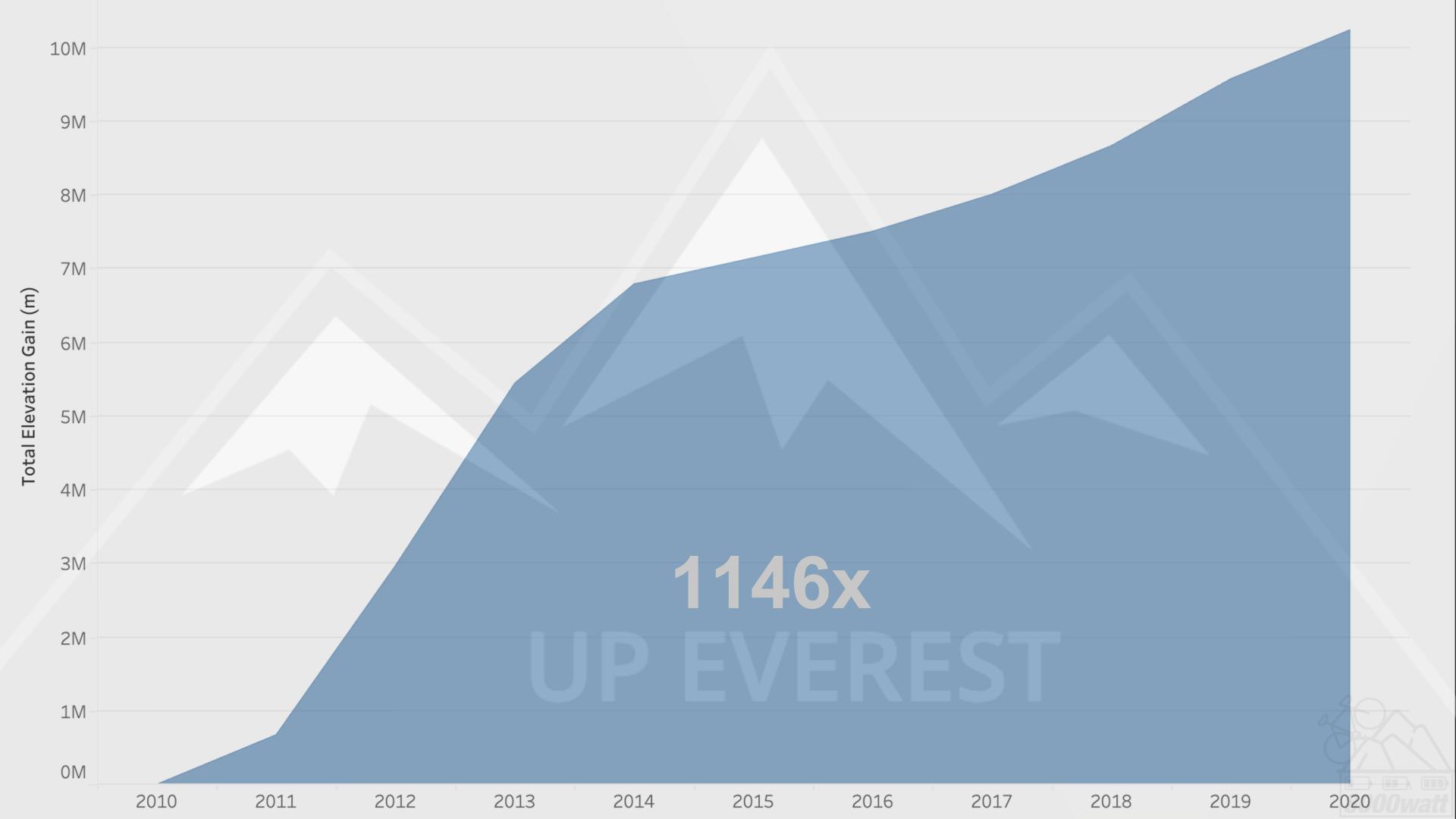
World map



Find out where all  
our 134 cyclists  
around the world  
are located

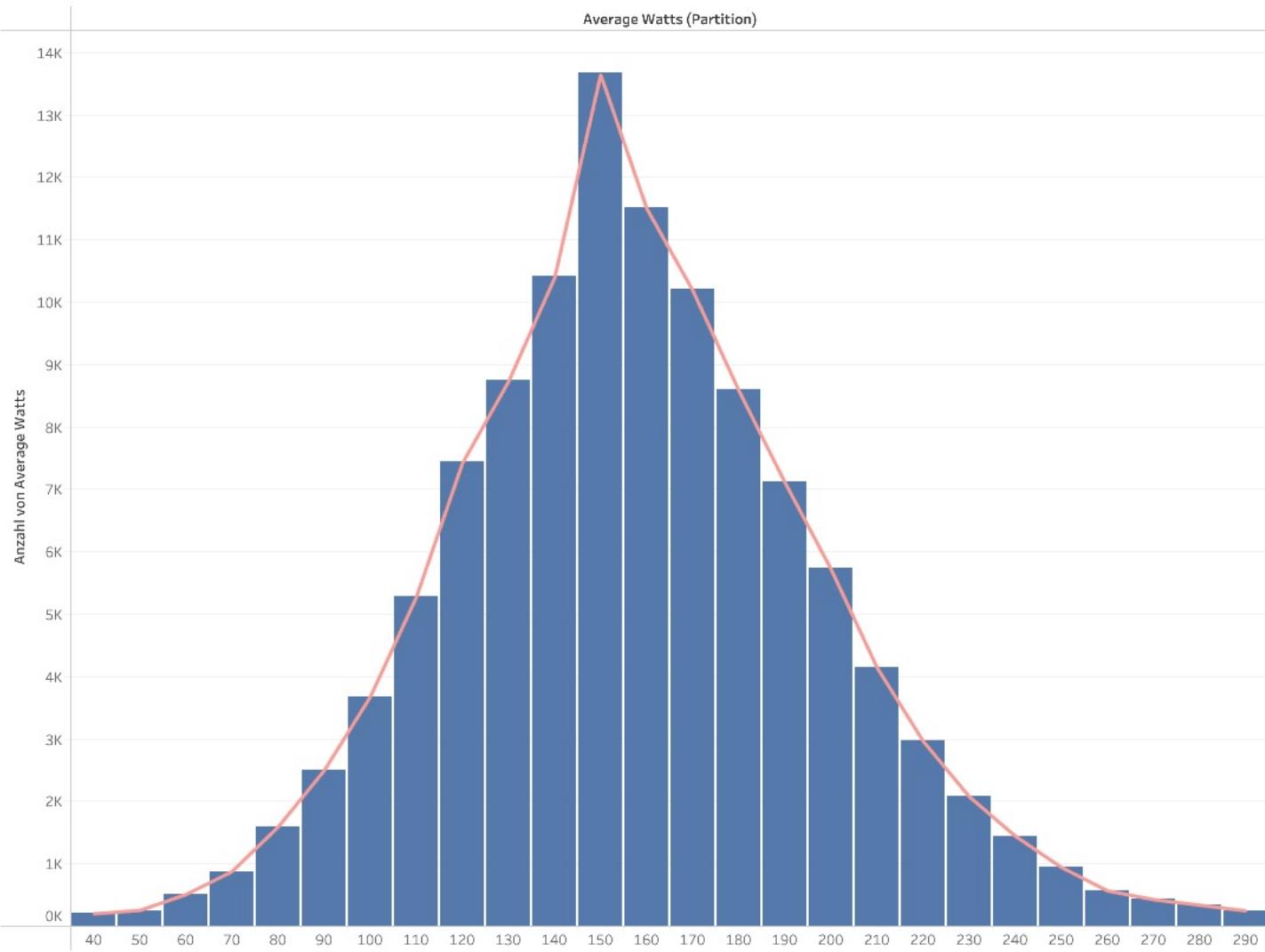
# Awesome DATA ANALYSIS

- Started with 279.288 unique observations from 134 cyclists
- Started with 93 different features
- Data is provided in its raw state (i.e. all in metres and seconds)
- Data frame goes from: 30/12/**1989** 16:00:00 to 31/03/2021 10:35:49
- Longest ride: **3.192,1km**
- 20.658 observations with **ZERO** elevation





### Average Watts (Partition)



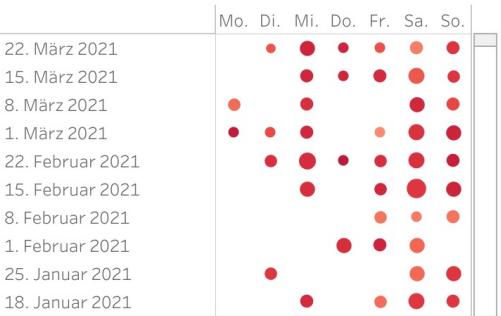
Athlete Name  
95Select Year(s)  
Mehrere Werte

Year(s)

2020

2021

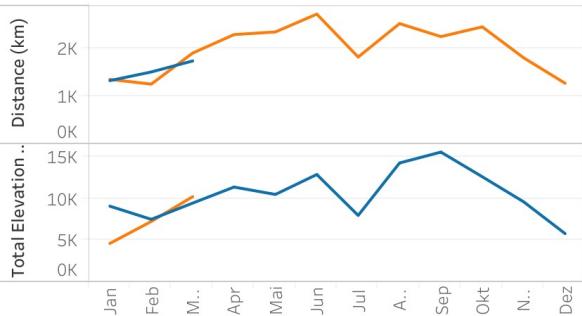
## Training per Day



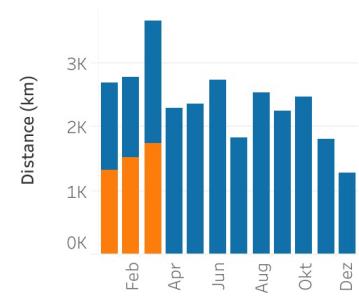
## Average Distance per Month



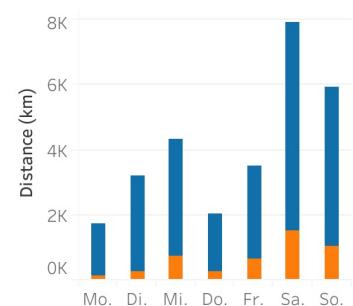
## Total Distance &amp; Elevation per Month



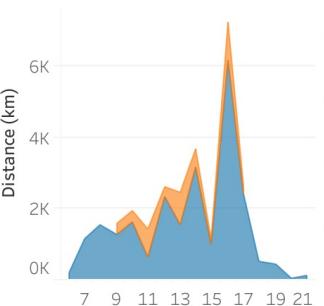
## Training Density per Month



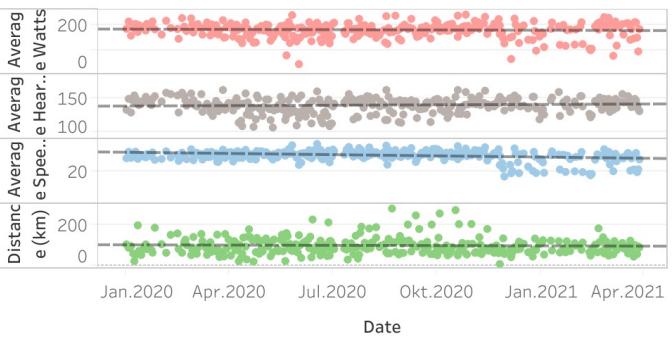
## Training Density per Weekday



## Training Density per Daytime

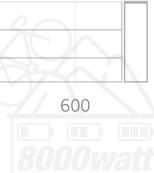
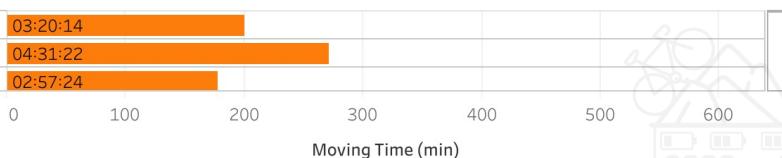


## Fitness &amp; Pace

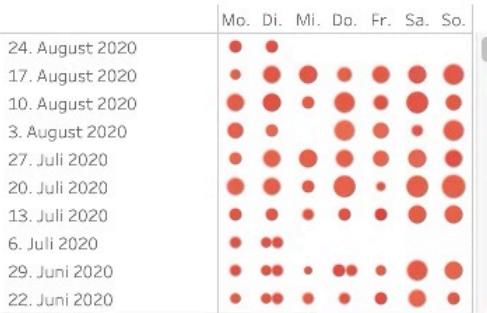


## Ride History

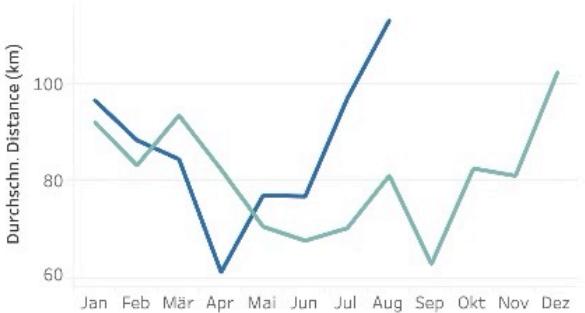
Date	Distance (km)	Total Elevation Gain (m)	Average Speed	Average Speed (km/h)	Average Heart Rate (bpm)
28.03.2021	90,8	797m	02:12	27,2	131bpm
27.03.2021	95,54	769m	02:50	21,1	134bpm
26.03.2021	57,49	594m	03:05	19,4	139bpm



## Training per Day



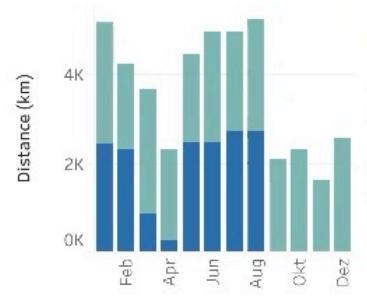
## Average Distance per Month



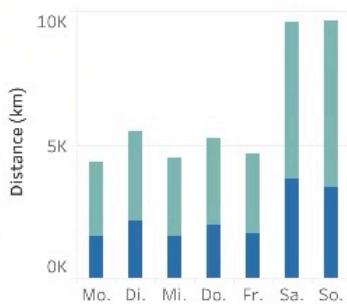
## Total Distance & Elevation per Month



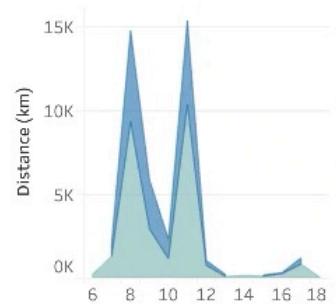
## Training Density per Month



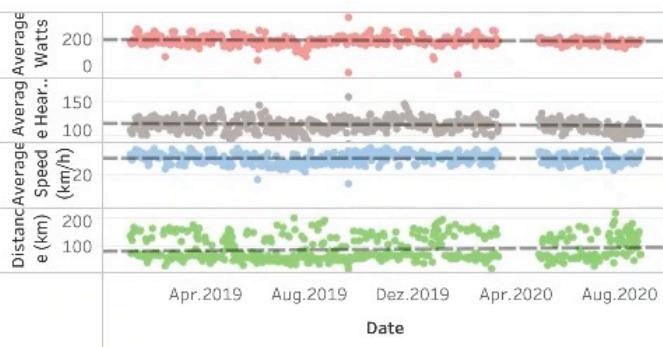
## Training Density per Weekday



## Training Density per Daytime

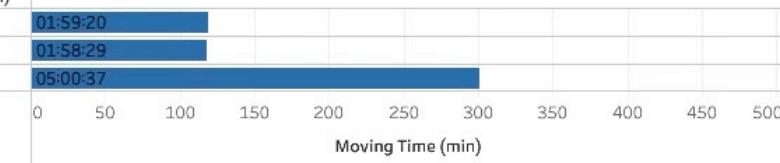


## Fitness & Pace



## Ride History

Date	Distance (km)	Total Elevation Gain (m)	Average Speed	Average Speed (km/h)	Average Heart Rate (bpm)
25.08.2020	66,68	122m	01:47	33,5	106bpm
24.08.2020	65,99	110m	01:48	33,4	102bpm
23.08.2020	151,09	1.924m	01:59	30,2	107bpm



Athlete Name

9

Select Year(s)

(Mehrere W...)

Year(s)

2019

2020

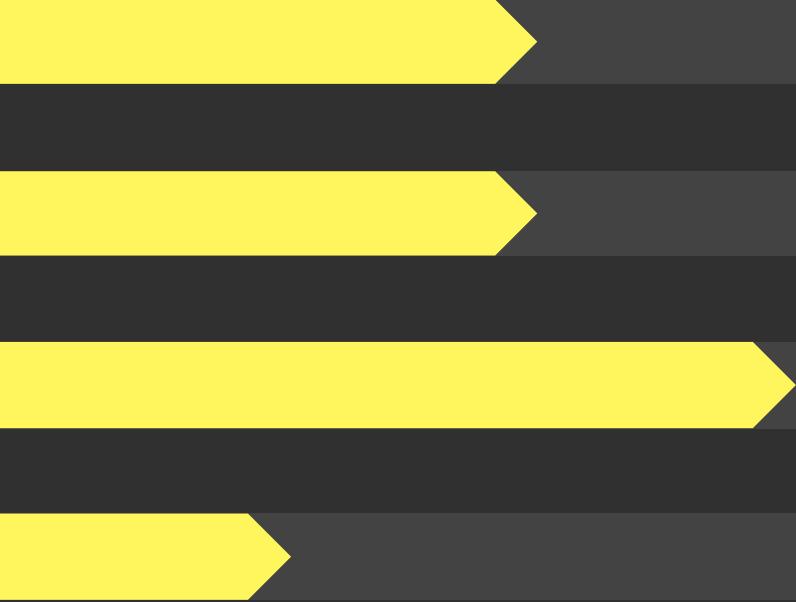
# 410 Watts

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The greatest weight-related power measured in competition was recorded for the former Italian professional cyclist Marco Pantani, who conquered the legendary L'Alpe d'Huez\* climb in 1997 with 7.2 watts/kg in 37:35 minutes.

That results in an average power of 410 watt.





# **BACKGROUND**

# **DATA ANALYSIS**

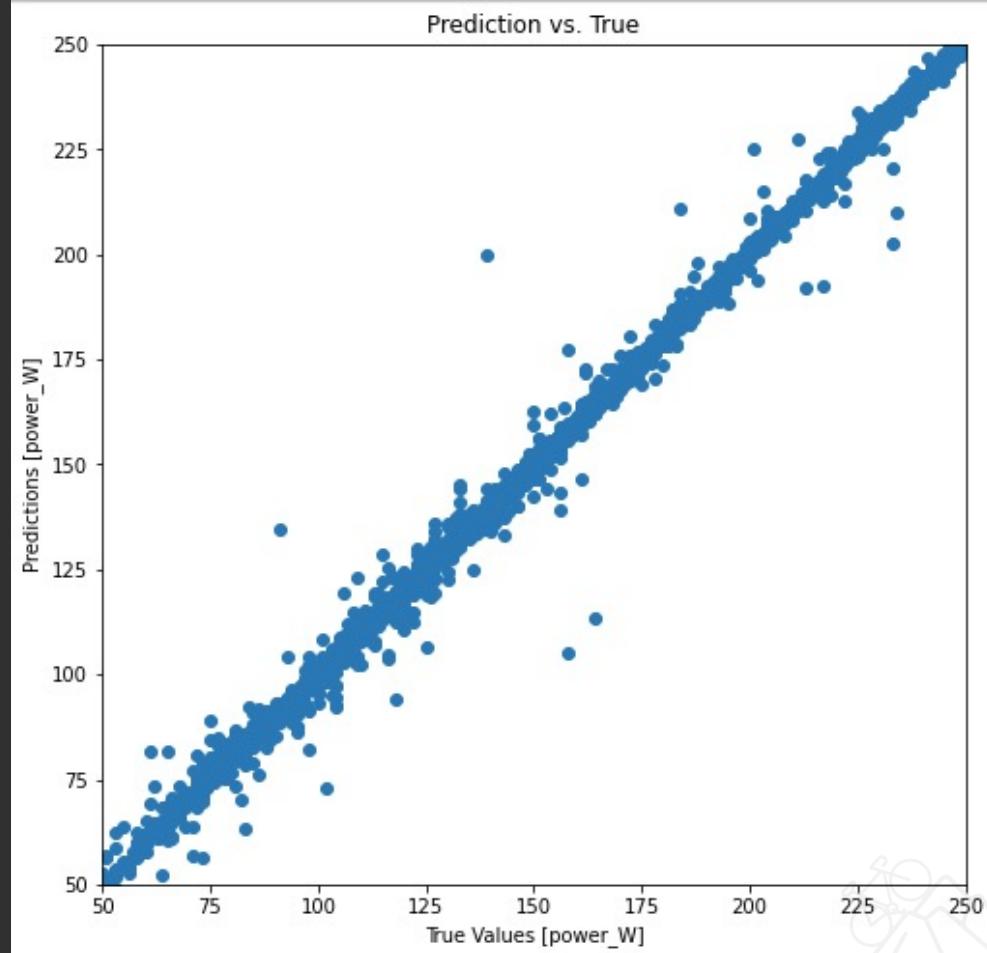
# **MODEL RESULTS**

# **FURTHER WORK**

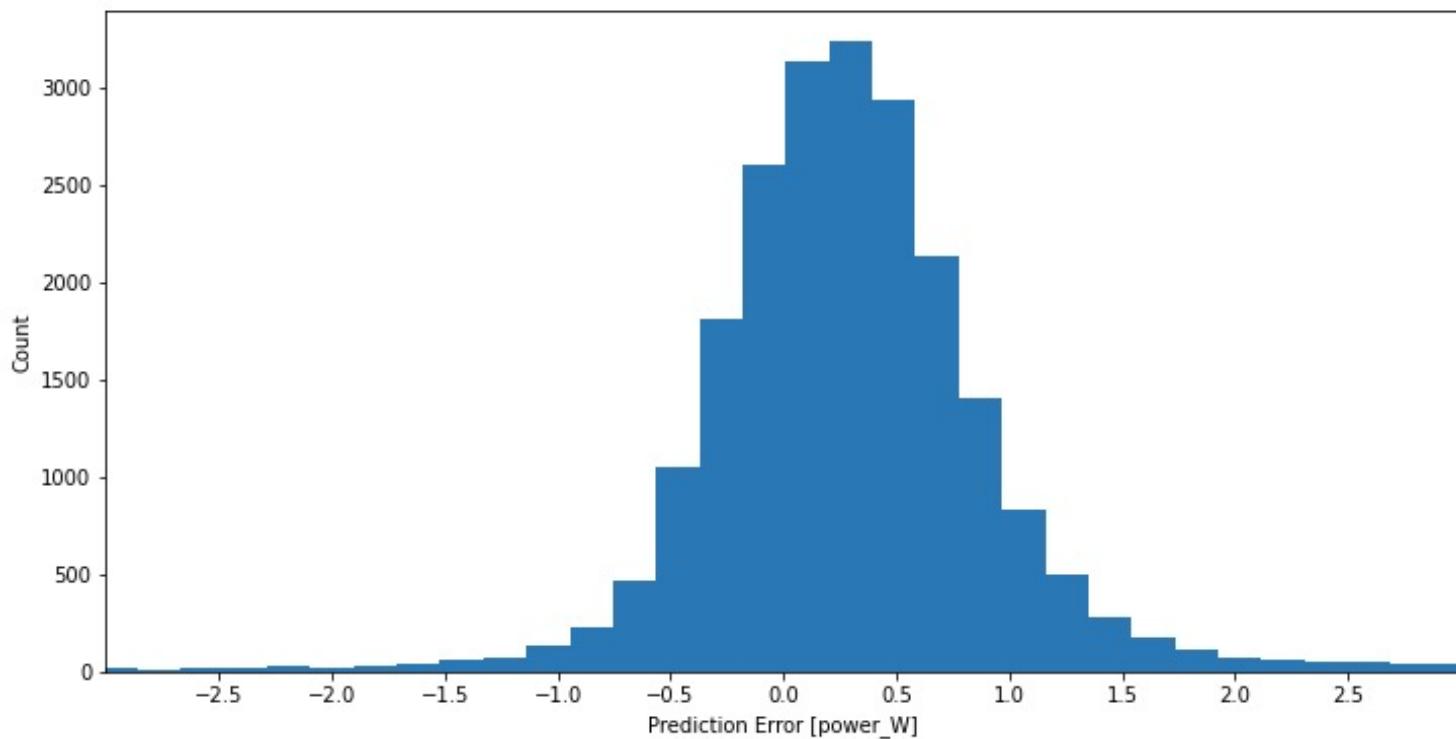
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### Input variables:

- distance in km
  - elevation gain in m
  - elapsed time in s
  - moving time in s
  - start time in s
  - average speed in km/h
  - cadence (pedal strokes/minute)
  - average heart rate in bpm
  - elevation high in m
  - elevation low in m
  - average temperature in °C
  - date
  - power in Watts
- 



Error distribution



- The trained model (deep neural network) obtained a final Mean Squared Error (MSE) of 39,98 on the test set
- Main fault tolerance is between -1,5 watts and 2 watts

# BACKGROUND DATA ANALYSIS MODEL RESULTS **FURTHER WORK**



- Split data into training and validation set based on cyclists
- Add additional data:
  - Unknown information about cyclists: gender, weight, size, age
  - normal heights (height above sea level) and related oxygen content
  - Unknown bike information: weight, tire width and related rolling resistance
- Include the FTP (Functional Threshold Power)

# End. Thanks! Questions?



[github.com/Jo105](https://github.com/Jo105)



[instagram.com/105jo](https://instagram.com/105jo)



[public.tableau.com/profile/jo105](https://public.tableau.com/profile/jo105)



## Johannes Pfohl

- More than 4 years working experience as Key Account Manager & Project Manager @Lufthansa Technik
- Degree in Business Administration (major fields of study: International Management & Marketing)
- Diploma Thesis: Development of an online-based marketplace for aircraft materials under the management of Lufthansa Technik AG

**„Full force voraus,  
8000Watt und immer großes  
Blatt!“**