Predicting IAAF World Half Marathon Championship & Training Strategy for Athlete

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Introduction

IAAF(International Association of Athletics Federations) World Half Marathon Championship is a well-known sports event in the world. As a possible pre-qualification of the most famous six World Marathon Major, including Boston Marathon, it is a highly participated marathon event.

Predicting athletes' performance is significant. It helps athletes to determine their further training strategy. For sport enthusiasts, predicting can bring more professional guidance to them and attract more public attention.

Approach

- Web data scraping

- Build a regression model based on predictor variables: age, discipline, performance, date

```
=> IAAF_code | Name              | Nationality          | discipline | performance | date
   273114      MOHAMUD AADAN     GREAT BRITAIN & NI     3000 M       8:13.12         7/15/2017
```

- Provide a training strategy

Multiple regression

In the multivariate case, when there is more than one independent variable, the regression line cannot be visualized in the two dimensional space. We could construct a linear equation containing all those variables. In general then, multiple regression procedures will estimate a linear equation of the form:

$$Y = a + b_1*X_1 + b_2*X_2 + \ldots + b_p*X_p$$

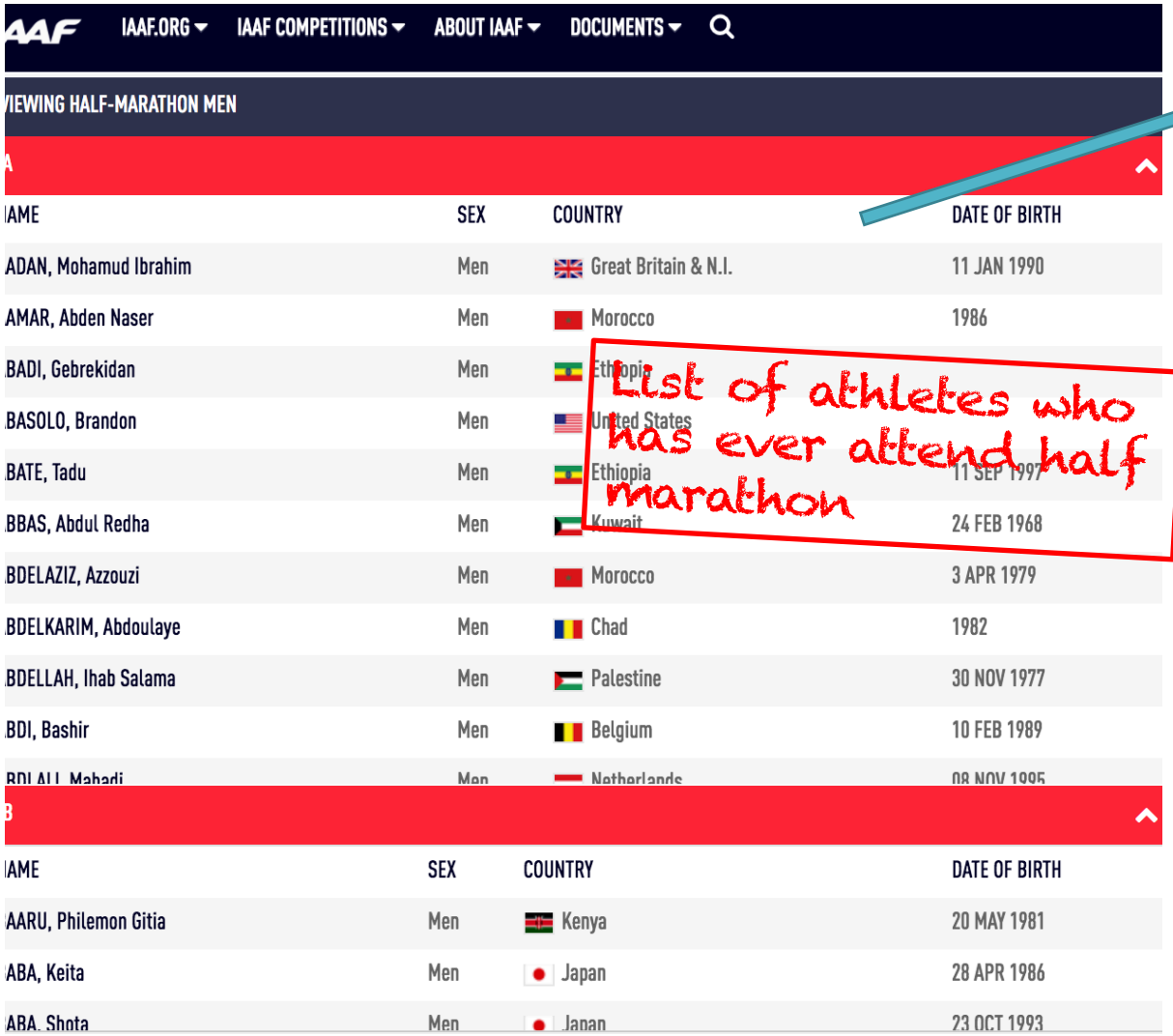
Naive Bayes classifier

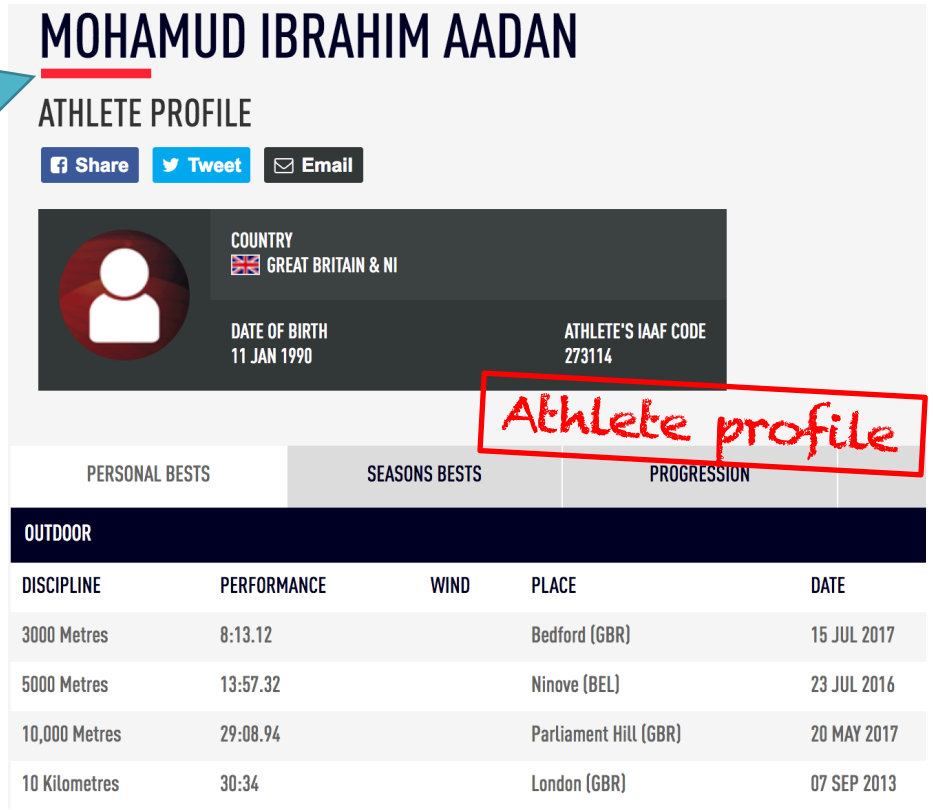
In machine learning, naive Bayes classifiers are a family of simple probabilistic classifiers based on applying Bayes' theorem with independence assumptions between the features.

$$P(C_k|x)\frac{P(C_k)P(x|C_k)}{P(x)}$$

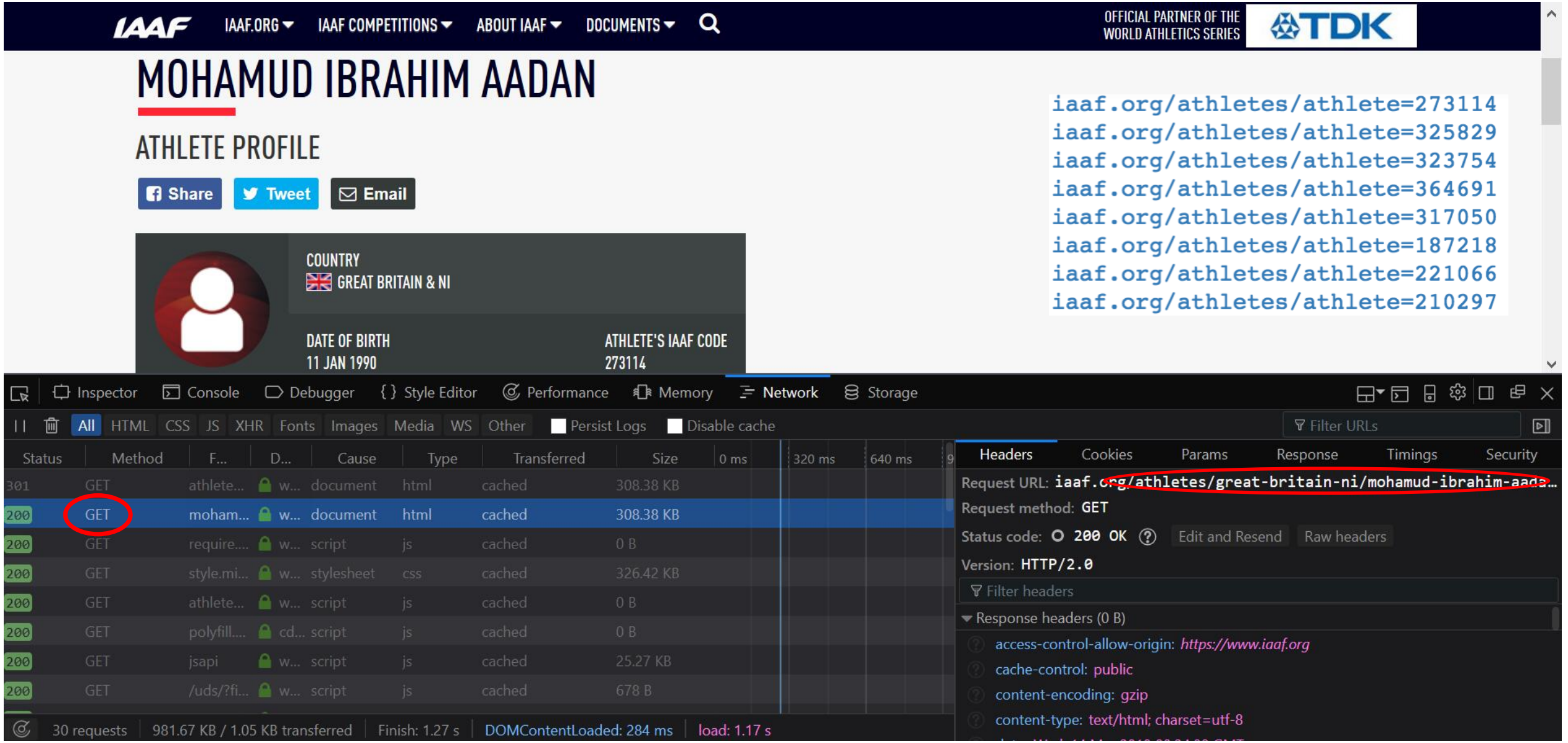
Knowing the probability of x|Ck, calculate P(Ck|x): to determine the result.

Data Source


IAAF.ORG
IAAF COMPETITIONS
ABOUT IAAF
DOCUMENTS
IEWING HALF-MARATHON MEN
AME | SEX | COUNTRY | DATE OF BIRTH
ADAN, Mohamud Ibrahim | Men | Great Britain & N.I. | 11 JAN 1990
AMAR, Abden Naser | Men | Morocco | 1986
BADI, Gebrekidan | Men | Ethiopia
BASOLO, Brandon | Men | United States
BATE, Tadu | Men | Ethiopia | 11 SEP 1997
BBAS, Abdul Redha | Men | Kuwait | 24 FEB 1968
BDELAZIZ, Azzouzi | Men | Morocco | 3 APR 1979
BDELKARIM, Abdoulaye | Men | Chad | 1982
BDELLAH, Ihab Salama | Men | Palestine | 30 NOV 1977
BDI, Bashir | Men | Belgium | 10 FEB 1989
BDLALI, Mahadi | Men | Netherlands | 08 NOV 1995
AME | SEX | COUNTRY | DATE OF BIRTH
AARU, Philemon Gitia | Men | Kenya | 20 MAY 1981
ABA, Keita | Men | Japan | 28 APR 1986
ABA, Shota | Men | Japan | 23 OCT 1993
List of athletes who has ever attend half marathon


MOHAMUD IBRAHIM AADAN
ATHLETE PROFILE
Share
Tweet
Email
COUNTRY
GREAT BRITAIN & NI
DATE OF BIRTH
11 JAN 1990
ATHLETE'S IAAF CODE
273114
Athlete profile
PERSONAL BESTS
SEASONS BESTS
PROGRESSION
OUTDOOR
DISCIPLINE | PERFORMANCE | WIND | PLACE | DATE
3000 Metres | 8:13.12 | | Bedford (GBR) | 15 JUL 2017
5000 Metres | 13:57.32 | | Ninove (BEL) | 23 JUL 2016
10,000 Metres | 29:08.94 | | Parliament Hill (GBR) | 20 MAY 2017
10 Kilometres | 30:34 | | London (GBR) | 07 SEP 2013

Data scraping



Redirected URL →

Original URL
↓

```
t(href)
```

```
iaaf.org/athletes/athlete=273114
iaaf.org/athletes/athlete=325829
iaaf.org/athletes/athlete=323754
iaaf.org/athletes/athlete=364691
iaaf.org/athletes/athlete=317050
iaaf.org/athletes/athlete=187218
iaaf.org/athletes/athlete=221066
iaaf.org/athletes/athlete=210297
iaaf.org/athletes/athlete=56172
iaaf.org/athletes/athlete=281105
iaaf.org/athletes/athlete=350387
iaaf.org/athletes/athlete=263903
iaaf.org/athletes/athlete=137596
iaaf.org/athletes/athlete=242055
iaaf.org/athletes/athlete=243638
iaaf.org/athletes/athlete=136290
iaaf.org/athletes/athlete=251403
iaaf.org/athletes/athlete=138182
iaaf.org/athletes/athlete=310866
```

```
# identify user agent to get access to the GET request
headers = {'User-Agent':'Mozilla/5.0 (Macintosh; Intel Mac OS X 10_12_6) App
for i in urls:
    rs = requests.get(i,headers = headers).url
    links.append(rs)
    print(rs)
```

```
https://www.iaaf.org/athletes/great-britain-ni/mohamud-ibrahim-aadan-273114
https://www.iaaf.org/athletes/morocco/abden-naser-aamar-325829
https://www.iaaf.org/athletes/ethiopia/gebrekidan-abadi-323754
https://www.iaaf.org/athletes/united-states/brandon-abasolo-364691
https://www.iaaf.org/athletes/ethiopia/tadu-abate-317050
https://www.iaaf.org/athletes/kuwait/abdul-redha-abbas-187218
https://www.iaaf.org/athletes/morocco/azzouzi-abdelaziz-221066
https://www.iaaf.org/athletes/chad/abdoulaye-abdelkarim-210297
https://www.iaaf.org/athletes/palestine/ihab-salama-abdellah-56172
https://www.iaaf.org/athletes/belgium/bashir-abdi-281105
https://www.iaaf.org/athletes/netherlands/mahadi-abdi-ali-350387
https://www.iaaf.org/athletes/italy/mohad-abdikadar-sheik-ali-263903
https://www.iaaf.org/athletes/united-states/abdihakem-abdirahman-137596
https://www.iaaf.org/athletes/ethiopia/ali-abdosh-242055
https://www.iaaf.org/athletes/chad/ahmat-abdou-daoud-243638
https://www.iaaf.org/athletes/republic-of-yemen/sofian-abdul-raggeb-136290
https://www.iaaf.org/athletes/ethiopia/shami-abdulahi-251403
https://www.iaaf.org/athletes/qatar/ahmad-hassan-abdullah-138182
https://www.iaaf.org/athletes/japan/hiroki-abe-310866
```

```
In [305]: name = soup.find("h1")
          name.get_text()

Out[305]: '\n            Abden Naser AAMAR\n        '

In [306]: basic = soup.find_all('li',attrs ={'class':'no-after'})
          info =[]
          for li in basic:
              print(li.get_text())

                                    COUNTRY

                                    Morocco


                                         DATE OF BIRTH
                                         1986


                                      ATHLETE'S IAAF CODE
                                      325829

In [314]: performance = soup.find_all('div',attrs ={'class':'container offset-below'})
          performance
```

tbody | 300×250 VIEW GRAPH

	PERFORMANCE	PLACE	D
2017	8:13.12	Bedford (GBR)	1
	PERFORMANCE	PLACE	D
2016	8:15.56	Watford (GBR)	0
	PERFORMANCE	PLACE	D
2015	8:18.86	Crawley (GBR)	0
	PERFORMANCE	PLACE	D
2014	8:25.44	Lee Valley (GBR)	0
	PERFORMANCE	PLACE	D
2013	8:25.58	Wormwood Scrubs (GBR)	0

```
"#273114-3000-oMod
</h2>
</div>
... ▼<table class="recor
  ▼<thead>
    ▶<tr>…</tr>
  </thead>
  ▼<tbody>
    ▶<tr>…</tr>
    ▶<tr>…</tr>
    ▶<tr>…</tr>
    ▶<tr>…</tr>
    ▶<tr>…</tr>
  </tbody>
</table>
▶<script type="text/
<script src="https:/
file=visualization&v
<link href="https://
```

```
<tbody>
<tr>
<td data-th="Discipline">
                                    10 Kilometres
                                </td>
<td data-th="Performance">
                                    30:41
                                </td>
<td data-th="Wind">
</td>
<td data-th="Place">
                                    Casablanca (MAR)
                                </td>
<td data-th="Date">
                                    06 MAR 2016
                                </td>
<td data-th="Records">
</td>
</tr>
```

PACE CHART

MILE BEST	5K BEST / AVG MILE PACE	10K BEST / AVG MILE PACE	TEMPO AVG MILE PACE	HALF MARATHON BEST / AVG MILE PACE	MARATHON BEST / AVG MILE PACE	RECOVERY DAY PACE
5:00	17:05 / **5:30**	35:45 / **5:45**	**6:05**	1:18:00 / **6:00**	2:44:00 / **6:15**	**7:00**
5:30	18:45 / **6:00**	39:00 / **6:15**	**6:35**	1:25:00 / **6:30**	3:00:00 / **6:50**	**7:35**
6:00	20:15 / **6:30**	42:00 / **6:45**	**7:05**	1:35:00 / **7:15**	3:15:00 / **7:25**	**8:10**
6:30	22:00 / **7:05**	45:45 / **7:20**	**7:40**	1:40:00 / **7:35**	3:30:00 / **8:00**	**8:45**
7:00	23:45 / **7:40**	49:00 / **7:55**	**8:15**	1:50:00 / **8:20**	3:45:00 / **8:35**	**9:20**
7:30	25:15 / **8:05**	52:30 / **8:25**	**8:50**	1:55:00 / **8:45**	4:00:00 / **9:10**	**9:55**
8:00	27:00 / **8:40**	55:50 / **9:00**	**9:25**	2:05:00 / **9:30**	4:15:00 / **9:45**	**10:30**

Next Steps

- Build prediction model
- Apply athletes' data to the training plan

The training strategy basically refer to the Half Marathon Pace Chart

References

- Thomas A. Severini. (2014). Analytic Methods in Sports: Using Mathematics and Statistics to Understand Data from Baseball, Football, Basketball, and Other Sports. Chapter 2.
- S Tufféry. (2011). Data mining and statistics for decision making. 534 -538
- Michael Bowles. (2015). Machine Learning in Python: Essential Techniques for Predictive Analysis. 122-124
- Brian Hanley. Pacing profiles and pack running at the IAAF World Half Marathon Championships. (2015). https://pdfs.semanticscholar.org/819e/8db906d3673e46b6f609d1d77838f34ae1f1.pdf
- https://en.wikipedia.org/wiki/Naive_Bayes_classifier