Boston Marathon-Secret to Runners

- Zhenghong Ma
- Chih-Yen Lin
- Lyu Jishi
- Roya Karimian

Team 17

Motivation

- Give insights to Boston Marathon, one of the world's best - known road racing events.
- Decode the secrets of runners, age, genders, pace, and states where runners come from.

Datasets

- The data is from the years 2015. 2016, 2017. It contains the name, age, gender, country, city and state (where available), times at 9 different stages of the race, expected time, finish time and pace, overall place, gender place and division place.
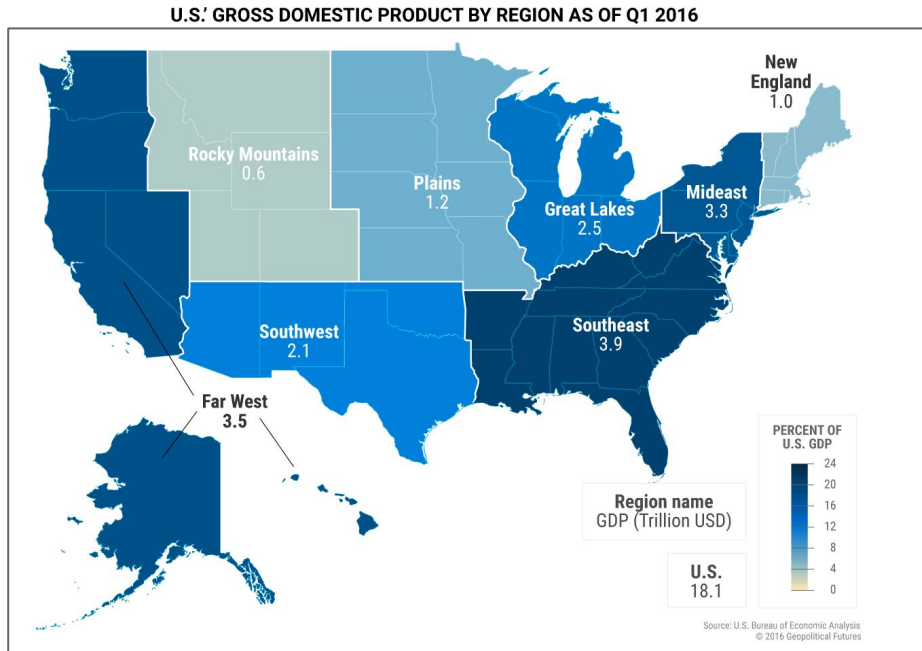- GPS data containing altitudes of the points on the course.

US Runners Distribution Map

2017 Runners Distribution Map
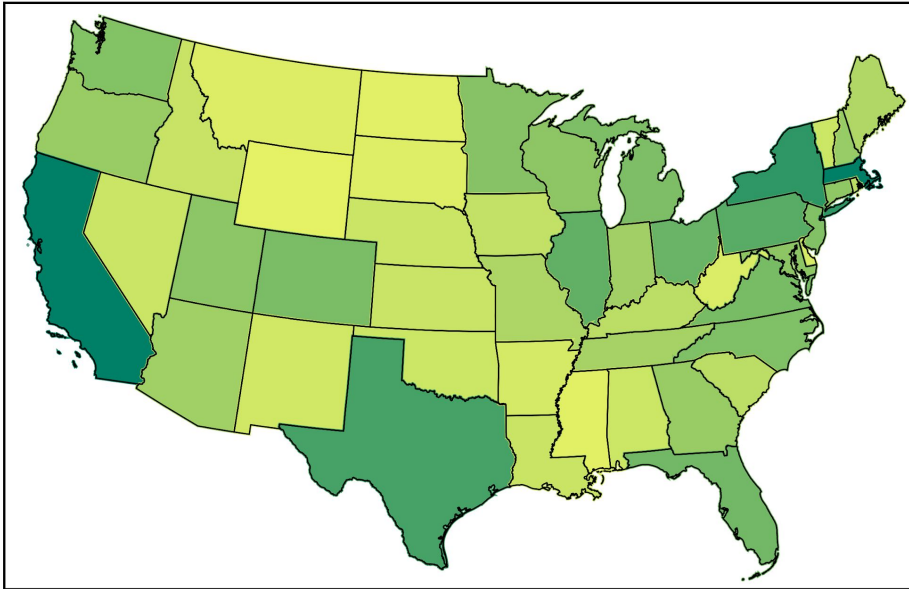
- Over 98% of runners are from US

- The majority of runners are from California, Texas and Massachusetts

- The numbers of runners are related to the economic level and population of the state
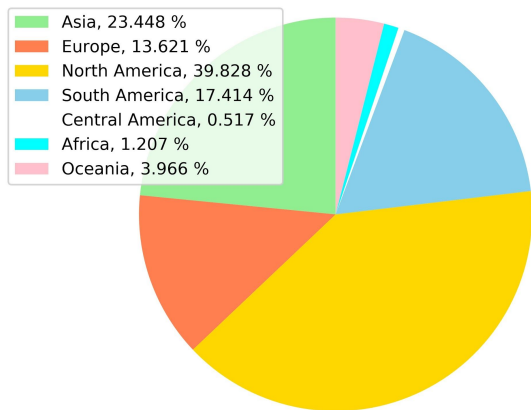
US GDP Map

U.S.' GROSS DOMESTIC PRODUCT BY REGION AS OF Q1 2016

- The GDP Map and the map of numbers of runners reflects the relation between economy level and participation for sports

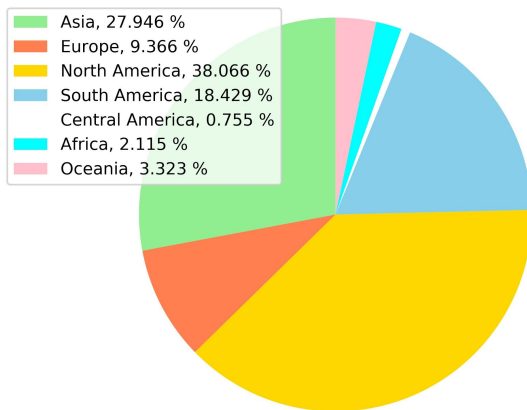Resource: https://geopoliticalfutures.com/a-tale-of-two-economies-russia-and-the-us/

Year comparison of runners of continents (US excluded)

2015

Asia, 23.448 %	
Europe, 13.621 %	
North America, 39.828 %	
South America, 17.414 %	
Central America, 0.517 %	
Africa, 1.207 %	
Oceania, 3.966 %	

2016

Asia, 27.946 %	
Europe, 9.366 %	
North America, 38.066 %	
South America, 18.429 %	
Central America, 0.755 %	
Africa, 2.115 %	
Oceania, 3.323 %	

2017

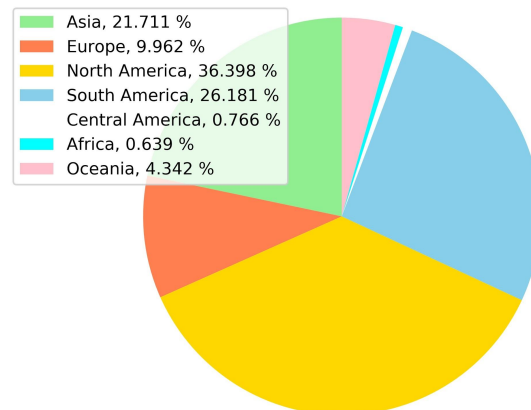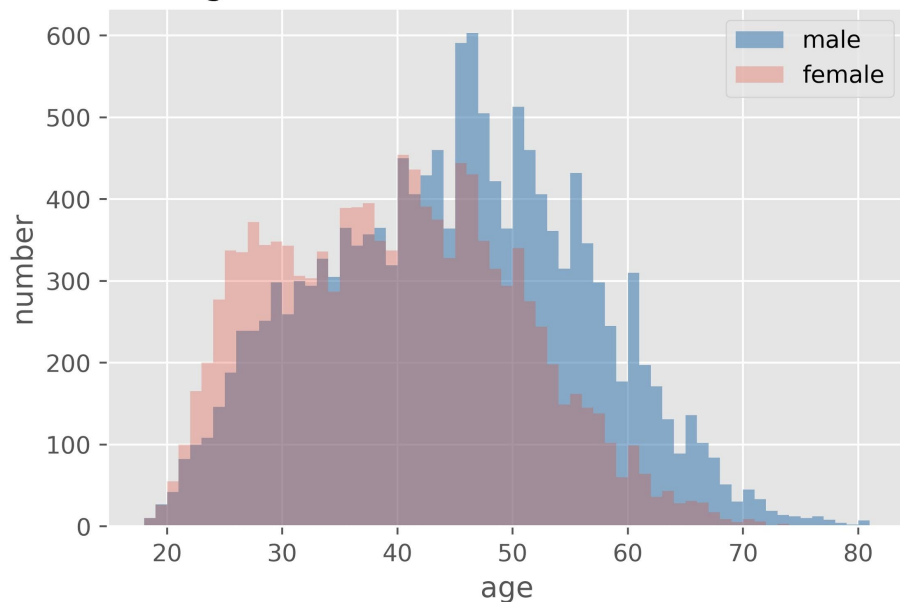|	
Asia, 21.711 %	
Europe, 9.962 %	
North America, 36.398 %	
South America, 26.181 %	
Central America, 0.766 %	
Africa, 0.639 %	
Oceania, 4.342 %	

Runner Demographics

Age Distribution for Different Genders

- There are more male runners than female runners in the dataset.
- Most of their ages are between 40 to 50.
- It could be due to the fact that young people are inclined to team sports but not individual sports.

Finish Time
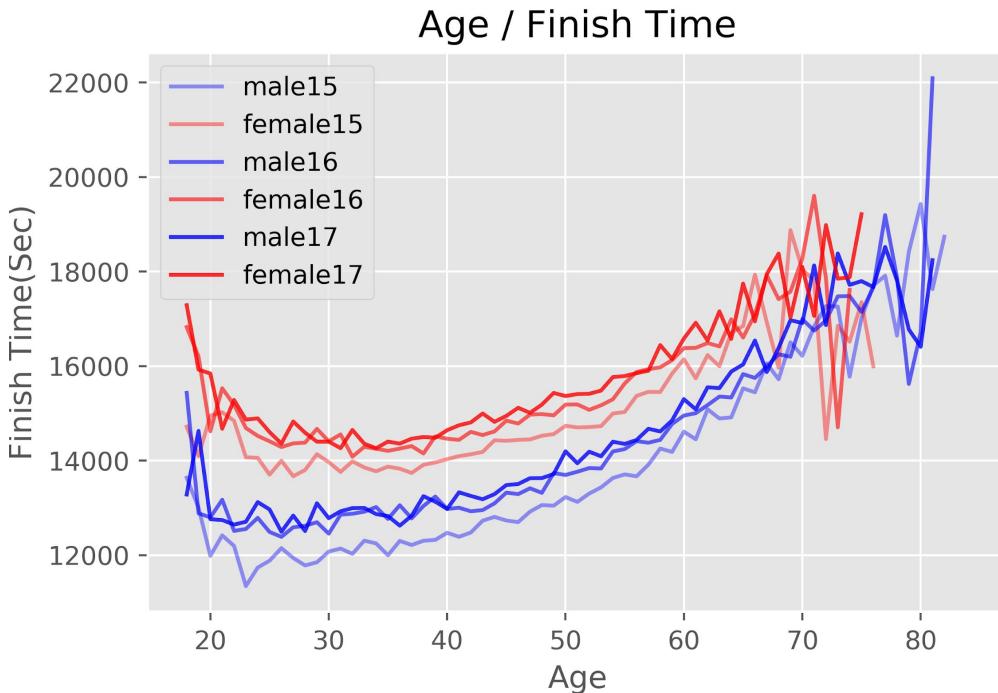
Age / Finish Time

- As we can see from this plot, we notice that the shortest average of the finish time occurred in 30 years old.
- Also, we found that even though women spent more time than men, there is a reverse between 70.

Negative Split

- Negative split is a racing strategy where you run the second half faster than the first half.
- Not everyone can achieve a negative split. In fact only 3% of runners ran a negative split in 2017.
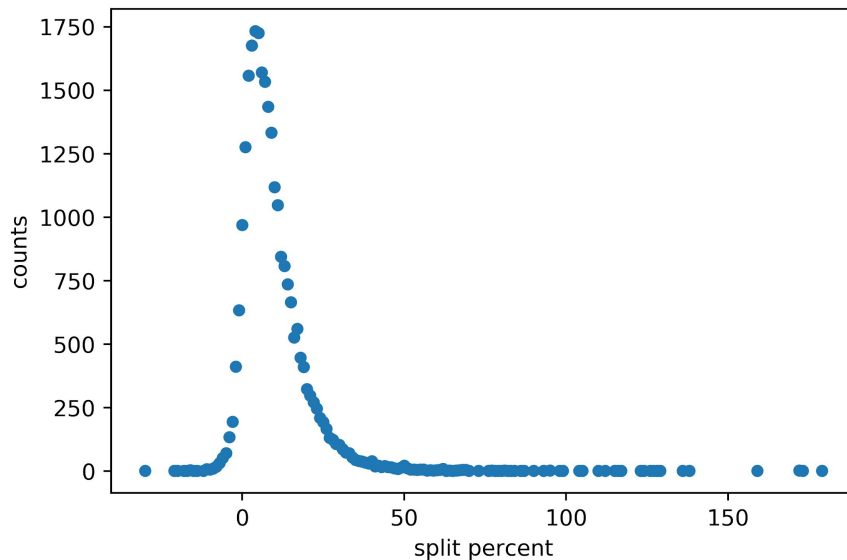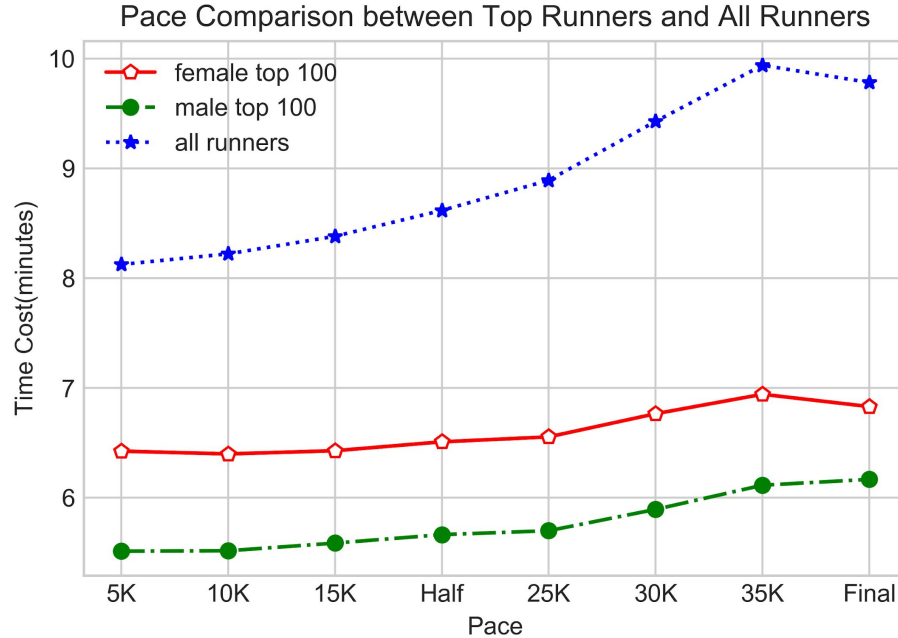
Negative Split

- Elite athletes run a negative split more often than regular runners.
- More runners achieved negative splits in 2015, may be due to weather.

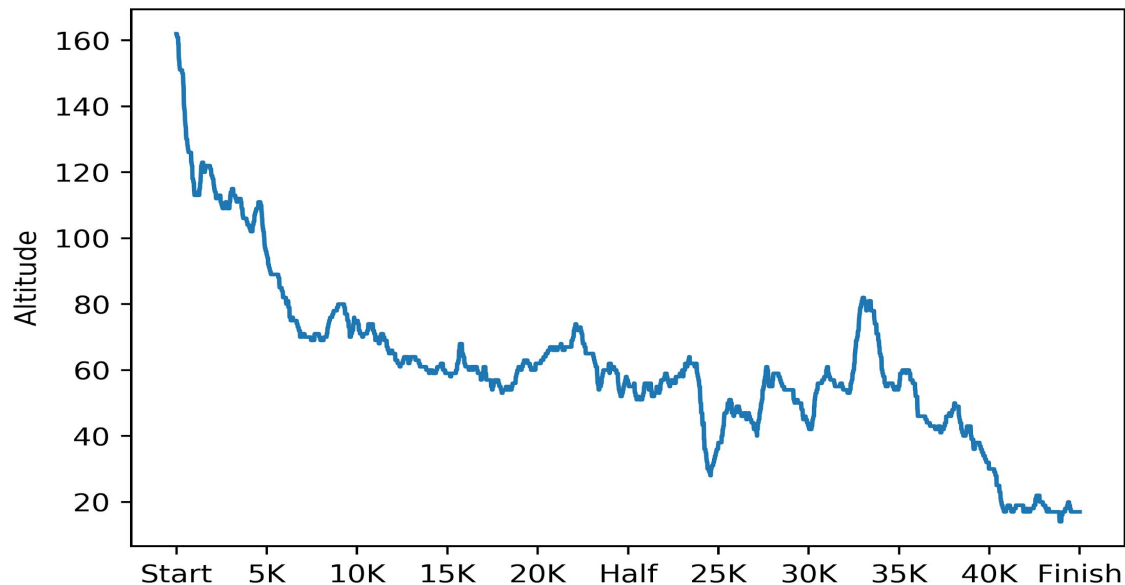| Year	Temperature	Sky
2015	46-46	Overcast
2016	71-61	Clear
2017	70-73	Clear

Pace Comparison

Pace Comparison between Top Runners and All Runners
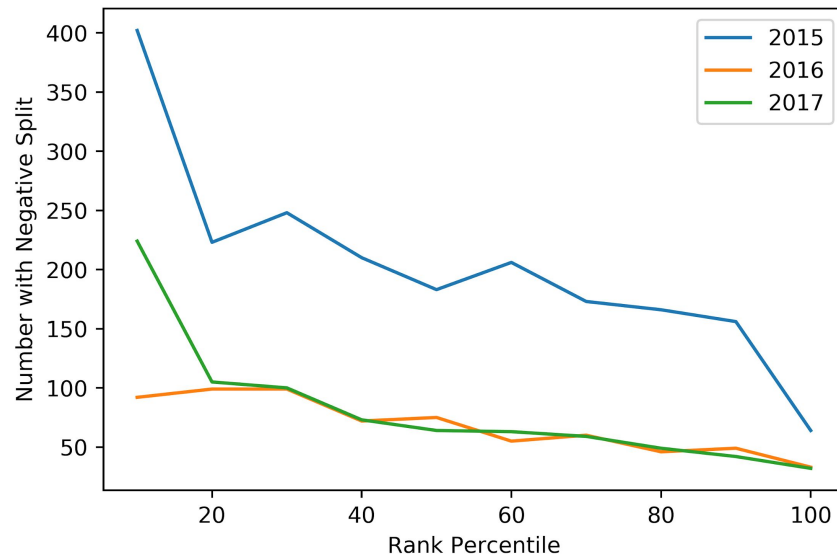
- The pace variation of top runners is smaller while the pace changes violently among all runners.
- Top runners' performance is more steady than all runners.

Boston Marathon Route

- We can see the route goes downhill till 25K.
- Around 32K there is a hill known as "HeartBreak Hill"

Conclusions

- **Geographical factor**: The majority of runners are from North America, specifically from Massachusetts, California and Texas. But Boston Marathon is becoming more international.
- **Age factor**: The participation peak is between ages 40-50, and the best performance is between ages 20-30. It can be due to experience and preference for individual sports.
- **Strategic factor**: Negative Splits is used as a strategy by runners but can be achieved only by few elite.
- **Strategic factor**: Elite runners have much more steady paces, which means runners can improve their performance by controlling their paces

Thank You