# Introduction to Data Science

Ethan Meyers

# Table of contents

**Welcome** **3**

**1 Introduction** **4**

1.1 Data & Methods . . . . . 5

1.2 Conclusion . . . . . 5

References . . . . . 5

# Welcome


This book gives an introduction to Data Science using the Python programming langauge.

# 1 Introduction

This is a book created from markdown and executable code.

```
import matplotlib.pyplot as plt
import numpy as np
eruptions = [1492, 1585, 1646, 1677, 1712, 1949, 1971, 2021]
```

```
plt.figure(figsize=(6, 1))
plt.eventplot(eruptions, lineoffsets=0, linelengths=0.1, color='black')
plt.gca().axes.get_yaxis().set_visible(False)
plt.ylabel('')
plt.show()
```

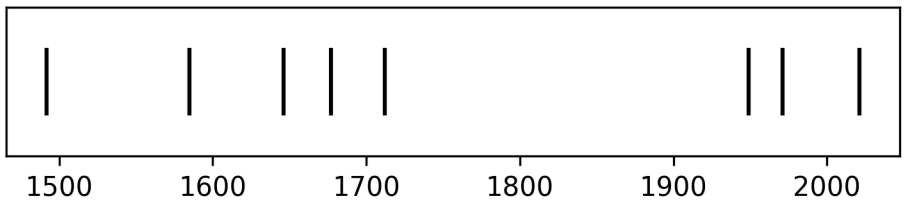


Figure 1.1: Timeline of recent earthquakes on La Palma

```
avg_years_between_eruptions = np.mean(np.diff(eruptions[:-1]))
avg_years_between_eruptions
```

Based on data up to and including 1971, eruptions on La Palma happen every 79.8 years on average.

Studies of the magma systems feeding the volcano, such as Marrero et al. (2019), have proposed that there are two main magma reservoirs feeding the Cumbre Vieja volcano; one in the mantle (30-40km depth) which charges and in turn feeds a shallower crustal reservoir (10-20km depth).

Eight eruptions have been recorded since the late 1400s (Figure 1.1).

Data and methods are discussed in Section 1.1.

Let $x$ denote the number of eruptions in a year. Then, $x$ can be modeled by a Poisson distribution

$$p(x) = \frac{e^{-\lambda}\lambda^x}{x!} \tag{1.1}$$

where $\lambda$ is the rate of eruptions per year. Using Equation 1.1, the probability of an eruption in the next $t$ years can be calculated.

Table 1.1: Recent historic eruptions on La Palma

| Name | Year |
|---|---|
| Current | 2021 |
| Teneguía | 1971 |
| Nambroque | 1949 |
| El Charco | 1712 |
| Volcán San Antonio | 1677 |
| Volcán San Martin | 1646 |
| Tajuya near El Paso | 1585 |
| Montaña Quemada | 1492 |

Table 1.1 summarises the eruptions recorded since the colonization of the islands by Europeans in the late 1400s.

Here is a cover image of the book genderated by chatGPT (**?@fig-cover_image**).

Figure 1.2 shows the location of recent Earthquakes on La Palma.

## 1.1 Data & Methods

## 1.2 Conclusion

## References

Marrero, José, Alicia García, Manuel Berrocoso, Ángeles Llinares, Antonio Rodríguez-Losada, and R. Ortiz. 2019. "Strategies for the Development of Volcanic Hazard Maps in Monogenetic Volcanic Fields: The Example of La Palma (Canary Islands)." *Journal of Applied Volcanology* 8 (July). https://doi.org/10.1186/s13617-019-0085-5.

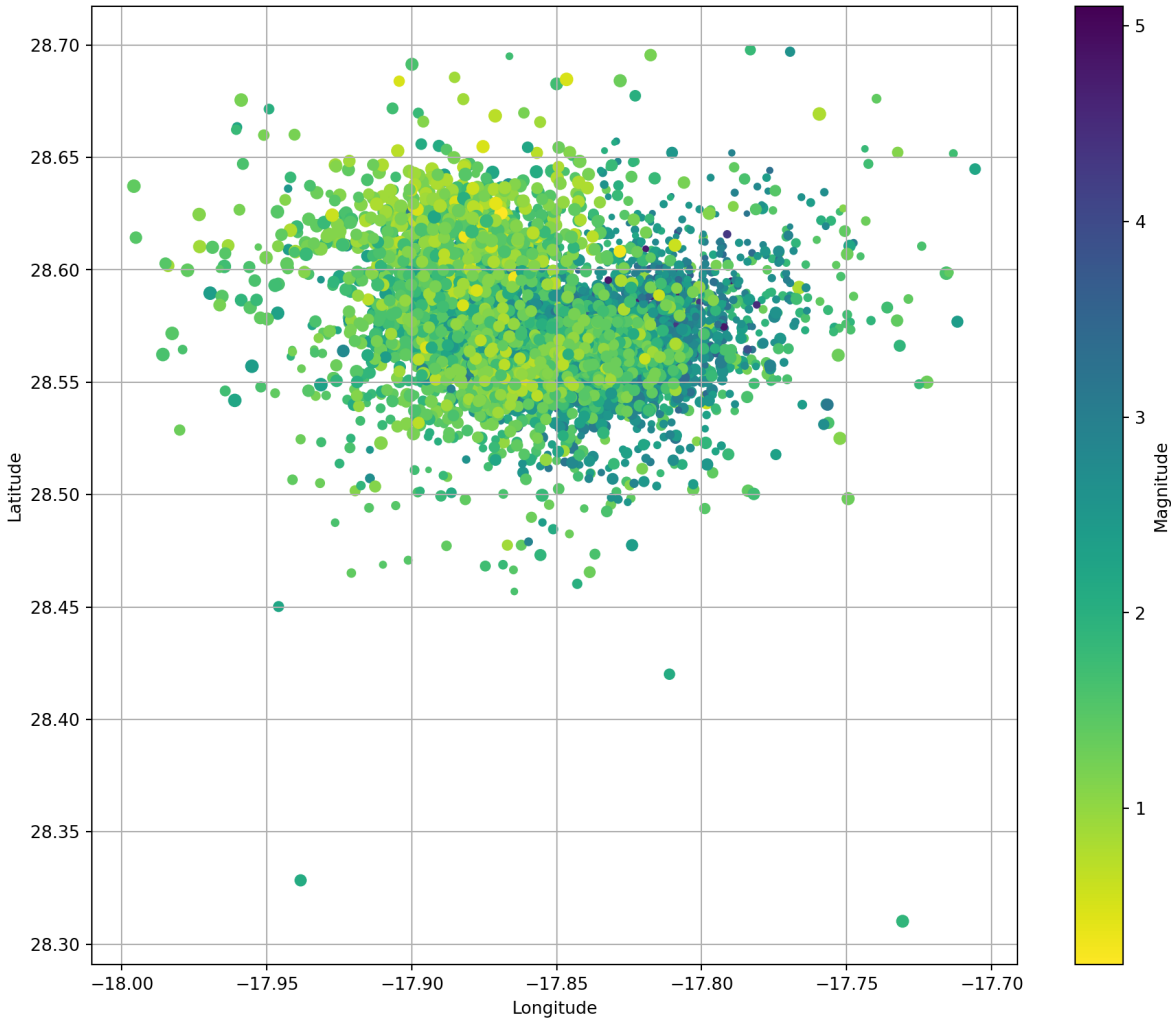


Figure 1.2: Locations of earthquakes on La Palma since 2017.