# **Flood Risk Prediction**

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### Abstract (This will be our abstract.)

Our project aims to develop a machine learning model in Julia to predict the likelihood of floods based on the monthly and annual rainfall in Kerala, a flood-prone subdivision in India. Leveraging a publicly available dataset, we will analyze historical rainfall patterns and develop a robust regression model to estimate flood probabilities. This model has the potential to be a valuable tool for for policymakers, disaster management authorities, and local communities, providing timely insights to improve flood preparedness and mitigation strategies. The motivation behind this project lies in the increasing frequency and severity of floods, exacerbated by climate change and rapid urbanization. Kerala, in particular, has experienced devastating floods in recent years, making accurate flood prediction models critical for risk management. Our machine learning approach will incorporate rainfall data and the use of advanced regression techniques, allowing for a flexible and reliable flood forecasting tool. Employing machine learning techniques, we aim to develop a model that can adapt to changing weather patterns, offering a flexible and reliable flood forecasting tool. Ultimately, our aim is to contribute to the development of more effective flood prediction and management systems, minimizing the human, infrastructural, and environmental losses caused by floods.

This manuscript is a template (aka "rootstock") for <u>Manubot</u>, a tool for writing scholarly manuscripts. Use this template as a starting point for your manuscript.

The rest of this document is a full list of formatting elements/features supported by Manubot. Compare the input ( .md files in the /content directory) to the output you see below.

# **Basic formatting**

**Bold text** 

Semi-bold text

Italic text

#### Combined italics and bold

#### Strikethrough

- 1. Ordered list item
- 2. Ordered list item
  - a. Sub-item
  - b. Sub-item
    - i. Sub-sub-item
- 3. Ordered list item
  - a. Sub-item
- List item
- List item
- · List item

subscript: H<sub>2</sub>O is a liquid

superscript: 2<sup>10</sup> is 1024.

unicode superscripts<sup>0123456789</sup>

#### unicode subscripts<sub>0123456789</sub>

A long paragraph of text. Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

Putting each sentence on its own line has numerous benefits with regard to <u>editing</u> and <u>version</u> control.

Line break without starting a new paragraph by putting two spaces at end of line.

## **Document organization**

Document section headings:

# **Heading 1**

# **Heading 2**

## **Heading 3**

**Heading 4** 

Heading 5

Heading 6



#### Horizontal rule:

Heading 1's are recommended to be reserved for the title of the manuscript.

Heading 2's are recommended for broad sections such as Abstract, Methods, Conclusion, etc.

Heading 3's and Heading 4's are recommended for sub-sections.

### Links

Bare URL link: https://manubot.org

Long link with lots of words and stuff and junk and bleep and blah and stuff and other stuff and more stuff yeah

Link with text

Link with hover text

Link by reference

#### **Citations**

Citation by DOI [1].

Citation by PubMed Central ID [2].

Citation by PubMed ID [3].

Citation by Wikidata ID [4].

Citation by ISBN [5].

Citation by URL [6].

Citation by alias [7].

Multiple citations can be put inside the same set of brackets [1,5,7]. Manubot plugins provide easier, more convenient visualization of and navigation between citations [2,3,7,8].

Citation tags (i.e. aliases) can be defined in their own paragraphs using Markdown's reference link syntax:

# Referencing figures, tables, equations

Figure 1

Figure 2

```
Figure 3

Figure 4

Table 1

Equation 1

Equation 2
```

# **Quotes and code**

Quoted text

Quoted block of text

Two roads diverged in a wood, and I—I took the one less traveled by, And that has made all the difference.

Code in the middle of normal text, aka inline code.

Code block with Python syntax highlighting:

```
from manubot.cite.doi import expand_short_doi

def test_expand_short_doi():
    doi = expand_short_doi("10/c3bp")
    # a string too long to fit within page:
    assert doi == "10.25313/2524-2695-2018-3-vliyanie-enhansera-copia-i-
        insulyatora-gypsy-na-sintez-ernk-modifikatsii-hromatina-i-
        svyazyvanie-insulyatornyh-belkov-vtransfetsirovannyh-geneticheskih-
        konstruktsiyah"
```

Code block with no syntax highlighting:

```
Exporting HTML manuscript
Exporting DOCX manuscript
Exporting PDF manuscript
```

## **Figures**



**Figure 1:** A square image at actual size and with a bottom caption. Loaded from the latest version of image on GitHub.



**Figure 2:** An image too wide to fit within page at full size. Loaded from a specific (hashed) version of the image on GitHub.



Figure 3: A tall image with a specified height. Loaded from a specific (hashed) version of the image on GitHub.



Figure 4: A vector .svg image loaded from GitHub. The parameter sanitize=true is necessary to properly load SVGs hosted via GitHub URLs. White background specified to serve as a backdrop for transparent sections of the image. Note that if you want to export to Word ( .docx ), you need to download the image and reference it locally (e.g. content/images/vector.svg) instead of using a URL.

# **Tables**

**Table 1:** A table with a top caption and specified relative column widths.

Bowling Scores	Jane	John	Alice	Bob
Game 1	150	187	210	105
Game 2	98	202	197	102
Game 3	123	180	238	134

**Table 2:** A table too wide to fit within page.

	Digits 1-33	Digits 34-66	Digits 67-99	Ref.
pi	3.14159265358979323 846264338327950	28841971693993751 0582097494459230	78164062862089986 2803482534211706	piday.org
е	2.71828182845904523 536028747135266	24977572470936999 5957496696762772	40766303535475945 7138217852516642	nasa.gov

Table 3: A table with merged cells using the attributes plugin.

	Colors		
Size	Text Color	Background Color	
big	blue	orange	
small	black	white	

## **Equations**

A LaTeX equation:

$$\int_0^\infty e^{-x^2} dx = \frac{\sqrt{\pi}}{2} \tag{1}$$

An equation too long to fit within page:

$$x = a + b + c + d + e + f + g + h + i + j + k + l + m + n + o + p + q + r + s + t + u + v + w + x + y + z + 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9$$
 (2)

# **Special**

▲ WARNING The following features are only supported and intended for .html and .pdf exports. Journals are not likely to support them, and they may not display correctly when converted to other formats such as .docx.

LINK STYLED AS A BUTTON

Adding arbitrary HTML attributes to an element using Pandoc's attribute syntax:

Manubot Manubot Manubot Manubot Manubot. Manubot Manubot Manubot Manubot. Manubot Manubot. Manubot Manubot. Manubot. Manubot.

Adding arbitrary HTML attributes to an element with the Manubot attributes plugin (more flexible than Pandoc's method in terms of which elements you can add attributes to):

Manubot Manubo

Available background colors for text, images, code, banners, etc:

white lightgrey grey darkgrey black lightred lightyellow lightgreen lightblue lightpurple red orange yellow green blue purple

Using the **Font Awesome** icon set:

### **Light Grey Banner**

useful for general information - manubot.org

#### **6** Blue Banner

useful for important information - manubot.org

### **\Omega** Light Red Banner

useful for warnings - manubot.org

# **Dataset Description**

- Source: This dataset can be found on Kaggle, at this link:
   https://www.kaggle.com/code/mukulthakur177/flood-prediction-model. It was generated to help build a predictive model for flood occurrences using meteorological and environmental factors.
- Format: The dataset is in CSV format, which is commonly used for tabular data storage. Each row represents a specific data point, with columns detailing various features that might impact flood conditions.
- Contents: The columns of the dataset cover parameters typically used to forecast flood situations, and the dataset serves as a basis for training machine learning models in flood prediction. More specifically, the dataset includes the following columns:
  - 1. Rainfall (mm): Represents the amount of rainfall in millimeters. This is a key factor in flood prediction models.
  - 2. Temperature (°C): Indicates the temperature in degrees Celsius.
  - 3. Humidity (%): Provides the humidity level in percentage, which can influence weather conditions and potential flood situations.
  - 4. Flood (0/1): A binary indicator where '0' signifies no flood, and '1' indicates a flood event.

# **Proposal**

Our team plans to use the Kaggle flood prediction dataset to develop a machine learning model in Julia that predicts the likelihood of floods in Kerala, India. We will analyze the historical monthly rainfall, temperature, and humidity data in the dataset to identify patterns correlated with flood occurrences. By applying regression techniques, we aim to create a model that estimates flood probabilities accurately, providing a valuable tool for disaster management authorities and local communities.

The motivation behind this project stems from the increasing frequency of floods due to climate change, particularly in Kerala. Accurate prediction models are crucial for improving flood preparedness and risk mitigation strategies. Our model will offer timely insights, ultimately contributing to reducing the human, infrastructural, and environmental losses caused by floods in this region.

### References

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Daniel S Himmelstein, Ariel Rodriguez Romero, Jacob G Levernier, Thomas Anthony Munro, Stephen Reid McLaughlin, Bastian Greshake Tzovaras, Casey S Greene *eLife* (2018-03-01) <a href="https://doi.org/ckcj">https://doi.org/ckcj</a>

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Brett K Beaulieu-Jones, Casey S Greene

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