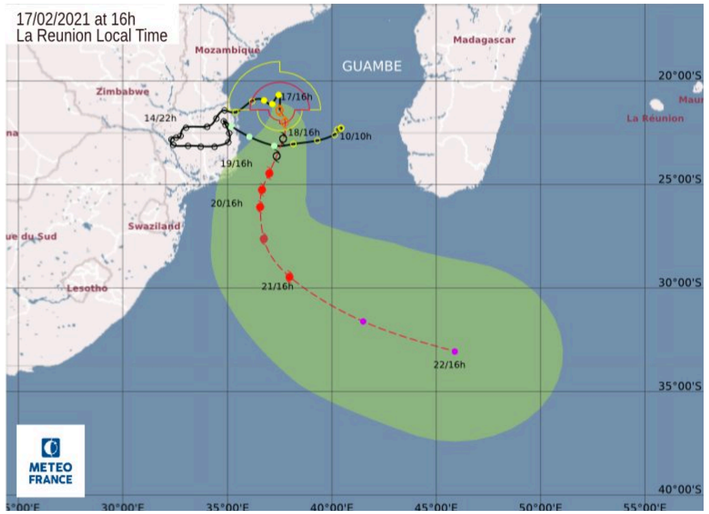
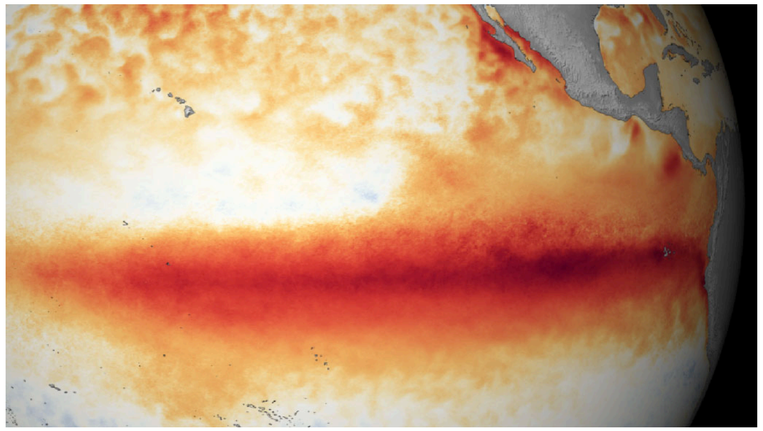
Challenges 1+2+3

Machine Learning with Weather and Climate Data

So Takao (UCL) and Bertrand Chapron (IFREMER)

Conventional numerical methods don’t work well on certain tasks…

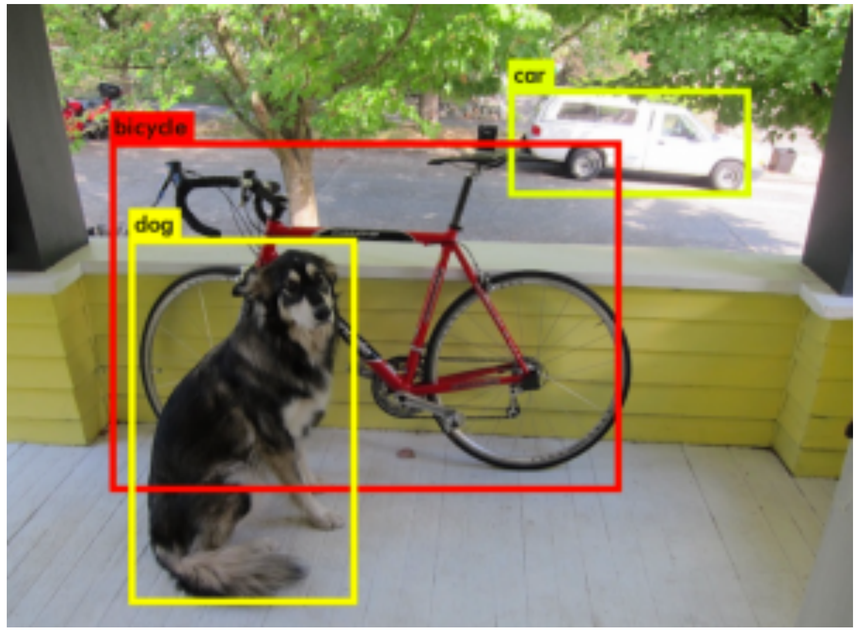


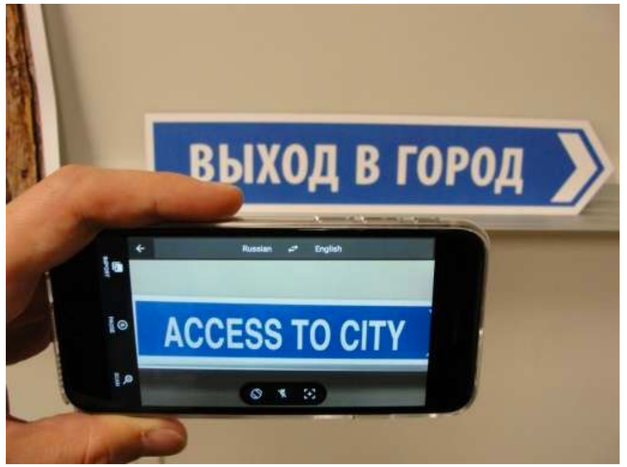


…Can we use Machine Learning to deliver **data-driven** solutions to these problems?

What is machine learning?

Automatic extraction of patterns from large amounts of data





How do we apply this to weather/climate science?

Input X

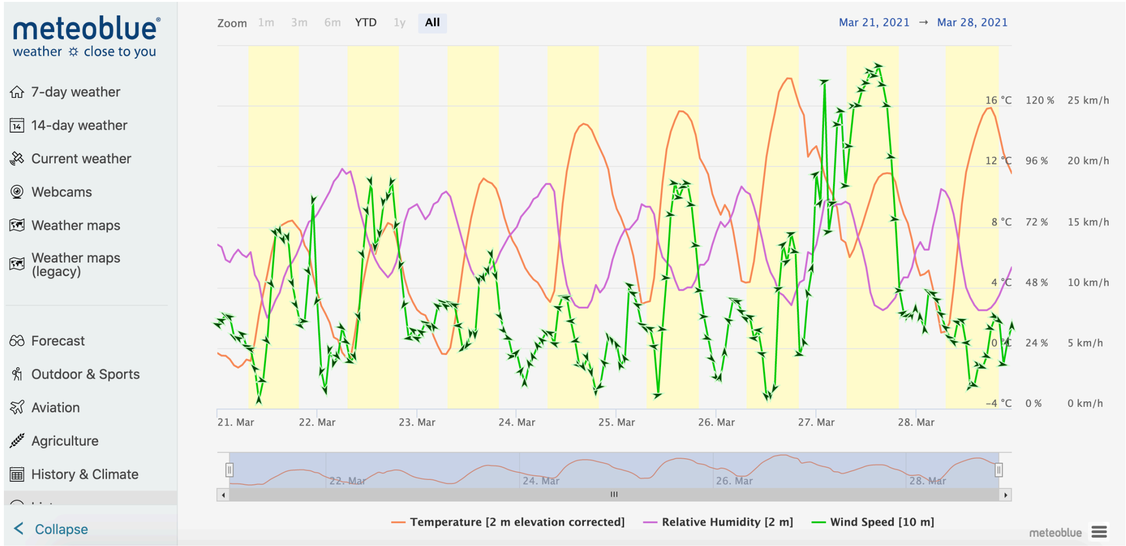
Machine Learning Model

Output y

Challenge 1: Predicting the rainfall in Basel, Switzerland

- Data from meteoblue.com

Category of rainfall	Intensity (mm)
Trace	≤ 3.0 mm
Light rain	= 4.57- 9.64 mm
Moderate rain	= 9.65- 22.34 mm
Moderately heavy rain	= 22.35- 44.19 mm
Heavy rain	= 44.20- 88.90 mm
Very heavy rain	≥ 89 mm

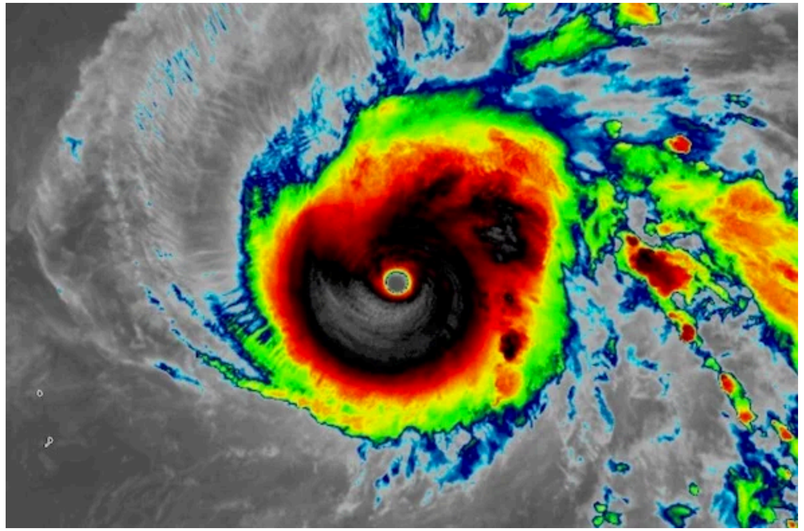


- **Task:** Can you predict the rainfall during the period 03/2020-03/2021 using other variables?
- **Training data:** 03/2010-03/2020

- **Techniques:** Binary/multi-class Classification, Regression, Time-series modelling, etc…
- Beginner-friendly

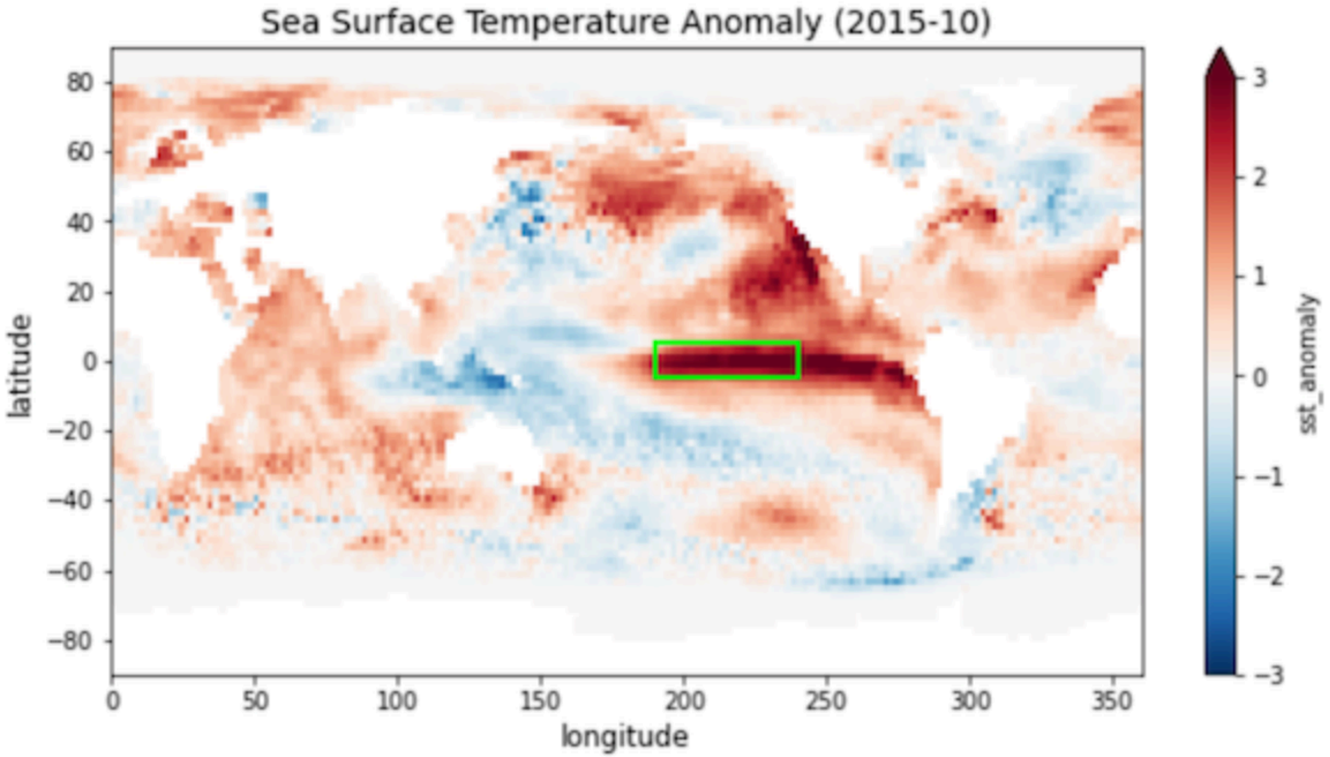
Challenge 2: Predicting the trajectory and intensity of tropical cyclones

- Storm data from US NRL and NOAA
- **Tasks:**
  - Can you predict the highest intensity a cyclone will reach in a given region?
  - How far in advance can you predict this?
  - How many cyclones will there be?
  - How many will reach categories 4 and 5?
- **Techniques:** Regression, classification



Challenge 3: Predicting the occurence of El-Nino events

El Nino (Definition): An event where the 5 months running average of the sea surface temperature anomaly in the Nino 3.4 region 5°S ~ 5°N, 120° ~ 170°W (equivalently, -5° ~ 5°N, 190° ~ 240°E) exceeds 0.4°C for periods of 6 months or longer.



Task: Can you predict the occurrence of El Nino events 1-6 months in advance?

Data from various sources available from 1981-2019

Techniques: Timeseries modelling, CNNs

Getting started

- All information about the challenges and datasets are available on Github:

  https://github.com/sotakao/STUOD_Hackathon_2021

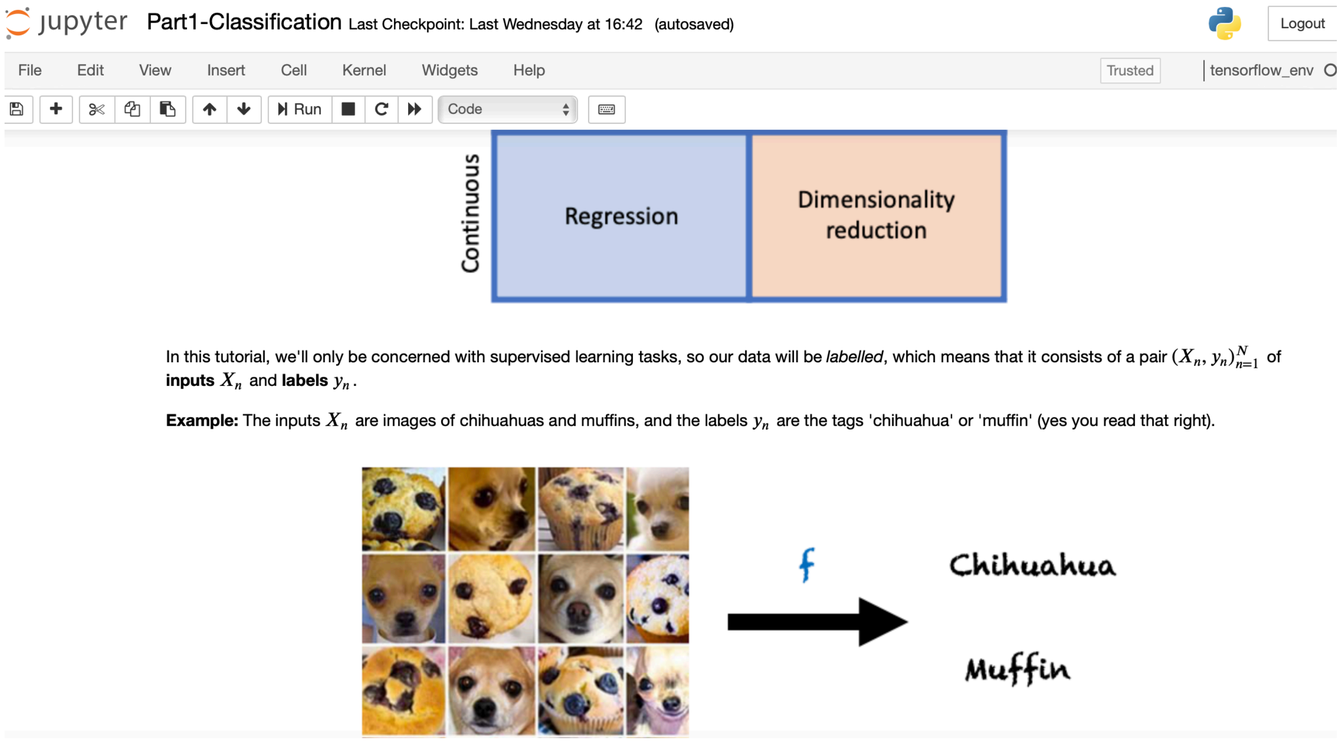
- Preferred methods of communication:
  - Zoom
  - Slack

  (Links can be found in the Hackathon information booklet)

- Who to contact:

  Me (So Takao), Bertrand Chapron (aka Canard Duck), Jean-Francois Piolle, Ronan Fablet, Nicolas Reul (for Tropical Cyclones challenge)

- You can use other datasets or even formulate your own problems as long as it’s weather/climate related
- Please report any issues/bugs in Github or Slack
- Interactive tutorials available!
  - Classification with L63
  - Regression with L96
  - Handling data with pandas
  - Getting started with xarray



When you present, remember to…

- Include a problem statement
- Indicate what data you chose for training/testing
- What is the baseline that you are comparing against?
- What is the metric that you are using to compare models?
- What are some challenges you faced?
- What next?

Final words

- It’s ok if you don’t complete, you are here to learn!
- Ask us anything if you are having any difficulties
- Please be respectful of others and work as a team

happy hacking!