10Pearls

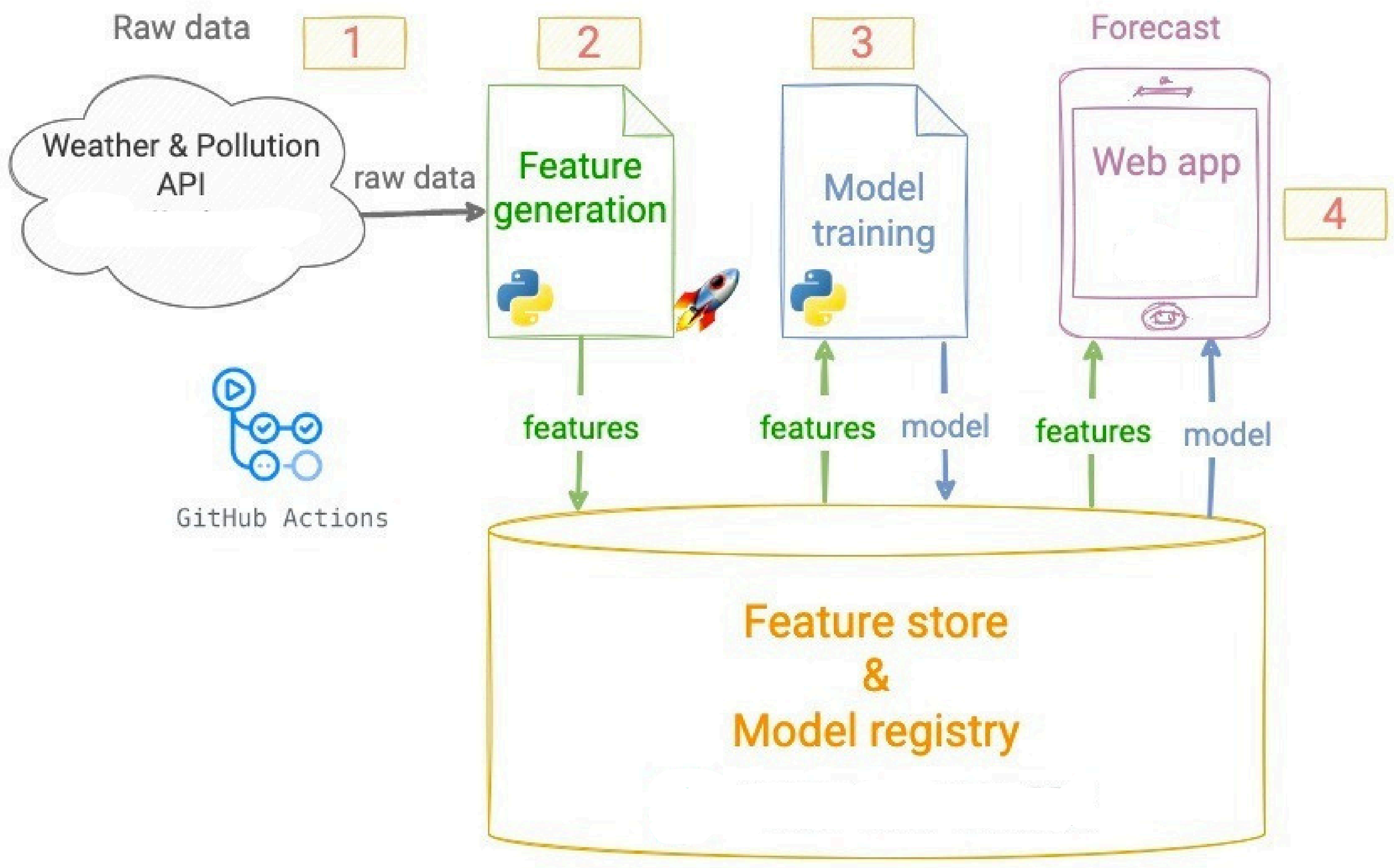
Pearls AQI Predictor

Let’s predict the Air Quality Index (AQI) in your city in the next 3 days, using a 100% serverless stack.

High Level Overview

The following is a high level overview for you to achieve this

Air Quality Index (AQI) prediction service



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Feature Pipeline

Write a Python script that:

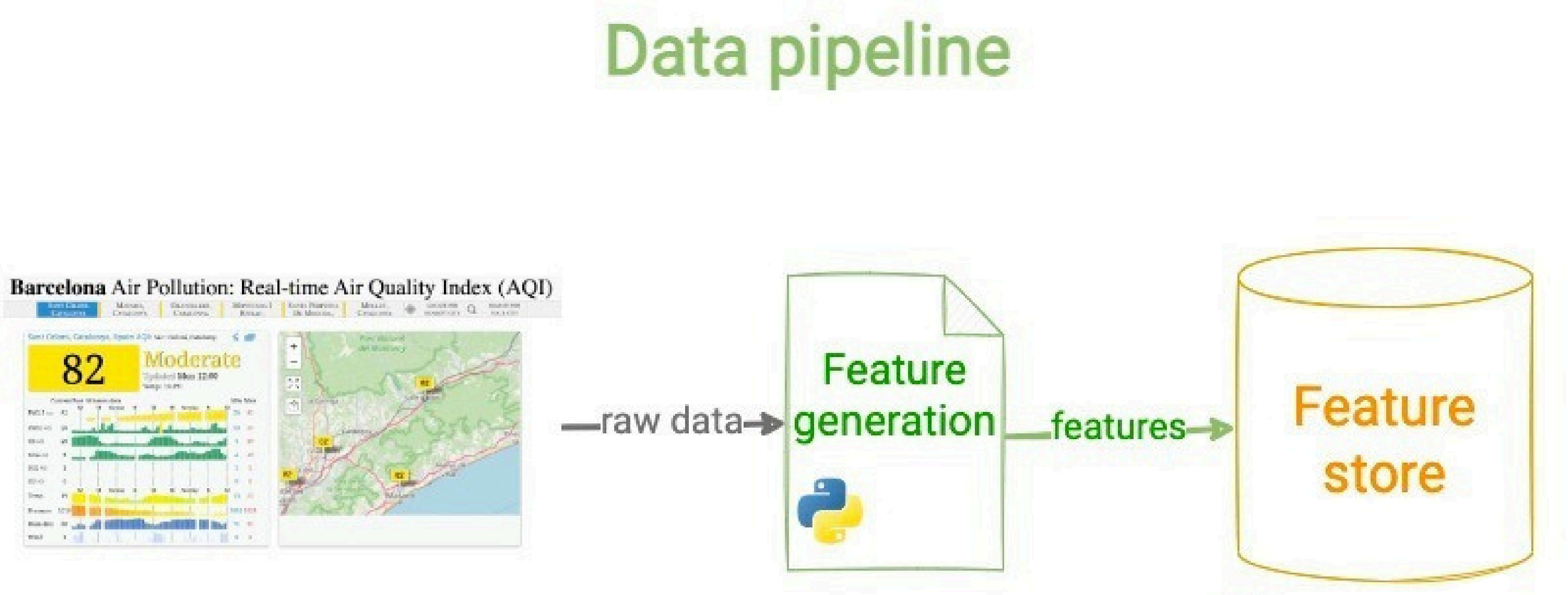
1 → Fetches raw weather and pollutant data from an external API like AQICN or OpenWeather
(The above api is just an example, you may need to explore other options too)

2 → Computes features from this raw data (aka model inputs), and targets (aka model outputs)

- Include time-based features (hour, day, month) and derived features like AQI change rate.

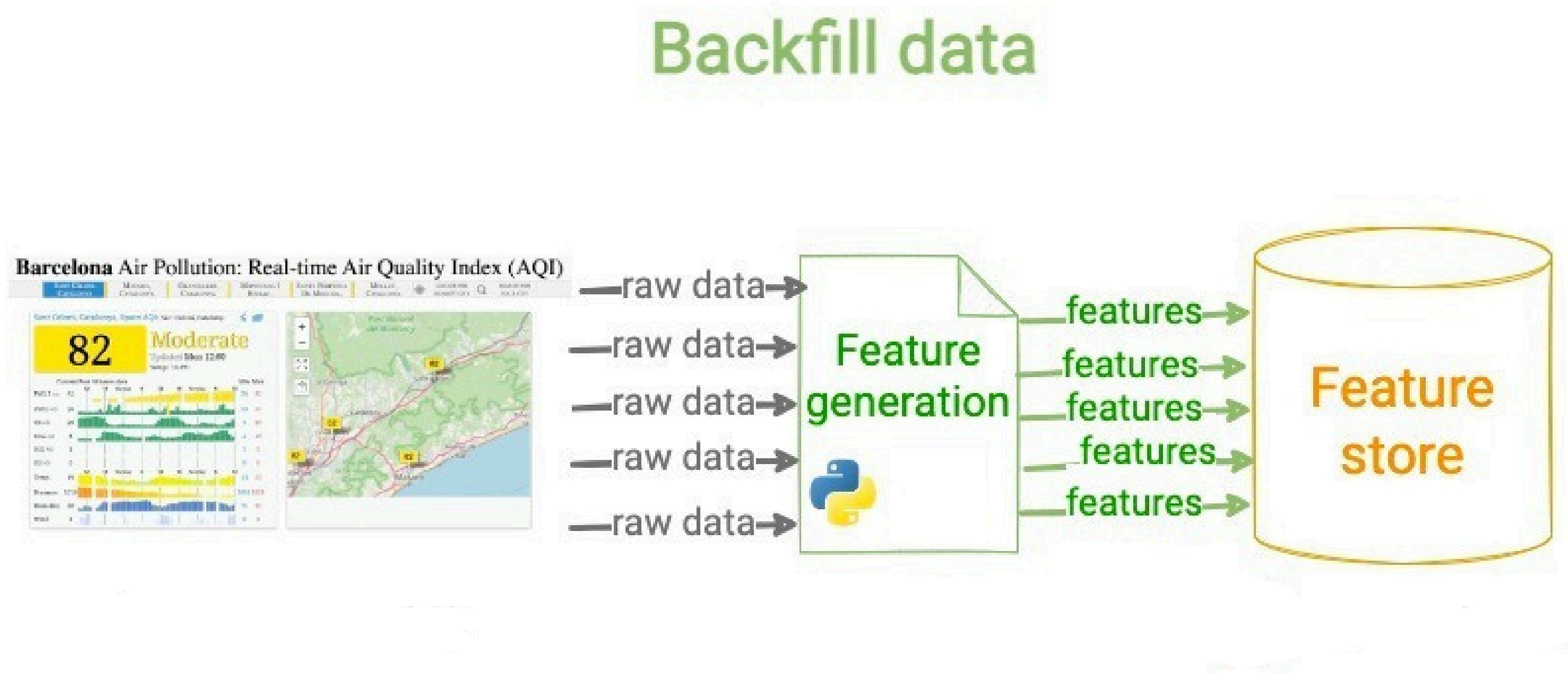
3 →Stores these features in the Feature store

- You may want to explore Hopsworks or Vertex AI (Free tiers)



Backfill Historical Data (features, targets)

Run the feature script from step 1 for a range of past dates, to generate training data for your ML models.



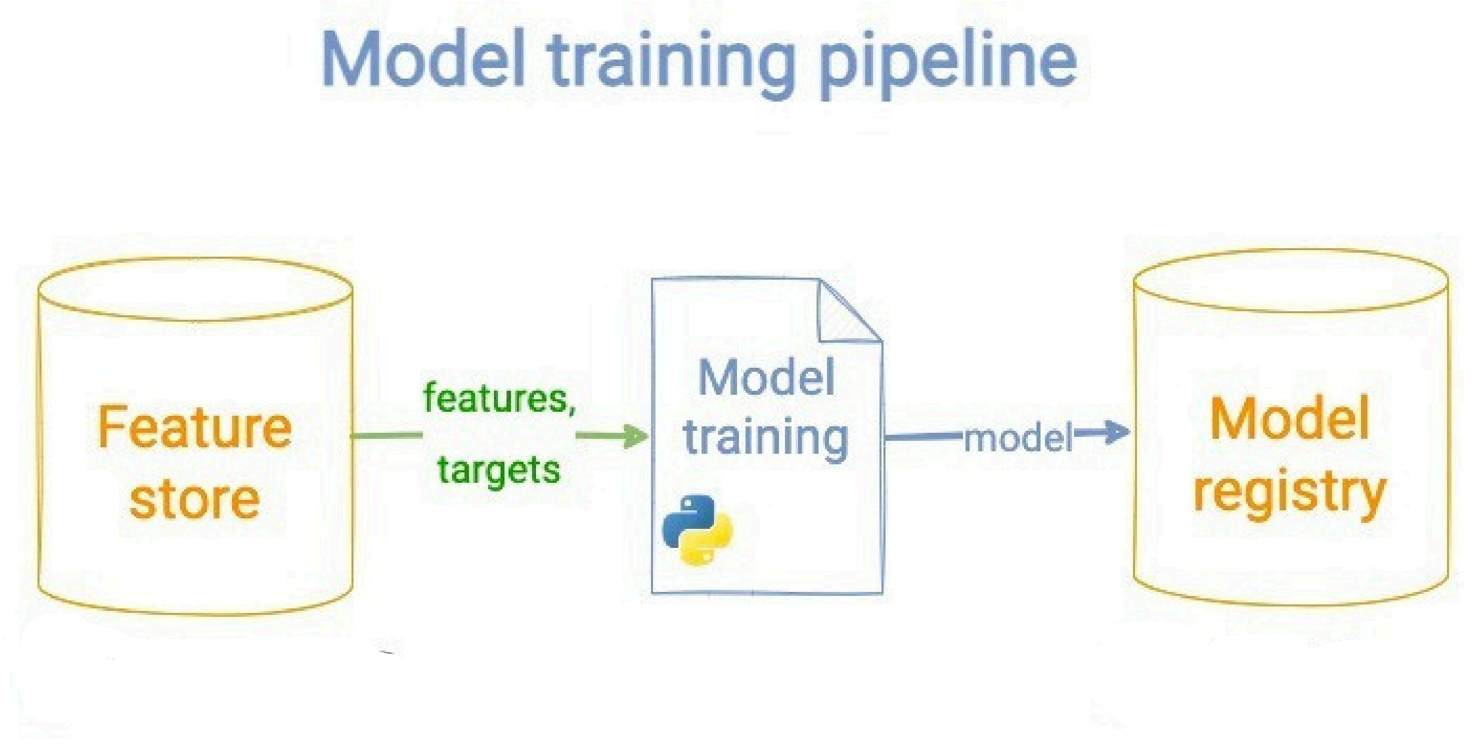
Training Pipeline

1 → Fetches historical (features, targets)from the Feature Store.

2 → Trains and evaluate the best ML model possible for this data

- *Experiment with Scikit-learn models (Random Forest, Ridge Regression) and TensorFlow/PyTorch for advanced models.*
- *Evaluate performance using RMSE, MAE, and R².*

3 → Stores the trained model in the Model Registry.

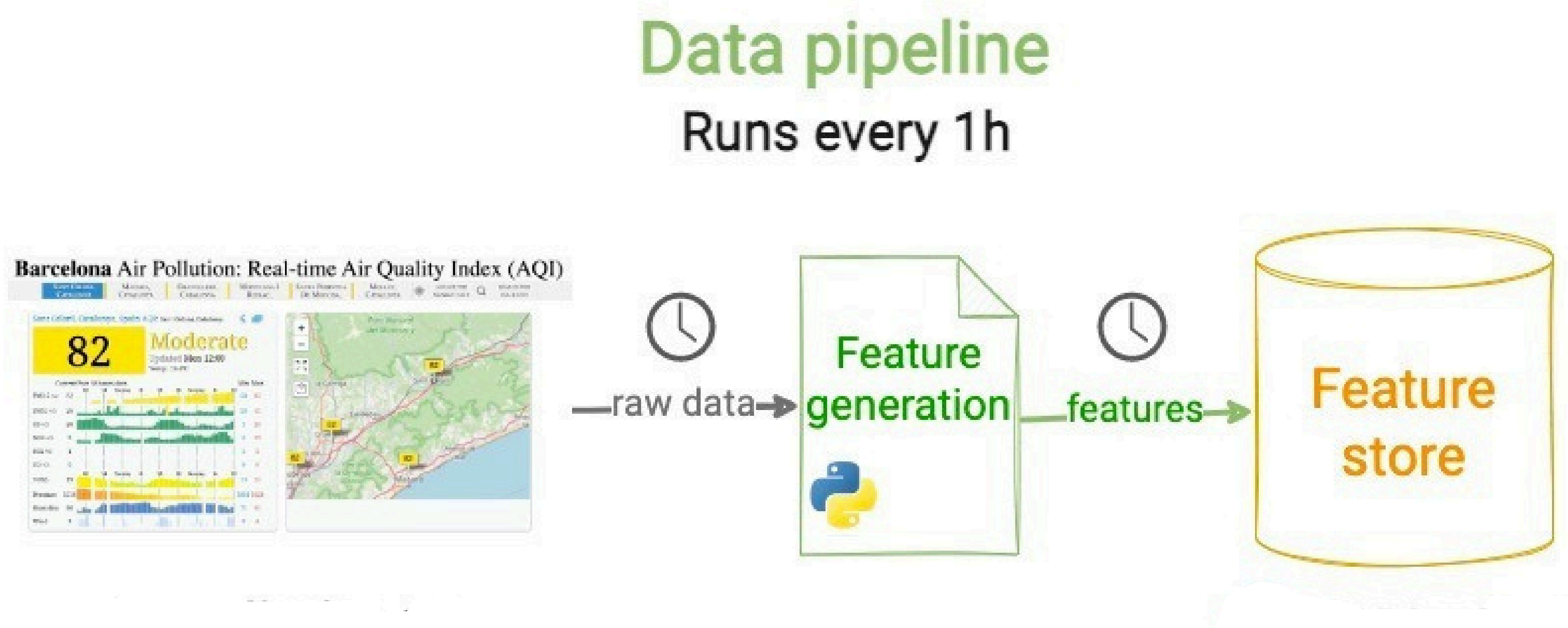


Automate pipeline runs

Create a CI/CD pipeline that automatically runs

→ the **feature script every hour**, and
→ the **training script every** day.

Some popular and free CI/CD tools that you can use are Apache Airflow and Github Actions but you are encouraged to explore other tools too

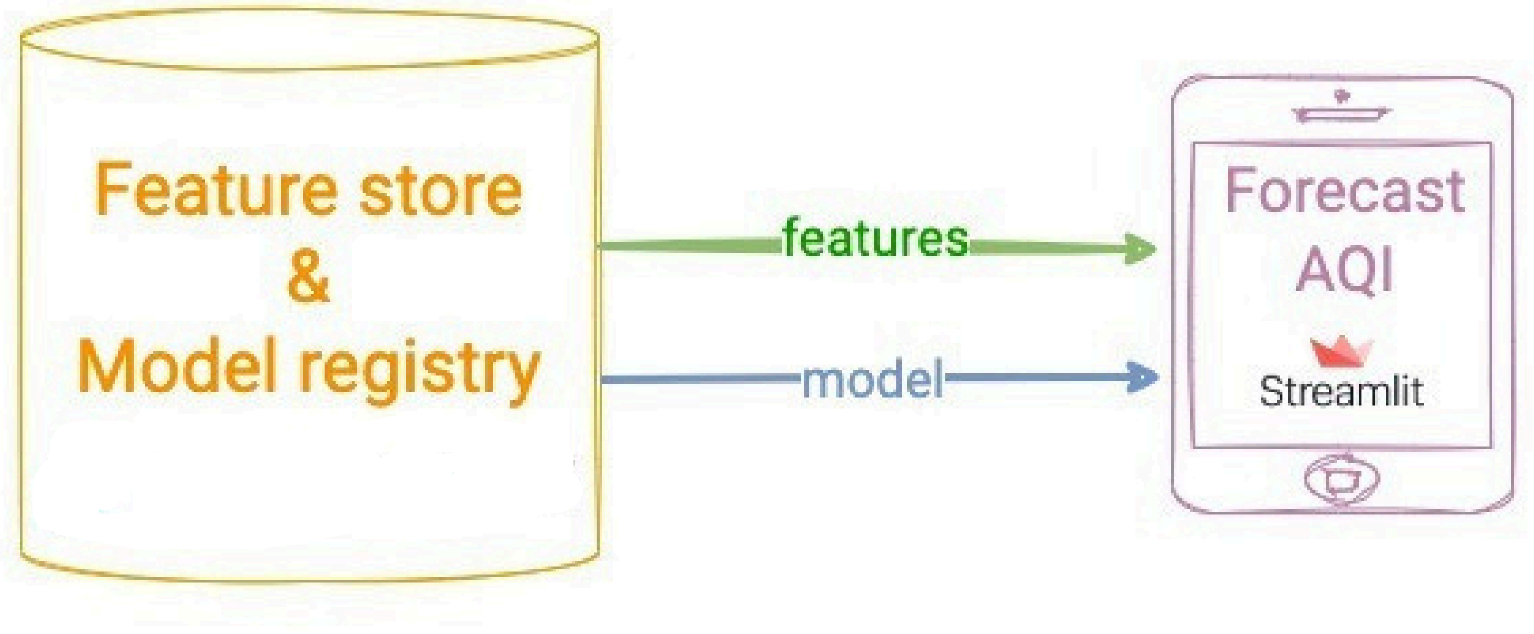


The Web App

1 → Loads the model and features from the Feature Store,

2 → Computes model predictions and shows them on a simple and descriptive dashboard.

3 → Use Streamlit/Gradio/or any framework of your choice and Flask/FastApi for the web app



Submissions

Some Guidelines

- Perform EDA to identify trends.
- You should use a variety of forecasting models, from statistical modelling to deep learning models
- Containerize the application using Docker.
- Use SHAP or LIME for feature importance explanations.
- Add alerts for hazardous AQI levels

Final Submissions:

- End-to-end AQI prediction system.
- A scalable, automated pipeline.
- An interactive dashboard showcasing real-time and forecasted AQI data.
- A detailed report documenting everything you managed to achieve