

CZAR OF HACKATHON



Respira

One good turn deserves another
One good man deserves a purifier



OVERVIEW

- Introduction
- Goal
- Setting & Implementation
- Feature
- Vision
- Reference

INTRODUCTION

An optimized, customized system

- Develop a automatic scoring system.
- Develop a mathematical model for power allocation.
- Design a simple framework for data visualization, processing, scraping, and training.
- Visualization
 - Visualize air quality and air data dashboard.
 - Process history data and visualize correlation between data.



GOAL - 1

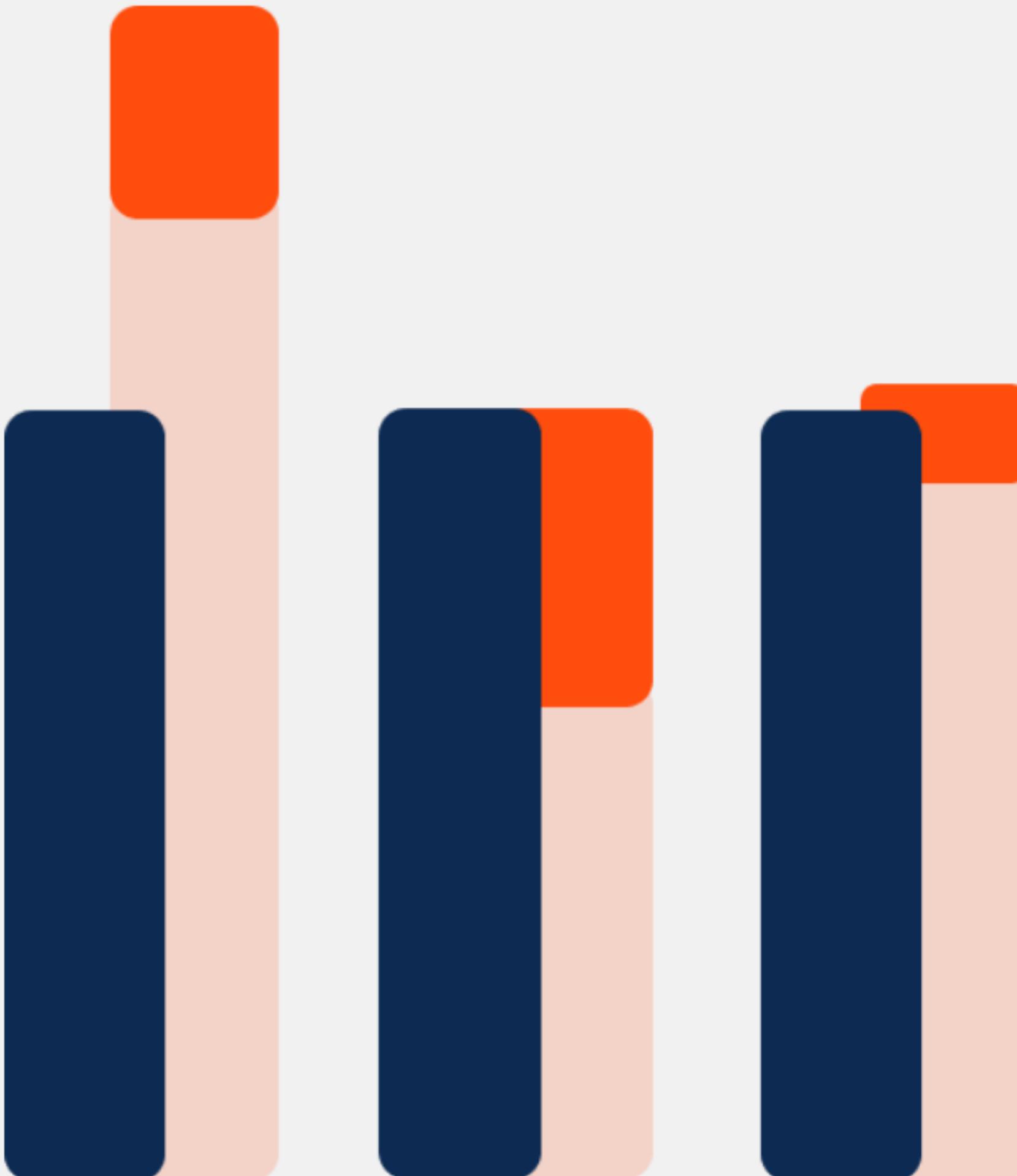
Automatic Scoring System



- Step 1 : label current air quality
 - Labeling standards can be changed
 - based on user feedback
 - based on discrete quality metrics (AQI)
- Step 2 : Use logistic regression to fit the labels
 - Each air data vector will then be associated with a probability between 0~1
- Step 3 : Visualize real-time score on the webpage

GOAL - 2

POWER ALLOCATE OPTIMIZATION



- Scores after allocation
- Scores without algorithm
- Wasted Power



GOAL - 2 POWER ALLOCATE OPTIMIZATION

- Can we develop a mathematical model to better allocate power rather than divide power averagely ? Scenarios with lower scores should be allocated more power.

Total of m scenarios : $1 \sim m$

A data vector at i_{th} location is denoted as $x^i = [x_1^i \ x_2^i \ \dots \ x_n^i]$, x^{i_0} is the initial measurement

Suppose we wish to allocate a total of power of P to m locations.

The power allocated to the i_{th} location is $a_i W$, hence $\sum_{i=1}^m a_i = 1$.

We model the relation between power and the score as linear, that is :

$$x^{i_f} = x^{i_0} + a_i V, \quad V = [V_1 \ V_2 \ \dots \ V_n].$$



The scaling factor V can be determined using past collected air purifier data.

GOAL - 2 POWER ALLOCATE OPTIMIZATION

Objective :

$[a_1 \ a_2 \ \dots \ a_n] = \operatorname{argmin} \operatorname{Var}[f(x^{i_f})]$, subject to $\sum_{i=1}^m a_i = 1$. $f(x)$ is the score function.

We solve this by using the lagrange multiplier method.

$$T = \operatorname{Var}[f(x^{i_f})] + \gamma(1 - \sum_{i=1}^m a_i)$$

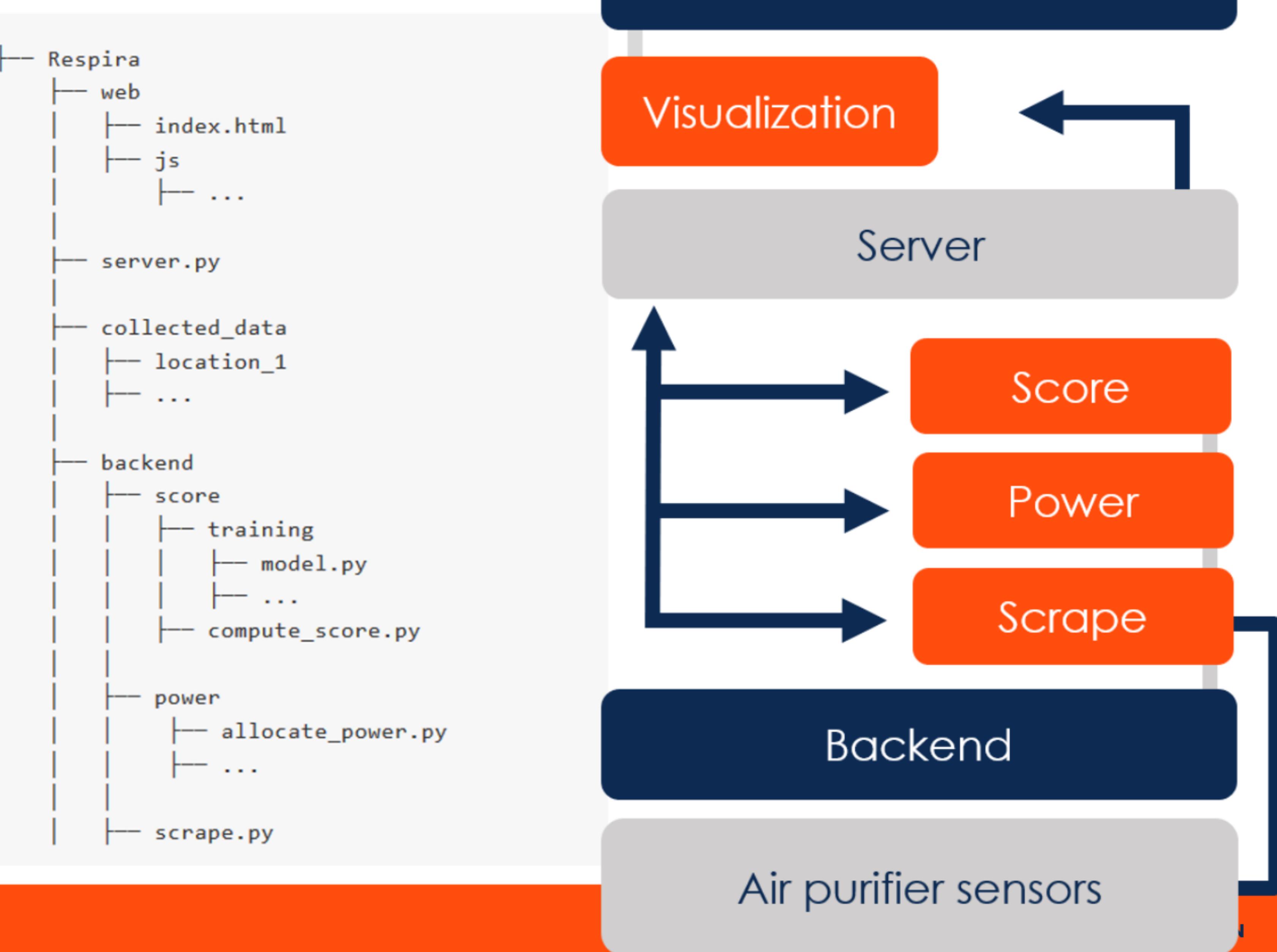
$$\frac{\partial T}{\partial a_i} = 0$$

$$\frac{\partial T}{\partial \nu} = (1 - \sum_{i=1}^m a_i) = 0$$



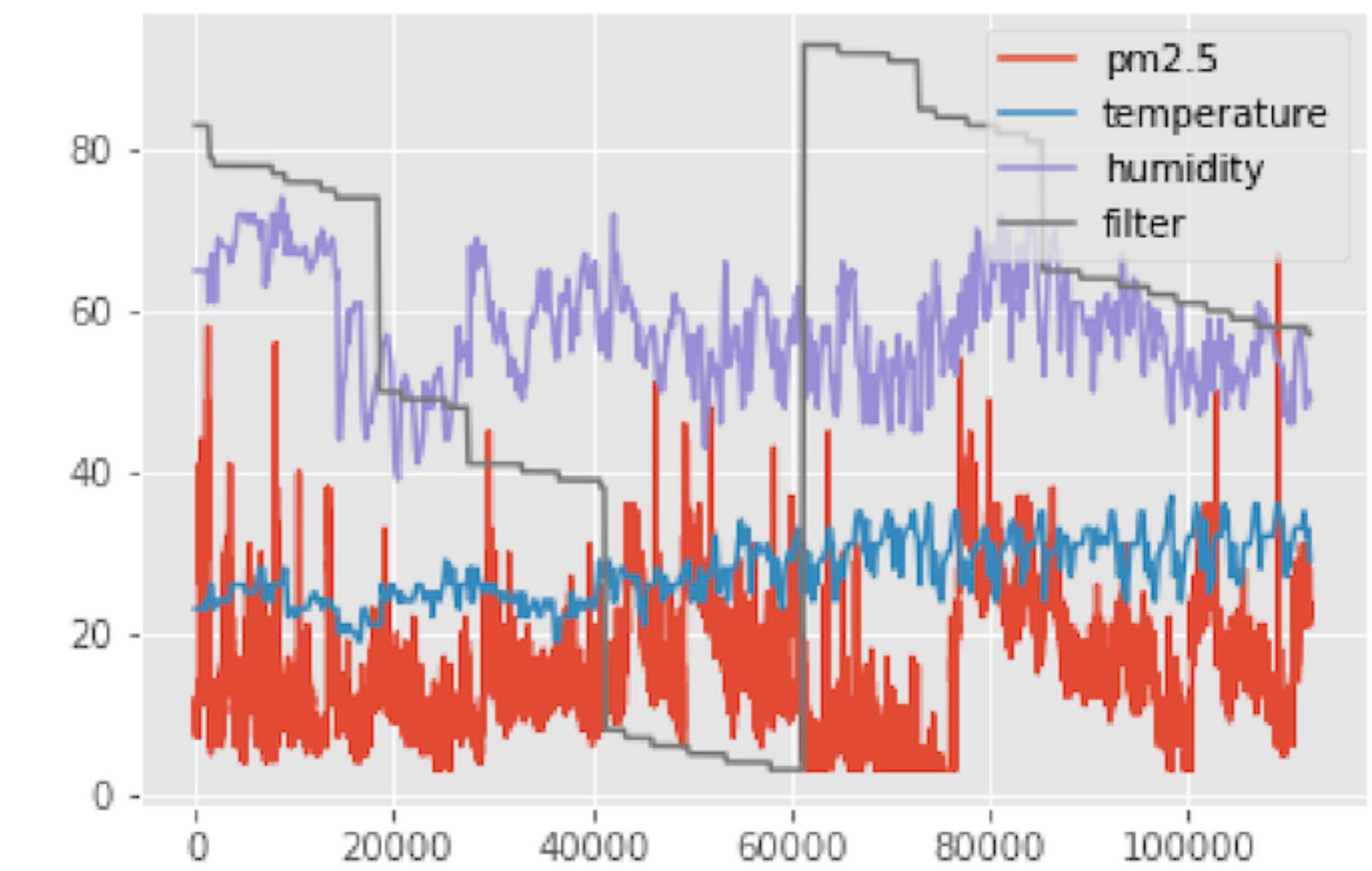
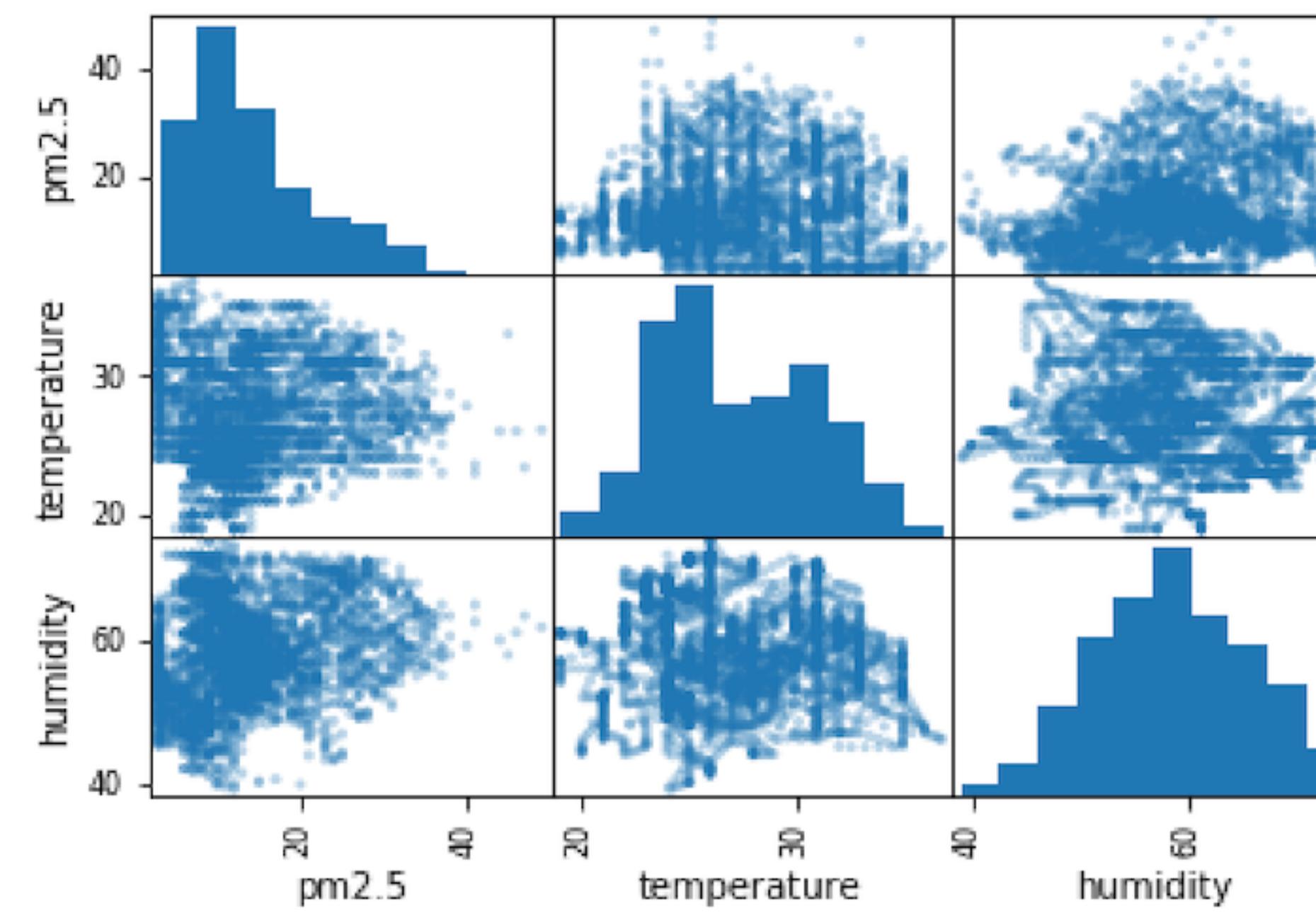
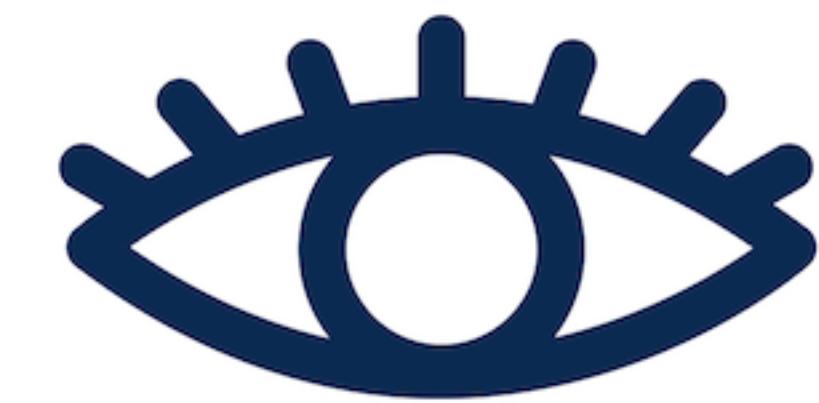
GOAL - 3

Framework



GOAL - 4

Visualization



Settings & Implementations



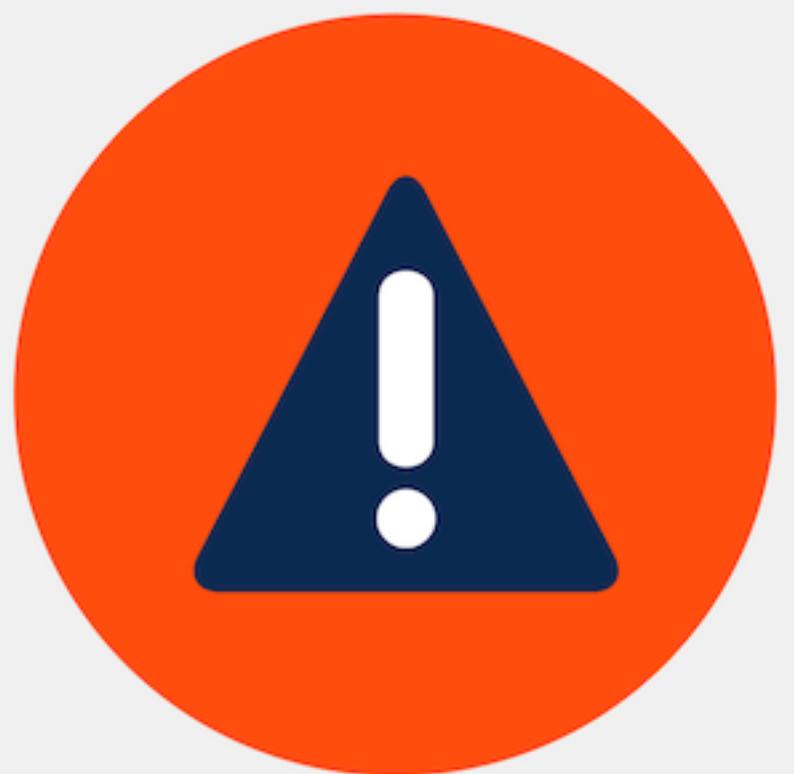
- No real-time data for visualization: we model various air data as a **gaussian distribution**. The parameters are calculated using **Maximum Likelihood Estimation** based on history data.
- Length mismatch between air measurements: simply augment data using interpolation.

Feature

VISUALIZE OPTIMIZATION



1. Eco-friendly



2. Danger Detecting

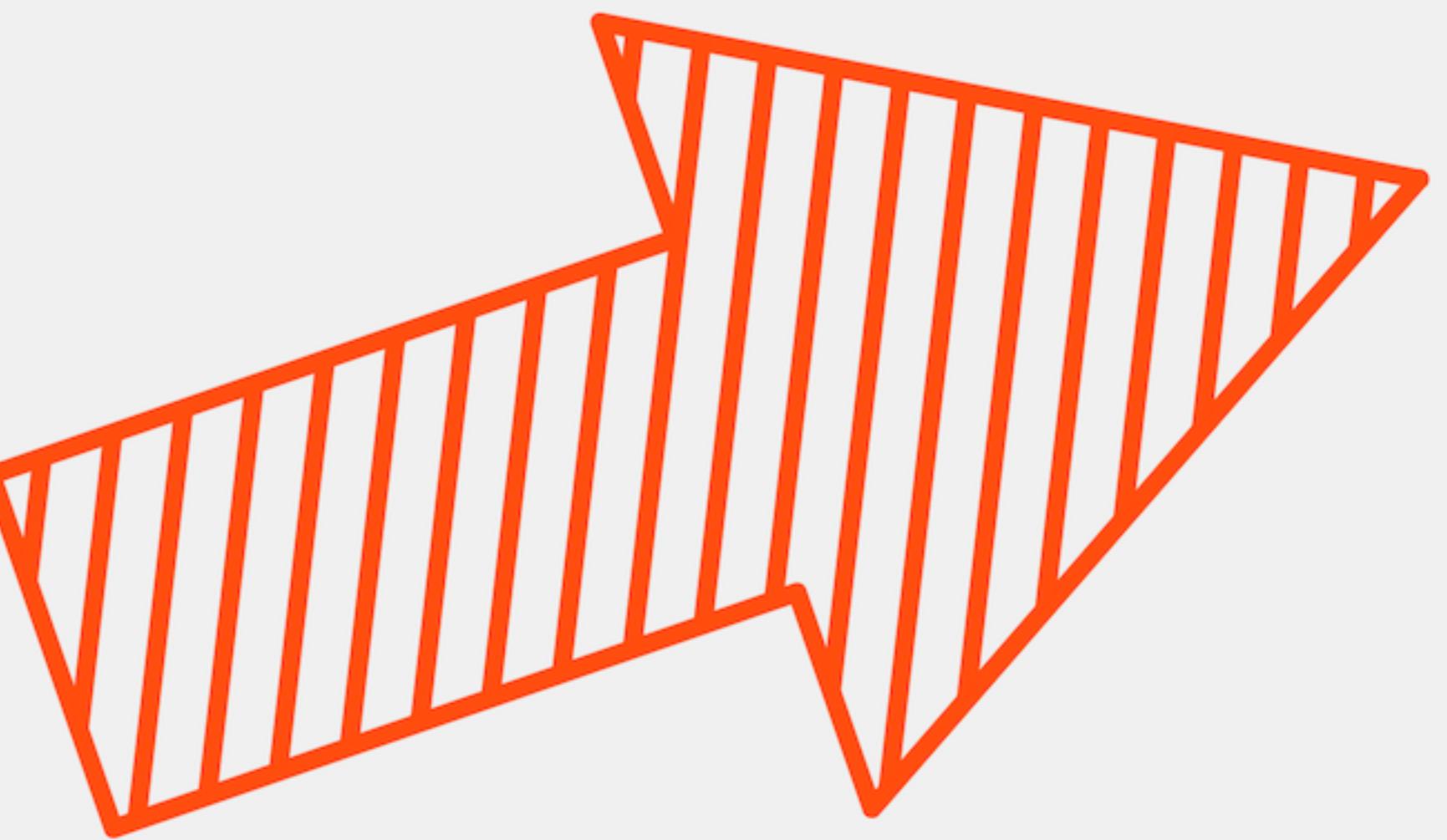


3. Economic

VISION

Olfactory Reality

Filter different
types of air



Generate
different
types of air

REFERENCE

WHO Air pollution

<https://www.who.int/airpollution/en/>

Environmental Protection Administration Execution Yuan

<https://taqm.epa.gov.tw/taqm/tw/default.aspx>

III DSI

<https://www.facebook.com/iii.dsi/>

Q & A Time

Thanks for listening