

Machine Learning Monkey

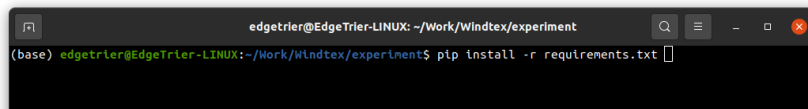
Instruction & Information

Version 1.0-alpha

1. Machine Learning Monkey Installation

1. **Python v 3.8+**
2. **Python Package Prerequisites**

In terminal, please enter **pip install -r requirements.txt** to install the required packages.



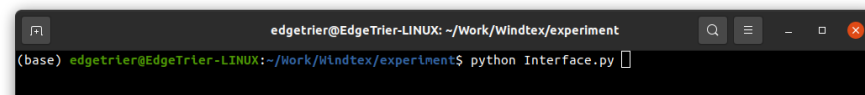
```
edgetrier@EdgeTrier-LINUX: ~/Work/Windtex/experiment
(base) edgetrier@EdgeTrier-LINUX:~/Work/Windtex/experiment$ pip install -r requirements.txt
```

Or manually install the packages by pip/conda

1. numpy
2. scipy
3. scikit-learn
4. scikit-image
5. matplotlib
6. shapely
7. pillow
8. opencv-python
9. tqdm

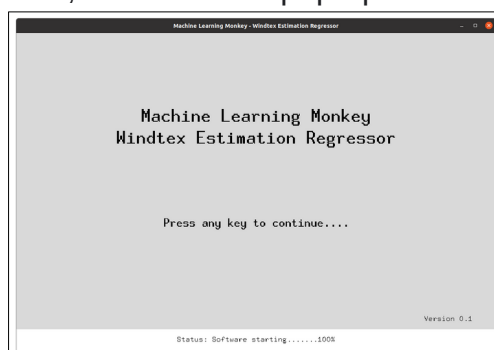
2. Start Machine Learning Monkey

1. In terminal, please enter **python Interface.py** .



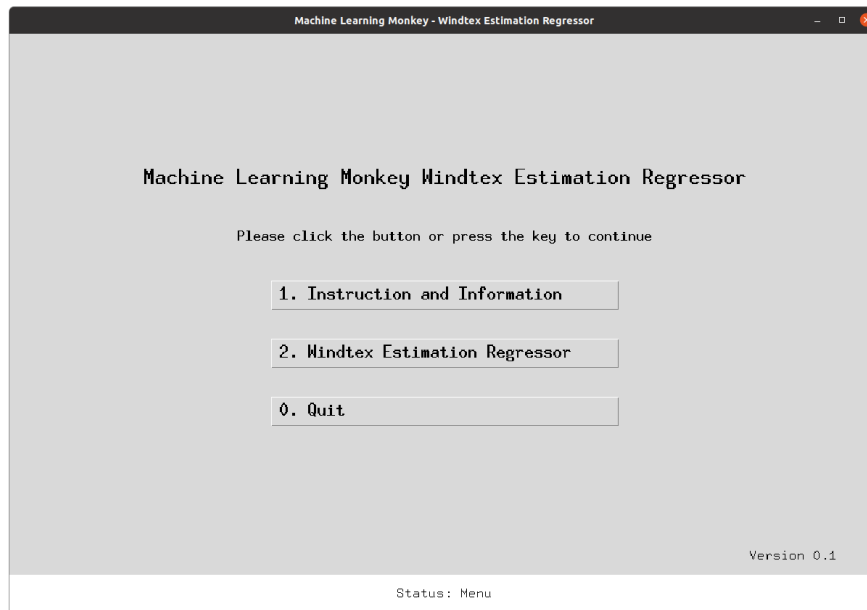
```
edgetrier@EdgeTrier-LINUX: ~/Work/Windtex/experiment
(base) edgetrier@EdgeTrier-LINUX:~/Work/Windtex/experiment$ python Interface.py
```

2. Then, a window will pop-up as shown below



3. Press **any** key when the loading is completed; **Esc** key to close the window

3. Menu Page



1. **Instruction and Information** – open user manual
2. **Windtex Estimation Regressor** – start Windtex Estimation Regressor Model
3. **Quit** – close the windows

4. Windtex Estimation Regressor

The screenshot shows a web application window titled "Machine Learning Monkey - Windtex Estimation Regressor". The interface is divided into two main sections: "Step 1: Preparing the model" and "Step 2: ML Monkey Options".

Step 1: Preparing the model

- 1. Ada Boost Regression - Decision Tree Regression
- 2. Decision Tree Regression
- 3. Support Vector Regression
 - 4. Huber Regression
 - 5. Logistic Regression
 - 6. Linear Regression
 - 7. Ridge Regression
- Custom Model (required fit() and predict() function)
 - Custom Model Upload

Step 2: ML Monkey Options

☐ Self Training

If you tick the Self Training, Please upload the required files below: (See Information and Instruction)

Data CSV File Upload

Image Folder Upload

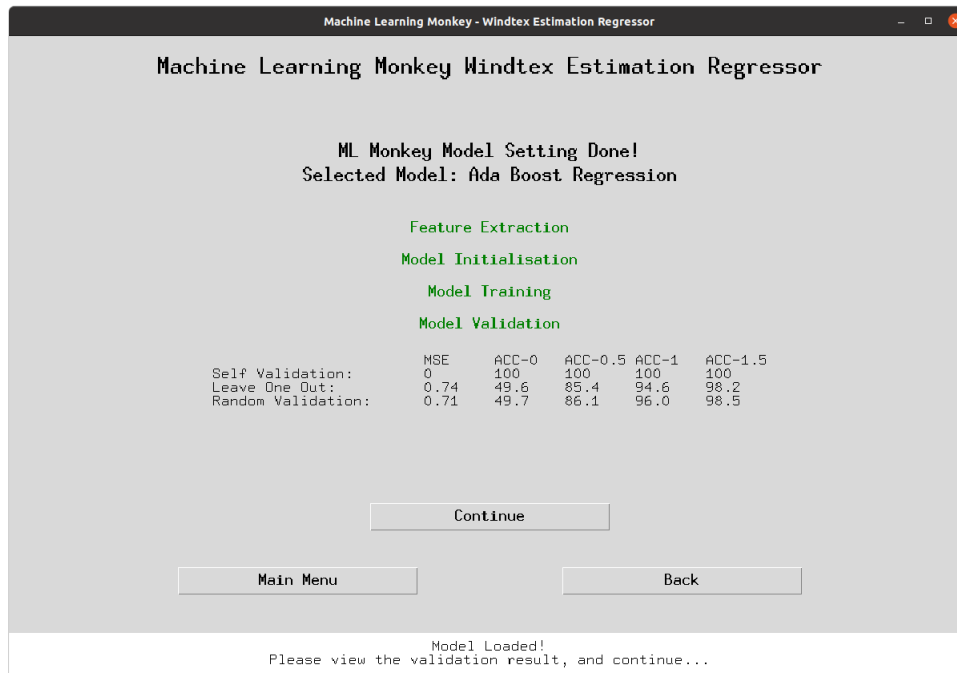
Label JSon File Upload

Build Model **Main Menu**

Status: ML Monkey Setting
Selected Model: Ada Boost Regression

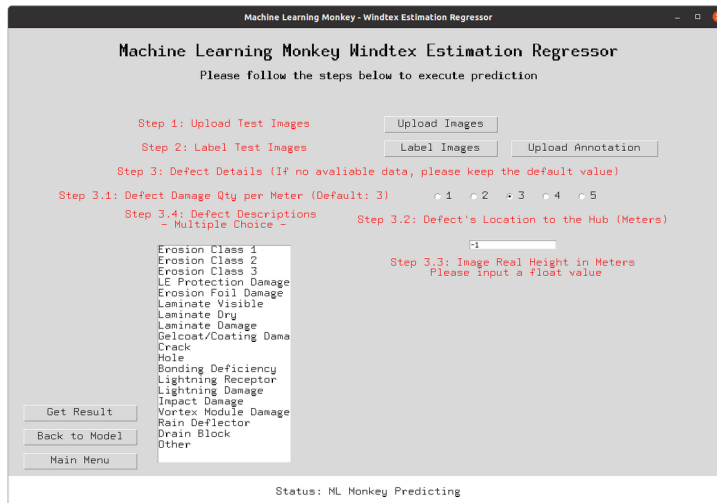
1. The optimal settings have been loaded as default option. Please press **Build Model** button to continue.
2. Step 1: Preparing the model
 - The list shows 7 trained models, simply click one of those options and continue.
 - **Custom Model** option: using the uploaded model (custom model needs to have fit() and predict() functions and save as a pickle file) to train and execute regression. Detail please refers to Section 8.
3. Step 2: ML Monkey Options
 - Self Training option: model will be trained with uploaded data, including images, data and annotation label. Detail please refers to Section 9.
4. Click **Build Model** button to continue.

5. Model Validation Page

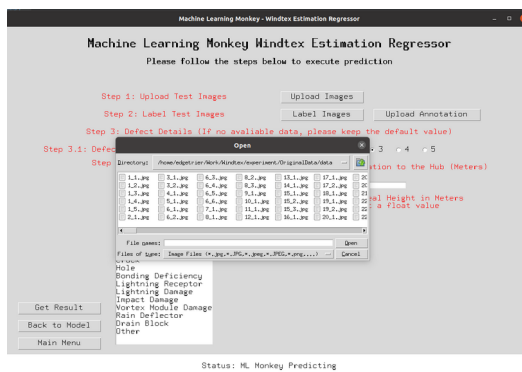


1. There are 4 steps for loading a model
 - Feature Extraction, Model Initialisation, Model Training and Model Validation.
2. When the text turns to **blue** colour, ML Monkey is working on this step.
3. When the text turns to **green** colour, ML Monkey has completed this step.
4. After the completion of **model validation**, a evaluation table will show on the screen.
 1. MAE = Mean Absolute Error
 2. RMSE = Root Mean Squared Error
 3. ACC-0 = Accuracy when considering no errors as true positive predictions
 4. ACC-0.5 = Accuracy when considering ± 0.5 weeks errors as true positive predictions
 5. ACC-1 = Accuracy when considering ± 1 weeks errors as true positive predictions
 6. ACC-1.5 = Accuracy when considering ± 1.5 weeks errors as true positive predictions
5. Click **Continue** button to continue.

6. Prediction Execution Page

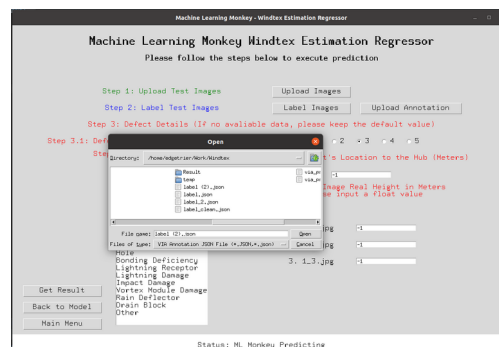
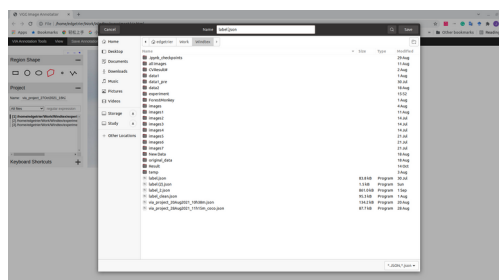
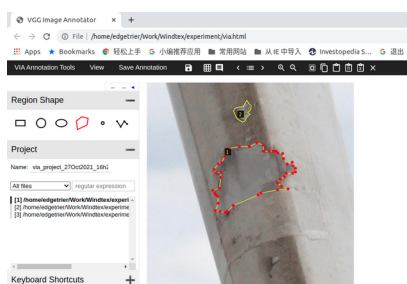


1. Step 1: Upload Test Images – select the testing images from file system



2. Step 2: Annotate Test Images

- System will automatically open VIA annotation tool;
- Use polygon to annotate all defects in all images;
- Save annotations;
- Upload the annotation file;



3. Step 3: Input Defect Information – manual input the data from the defect report
 - Defect Qty per Meter (1-2-3-4-5);
 - Defect Location to Hub – positive float (unit: meters);
 - Image Height in real world – positive float (unit: meters): users need to define the real height of each image by their own-decision;
 - Defect Description – multiple selection: select the relative choices, the selected will turn blue colour;

The screenshot shows the 'Machine Learning Monkey Windtex Estimation Regressor' window. The title bar reads 'Machine Learning Monkey - Windtex Estimation Regressor'. The main heading is 'Machine Learning Monkey Windtex Estimation Regressor' with the instruction 'Please follow the steps below to execute prediction'. The interface is divided into four steps:

- Step 1: Upload Test Images** with an 'Upload Images' button.
- Step 2: Label Test Images** with 'Label Images' and 'Upload Annotation' buttons.
- Step 3: Defect Details** (If no available data, please keep the default value). This step contains:
 - Step 3.1: Defect Damage Qty per Meter (Default: 3)** with a radio button selection (1, 2, 3, 4, 5).
 - Step 3.2: Defect's Location to the Hub (Meters)** with a text input field containing '44.8'.
 - Step 3.3: Image Real Height in Meters** with the instruction 'Please input a float value' and a text input field.
 - Step 3.4: Defect Descriptions - Multiple Choice -** with a list box containing:
 - Erosion Class 1
 - Erosion Class 2
 - Erosion Class 3
 - LC Protection Damage
 - Erosion Coat Damage
 - Complete Visible
 - Laminate Dry
 - Laminate Damage
 - Gelcoat/Coating Damage
 - Crack
 - Hole
 - Bonding Deficiency
 - Lightning Receptor
 - Lightning Damage
 - Impact Damage
 - Vortex Module Damage
 - Rain Deflector
 - Drain Block
 - Other

Below the list box are buttons for 'Get Result', 'Back to Model', and 'Main Menu'. To the right of the list box, there are three image preview sections:

- 1. 1_1.jpg with a value of 0.2
- 2. 1_2.jpg with a value of 0.25
- 3. 1_3.jpg with a value of 0.15

At the bottom, the status bar reads 'Status: ML Monkey Predicting'.

4. Step 4: Click **Get Result** button to continue.

7. Result Page

The screenshot shows the 'Machine Learning Monkey Windtex Estimation Regressor' window. The title bar reads 'Machine Learning Monkey - Windtex Estimation Regressor'. The main heading is 'Machine Learning Monkey Windtex Estimation Regressor' with the instruction 'Please follow the steps below to execute prediction'. The interface displays the result:

Result
2.5 Week(s)

At the bottom, there are buttons for 'Another Prediction' and 'Main Menu'. The status bar at the bottom reads 'Status: ML Monkey Result'.

1. Result will be shown on the screen.
2. Click **Another Prediction** button to test another data with same regression model.

8. Custom Model

1. Custom model is loaded by reading the **pickle file** in ML Monkey.
2. Custom model can be an algorithm from **sklearn** package.
3. Custom model also can be other algorithms which contain **fit()** and **prediction()** functions in their built-in classes.
4. Custom model should be untrained and initialised.
5. How to save a custom model in **python**:
 1. `model = YOUR_MODEL(PARAMETERS)`
 2. `with open("name.pkl", "wb") as pk_file:`
 `import pickle`
 `pickle.dump(model, pk_file)`
 `pk_file.close()`
6. Upload to ML Monkey, and the custom model will be trained and validated with the default dataset.

9. Self Training

1. An example is shown in **Example Data** folder.
2. **Image folder** – All images which are extracted from report
 1. **Filename** - <ID>_<index>.jpg .
 2. **ID** should match with the ID in Data.csv.
 3. **index** should start from 1.
3. **Data.csv** – All defect information which are extracted from report
 1. Fill the **related values** in each row, one row presents one task.
 2. **ID** must be any integer, but should be **unique**.
 3. **Description** - use “,” to split the multiple descriptions
 4. **Length (meters)** – Real Heights of each image in meter;
use “+” to split the values of each image (e.g. ID_1+ID_2+ID_3).
 5. **Position** - use “,” to split the multiple positions.
4. **Label.json** – All defect shape information which are annotated through **VIA Annotation Tools**
 1. Download and Open **VIA Annotation Tools**
 2. Add Files
 3. Annotate all Defects
 4. Export Annotation as **json**