TPH forecast with Raspberry Pi and TensorFlow.

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Welcome to TPH forecast with Raspberry Pi and AI's documentation!

CHAPTER

ONE

ABOUT

This project aim at forecasting temperature, pressure and humidity(TPH). And controling air-conditioner. Home-automation with AI on Raspberry Pi and RIp TPH Monitor.

This is integrated your home automation, controling air-conditioner with AI and another infrared controlled devices such as television set or celling light and so on.

1.1 TPH forecast with Raspberry Pi and AI.

I explain first boot your Raspberry Pi and set up Python environment for developing.

This project is developing now, yet not finish.

1.1.1 Preparing

Please get somethings next list.

- Raspberry Pi 3B, 3B+
- RPi TPH Monitor Rev2
- micro SD card, 16GB above(recommended)
- USB connected key board
- USB connected mouse
- Raspbian
- HDMI cable and display
  - use TV instead of display
- Python development environment
  - We supported only Python 3.7 upper version.

1.1.2 Set up Raspberry Pi

You must set up your Raspberry Pi.

On your Mac or PC(Linux, MS-Windows), you can install Raspbian to microSD card.

Download newest Raspbian

I recommend using official Raspbian which can download from Raspberry Pi Downloads.

You will choose "Raspbian Buster with desktop and recommended software" or "Raspbian Buster with desktop".

Installing operating system image

You must read installation guide for installing operating system image.

And download balenaEtcher.

macOS

If you use Apple Mac, you can install via `brew`.

```
$ brew cask install balenaetcher
```

First boot

Only first boot time, You must connect USB keyboard, USB mouse, and monitor via HDMI. You must set Wi-Fi network and enable SSH via `raspbian-config`. Please set fixed IP address, for example `192.168.0.121/24`.

Test remote connect

On your Mac or PC, remote connecting test via `ssh`.

```
$ ssh pi@192.168.0.121
```

Package upgrade

I recommend upgrade your Raspbian.

```
$ sudo apt update
...
```

```
$ sudo apt upgrade
```

1.1.3 Prepare development environment

You can development on your Raspberry Pi.

I recommend preparing development environment on your Mac or PC.

pyenv and pyenv-virtualenv

Please install

macOS, Linux

- pyenv
- pyenv-virtualenv

Install Python via PyEnv

```
$ pyenv install 3.8.0
```

And setup pyenv-virtualenv

```
$ pyenv virtualenv 3.8.0 djrpi380
```

cf. my home directory.

```
$ pyenv versions
* system (set by /Users/mitsu/.pyenv/version)
 3.7.4
 3.7.4/envs/djsample374
 3.8.0
 3.8.0/envs/djrpi380
 djrpi380
 djsample374
```

```
$ python --version
Python 2.7.16
```

my environment directory.

```
$ cd ~/git/hub/django-rpi-tph-monitor
```

```
$ pyenv local djrpi380
```

```
$ pyenv versions
 system
 3.7.4
 3.7.4/envs/djsample374
 3.8.0
 3.8.0/envs/djrpi380
* djrpi380 (set by /Users/mitsu/git/hub/django-rpi-tph-monitor/.python-version)
 djsample374
```

```
$ python --version
Python 3.8.0
```

MS-Windows

If you use MS-Windows, venv instead of pyenv.

Hydrogen

Hydrogen is an interactive coding environment that supports Python, R, JavaScript and other Jupyter kernels.

```
$ python -m ipykernel install --user --name=dj3rpi380 --display-name=dj3rpi380
```

If you multiple pyenv versions, you may repeat this command.

List your ipkernel.

```
$ jupyter kernelspec list
```

Let's begin development "Home automation application".

1.1.4 Documentation

We published documentation on Read the Docs.

TPH forecast with Raspberry Pi and AI documentation.

1.2 Development

This is setup protocol for developing Home automation with Raspberry PI and AI.

Not yet complete this project.

1.2.1 Getting started

1.2.2 Requirements

Python modules

- Django
- djangorestframework
- django-filter
- django-background-tasks
- dash
- plotly
- and so on.

```
$ cd tph
```

You may install Python packages via *pip*.

```
$ pip install -r requirements.txt
```

On your development Mac, Ubuntu, or MS-Windows.

```
$ pip install -r requirements_dev.txt
```

On your target Raspberry Pi.

About my Raspberry Pi 3B.

```
$ cat /etc/debian_version
10.9
$ uname -a
Linux raspi3b 5.10.17-v7+ #1414 SMP Fri Apr 30 13:18:35 BST 2021 armv7l GNU/Linux
$ lsb_release -a
No LSB modules are available.
Distributor ID: Raspbian
Description:    Raspbian GNU/Linux 10 (buster)
Release:    10
Codename:   buster
$ cat /proc/device-tree/model
Raspberry Pi 3 Model B Rev 1.2
```

Enable i2c via raspi-config.

```
$ sudo raspi-config
```

Add i2c group your user account.

```
$ sudo usermod -aG i2c pi
```

Install MariaDB.

- How to Install MariaDB on Raspberry Pi?
- Install MariaDB on Raspberry Pi OS

```
$ sudo apt install mariadb-server
$ sudo mysql_secure_installation
Change the root password? [Y/n] y
Remove anonymous users? [Y/n] y
Disallow root login remotely? [Y/n] y
Remove test database and access to it? [Y/n] y
```

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```
Reload privilege tables now? [Y/n]
Cleaning up...
```

Install Python 'mysqlclient' module.

```
$ sudo apt install python3-dev default-libmysqlclient-dev build-essential
$ pip install mysqlclient
```

Setup timezone to MariaDB.

```
$ /usr/bin/mysql_tzinfo_to_sql /usr/share/zoneinfo > timezone.sql
$ mysql -u root -p -Dmysql < ./timezone.sql
```

Restart MariaDB.

```
$ sudo /etc/init.d/mysql restart
```

Install Python modules.

You should install another python modules.

```
$ pip install -r requirements_rpi.txt
```

And edit your tph/tph/settings.py

```
ON_RASPBERRY_PI = True
USE_SMBUS2 = True
```

recommended IDE(Integrated Development Environment)

- Atom ; base editor
- atom-ide ; make IDE base package
- ide-python ; support Atom-IDE Python language
- atom-ide-debugger-python ; DEBUG Python
- Hydrogen ; interactive coding environment in atom

setup for Hydrogen

```
$ pip install jupyter
$ python -m ipykernel install --user --name=<name> --display-name=<name>
$ jupyter kernelspec list
```

1.2.3 make

```
$ Python manage.py startapp monitor
```

```
$ Python manage.py makemigrations monitor
```

Set up your data base

```
$ Python manage.py migrate
```

```
Operations to perform:
 Apply all migrations: admin, auth, contenttypes, sessions
Running migrations:
 Applying contenttypes.0001_initial... OK
 Applying auth.0001_initial... OK
 Applying admin.0001_initial... OK
 Applying admin.0002_logentry_remove_auto_add... OK
 Applying admin.0003_logentry_add_action_flag_choices... OK
 Applying contenttypes.0002_remove_content_type_name... OK
 Applying auth.0002_alter_permission_name_max_length... OK
 Applying auth.0003_alter_user_email_max_length... OK
 Applying auth.0004_alter_user_username_opts... OK
 Applying auth.0005_alter_user_last_login_null... OK
 Applying auth.0006_require_contenttypes_0002... OK
 Applying auth.0007_alter_validators_add_error_messages... OK
 Applying auth.0008_alter_user_username_max_length... OK
 Applying auth.0009_alter_user_last_name_max_length... OK
 Applying auth.0010_alter_group_name_max_length... OK
 Applying auth.0011_update_proxy_permissions... OK
 Applying sessions.0001_initial... OK
```

Using SCSS/SASS

Set up use Sass my Django project.
See and install How to use SCSS/SASS in your Django Project(Python Way).

Download Bootstrap Source file here.
And copy SCSS files to `static/bootstrap`.

```
$ cp -r your/bootstrap-4.x.x/scss/* tph/static/bootstrap
```

Install some Python modules.

```
pip install django_compressor
pip install django-libsass
```

Background tasks

I selected Django Background Tasks for save datas interval.
For Django 3.2, `pip install django-background-tasks`.

```
pip install django-background-tasks
```

Registration background tasks and execute

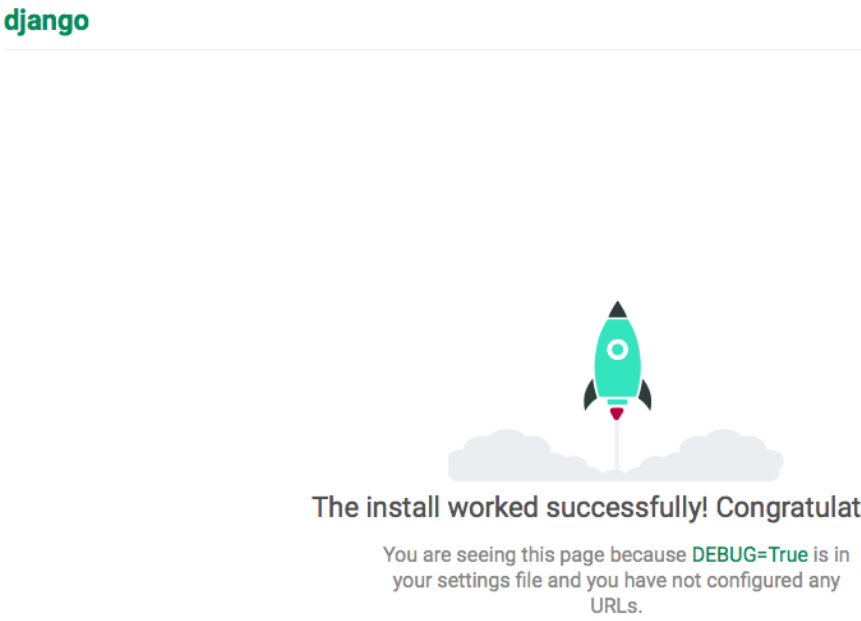
First step

Create your Django Project.

```
mkdir django-rpi-tph-monitor
cd django-rpi-tph-monitor
```

```
django-admin startproject tph
cd tph
```

```
python manage.py runserver
```



Access `http://localhost:8000/` on your browser.

For access from remote computer to Raspberry Pi, on your Raspberry Pi:

```
python manage.py runserver 192.168.xxx.xxx:8000
```

You have to get another shell(terminal). Second registration task.

```
$ curl -X GET http://localhost:8000/monitor/tasks/5/30
```

Third run process tasks.

```
$ ./manage.py process_tasks
```

You can check tasks from your database that default is db.sqlite3. See background_task, background_task_completed_tasks, or monitor_bme280 tables.

1.2.4 Documentation

This project's documents are making with SPHINX. How to use, please see Installing Sphinx.

Note: If you are using PyEnv, you must install via `pip`.

```
$ pyenv virtualenv 3.9.4 dj32rpi394docs
$ cd ${your django-rpi-monitor}/docs
$ pyenv local dj32rpi394docs
$ pip install --upgrade pip
$ pip install -r requirements.txt
```

Additional packages.

Sphinx-copybutton

Sphinx-copybutton

```
$ pip install --upgrade sphinx-copybutton
```

Read the Docs Theme

```
$ pip install --upgrade sphinx-rtd-theme
```

Making our documents.

You can create document.

```
cd docs
make html
```

CHAPTER

TWO

INDICES AND TABLES

- genindex
- modindex
- search