Raspberry Pi Zero: SSH Setup over Wi-Fi and ML Model Deployment

This documentation walks you through a complete setup of a Raspberry Pi Zero (or Zero W) to:

1. Enable SSH over Wi-Fi
2. Transfer a machine learning model to the Pi
3. Run the model using a Python script

Requirements

- Raspberry Pi Zero or Zero 2W
- microSD card (8GB minimum)
- Raspberry Pi Imager (https://www.raspberrypi.com/software/)
- macOS or Linux laptop with Terminal access
- micro-USB to USB-A or USB-C cable (must support data transfer)
- Wi-Fi network credentials (SSID and password)
- ML model in `.tflite` format (TensorFlow Lite) - conversion code is in the repository

Part 1: Flash and Configure the microSD Card

1.1 Install and Open Raspberry Pi Imager

- Download from: https://www.raspberrypi.com/software/

1.2 Select OS and Storage

- **OS**: Raspberry Pi OS Lite (32-bit)
- **Storage**: Your microSD card

1.3 Advanced Settings (Click Gear Icon or Ctrl+Shift+X)

- **Set hostname**: `raspberrypi.local`
- **Enable SSH**: Checked
- **Username**: `pi`
- **Password**: e.g. `raspberry`
- **Configure Wi-Fi**:
  - SSID: `YourWiFiName`
  - Password: `YourWiFiPassword`
  - Country Code: e.g. `US`
- Click Save → Write

Part 2: Verify Boot Files (Optional but Recommended)

After flashing, reinsert the SD card in computer and open Terminal:

```
cd /Volumes/boot
```

2.1 Create an ssh file (if not already done by Imager):

```
touch ssh
```

2.2 Create wpa_supplicant.conf manually if needed:

```
nano wpa_supplicant.conf

Paste the following (replace values as needed):

country=US

ctrl_interface=DIR=/var/run/wpa_supplicant GROUP=netdev

update_config=1

network={

    ssid="YourWiFiName"

    psk="YourWiFiPassword"

    key_mgmt=WPA-PSK

}
```

Save and exit: Control + X, Y, Enter

Eject the card:

```
diskutil eject /Volumes/boot
```

Insert SD card into the Rasberry Pi.

Part 3: SSH into the Raspberry Pi

3.1 Boot the Pi and Wait (~60-90 seconds)

- Plug the Pi into a power source (micro usb must plug into USB port NOT PWR IN port)
- Make sure it's connected to your Wi-Fi (check router or hotspot to verify)

3.2 Connect via Terminal:

```
ssh pi@raspberrypi.local
```

- Accept the fingerprint warning
- Enter password (`raspberry` if default other enter custom password)

If this fails, check your router for the Pi's IP and try:

```
ssh pi@<Pi-IP-Address>
```

Part 4: Upload and Run the ML Model

4.1 Transfer the `.tflite` model from your laptop:

```
scp /path/to/model.tflite pi@raspberrypi.local:~/model.tflite
```

4.2 Install Python and TFLite Runtime on the Pi:

```
sudo apt update

sudo apt install python3-pip -y

pip3 install --extra-index-url https://google-coral.github.io/py-repo/
tflite_runtime
```

4.3 Create and Run Inference Script:

Create a file called `run_model.py`:

```python
import numpy as np

import tflite_runtime.interpreter as tflite

interpreter = tflite.Interpreter(model_path="model.tflite")

interpreter.allocate_tensors()


input_details = interpreter.get_input_details()

output_details = interpreter.get_output_details()
```

```
input_data = np.array([[0.5, 0.3]], dtype=np.float32)

interpreter.set_tensor(input_details[0]['index'], input_data)

interpreter.invoke()

output = interpreter.get_tensor(output_details[0]['index'])

print("Model output:", output)
```

Run the script:

```
python3 run_model.py
```

Final Notes

You now have:

- SSH access to your Pi over Wi-Fi
- Your ML model uploaded onto the Pi
- Inference running using Python

Next time you can now simply SSH into `raspberrypi.local`. No need to repeat Parts 1 and 2. and You can repeat the model steps if needed.