**********Draft**********

TensorFlow for Raspberry Pi 4 64 bit and Raspberry Pi Pico
10/04/22

**********Draft**********

One of the first videos on Tensorflow that I watched was

video link https://www.youtube.com/watch?v=tPYj3fFJGjk&t=339s

TensorFlow 2.0 Complete Course - Python Neural Networks for Beginners Tutorial

About the Author
The author of this course is Tim Ruscica, otherwise known as “Tech With Tim” from his educational programming YouTube channel. Tim has a passion for teaching and loves to teach about the world of machine learning and artificial intelligence.

This has led to a journey of learning.
Spent many hours working on C/C++ using the https://github.com/raspberrypi/pico-tflmicro.
This repository provided and older version of Tensorflow Lite for the Raspberry Pi Pico.
Since then I have managed to update https://github.com/develone/devel-pico-tflmicro
to early Sep 2022,

Installed Tensorflow 2.9 on a 64 bit Raspberry Pi 4 4Gb.
10/3/2022

video link https://youtu.be/QLZWQlg-Pk0

How to Install Tensorflow 2 on a Raspberry Pi

https://www.samwestby.com/tutorials/rpi-tensorflow.html

Sam Westby

This has led to several videos on Game On! - Flatbuffers

uname -m
aarch64

python3 -V
Python 3.9.2

cat /etc/os-release
PRETTY_NAME="Debian GNU/Linux 11 (bullseye)"
NAME="Debian GNU/Linux"
VERSION_ID="11"

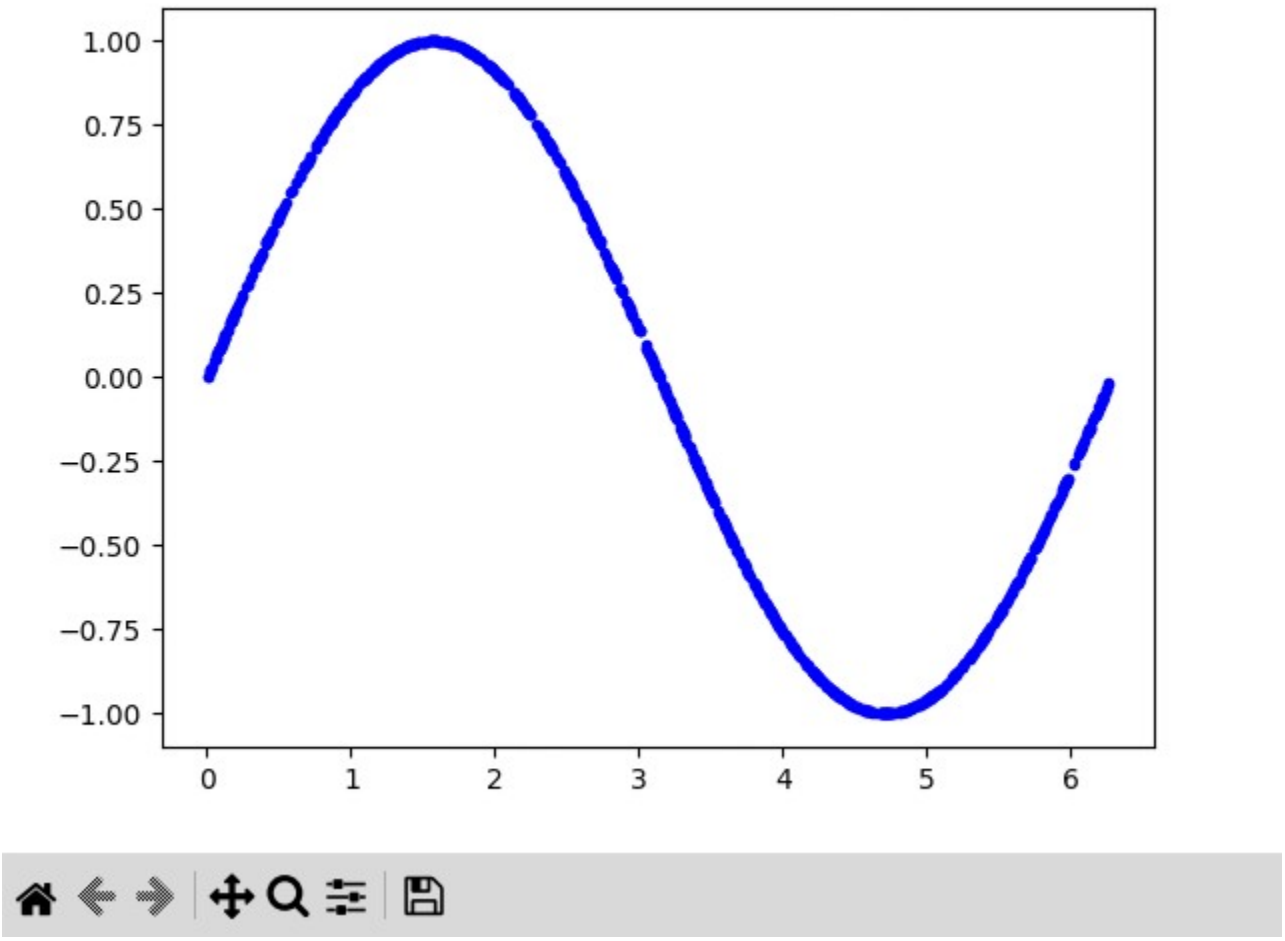
VERSION="11 (bullseye)"
VERSION_CODENAME=bullseye
ID=debian
HOME_URL="https://www.debian.org/"
SUPPORT_URL="https://www.debian.org/support"
BUG_REPORT_URL="https://bugs.debian.org/"

sudo apt-get install --yes libssl-dev zlib1g-dev libbz2-dev libreadline-dev libsqlite3-dev llvm libncurses5-dev libncursesw5-dev xz-utils tk-dev libgdbm-dev lzma lzma-dev tcl-dev libxml2-dev libxmlsec1-dev libffi-dev liblzma-dev wget curl make build-essential openssl

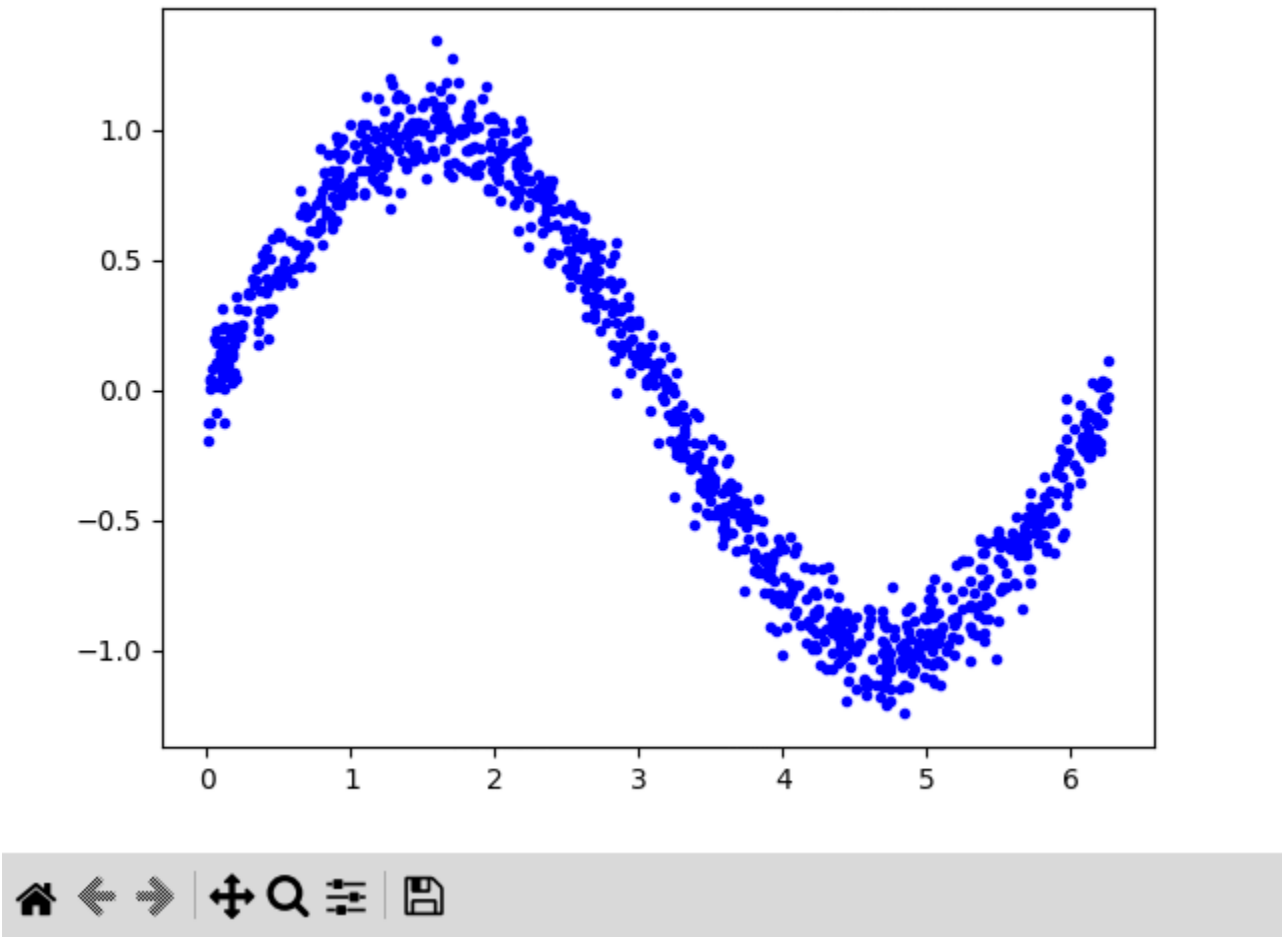
sudo apt-get install -y libhdf5-dev libc-ares-dev libeigen3-dev gcc gfortran libgfortran5 libatlas3-base libatlas-base-dev libopenblas-dev libopenblas-base libblas-dev liblapack-dev cython3 libatlas-base-dev openmpi-bin libopenmpi-dev python3-dev

numpy was used to generate a 1000 point sin.
x_values = np.random.uniform(low=0, high=2*math.pi, size=SAMPLES).astype(np.floa
t32)

y_values = np.sin(x_values).astype(np.float32)

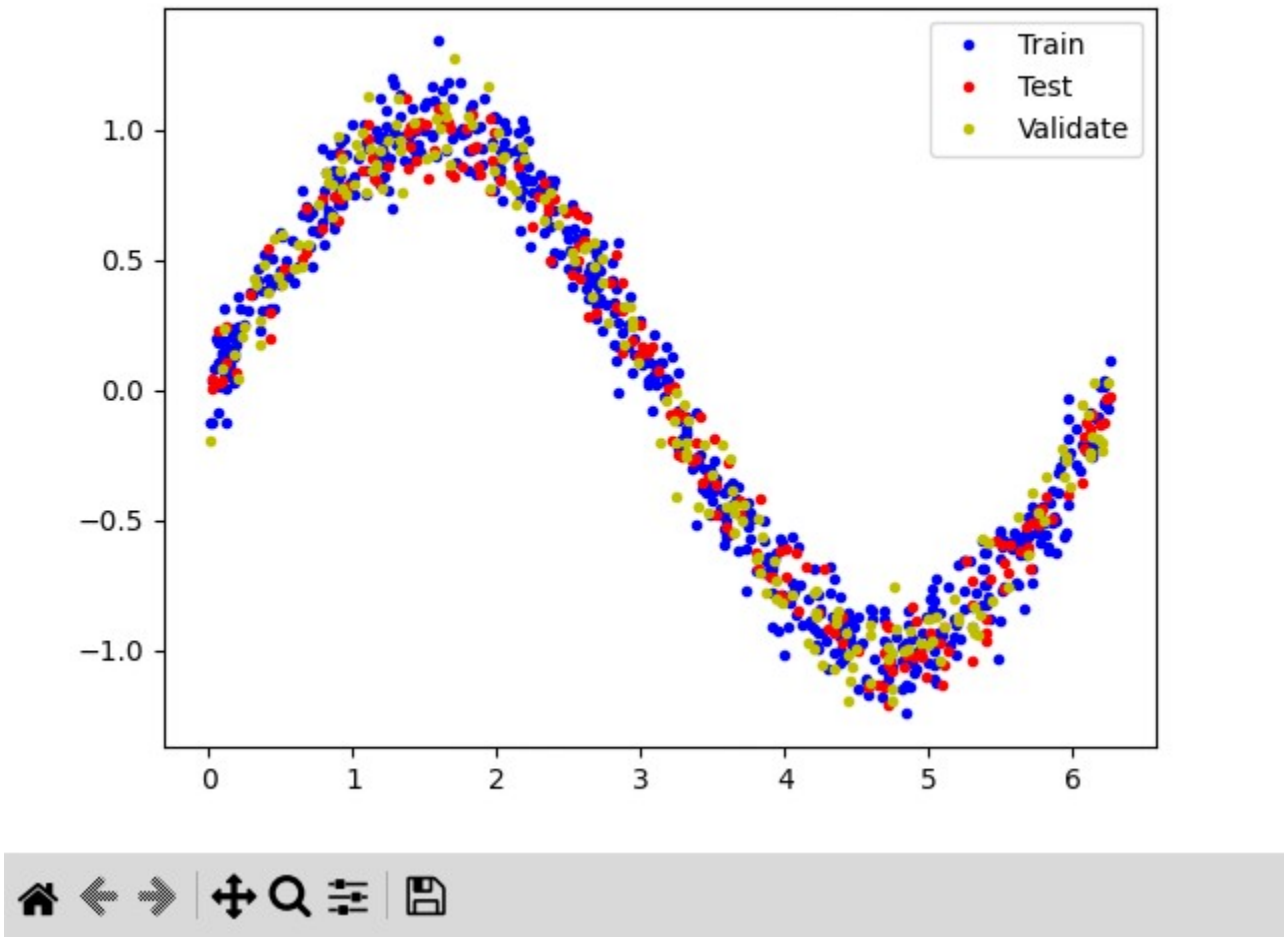


signal with noise.



Xx

Spiting into three sets Train, Test, and Validate



xxx

```
Epoch 1/500
10/10 [==============================] - 2s 55ms/step - loss: 2.7676 - mae: 1.1393 -
val_loss: 2.8071 - val_mae: 1.1649
Epoch 2/500
10/10 [==============================] - 0s 10ms/step - loss: 2.6837 - mae: 1.1251 -
val_loss: 2.7240 - val_mae: 1.1510
Epoch 3/500
10/10 [==============================] - 0s 10ms/step - loss: 2.6044 - mae: 1.1115 -
val_loss: 2.6424 - val_mae: 1.1373
Epoch 4/500
10/10 [==============================] - 0s 10ms/step - loss: 2.5253 - mae: 1.0979 -
val_loss: 2.5640 - val_mae: 1.1240
Epoch 5/500
10/10 [==============================] - 0s 10ms/step - loss: 2.4516 - mae: 1.0850 -
val_loss: 2.4878 - val_mae: 1.1109
Epoch 6/500
```

10/10 [==============================] - 0s 10ms/step - loss: 2.3774 - mae: 1.0720 - val_loss: 2.4156 - val_mae: 1.0984

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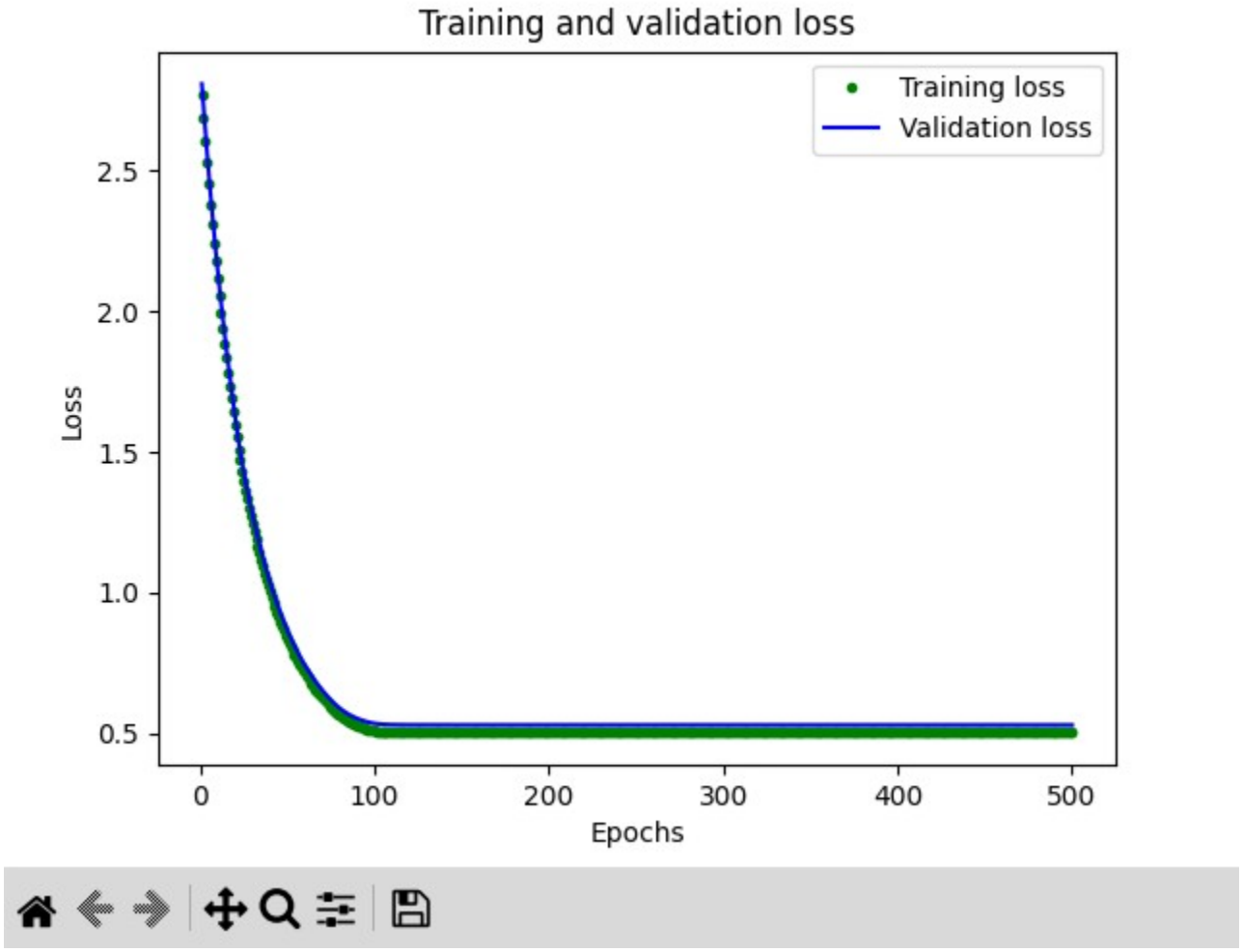
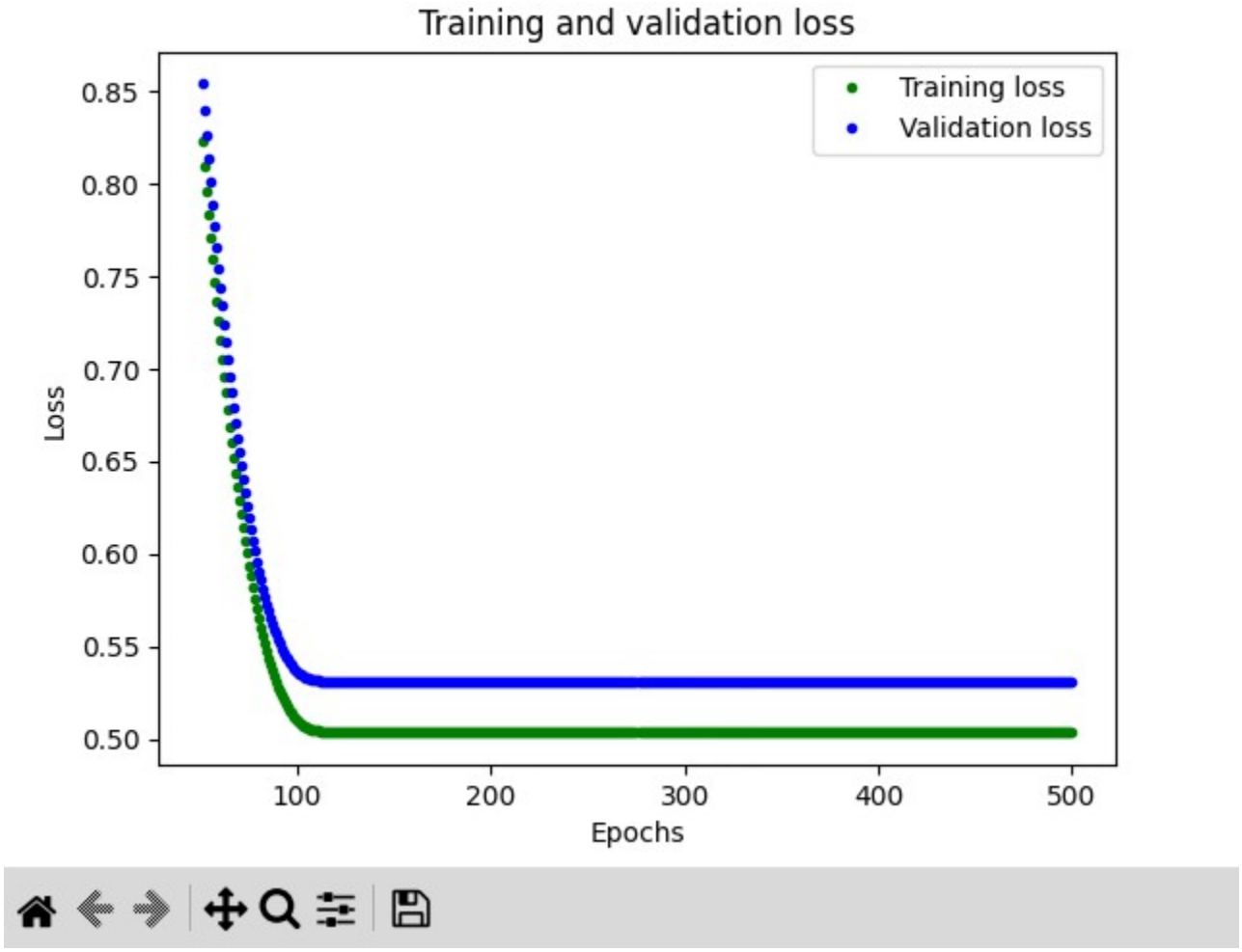
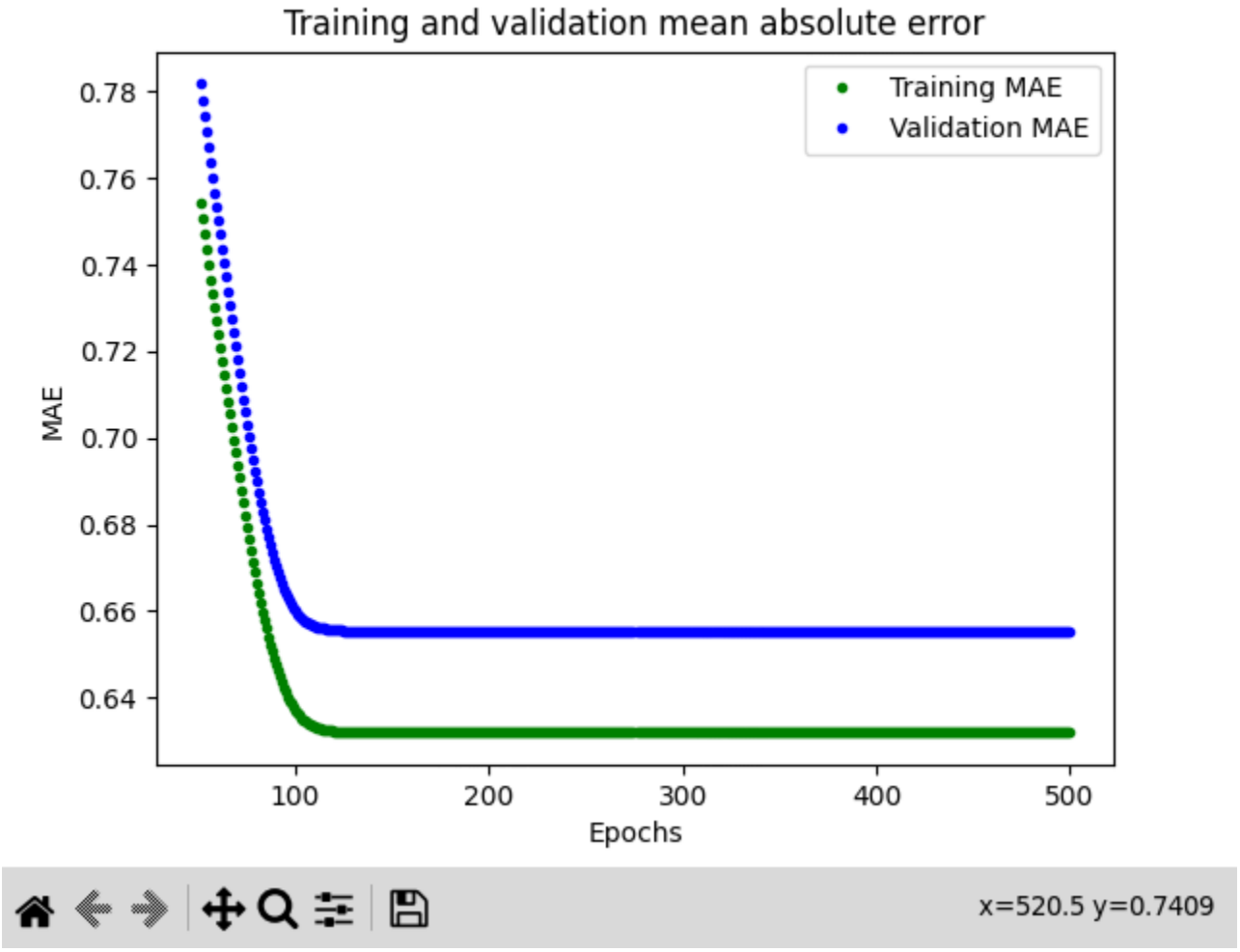
Epoch 494/500
10/10 [==============================] - 0s 10ms/step - loss: 0.5033 - mae: 0.6320 - val_loss: 0.5307 - val_mae: 0.6552
Epoch 495/500
10/10 [==============================] - 0s 11ms/step - loss: 0.5033 - mae: 0.6320 - val_loss: 0.5307 - val_mae: 0.6552
Epoch 496/500
10/10 [==============================] - 0s 11ms/step - loss: 0.5033 - mae: 0.6320 - val_loss: 0.5307 - val_mae: 0.6552
Epoch 497/500
10/10 [==============================] - 0s 11ms/step - loss: 0.5033 - mae: 0.6320 - val_loss: 0.5307 - val_mae: 0.6552
Epoch 498/500
10/10 [==============================] - 0s 11ms/step - loss: 0.5033 - mae: 0.6320 - val_loss: 0.5307 - val_mae: 0.6552
Epoch 499/500
10/10 [==============================] - 0s 10ms/step - loss: 0.5033 - mae: 0.6320 - val_loss: 0.5307 - val_mae: 0.6552
Epoch 500/500
10/10 [==============================] - 0s 10ms/step - loss: 0.5033 - mae: 0.6320 - val_loss: 0.5307 - val_mae: 0.6552


Training and validation loss
Training loss
Validation loss
Loss
Epochs
0
100
200
300
400
500
0.5
1.0
1.5
2.0
2.5

xxx


Training and validation loss
Training loss
Validation loss
Loss
Epochs
0.85
0.80
0.75
0.70
0.65
0.60
0.55
0.50
100
200
300
400
500

xxx


Training and validation mean absolute error
Training MAE
Validation MAE
MAE
Epochs
0.78
0.76
0.74
0.72
0.70
0.68
0.66
0.64
100
200
300
400
500
x=520.5 y=0.7409