```
pip install tensorflow

Collecting tensorflow
  Using cached tensorflow-2.9.1-cp39-cp39-win_amd64.whl (444.0 MB)
Collecting gast<=0.4.0,>=0.2.1
  Using cached gast-0.4.0-py3-none-any.whl (9.8 kB)
Collecting flatbuffers<2,>=1.12
  Using cached flatbuffers-1.12-py2.py3-none-any.whl (15 kB)
Collecting protobuf<3.20,>=3.9.2
  Using cached protobuf-3.19.4-cp39-cp39-win_amd64.whl (895 kB)
Collecting astunparse>=1.6.0
  Using cached astunparse-1.6.3-py2.py3-none-any.whl (12 kB)
Requirement already satisfied: six>=1.12.0 in c:\users\yusuf\
anaconda3\lib\site-packages (from tensorflow) (1.16.0)
Requirement already satisfied: wrapt>=1.11.0 in c:\users\yusuf\
anaconda3\lib\site-packages (from tensorflow) (1.12.1)
Collecting keras-preprocessing>=1.1.1
  Using cached Keras_Preprocessing-1.1.2-py2.py3-none-any.whl (42 kB)
Requirement already satisfied: h5py>=2.9.0 in c:\users\yusuf\
anaconda3\lib\site-packages (from tensorflow) (3.2.1)
Collecting libclang>=13.0.0
  Using cached libclang-14.0.6-py2.py3-none-win_amd64.whl (14.2 MB)
Collecting google-pasta>=0.1.1
  Using cached google_pasta-0.2.0-py3-none-any.whl (57 kB)
Note: you may need to restart the kernel to use updated
packages.Collecting termcolor>=1.1.0
  Using cached termcolor-1.1.0.tar.gz (3.9 kB)
Collecting tensorflow-estimator<2.10.0,>=2.9.0rc0
  Using cached tensorflow_estimator-2.9.0-py2.py3-none-any.whl (438
kB)
Collecting absl-py>=1.0.0
  Using cached absl_py-1.2.0-py3-none-any.whl (123 kB)
Collecting keras<2.10.0,>=2.9.0rc0
  Using cached keras-2.9.0-py2.py3-none-any.whl (1.6 MB)
Collecting grpcio<2.0,>=1.24.3
  Using cached grpcio-1.47.0-cp39-cp39-win_amd64.whl (3.6 MB)
Collecting opt-einsum>=2.3.2
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Requirement already satisfied: typing-extensions>=3.6.6 in c:\users\
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Requirement already satisfied: setuptools in c:\users\yusuf\anaconda3\
lib\site-packages (from tensorflow) (58.0.4)
Collecting tensorboard<2.10,>=2.9
  Using cached tensorboard-2.9.1-py3-none-any.whl (5.8 MB)
Requirement already satisfied: packaging in c:\users\yusuf\anaconda3\
lib\site-packages (from tensorflow) (21.0)
Collecting tensorflow-io-gcs-filesystem>=0.23.1
  Using cached tensorflow_io_gcs_filesystem-0.26.0-cp39-cp39-
win_amd64.whl (1.5 MB)
Requirement already satisfied: numpy>=1.20 in c:\users\yusuf\
```

anaconda3\lib\site-packages (from tensorflow) (1.20.3)
Requirement already satisfied: wheel<1.0,>=0.23.0 in c:\users\yusuf\
anaconda3\lib\site-packages (from astunparse>=1.6.0->tensorflow)
(0.37.0)
Collecting markdown>=2.6.8
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Collecting google-auth-oauthlib<0.5,>=0.4.1
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Requirement already satisfied: werkzeug>=1.0.1 in c:\users\yusuf\
anaconda3\lib\site-packages (from tensorboard<2.10,>=2.9->tensorflow)
(2.0.2)
Requirement already satisfied: requests<3,>=2.21.0 in c:\users\yusuf\
anaconda3\lib\site-packages (from tensorboard<2.10,>=2.9->tensorflow)
(2.26.0)
Collecting tensorboard-plugin-wit>=1.6.0

  Using cached tensorboard_plugin_wit-1.8.1-py3-none-any.whl (781 kB)
Collecting tensorboard-data-server<0.7.0,>=0.6.0
  Using cached tensorboard_data_server-0.6.1-py3-none-any.whl (2.4 kB)
Collecting google-auth<3,>=1.6.3
  Using cached google_auth-2.11.0-py2.py3-none-any.whl (167 kB)
Collecting rsa<5,>=3.1.4
  Using cached rsa-4.9-py3-none-any.whl (34 kB)
Collecting pyasn1-modules>=0.2.1
  Using cached pyasn1_modules-0.2.8-py2.py3-none-any.whl (155 kB)
Collecting cachetools<6.0,>=2.0.0
  Using cached cachetools-5.2.0-py3-none-any.whl (9.3 kB)
Collecting requests-oauthlib>=0.7.0
  Using cached requests_oauthlib-1.3.1-py2.py3-none-any.whl (23 kB)
Requirement already satisfied: importlib-metadata>=4.4 in c:\users\
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Requirement already satisfied: charset-normalizer~=2.0.0 in c:\users\
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Requirement already satisfied: idna<4,>=2.5 in c:\users\yusuf\
anaconda3\lib\site-packages (from requests<3,>=2.21.0-
>tensorboard<2.10,>=2.9->tensorflow) (3.2)
Requirement already satisfied: urllib3<1.27,>=1.21.1 in c:\users\
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>tensorboard<2.10,>=2.9->tensorflow) (1.26.7)
Collecting oauthlib>=3.0.0

```
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Requirement already satisfied: pyparsing>=2.0.2 in c:\users\yusuf\
anaconda3\lib\site-packages (from packaging->tensorflow) (3.0.4)
Building wheels for collected packages: termcolor
  Building wheel for termcolor (setup.py): started
  Building wheel for termcolor (setup.py): finished with status 'done'
  Created wheel for termcolor: filename=termcolor-1.1.0-py3-none-
any.whl size=4847
sha256=62f60bf76dc22b12fd8b95f2712d5879bd0977e3b6f83bd6c7e926f34d6080c
e
  Stored in directory: c:\users\yusuf\appdata\local\pip\cache\wheels\
b6\0d\90\0d1bbd99855f99cb2f6c2e5ff96f8023fad8ec367695f7d72d
Successfully built termcolor
Installing collected packages: pyasn1, rsa, pyasn1-modules, oauthlib,
cachetools, requests-oauthlib, google-auth, tensorboard-plugin-wit,
tensorboard-data-server, protobuf, markdown, grpcio, google-auth-
oauthlib, absl-py, termcolor, tensorflow-io-gcs-filesystem,
tensorflow-estimator, tensorboard, opt-einsum, libclang, keras-
preprocessing, keras, google-pasta, gast, flatbuffers, astunparse,
tensorflow
Successfully installed absl-py-1.2.0 astunparse-1.6.3 cachetools-5.2.0
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0.4.6 google-pasta-0.2.0 grpcio-1.47.0 keras-2.9.0 keras-
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estimator-2.9.0 tensorflow-io-gcs-filesystem-0.26.0 termcolor-1.1.0
```

Importing relevent libraries

```python
import numpy as np
import pandas as pd
import tensorflow as tf
import tensorflow.keras.layers as L
import matplotlib.pyplot as plt
import plotly.graph_objects as go
import plotly.express as px
from sklearn.model_selection import train_test_split
```

Loading Dataset

```python
data = pd.read_csv('C:/Users/Yusuf/Desktop/Age, Gender & Ethnicity
Prediction/age_gender.csv')
```

```python
## Converting pixels into numpy array
data['pixels']=data['pixels'].apply(lambda x:  np.array(x.split(),
dtype="float32"))
```

```python
data.head()
```

```
   age  ethnicity  gender                        img_name  \
0    1          2       0   20161219203650636.jpg.chip.jpg
1    1          2       0   20161219222752047.jpg.chip.jpg
2    1          2       0   20161219222832191.jpg.chip.jpg
3    1          2       0    20161220144911423.jpg.chip.jpg
4    1          2       0    20161220144914327.jpg.chip.jpg

                                               pixels
0  [129.0, 128.0, 128.0, 126.0, 127.0, 130.0, 133...
1  [164.0, 74.0, 111.0, 168.0, 169.0, 171.0, 175....
2  [67.0, 70.0, 71.0, 70.0, 69.0, 67.0, 70.0, 79....
3  [193.0, 197.0, 198.0, 200.0, 199.0, 200.0, 202...
4  [202.0, 205.0, 209.0, 210.0, 209.0, 209.0, 210...
```

```python
print('Total rows: {}'.format(len(data)))
print('Total columns: {}'.format(len(data.columns)))
```

```
Total rows: 23705
Total columns: 5
```

Distributions

```python
## normalizing pixels data
data['pixels'] = data['pixels'].apply(lambda x: x/255)

## calculating distributions
age_dist = data['age'].value_counts()
ethnicity_dist = data['ethnicity'].value_counts()
gender_dist =
data['gender'].value_counts().rename(index={0:'Male',1:'Female'})

def ditribution_plot(x,y,name):
    fig = go.Figure([
        go.Bar(x=x, y=y)
    ])

    fig.update_layout(title_text=name)
    fig.show()
```

Age Distribtion

```python
ditribution_plot(x=age_dist.index, y=age_dist.values, name='Age
Distribution')
```

```
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```

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Ethnicity Distribution

```
ditribution_plot(x=ethnicity_dist.index, y=ethnicity_dist.values,
name='Ethnicity Distribution')
```

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Gender Distribution

```
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```

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```python
X = np.array(data['pixels'].tolist())

## Converting pixels from 1D to 3D
X = X.reshape(X.shape[0],48,48,1)
```

Sample Images
```python
plt.figure(figsize=(16,16))
for i in range(1500,1520):
    plt.subplot(5,5,(i%25)+1)
    plt.xticks([])
    plt.yticks([])
    plt.grid(False)
    plt.imshow(data['pixels'].iloc[i].reshape(48,48))
    plt.xlabel(
        "Age:"+str(data['age'].iloc[i])+
        "  Ethnicity:"+str(data['ethnicity'].iloc[i])+
        "  Gender:"+ str(data['gender'].iloc[i])
    )
plt.show()
```

Age:12 Ethnicity:4 Gender:0   Age:12 Ethnicity:4 Gender:0   Age:12 Ethnicity:4 Gender:0   Age:12 Ethnicity:0 Gender:1   Age:12 Ethnicity:0 Gender:1

Age:12 Ethnicity:4 Gender:0   Age:13 Ethnicity:0 Gender:1   Age:13 Ethnicity:0 Gender:1   Age:13 Ethnicity:0 Gender:1   Age:13 Ethnicity:0 Gender:1

Age:13 Ethnicity:0 Gender:1   Age:13 Ethnicity:0 Gender:1   Age:13 Ethnicity:0 Gender:1   Age:13 Ethnicity:0 Gender:1   Age:13 Ethnicity:0 Gender:1

Age:13 Ethnicity:0 Gender:1   Age:13 Ethnicity:0 Gender:1   Age:13 Ethnicity:0 Gender:1   Age:13 Ethnicity:0 Gender:1   Age:13 Ethnicity:0 Gender:1

Model for Gender Prediction

```python
y = data['gender']

X_train, X_test, y_train, y_test = train_test_split(
    X, y, test_size=0.22, random_state=37
)
```

Build and train model

```python
model = tf.keras.Sequential([
    L.InputLayer(input_shape=(48,48,1)),
    L.Conv2D(32, (3, 3), activation='relu', input_shape=(32, 32, 3)),
    L.BatchNormalization(),
    L.MaxPooling2D((2, 2)),
    L.Conv2D(64, (3, 3), activation='relu'),
    L.MaxPooling2D((2, 2)),
    L.Flatten(),
    L.Dense(64, activation='relu'),
    L.Dropout(rate=0.5),
    L.Dense(1, activation='sigmoid')
])
```

```python
model.compile(optimizer='sgd',
              loss=tf.keras.losses.BinaryCrossentropy(),
              metrics=['accuracy'])


## Stop training when validation loss reach 0.2700
class myCallback(tf.keras.callbacks.Callback):
    def on_epoch_end(self, epoch, logs={}):
        if(logs.get('val_loss')<0.2700):
            print("\nReached 0.2700 val_loss so cancelling training!")
            self.model.stop_training = True

callback = myCallback()

model.summary()
```

Model: "sequential_1"

_____

Layer (type)	Output Shape	Param #
conv2d_2 (Conv2D)	(None, 46, 46, 32)	320
batch_normalization_1 (Batc hNormalization)	(None, 46, 46, 32)	128
max_pooling2d_2 (MaxPooling 2D)	(None, 23, 23, 32)	0
conv2d_3 (Conv2D)	(None, 21, 21, 64)	18496
max_pooling2d_3 (MaxPooling 2D)	(None, 10, 10, 64)	0
flatten_1 (Flatten)	(None, 6400)	0
dense_2 (Dense)	(None, 64)	409664
dropout_1 (Dropout)	(None, 64)	0
dense_3 (Dense)	(None, 1)	65

===
Total params: 428,673
Trainable params: 428,609
Non-trainable params: 64
_____

```python
history = model.fit(
    X_train, y_train, epochs=20, validation_split=0.1, batch_size=64,
```

```
callbacks=[callback]
)

Epoch 1/20
260/260 [==============================] - 29s 111ms/step - loss:
0.5174 - accuracy: 0.7395 - val_loss: 0.5956 - val_accuracy: 0.7745
Epoch 2/20
260/260 [==============================] - 33s 126ms/step - loss:
0.3990 - accuracy: 0.8220 - val_loss: 0.4122 - val_accuracy: 0.8399
Epoch 3/20
260/260 [==============================] - 33s 125ms/step - loss:
0.3551 - accuracy: 0.8428 - val_loss: 0.3291 - val_accuracy: 0.8469
Epoch 4/20
260/260 [==============================] - 32s 125ms/step - loss:
0.3291 - accuracy: 0.8549 - val_loss: 0.3330 - val_accuracy: 0.8572
Epoch 5/20
260/260 [==============================] - 32s 125ms/step - loss:
0.3137 - accuracy: 0.8617 - val_loss: 0.3035 - val_accuracy: 0.8648
Epoch 6/20
260/260 [==============================] - 33s 125ms/step - loss:
0.2984 - accuracy: 0.8706 - val_loss: 0.3119 - val_accuracy: 0.8664
Epoch 7/20
260/260 [==============================] - 34s 130ms/step - loss:
0.2851 - accuracy: 0.8742 - val_loss: 0.3042 - val_accuracy: 0.8626
Epoch 8/20
260/260 [==============================] - 34s 129ms/step - loss:
0.2764 - accuracy: 0.8821 - val_loss: 0.2899 - val_accuracy: 0.8745
Epoch 9/20
260/260 [==============================] - 33s 126ms/step - loss:
0.2674 - accuracy: 0.8847 - val_loss: 0.2769 - val_accuracy: 0.8826
Epoch 10/20
260/260 [==============================] - 34s 129ms/step - loss:
0.2624 - accuracy: 0.8884 - val_loss: 0.2810 - val_accuracy: 0.8761
Epoch 11/20
260/260 [==============================] - 33s 128ms/step - loss:
0.2521 - accuracy: 0.8930 - val_loss: 0.2758 - val_accuracy: 0.8794
Epoch 12/20
260/260 [==============================] - 35s 133ms/step - loss:
0.2452 - accuracy: 0.8986 - val_loss: 0.2749 - val_accuracy: 0.8794
Epoch 13/20
260/260 [==============================] - ETA: 0s - loss: 0.2410 -
accuracy: 0.8990
Reached 0.2700 val_loss so cancelling training!
260/260 [==============================] - 34s 129ms/step - loss:
0.2410 - accuracy: 0.8990 - val_loss: 0.2693 - val_accuracy: 0.8853
```

Evaluate training history

```
fig = px.line(
    history.history, y=['loss', 'val_loss'],
    labels={'index': 'epoch', 'value': 'loss'},
```

```python
          title='Training History')
fig.show()
```

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loss, acc = model.evaluate(X_test,y_test,verbose=0)
print('Test loss: {}'.format(loss))
print('Test Accuracy: {}'.format(acc))

Test loss: 0.25372058153152466
Test Accuracy: 0.8851610422134399
```

Model for Ethnicity Prediction

```
y = data['ethnicity']

X_train, X_test, y_train, y_test = train_test_split(
    X, y, test_size=0.22, random_state=37
)
```

Build and train model

```
model = tf.keras.Sequential([
    L.InputLayer(input_shape=(48,48,1)),
    L.Conv2D(32, (3, 3), activation='relu', input_shape=(32, 32, 3)),
    L.MaxPooling2D((2, 2)),
    L.Conv2D(64, (3, 3), activation='relu'),
    L.MaxPooling2D((2, 2)),
    L.Flatten(),
    L.Dense(64, activation='relu'),
    L.Dropout(rate=0.5),
    L.Dense(5)
])

model.compile(optimizer='rmsprop',

loss=tf.keras.losses.SparseCategoricalCrossentropy(from_logits=True),
             metrics=['accuracy'])


## Stop training when validation accuracy reach 79%
class myCallback(tf.keras.callbacks.Callback):
    def on_epoch_end(self, epoch, logs={}):
        if(logs.get('val_accuracy')>0.790):
            print("\nReached 79% val_accuracy so cancelling
training!")
            self.model.stop_training = True

callback = myCallback()
```

```
model.summary()

Model: "sequential_2"
_____
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d_4 (Conv2D)           (None, 46, 46, 32)        320

 max_pooling2d_4 (MaxPooling  (None, 23, 23, 32)        0
 2D)

 conv2d_5 (Conv2D)           (None, 21, 21, 64)        18496

 max_pooling2d_5 (MaxPooling  (None, 10, 10, 64)        0
 2D)

 flatten_2 (Flatten)         (None, 6400)              0

 dense_4 (Dense)             (None, 64)                409664

 dropout_2 (Dropout)         (None, 64)                0

 dense_5 (Dense)             (None, 5)                 325

=================================================================
Total params: 428,805
Trainable params: 428,805
Non-trainable params: 0
_____

history = model.fit(
    X_train, y_train, epochs=16, validation_split=0.1, batch_size=64,
callbacks=[callback]
)

Epoch 1/16
260/260 [==============================] - 20s 73ms/step - loss:
1.2448 - accuracy: 0.5293 - val_loss: 1.0061 - val_accuracy: 0.6668
Epoch 2/16
260/260 [==============================] - 21s 82ms/step - loss:
0.9745 - accuracy: 0.6562 - val_loss: 0.8520 - val_accuracy: 0.7036
Epoch 3/16
260/260 [==============================] - 21s 81ms/step - loss:
0.8857 - accuracy: 0.6951 - val_loss: 0.7572 - val_accuracy: 0.7323
Epoch 4/16
260/260 [==============================] - 21s 82ms/step - loss:
0.8208 - accuracy: 0.7157 - val_loss: 0.7092 - val_accuracy: 0.7409
Epoch 5/16
260/260 [==============================] - 21s 83ms/step - loss:
```

```
0.7824 - accuracy: 0.7329 - val_loss: 0.6789 - val_accuracy: 0.7610
Epoch 6/16
260/260 [==============================] - 21s 82ms/step - loss:
0.7410 - accuracy: 0.7424 - val_loss: 0.6461 - val_accuracy: 0.7729
Epoch 7/16
260/260 [==============================] - 22s 83ms/step - loss:
0.7101 - accuracy: 0.7561 - val_loss: 0.6362 - val_accuracy: 0.7739
Epoch 8/16
260/260 [==============================] - 25s 98ms/step - loss:
0.6902 - accuracy: 0.7657 - val_loss: 0.6338 - val_accuracy: 0.7783
Epoch 9/16
260/260 [==============================] - 25s 95ms/step - loss:
0.6670 - accuracy: 0.7741 - val_loss: 0.6232 - val_accuracy: 0.7756
Epoch 10/16
260/260 [==============================] - ETA: 0s - loss: 0.6357 -
accuracy: 0.7823
Reached 79% val_accuracy so cancelling training!
260/260 [==============================] - 29s 112ms/step - loss:
0.6357 - accuracy: 0.7823 - val_loss: 0.6078 - val_accuracy: 0.7956
```

Evaluate training history

```
fig = px.line(
    history.history, y=['loss', 'val_loss'],
    labels={'index': 'epoch', 'value': 'loss'},
    title='Training History')
fig.show()
```

```
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```python
loss, acc = model.evaluate(X_test,y_test,verbose=0)
print('Test loss: {}'.format(loss))
print('Test Accuracy: {}'.format(acc))
```

```
Test loss: 0.605585515499115
Test Accuracy: 0.7969708442687988
```

Model for Age prediction

```python
y = data['age']

X_train, X_test, y_train, y_test = train_test_split(
    X, y, test_size=0.22, random_state=37
)
```

Build and train model

```python
model = tf.keras.Sequential([
    L.InputLayer(input_shape=(48,48,1)),
    L.Conv2D(32, (3, 3), activation='relu', input_shape=(32, 32, 3)),
    L.BatchNormalization(),
```

```python
    L.MaxPooling2D((2, 2)),
    L.Conv2D(64, (3, 3), activation='relu'),
    L.MaxPooling2D((2, 2)),
    L.Conv2D(128, (3, 3), activation='relu'),
    L.MaxPooling2D((2, 2)),
    L.Flatten(),
    L.Dense(64, activation='relu'),
    L.Dropout(rate=0.5),
    L.Dense(1, activation='relu')
])

sgd = tf.keras.optimizers.SGD(momentum=0.9)

model.compile(optimizer='adam',
              loss='mean_squared_error',
              metrics=['mae'])


## Stop training when validation loss reach 110
class myCallback(tf.keras.callbacks.Callback):
    def on_epoch_end(self, epoch, logs={}):
        if(logs.get('val_loss')<110):
            print("\nReached 110 val_loss so cancelling training!")
            self.model.stop_training = True

callback = myCallback()


model.summary()
```

Model: "sequential_3"

Layer (type)	Output Shape	Param #
conv2d_6 (Conv2D)	(None, 46, 46, 32)	320
batch_normalization_2 (Batc hNormalization)	(None, 46, 46, 32)	128
max_pooling2d_6 (MaxPooling 2D)	(None, 23, 23, 32)	0
conv2d_7 (Conv2D)	(None, 21, 21, 64)	18496
max_pooling2d_7 (MaxPooling 2D)	(None, 10, 10, 64)	0
conv2d_8 (Conv2D)	(None, 8, 8, 128)	73856
max_pooling2d_8 (MaxPooling	(None, 4, 4, 128)	0

```
 2D)

 flatten_3 (Flatten)            (None, 2048)                0

 dense_6 (Dense)                (None, 64)                  131136

 dropout_3 (Dropout)            (None, 64)                  0

 dense_7 (Dense)                (None, 1)                   65

=================================================================
Total params: 224,001
Trainable params: 223,937
Non-trainable params: 64
_____

history = model.fit(
    X_train, y_train, epochs=20, validation_split=0.1, batch_size=64,
callbacks=[callback]
)

Epoch 1/20
260/260 [==============================] - 42s 159ms/step - loss:
338.8476 - mae: 13.9669 - val_loss: 1257.0403 - val_mae: 29.9400
Epoch 2/20
260/260 [==============================] - 46s 178ms/step - loss:
212.0915 - mae: 10.8917 - val_loss: 584.3680 - val_mae: 19.3574
Epoch 3/20
260/260 [==============================] - 45s 173ms/step - loss:
183.2823 - mae: 10.1120 - val_loss: 128.5190 - val_mae: 8.6769
Epoch 4/20
260/260 [==============================] - 45s 173ms/step - loss:
165.1392 - mae: 9.5352 - val_loss: 139.0629 - val_mae: 8.4551
Epoch 5/20
260/260 [==============================] - 45s 172ms/step - loss:
156.1929 - mae: 9.2252 - val_loss: 169.5836 - val_mae: 9.2130
Epoch 6/20
260/260 [==============================] - 44s 168ms/step - loss:
147.4011 - mae: 8.9718 - val_loss: 141.1238 - val_mae: 9.2561
Epoch 7/20
260/260 [==============================] - 38s 146ms/step - loss:
144.3880 - mae: 8.8799 - val_loss: 195.2952 - val_mae: 10.2684
Epoch 8/20
260/260 [==============================] - 44s 171ms/step - loss:
137.4590 - mae: 8.6345 - val_loss: 125.9185 - val_mae: 8.1088
Epoch 9/20
260/260 [==============================] - ETA: 0s - loss: 137.3810 -
mae: 8.6356
Reached 110 val_loss so cancelling training!
260/260 [==============================] - 41s 156ms/step - loss:
137.3810 - mae: 8.6356 - val_loss: 100.0717 - val_mae: 7.4795
```

Evaluate training history

```python
fig = px.line(
    history.history, y=['loss', 'val_loss'],
    labels={'index': 'epoch', 'value': 'loss'},
    title='Training History')
fig.show()
```

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```

```python
mse, mae = model.evaluate(X_test,y_test,verbose=0)
print('Test Mean squared error: {}'.format(mse))
print('Test Mean absolute error: {}'.format(mae))
```

```
Test Mean squared error: 93.32354736328125
Test Mean absolute error: 7.178293228149414
```