C1W1_Assignment

March 8, 2023

1 Week 1 Assignment: Housing Prices

In this exercise you'll try to build a neural network that predicts the price of a house according to a simple formula.

Imagine that house pricing is as easy as:

A house has a base cost of 50k, and every additional bedroom adds a cost of 50k. This will make a 1 bedroom house cost 100k, a 2 bedroom house cost 150k etc.

How would you create a neural network that learns this relationship so that it would predict a 7 bedroom house as costing close to 400k etc.

Hint: Your network might work better if you scale the house price down. You don't have to give the answer 400...it might be better to create something that predicts the number 4, and then your answer is in the 'hundreds of thousands' etc.

[1]:
```
import tensorflow as tf
import numpy as np
from tensorflow import keras
```

[2]:
```
# GRADED FUNCTION: house_model
def house_model():
    ### START CODE HERE

    # Define input and output tensors with the values for houses with 1 up to 6␣
 ↪bedrooms
    # Hint: Remember to explictly set the dtype as float
#     xs = np.array([1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 8.0, 9.0, 10.0], dtype=float)
    xs = np.arange(1, 11, dtype = float)
    start = 1
    step = 0.5
    num = 10
    ys = (np.arange(0,num)*step+start)
#     ys = np.array([100.0, 150.0, 200.0, 250.0, 300.0, 350.0,450.0, 500.0, 550.
 ↪0], dtype=float)

    # Define your model (should be a model with 1 dense layer and 1 unit)
    model = tf.keras.Sequential([keras.layers.Dense(units = 1, input_shape =␣
 ↪[1])])
```

```
    # Compile your model
    # Set the optimizer to Stochastic Gradient Descent
    # and use Mean Squared Error as the loss function
    model.compile(optimizer='sgd', loss='mean_squared_error')

    # Train your model for 1000 epochs by feeding the i/o tensors
    model.fit(xs, ys, epochs=500)

    ### END CODE HERE
    return model
```

Now that you have a function that returns a compiled and trained model when invoked, use it to get the model to predict the price of houses:

[3]:
```
# Get your trained model
model = house_model()
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Epoch 1/500
1/1 [==============================] - 0s 212ms/step - loss: 19.2871
Epoch 2/500
1/1 [==============================] - 0s 2ms/step - loss: 0.9174
Epoch 3/500
1/1 [==============================] - 0s 3ms/step - loss: 0.0743
Epoch 4/500
1/1 [==============================] - 0s 2ms/step - loss: 0.0354
Epoch 5/500
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Epoch 6/500
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Epoch 14/500
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Epoch 15/500
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Epoch 257/500
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Epoch 279/500
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Epoch 280/500
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Epoch 304/500
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Epoch 328/500
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Epoch 352/500
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Epoch 376/500
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Epoch 398/500
1/1 [==============================] - 0s 2ms/step - loss: 0.0012
Epoch 399/500
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Epoch 400/500
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Epoch 401/500
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Epoch 421/500
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Epoch 422/500
1/1 [==============================] - 0s 1ms/step - loss: 9.9376e-04
Epoch 423/500
1/1 [==============================] - 0s 1ms/step - loss: 9.8543e-04
```

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Epoch 424/500
1/1 [==============================] - 0s 1ms/step - loss: 9.7717e-04
Epoch 425/500
1/1 [==============================] - 0s 1ms/step - loss: 9.6898e-04
Epoch 426/500
1/1 [==============================] - 0s 7ms/step - loss: 9.6086e-04
Epoch 427/500
1/1 [==============================] - 0s 2ms/step - loss: 9.5280e-04
Epoch 428/500
1/1 [==============================] - 0s 1ms/step - loss: 9.4482e-04
Epoch 429/500
1/1 [==============================] - 0s 1ms/step - loss: 9.3690e-04
Epoch 430/500
1/1 [==============================] - 0s 2ms/step - loss: 9.2905e-04
Epoch 431/500
1/1 [==============================] - 0s 2ms/step - loss: 9.2126e-04
Epoch 432/500
1/1 [==============================] - 0s 2ms/step - loss: 9.1354e-04
Epoch 433/500
1/1 [==============================] - 0s 2ms/step - loss: 9.0588e-04
Epoch 434/500
1/1 [==============================] - 0s 1ms/step - loss: 8.9829e-04
Epoch 435/500
1/1 [==============================] - 0s 1ms/step - loss: 8.9076e-04
Epoch 436/500
1/1 [==============================] - 0s 1ms/step - loss: 8.8329e-04
Epoch 437/500
1/1 [==============================] - 0s 1ms/step - loss: 8.7589e-04
Epoch 438/500
1/1 [==============================] - 0s 2ms/step - loss: 8.6855e-04
Epoch 439/500
1/1 [==============================] - 0s 2ms/step - loss: 8.6127e-04
Epoch 440/500
1/1 [==============================] - 0s 2ms/step - loss: 8.5405e-04
Epoch 441/500
1/1 [==============================] - 0s 1ms/step - loss: 8.4689e-04
Epoch 442/500
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Epoch 444/500
1/1 [==============================] - 0s 1ms/step - loss: 8.2577e-04
Epoch 445/500
1/1 [==============================] - 0s 1ms/step - loss: 8.1885e-04
Epoch 446/500
1/1 [==============================] - 0s 1ms/step - loss: 8.1199e-04
Epoch 447/500
1/1 [==============================] - 0s 1ms/step - loss: 8.0518e-04
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Epoch 448/500
1/1 [==============================] - 0s 1ms/step - loss: 7.9844e-04
Epoch 449/500
1/1 [==============================] - 0s 2ms/step - loss: 7.9175e-04
Epoch 450/500
1/1 [==============================] - 0s 2ms/step - loss: 7.8511e-04
Epoch 451/500
1/1 [==============================] - 0s 2ms/step - loss: 7.7853e-04
Epoch 452/500
1/1 [==============================] - 0s 1ms/step - loss: 7.7200e-04
Epoch 453/500
1/1 [==============================] - 0s 1ms/step - loss: 7.6554e-04
Epoch 454/500
1/1 [==============================] - 0s 2ms/step - loss: 7.5912e-04
Epoch 455/500
1/1 [==============================] - 0s 2ms/step - loss: 7.5275e-04
Epoch 456/500
1/1 [==============================] - 0s 1ms/step - loss: 7.4644e-04
Epoch 457/500
1/1 [==============================] - 0s 1ms/step - loss: 7.4019e-04
Epoch 458/500
1/1 [==============================] - 0s 1ms/step - loss: 7.3398e-04
Epoch 459/500
1/1 [==============================] - 0s 1ms/step - loss: 7.2783e-04
Epoch 460/500
1/1 [==============================] - 0s 2ms/step - loss: 7.2173e-04
Epoch 461/500
1/1 [==============================] - 0s 10ms/step - loss: 7.1568e-04
Epoch 462/500
1/1 [==============================] - 0s 2ms/step - loss: 7.0969e-04
Epoch 463/500
1/1 [==============================] - 0s 2ms/step - loss: 7.0374e-04
Epoch 464/500
1/1 [==============================] - 0s 2ms/step - loss: 6.9784e-04
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Epoch 466/500
1/1 [==============================] - 0s 2ms/step - loss: 6.8619e-04
Epoch 467/500
1/1 [==============================] - 0s 1ms/step - loss: 6.8044e-04
Epoch 468/500
1/1 [==============================] - 0s 1ms/step - loss: 6.7474e-04
Epoch 469/500
1/1 [==============================] - 0s 1ms/step - loss: 6.6908e-04
Epoch 470/500
1/1 [==============================] - 0s 1ms/step - loss: 6.6347e-04
Epoch 471/500
1/1 [==============================] - 0s 2ms/step - loss: 6.5791e-04
```

```
Epoch 472/500
1/1 [==============================] - 0s 1ms/step - loss: 6.5240e-04
Epoch 473/500
1/1 [==============================] - 0s 1ms/step - loss: 6.4693e-04
Epoch 474/500
1/1 [==============================] - 0s 1ms/step - loss: 6.4150e-04
Epoch 475/500
1/1 [==============================] - 0s 1ms/step - loss: 6.3613e-04
Epoch 476/500
1/1 [==============================] - 0s 1ms/step - loss: 6.3080e-04
Epoch 477/500
1/1 [==============================] - 0s 1ms/step - loss: 6.2551e-04
Epoch 478/500
1/1 [==============================] - 0s 1ms/step - loss: 6.2027e-04
Epoch 479/500
1/1 [==============================] - 0s 1ms/step - loss: 6.1507e-04
Epoch 480/500
1/1 [==============================] - 0s 1ms/step - loss: 6.0991e-04
Epoch 481/500
1/1 [==============================] - 0s 1ms/step - loss: 6.0480e-04
Epoch 482/500
1/1 [==============================] - 0s 2ms/step - loss: 5.9973e-04
Epoch 483/500
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Epoch 484/500
1/1 [==============================] - 0s 1ms/step - loss: 5.8973e-04
Epoch 485/500
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Epoch 486/500
1/1 [==============================] - 0s 2ms/step - loss: 5.7988e-04
Epoch 487/500
1/1 [==============================] - 0s 2ms/step - loss: 5.7502e-04
Epoch 488/500
1/1 [==============================] - 0s 1ms/step - loss: 5.7020e-04
Epoch 489/500
1/1 [==============================] - 0s 1ms/step - loss: 5.6542e-04
Epoch 490/500
1/1 [==============================] - 0s 2ms/step - loss: 5.6068e-04
Epoch 491/500
1/1 [==============================] - 0s 1ms/step - loss: 5.5598e-04
Epoch 492/500
1/1 [==============================] - 0s 2ms/step - loss: 5.5132e-04
Epoch 493/500
1/1 [==============================] - 0s 1ms/step - loss: 5.4670e-04
Epoch 494/500
1/1 [==============================] - 0s 2ms/step - loss: 5.4212e-04
Epoch 495/500
1/1 [==============================] - 0s 1ms/step - loss: 5.3757e-04
```

```
Epoch 496/500
1/1 [==============================] - 0s 2ms/step - loss: 5.3307e-04
Epoch 497/500
1/1 [==============================] - 0s 1ms/step - loss: 5.2860e-04
Epoch 498/500
1/1 [==============================] - 0s 2ms/step - loss: 5.2417e-04
Epoch 499/500
1/1 [==============================] - 0s 1ms/step - loss: 5.1978e-04
Epoch 500/500
1/1 [==============================] - 0s 1ms/step - loss: 5.1542e-04
```

Now that your model has finished training it is time to test it out! You can do so by running the next cell.

[4]:
```
new_x = 7.0
prediction = model.predict([new_x])[0]
print(prediction)
```

```
[4.000268]
```

If everything went as expected you should see a prediction value very close to 4. **If not, try adjusting your code before submitting the assignment.** Notice that you can play around with the value of `new_x` to get different predictions. In general you should see that the network was able to learn the linear relationship between `x` and `y`, so if you use a value of 8.0 you should get a prediction close to 4.5 and so on.

Congratulations on finishing this week's assignment!

You have successfully coded a neural network that learned the linear relationship between two variables. Nice job!

Keep it up!