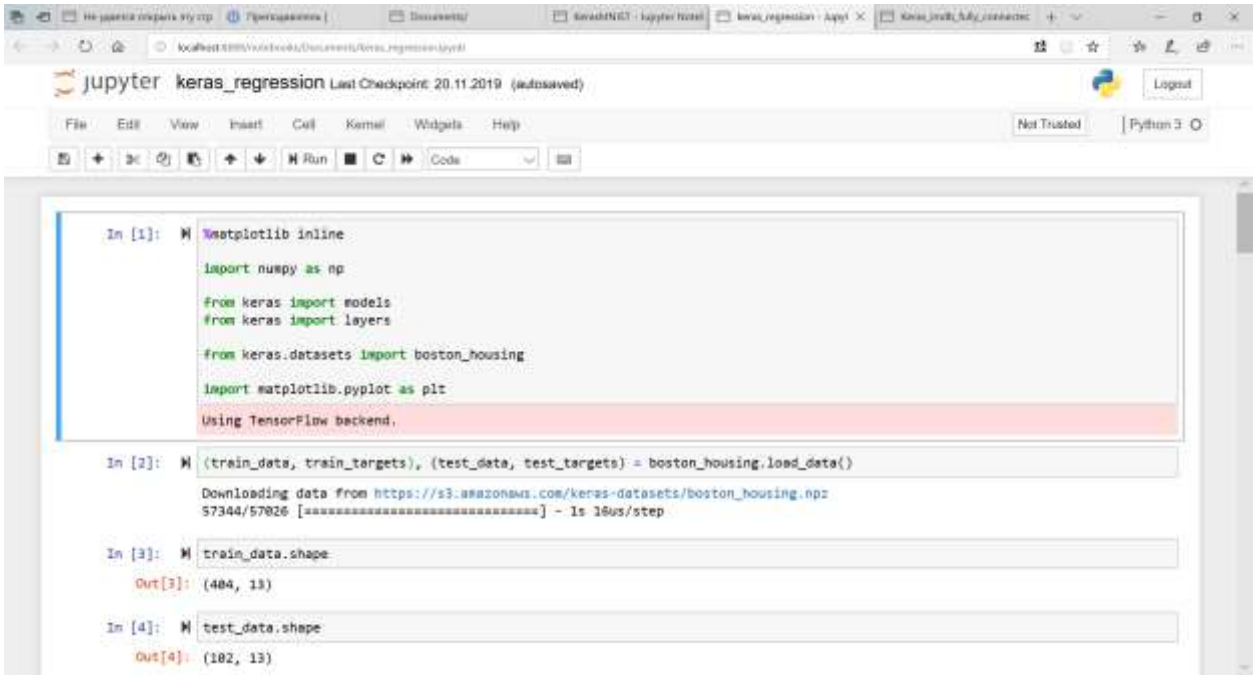
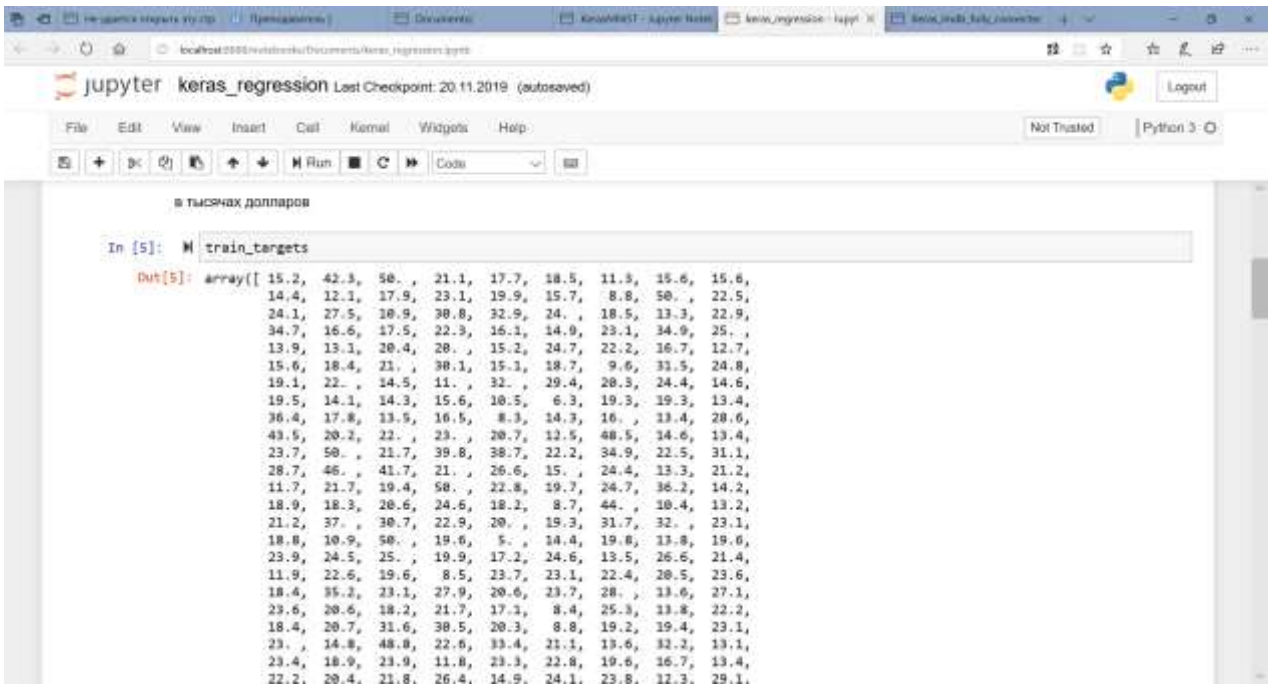
Лабораторное занятие 14. Кросс валидация в временных рядах, линейные модели. (с помощью нейрнных сетей)**1**

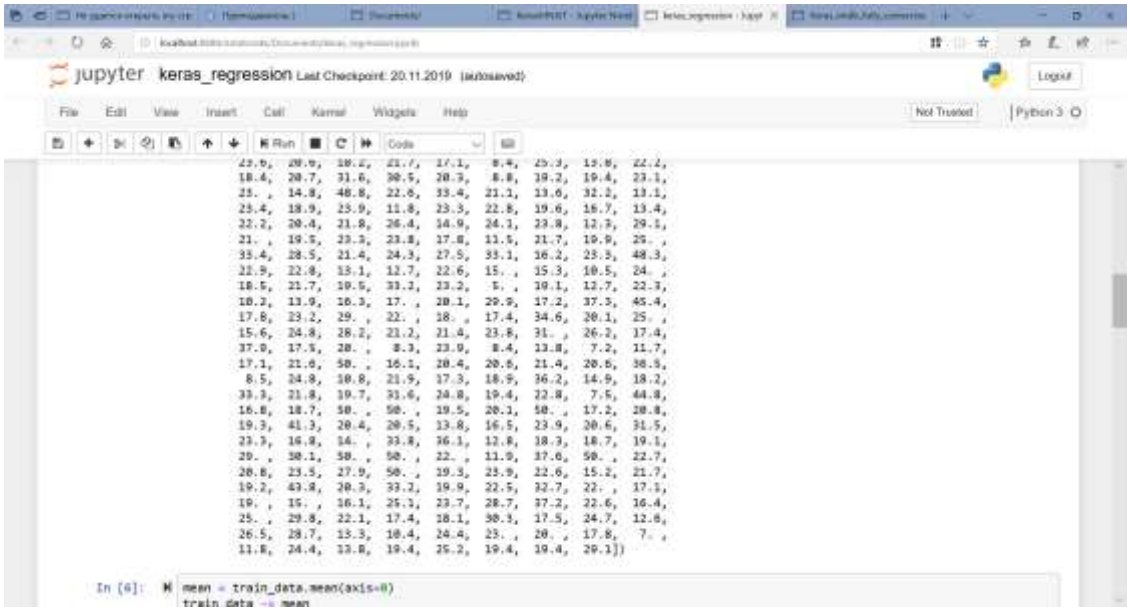
15-зертханалық сабақ. 15-зертханалық сабақ. Уақытқа байланысты қатарларда кросс валидация, сызықты модельдер(нейро желі көмегімен) 15-зертханалық сабақ. Уақытқа байланысты қатарларда кросс валидация, сызықты модельдер

Python және Anaconda да мысал. Сіз өз деректер қорына жасаныз!

Пример на Python и Anaconde. Ниже приведен пример. Каждый должен сделать для своего датасета.



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Python 3
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Code
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18.4, 20.7, 31.6, 30.5, 20.3, 8.8, 19.2, 19.4, 23.1,
23. , 14.8, 48.8, 22.6, 33.4, 21.1, 13.6, 32.2, 13.1,
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16.8, 18.7, 50. , 50. , 19.5, 20.1, 50. , 17.2, 20.8,
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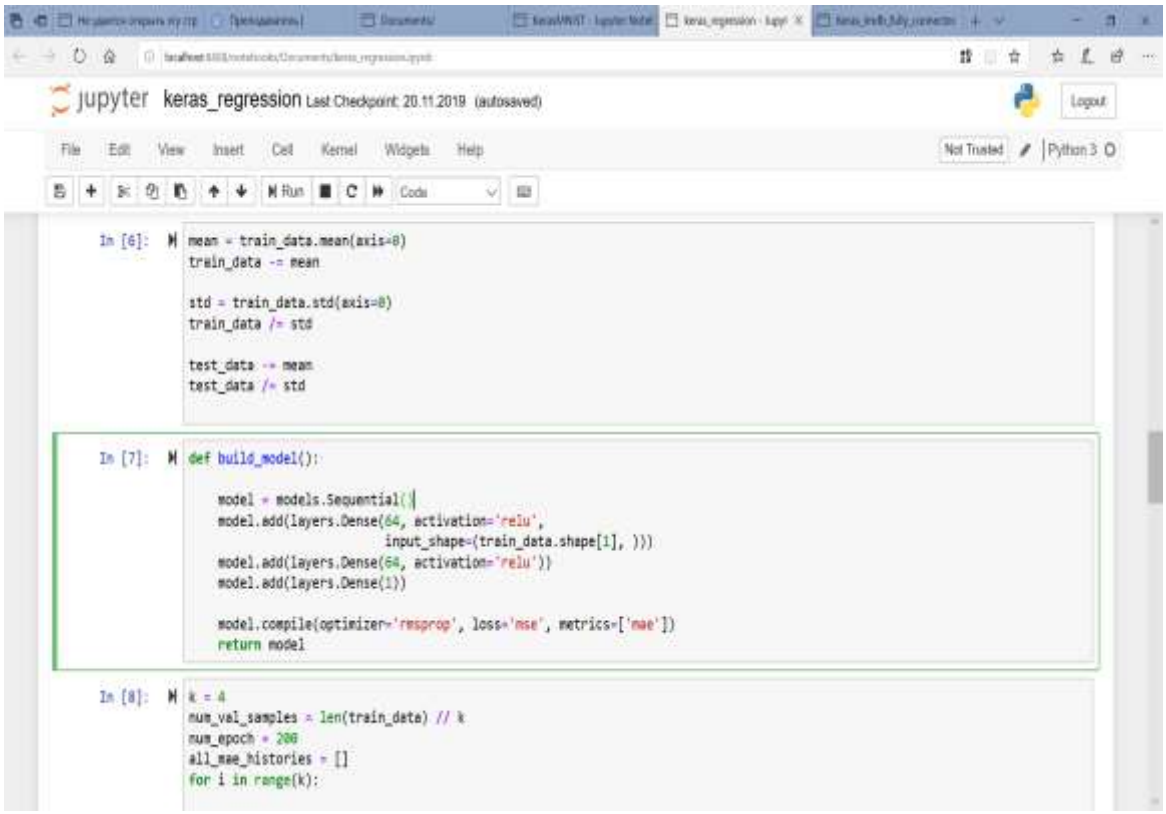
19. , 15. , 16.1, 25.1, 23.7, 28.7, 37.2, 22.6, 16.4,
25. , 29.8, 22.1, 17.4, 18.1, 30.3, 17.5, 24.7, 12.6,
26.5, 28.7, 13.3, 10.4, 24.4, 23. , 20. , 17.8, 7. ,
11.8, 24.4, 13.8, 19.4, 25.2, 19.4, 19.4, 29.1])
In [6]:
mean = train_data.mean(axis=0)
train_data -= mean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Python 3
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Code
In [6]:
mean = train_data.mean(axis=0)
train_data -= mean
std = train_data.std(axis=0)
train_data /= std
test_data -= mean
test_data /= std
In [7]:
def build_model():
model = models.Sequential()
model.add(layers.Dense(64, activation='relu',
input_shape=(train_data.shape[1],)))
model.add(layers.Dense(64, activation='relu'))
model.add(layers.Dense(1))
model.compile(optimizer='rmsprop', loss='mse', metrics=['mae'])
return model
In [8]:
k = 4
num_val_samples = len(train_data) // k
num_epoch = 200
all_mae_histories = []
for i in range(k):

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```
print("FOLD №", i)

val_data = train_data[i * num_val_samples: (i + 1) * num_val_samples]
val_targets = train_targets[i * num_val_samples:
                            (i + 1) * num_val_samples]

partial_train_data = np.concatenate(
    [
        train_data[: i * num_val_samples],
        train_data[(i + 1) * num_val_samples :]
    ], axis = 0)
partial_train_targets = np.concatenate(
    [
        train_targets[: i * num_val_samples],
        train_targets[(i + 1) * num_val_samples :]
    ], axis = 0)

model = build_model()
history = model.fit(partial_train_data, partial_train_targets,
                    validation_data = (val_data, val_targets),
                    epochs=num_epoch, batch_size=1, verbose=0)

mae_history = history.history['val_mean_absolute_error']
all_mae_histories.append(mae_history)
```

```
FOLD №  0
FOLD №  1
FOLD №  2
FOLD №  3
```

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Run Code

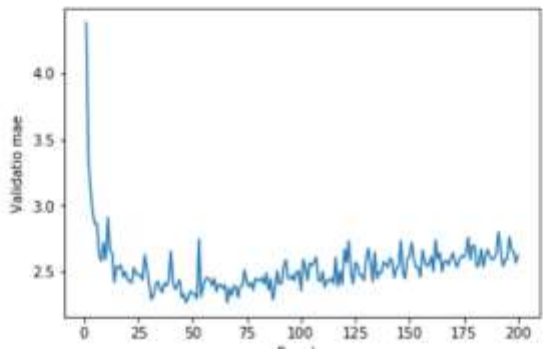
FOLD № 0
FOLD № 1
FOLD № 2
FOLD № 3

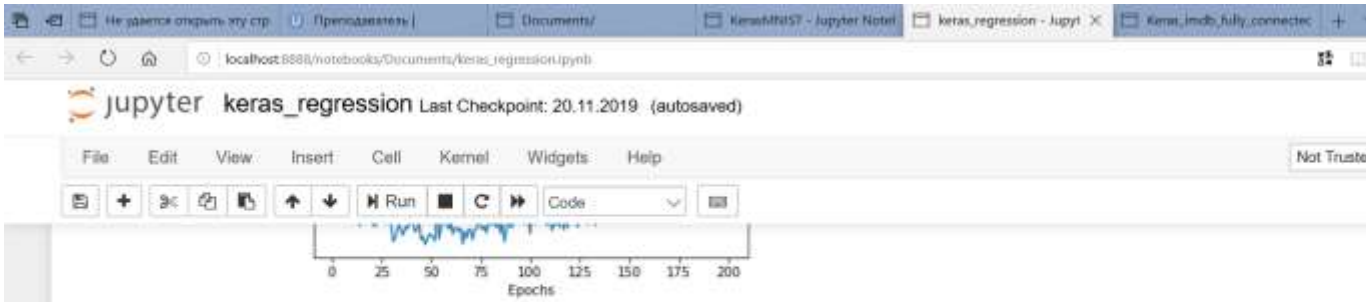
In [9]:

```
average_mae_history = [np.mean([x[i] for x in all_mae_histories])
                       for i in range(num_epoch)]
```

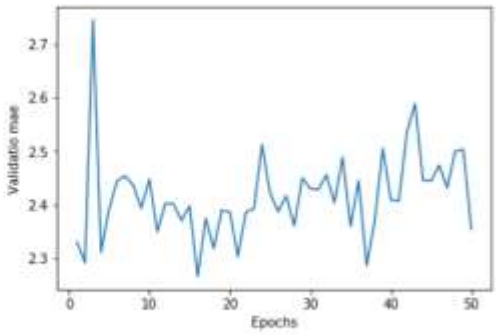
In [10]:

```
plt.plot(range(1, len(average_mae_history) + 1), average_mae_history)
plt.xlabel("Epochs")
plt.ylabel('Validatio mae')
plt.show()
```

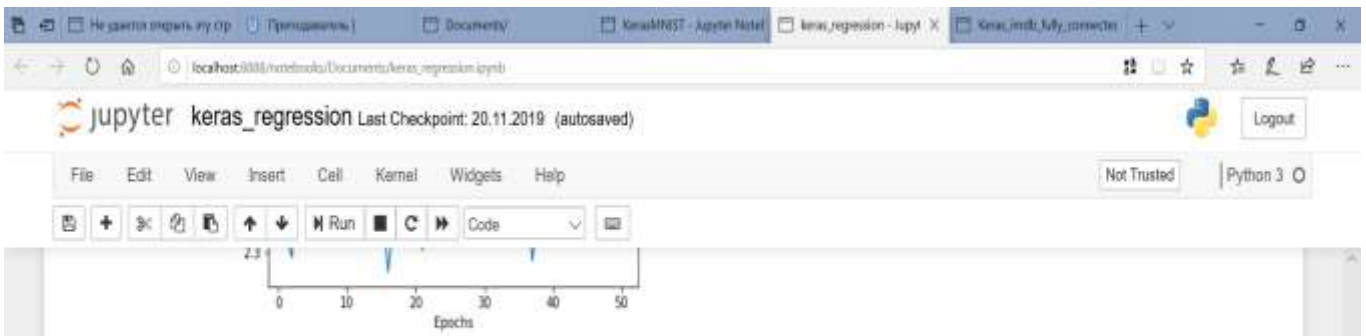




In [13]:
```
plt.plot(range(1, len(average_mae_history[50:100]) + 1), average_mae_history[50:100])
plt.xlabel("Epochs")
plt.ylabel('Validatio mae')
plt.show()
```

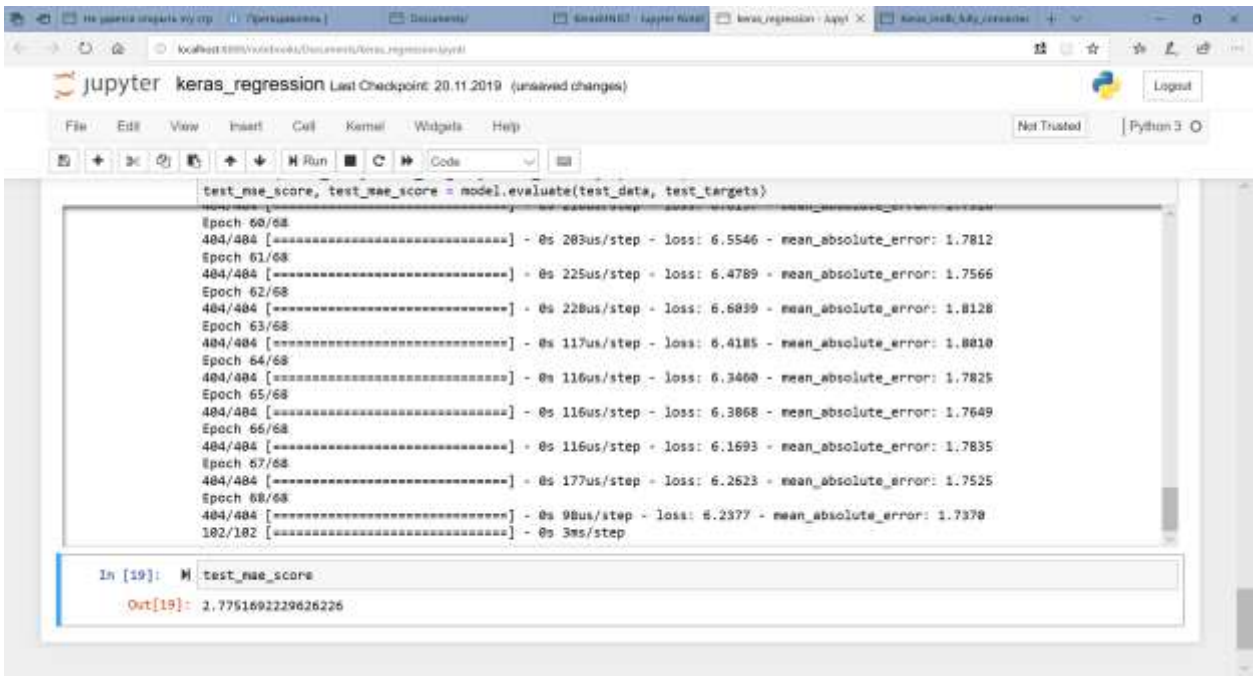


In [18]:
```
model = build_model()
model.fit(train_data, train_targets, batch_size=16, epochs=68)
```



In [18]:
```
model = build_model()
model.fit(train_data, train_targets, batch_size=16, epochs=68)
test_mse_score, test_mae_score = model.evaluate(test_data, test_targets)
```

```
Epoch 1/68
404/404 [==============================] - 1s 3ms/step - loss: 507.7415 - mean_absolute_error: 20.5262
Epoch 2/68
404/404 [==============================] - 0s 517us/step - loss: 342.2839 - mean_absolute_error: 16.2195
Epoch 3/68
404/404 [==============================] - 0s 470us/step - loss: 160.4718 - mean_absolute_error: 10.2928
Epoch 4/68
404/404 [==============================] - 0s 696us/step - loss: 63.7542 - mean_absolute_error: 5.8373
Epoch 5/68
404/404 [==============================] - 0s 1ms/step - loss: 37.2715 - mean_absolute_error: 4.4180
Epoch 6/68
404/404 [==============================] - 0s 866us/step - loss: 27.1400 - mean_absolute_error: 3.74450s - loss: 30.4682
- mean_absolute_error:
Epoch 7/68
404/404 [==============================] - 0s 619us/step - loss: 22.0638 - mean_absolute_error: 3.3515
Epoch 8/68
404/404 [==============================] - 0s 488us/step - loss: 19.2295 - mean_absolute_error: 3.08710s - loss: 22.6960
- mean_absolute_error:
Epoch 9/68
404/404 [==============================] - 0s 364us/step - loss: 16.8524 - mean_absolute_error: 2.9179
```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Code
test_mse_score, test_mae_score = model.evaluate(test_data, test_targets)
Epoch 60/68
404/404 [==============================] - 0s 203us/step - loss: 6.5546 - mean_absolute_error: 1.7812
Epoch 61/68
404/404 [==============================] - 0s 225us/step - loss: 6.4789 - mean_absolute_error: 1.7566
Epoch 62/68
404/404 [==============================] - 0s 228us/step - loss: 6.6039 - mean_absolute_error: 1.8128
Epoch 63/68
404/404 [==============================] - 0s 117us/step - loss: 6.4185 - mean_absolute_error: 1.8010
Epoch 64/68
404/404 [==============================] - 0s 116us/step - loss: 6.3460 - mean_absolute_error: 1.7825
Epoch 65/68
404/404 [==============================] - 0s 116us/step - loss: 6.3868 - mean_absolute_error: 1.7649
Epoch 66/68
404/404 [==============================] - 0s 116us/step - loss: 6.1693 - mean_absolute_error: 1.7835
Epoch 67/68
404/404 [==============================] - 0s 177us/step - loss: 6.2623 - mean_absolute_error: 1.7525
Epoch 68/68
404/404 [==============================] - 0s 98us/step - loss: 6.2377 - mean_absolute_error: 1.7370
102/102 [==============================] - 0s 3ms/step
In [19]:
test_mae_score
Out[19]:
2.7751692229626226