МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РФ

Федеральное государственное автономное
образовательное учреждение высшего образования
«Национальный исследовательский университет ИТМО»

Факультет программной инженерии и компьютерной техники

ЛАБОРАТОРНАЯ РАБОТА №4

по дисциплине

“Системы искусственного интеллекта”

Вариант №1

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Группа P33302

Преподаватель:

Королёва Ю.А.

Санкт-Петербург, 2022

Цель работы

Исследование алгоритмов решения задач методом поиска

Задание

Var	Part1 func	Part2 data	Hyperparameters
1	Absolute(Sin(x)) X: 6,3..6.3 Y: 0..1.2	CIFAR10	Layers count, neurons count per layer

There are represented such hyperparameters as

- Layer count
- Neurons count per layer (actually it's not hyperparameter but structure parameter)
- Learn rate
- Regularization L1 and L2
- Output layer activation type
- Layer activation type
- Loss function type
- Epoch count

1) By changing these hyperparameters try to reach max accuracy value(at least 0.95) for Part2 model with fixed epoch count 20
2) Change 1st hyperparameter's value from min to max with minimal step depends on your variant
3) Show impact on result using graphs
4) Describe impact of each hyperparameter on accuracy.
5) Set hyperparameter value back to one which produced max accuracy
6) Repeat 2-5 steps for second hyperparameter

Make a report including:

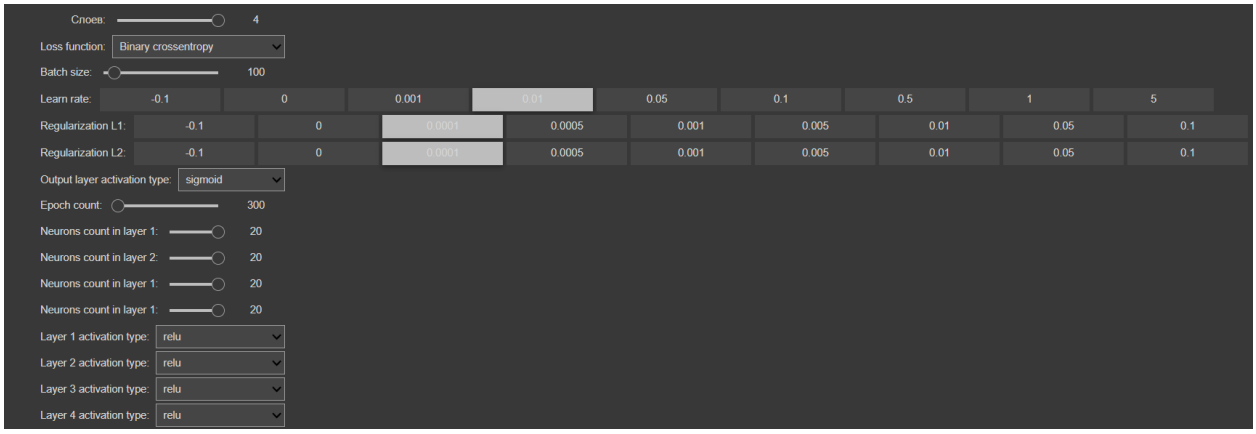
- Each hyperparameter description and its impact on accuracy.
- Hyperparameters' values which were used to reach accuracy value 0.95
- Graphs for these hyperparameters' values

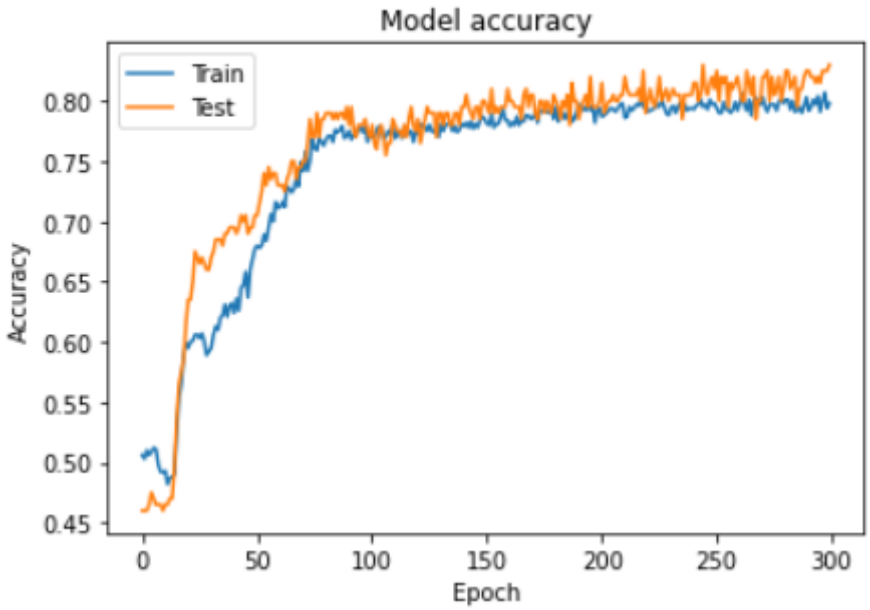
Выполнение работы

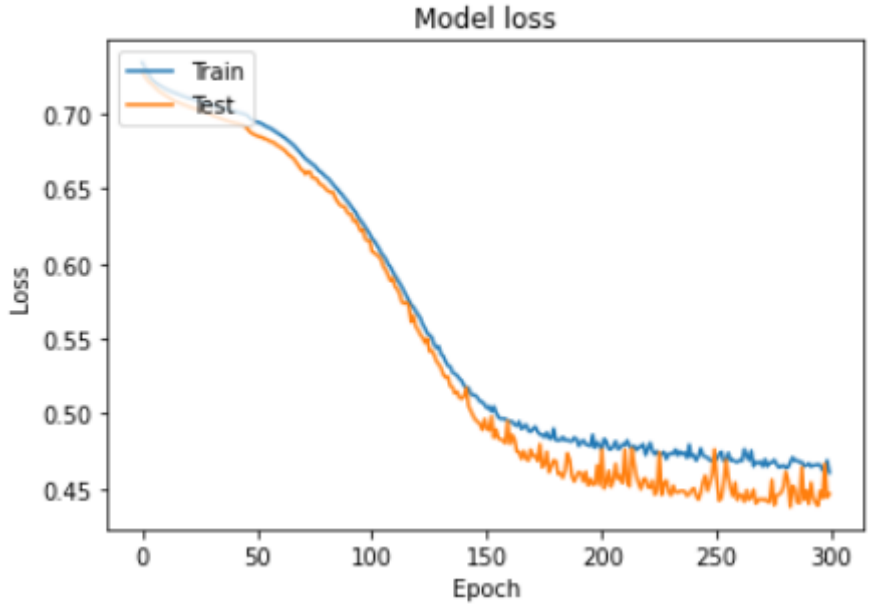
Часть 1

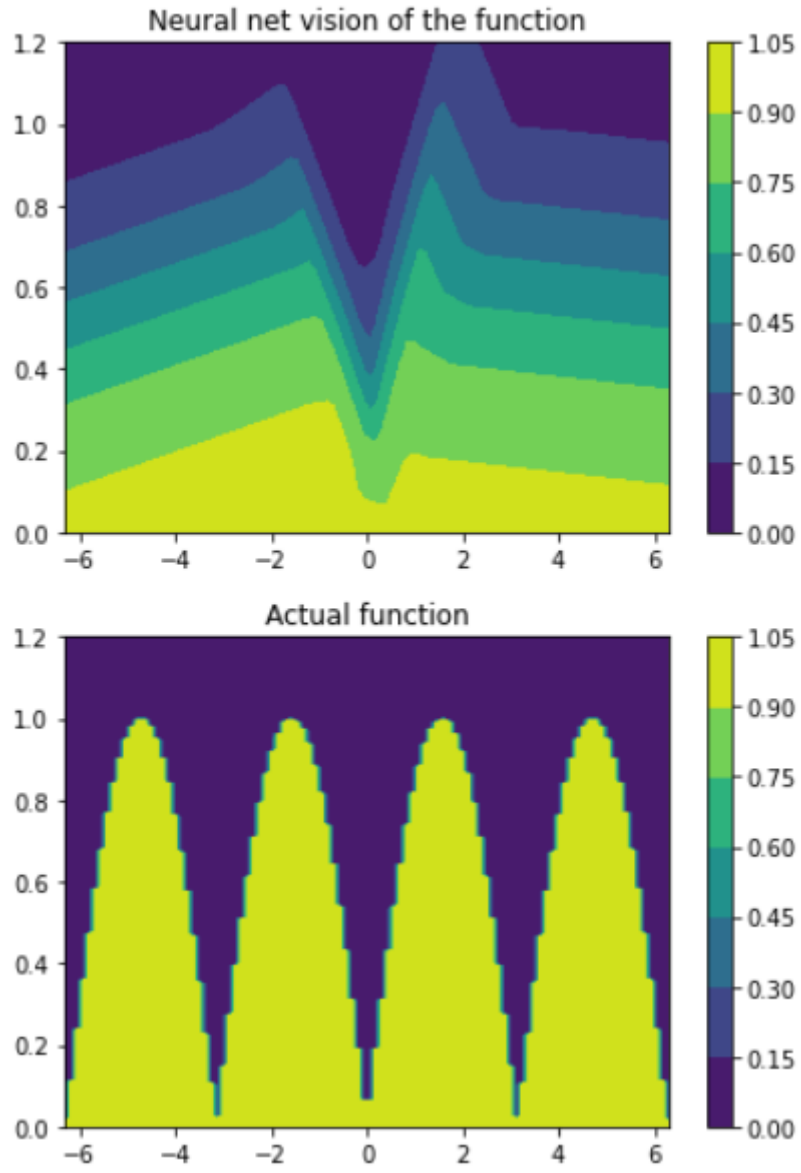
```python
# Your variant function
def main_func(x):
    return np.abs(np.sin(x))
def main_func_noisy(x):
    return main_func(x) + np.cos(4*x + 1) / 5

def result_func(xy):
    return main_func(xy[0]) > xy[1]

def result_func_noisy(xy):
    return main_func_noisy(xy[0]) > xy[1]
```

Параметры, при которых удалось достичь наибольшей достоверности:

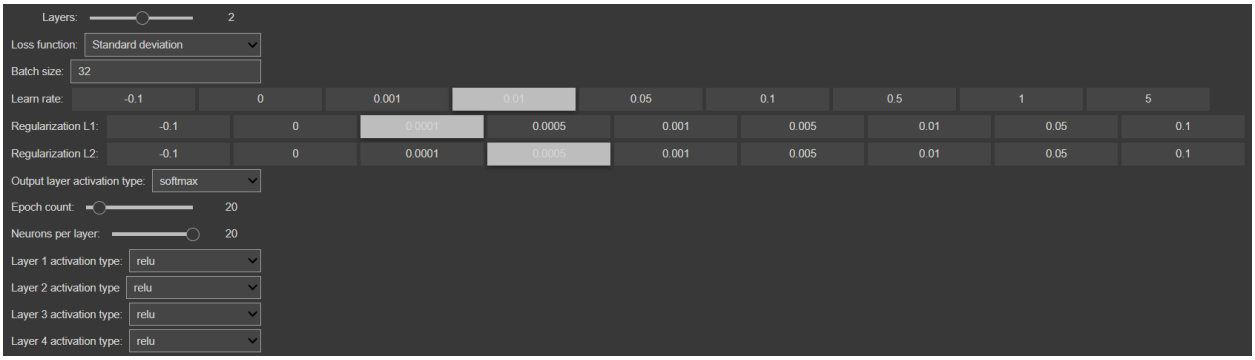


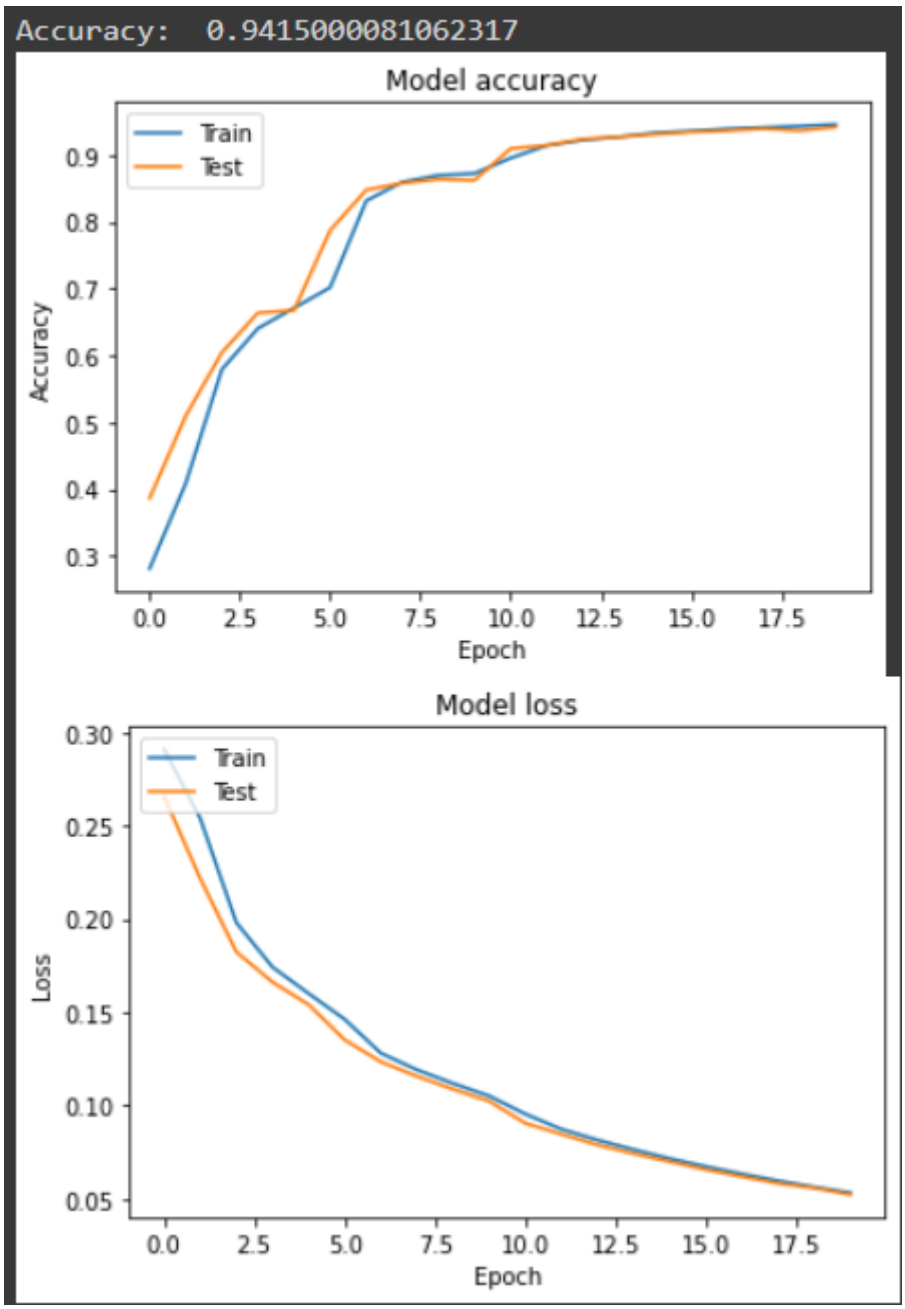





Neural net vision of the function
1.2
1.0
0.8
0.6
0.4
0.2
0.0
−6
−4
−2
0
2
4
6
1.05
0.90
0.75
0.60
0.45
0.30
0.15
0.00
Actual function
1.2
1.0
0.8
0.6
0.4
0.2
0.0
−6
−4
−2
0
2
4
6
1.05
0.90
0.75
0.60
0.45
0.30
0.15
0.00

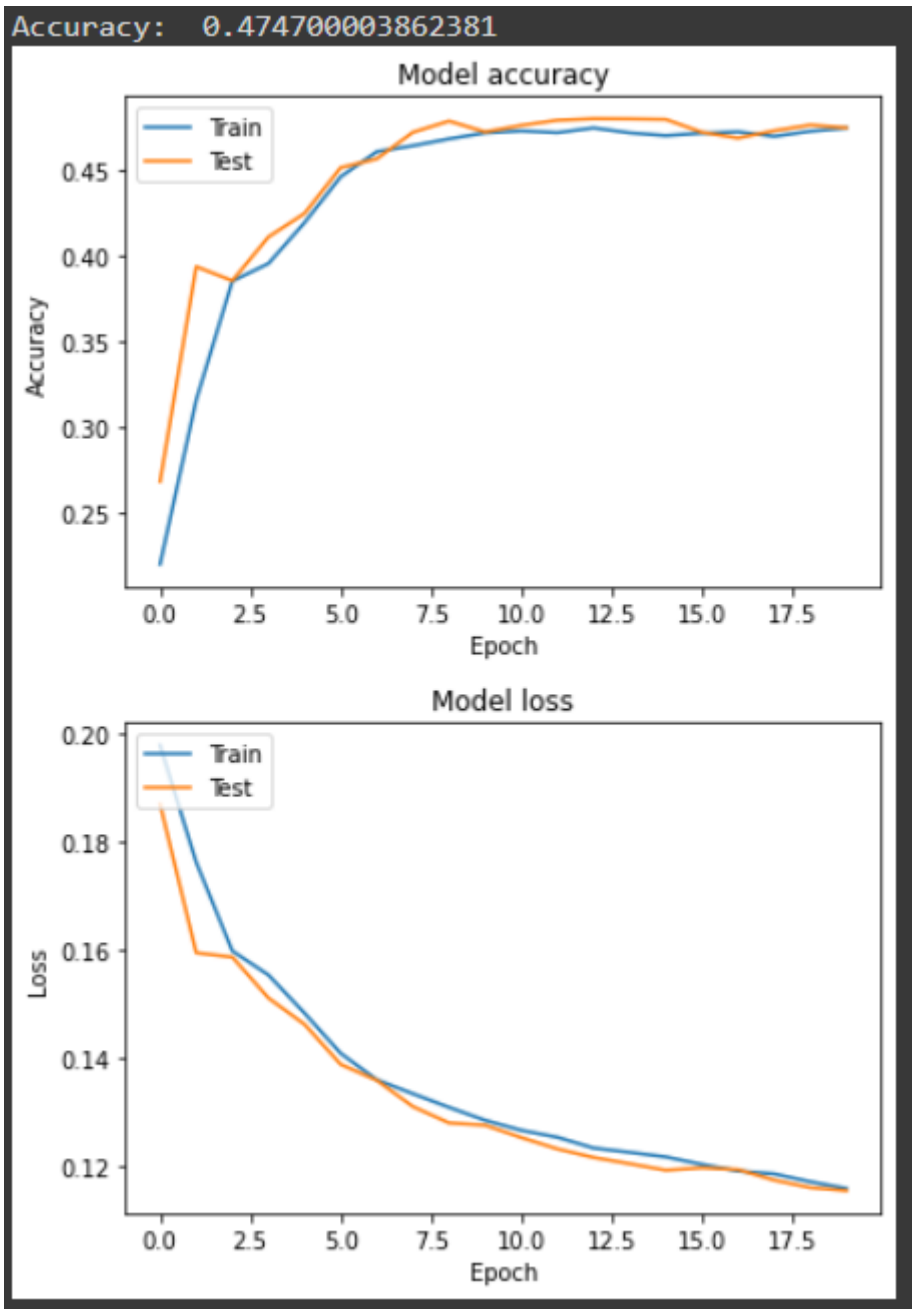
Часть 2


Layers: 2
Loss function: Standard deviation
Batch size: 32
Learn rate: -0.1 0 0.001 0.01 0.05 0.1 0.5 1 5
Regularization L1: -0.1 0 0.0001 0.0005 0.001 0.005 0.01 0.05 0.1
Regularization L2: -0.1 0 0.0001 0.0005 0.001 0.005 0.01 0.05 0.1
Output layer activation type: softmax
Epoch count: 20
Neurons per layer: 20
Layer 1 activation type: relu
Layer 2 activation type: relu
Layer 3 activation type: relu
Layer 4 activation type: relu

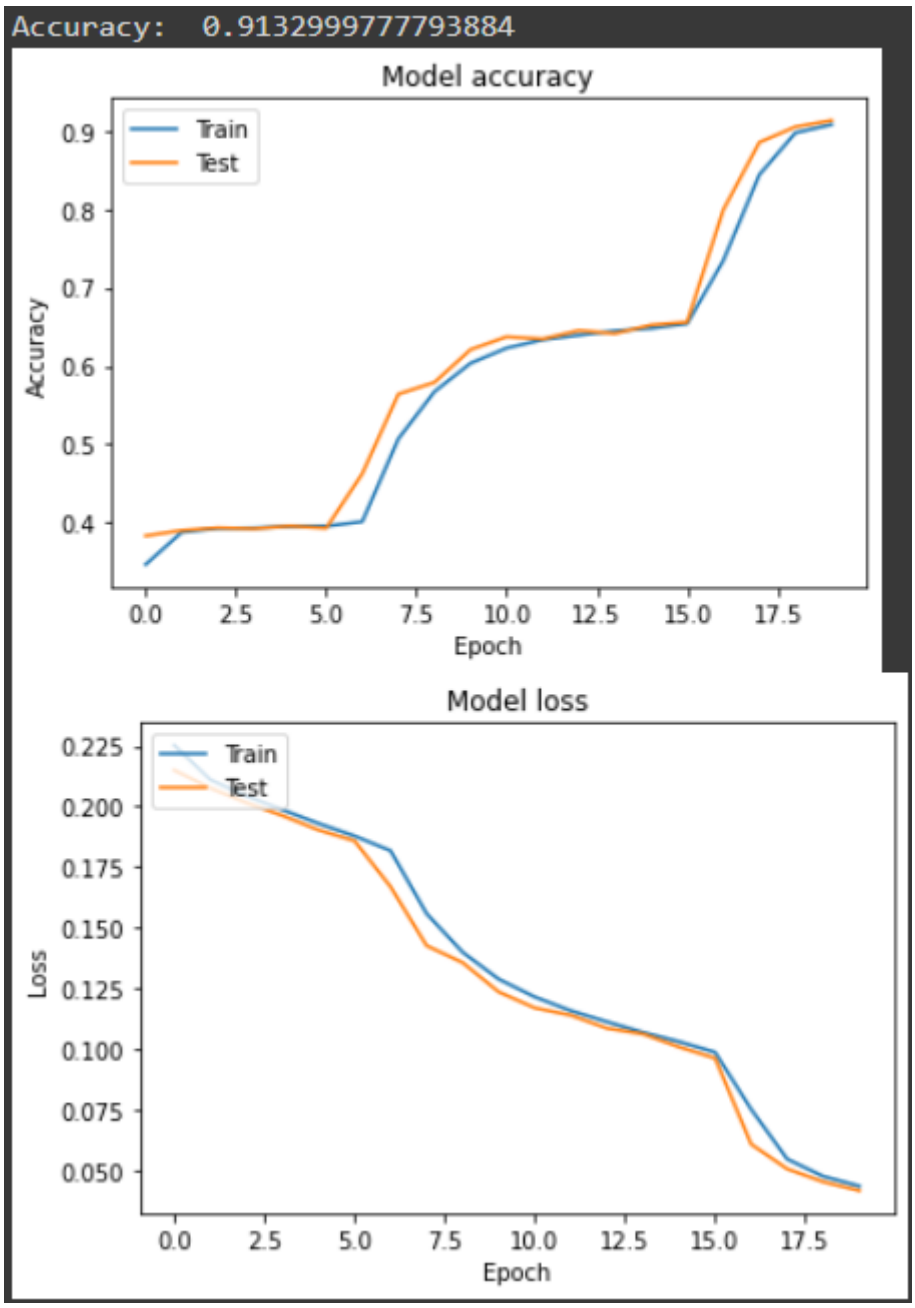


Зависимость от Layer count:

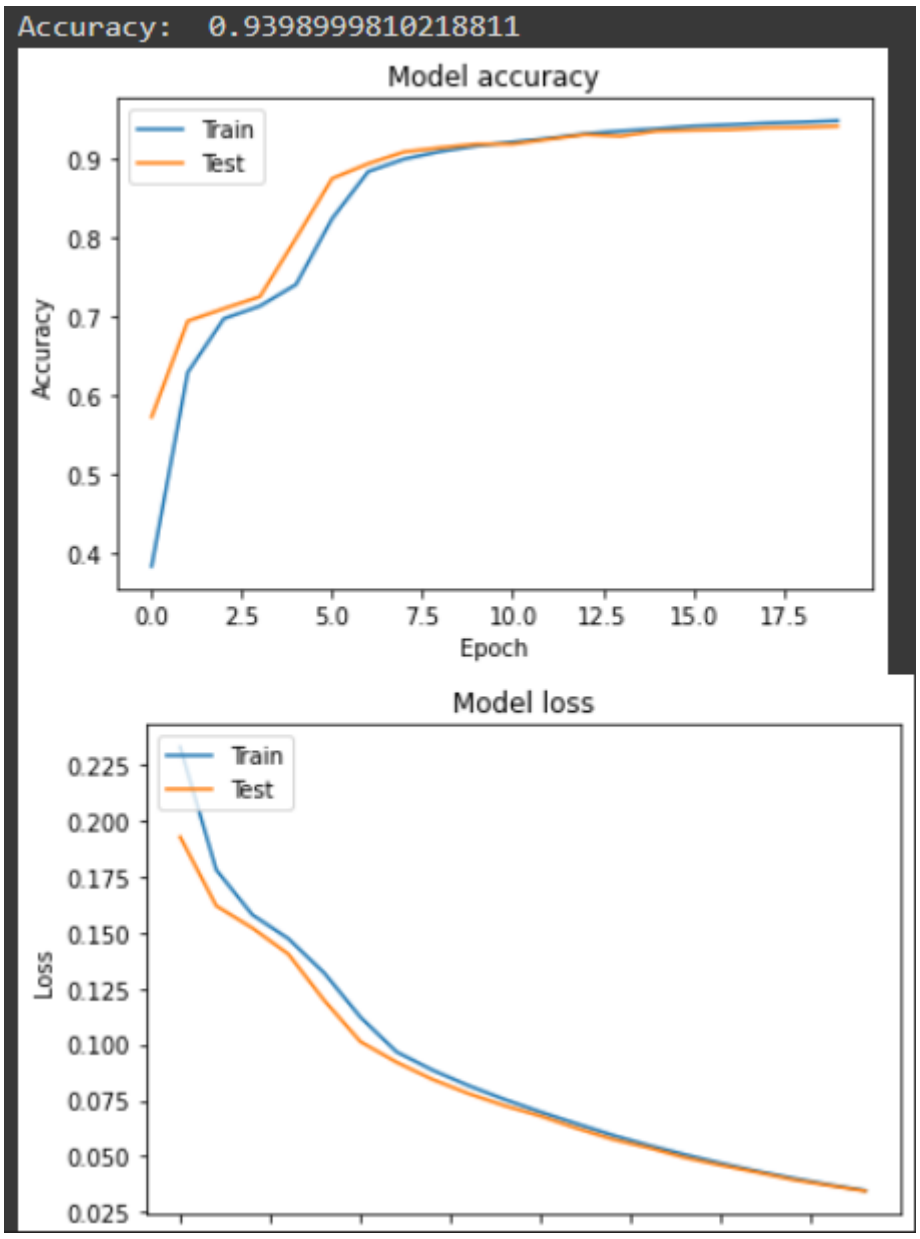
Layer count = 0:



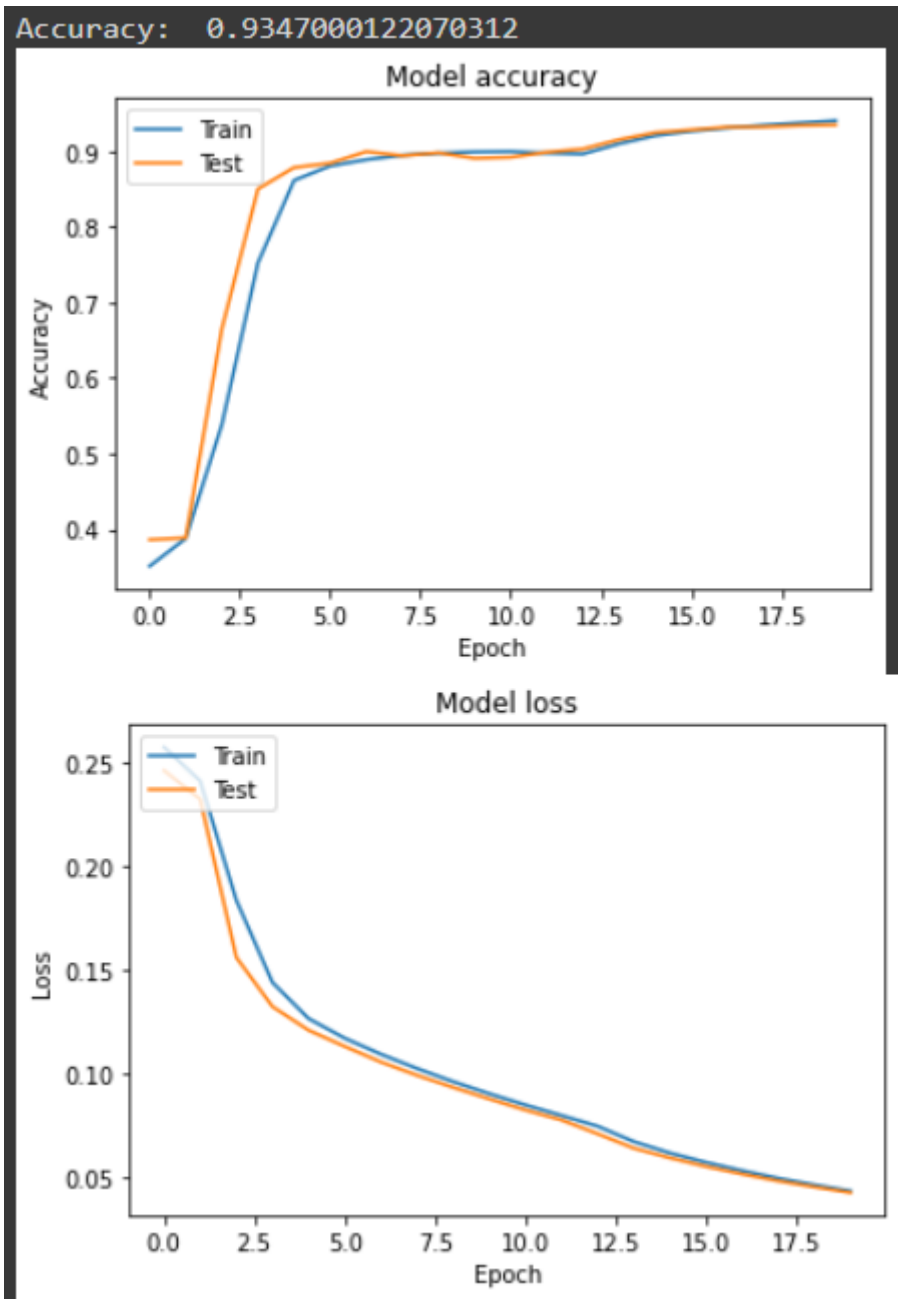
Layer count = 1:



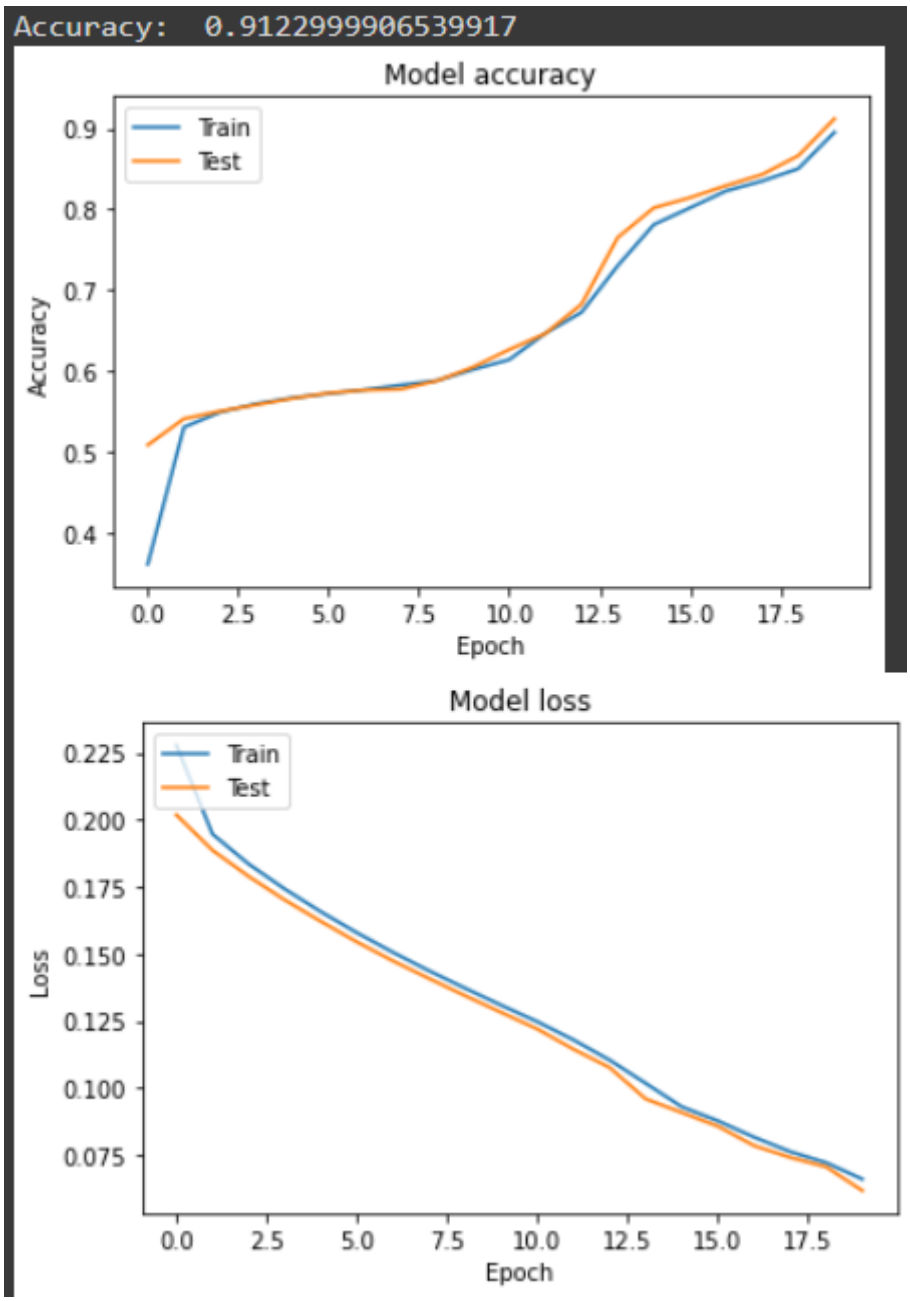
Layer count = 2:



Layer count = 3:

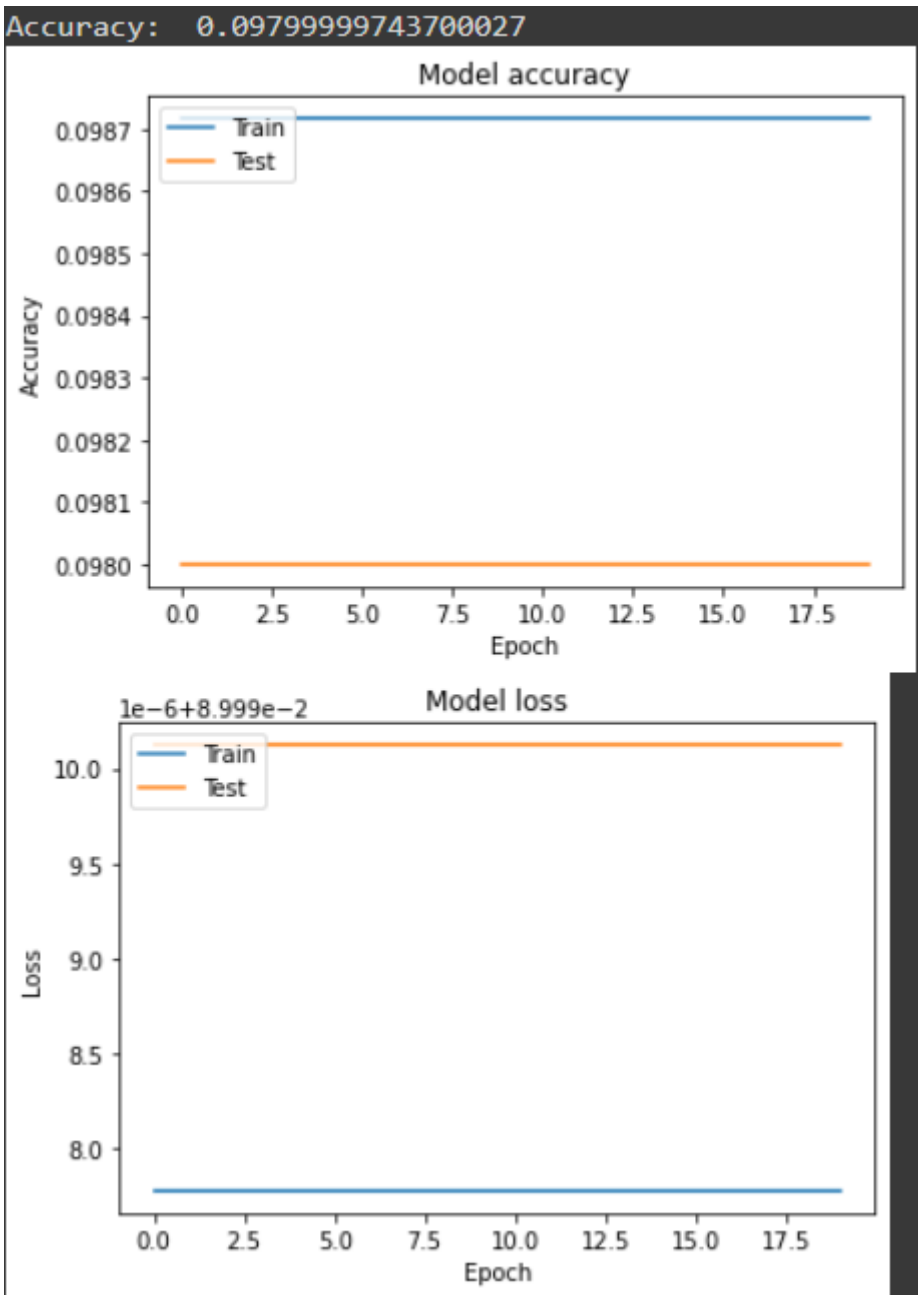


Layer count = 4:

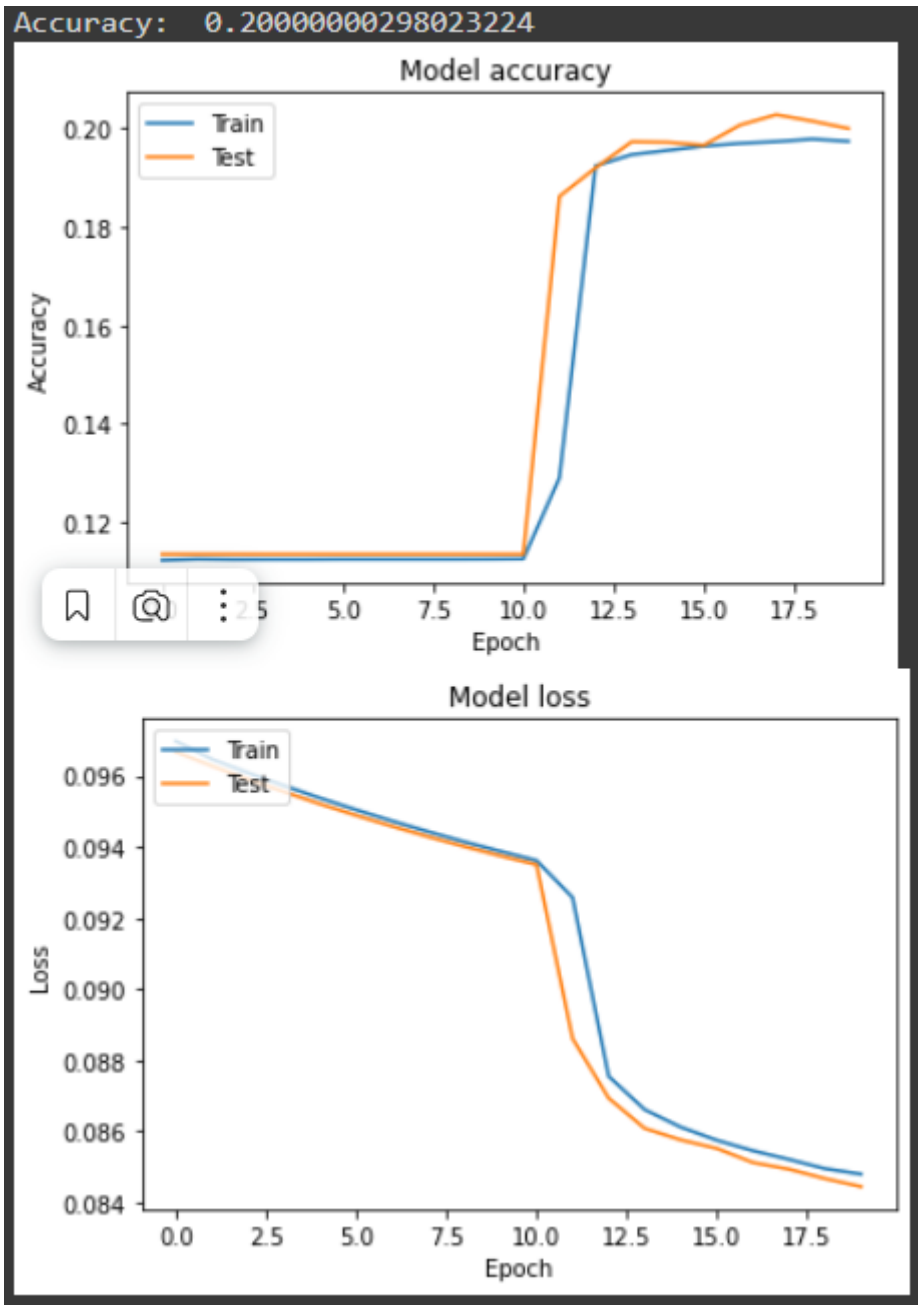


Зависимость от neurons count per:

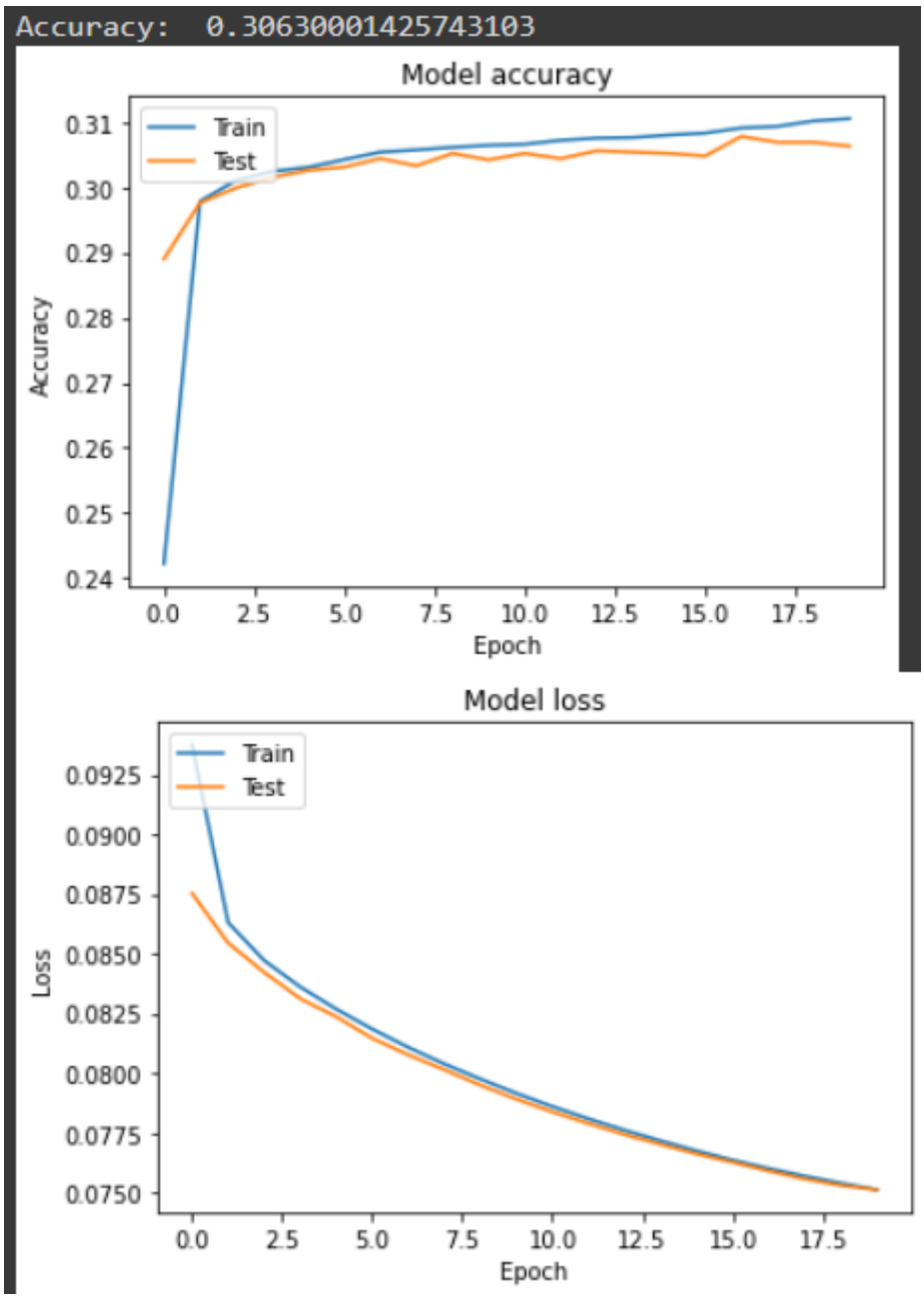
neurons count per = 0:



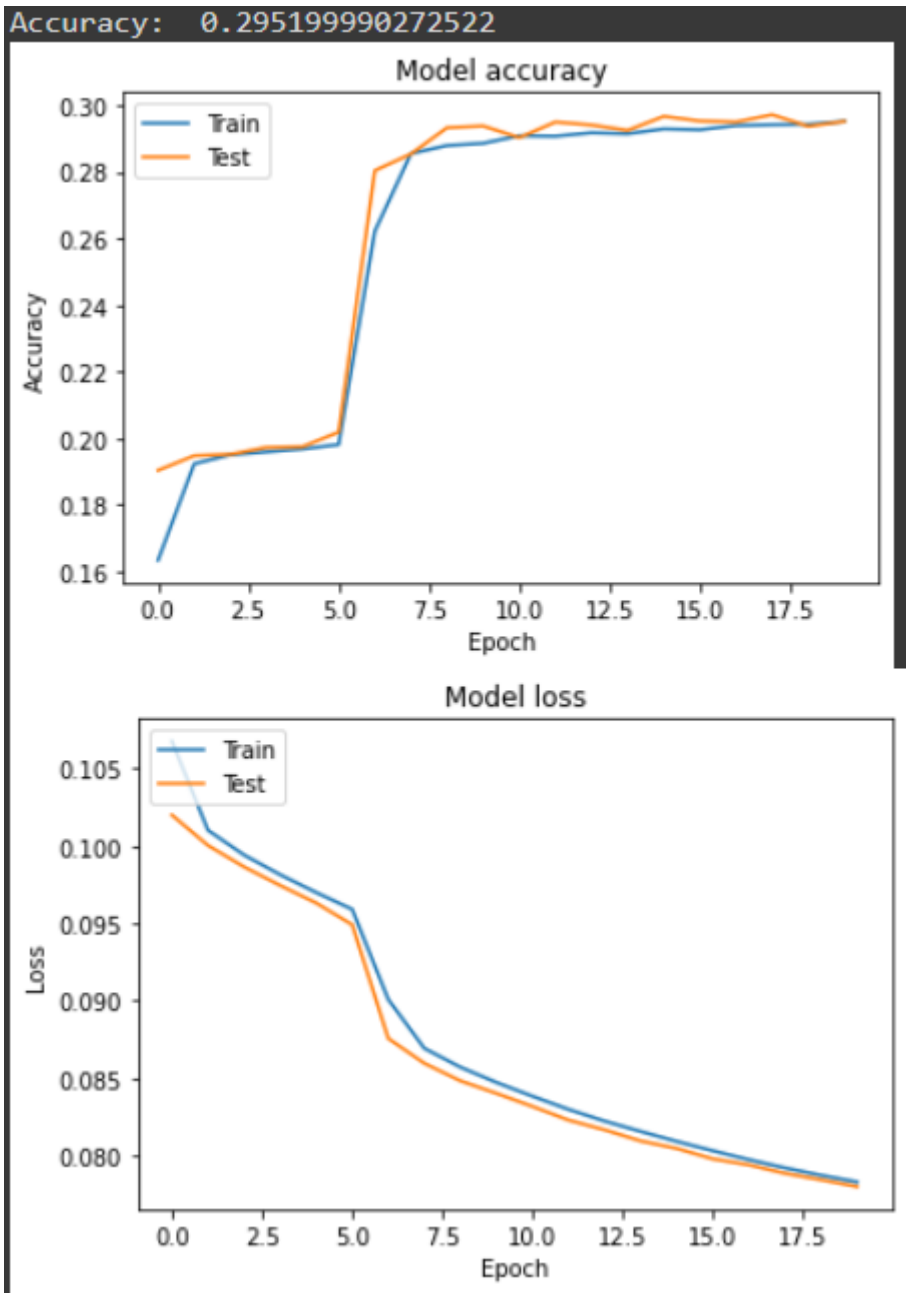
neurons count per = 1:



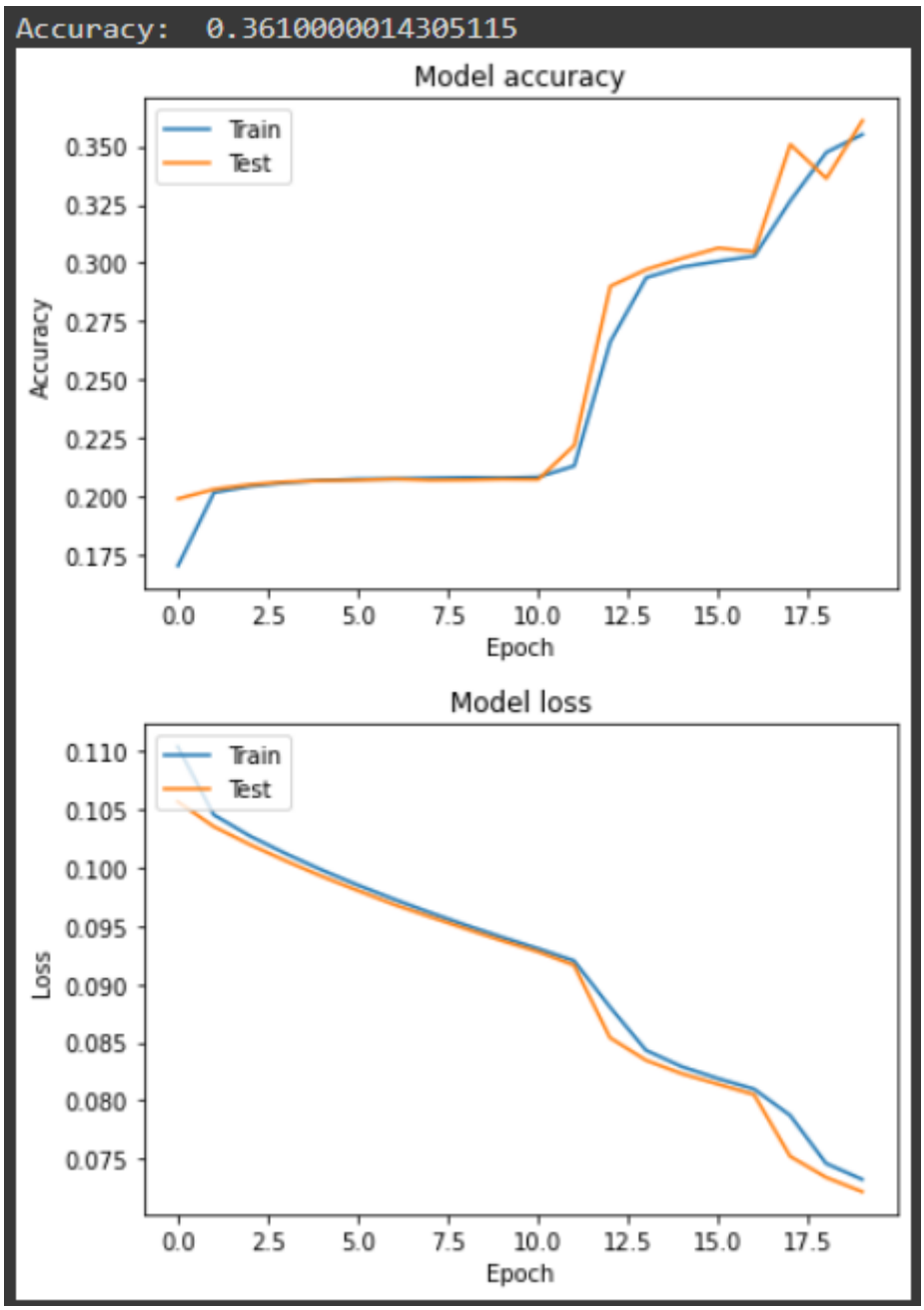
neurons count per = 2:



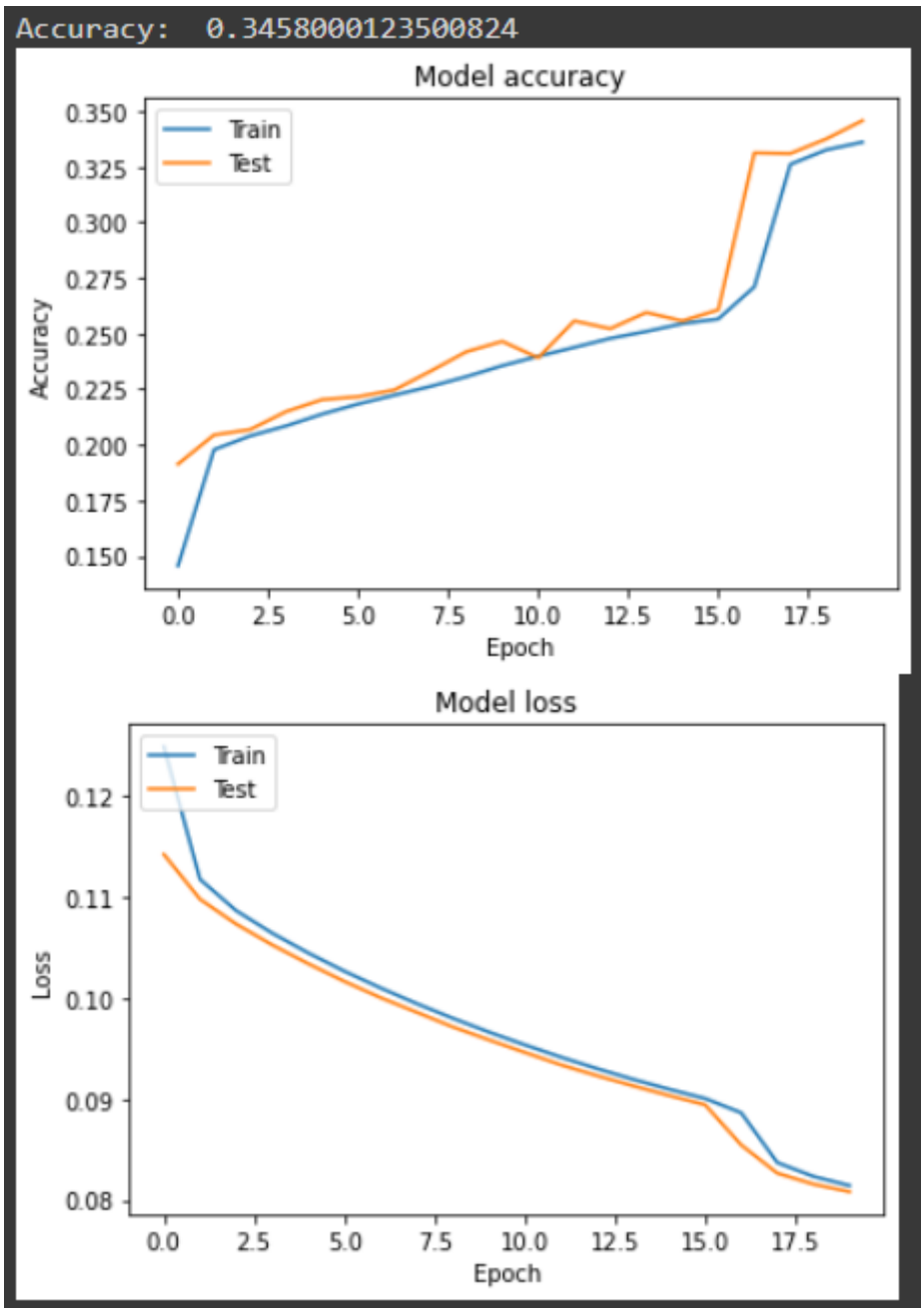
neurons count per = 3:



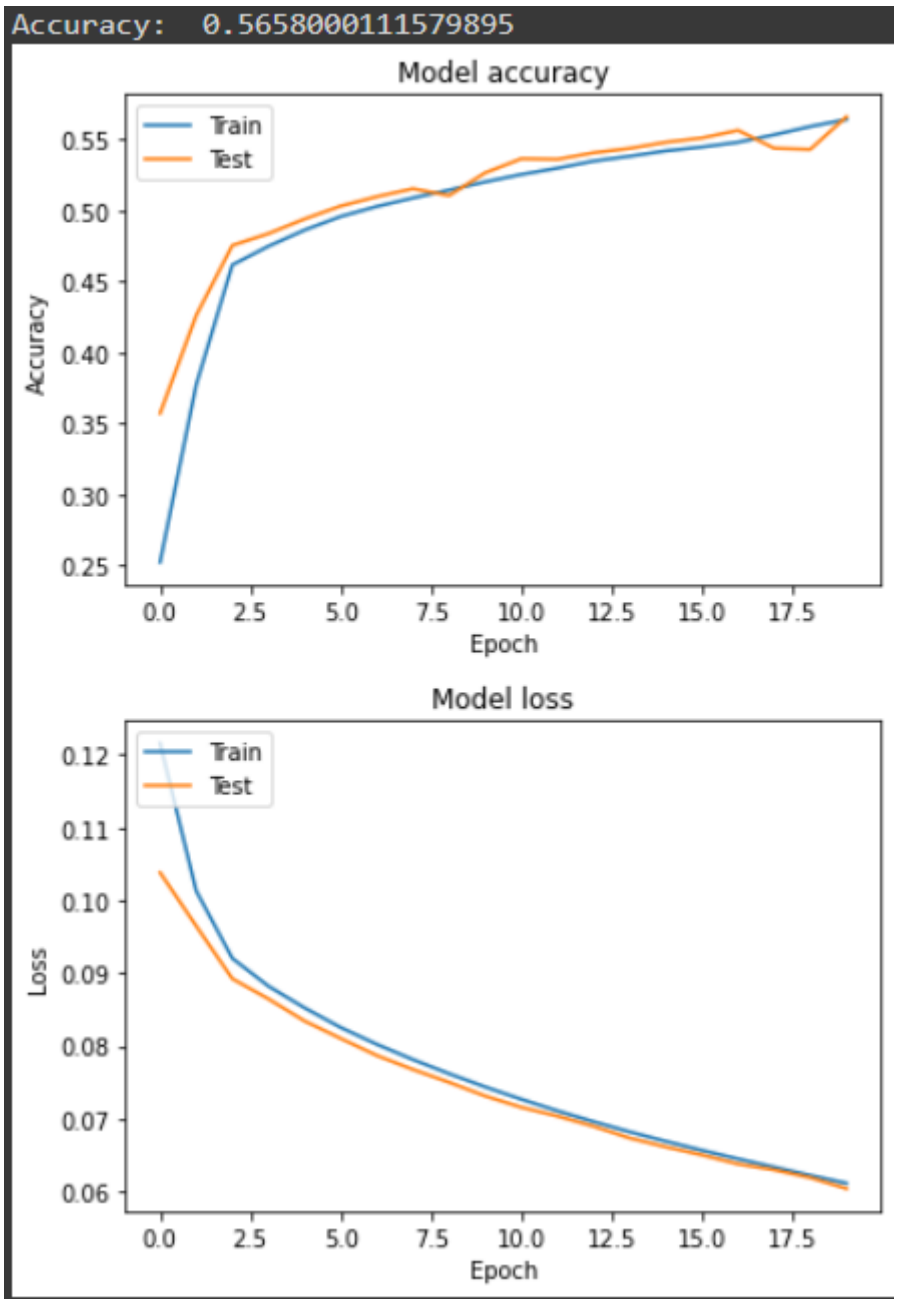
neurons count per = 4:



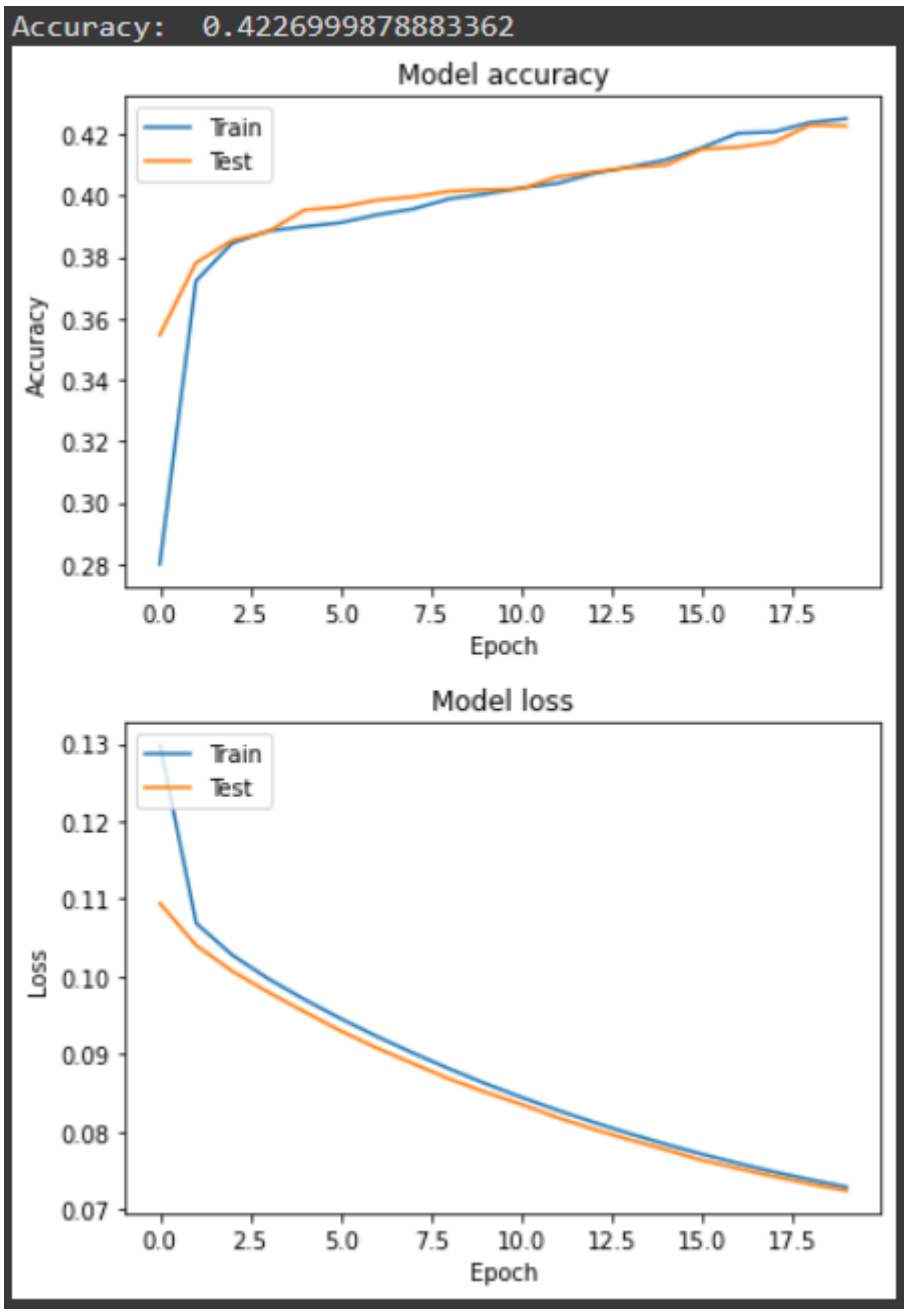
neurons count per = 5:



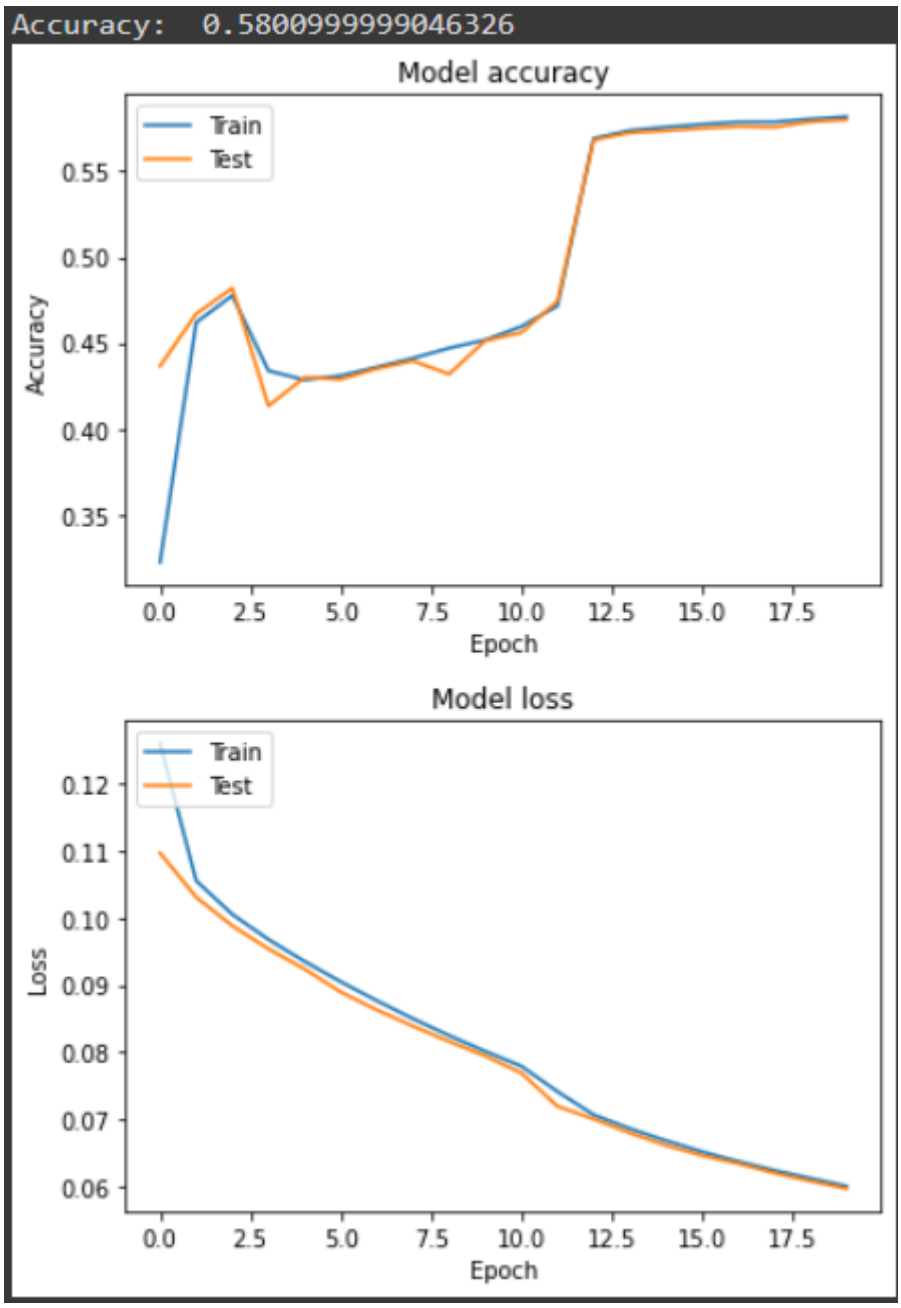
neurons count per = 6:



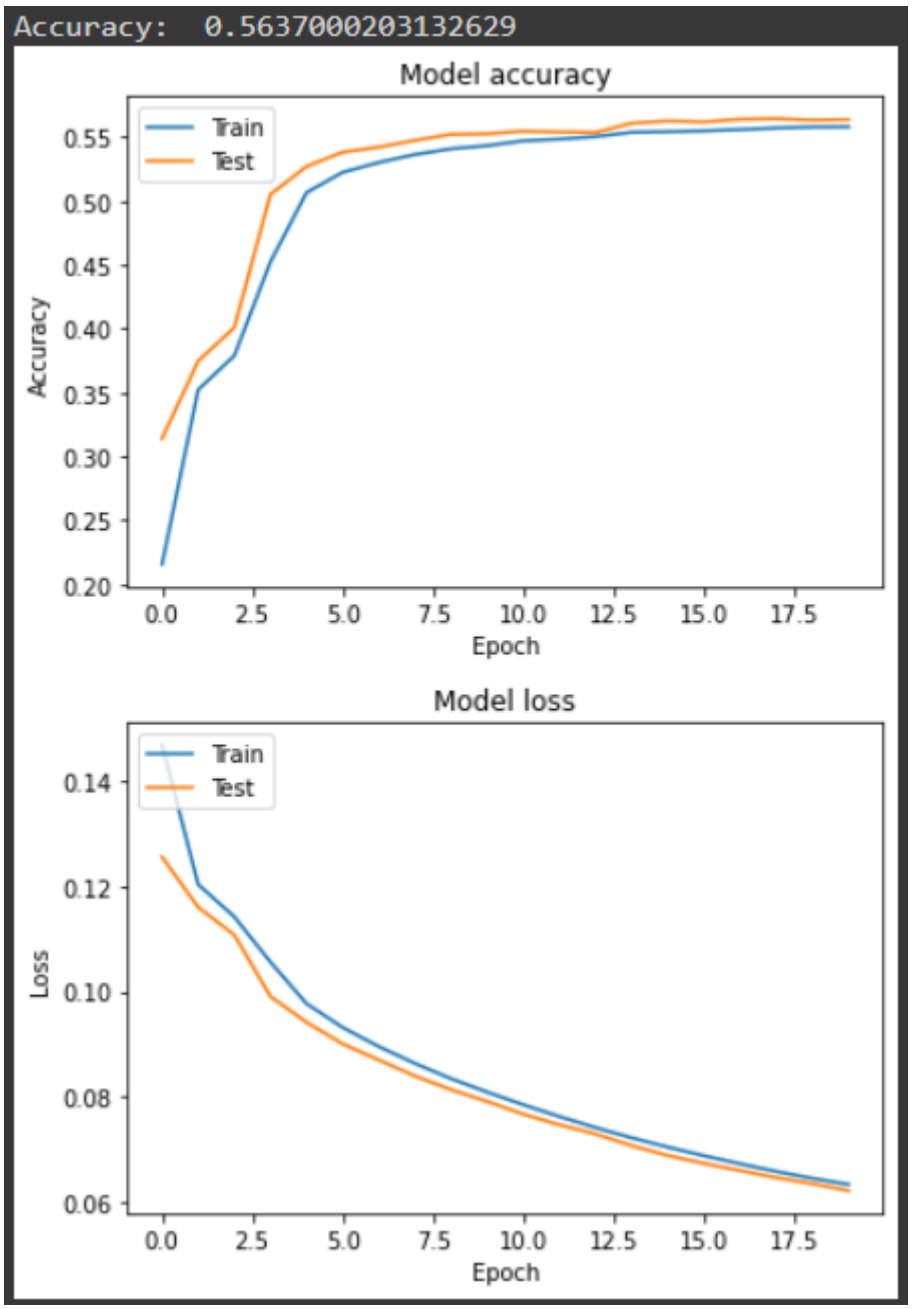
neurons count per = 7:



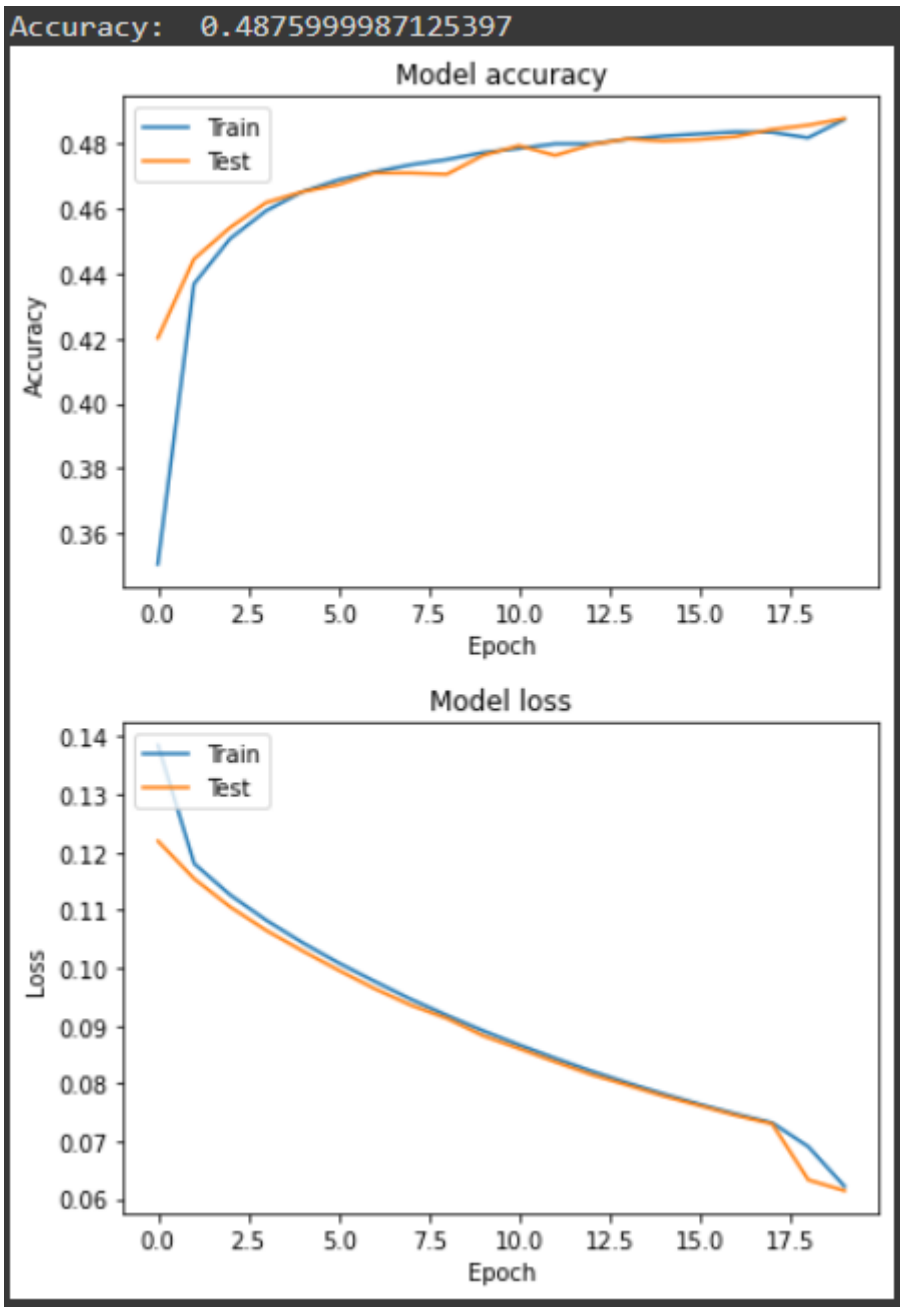
neurons count per = 8:



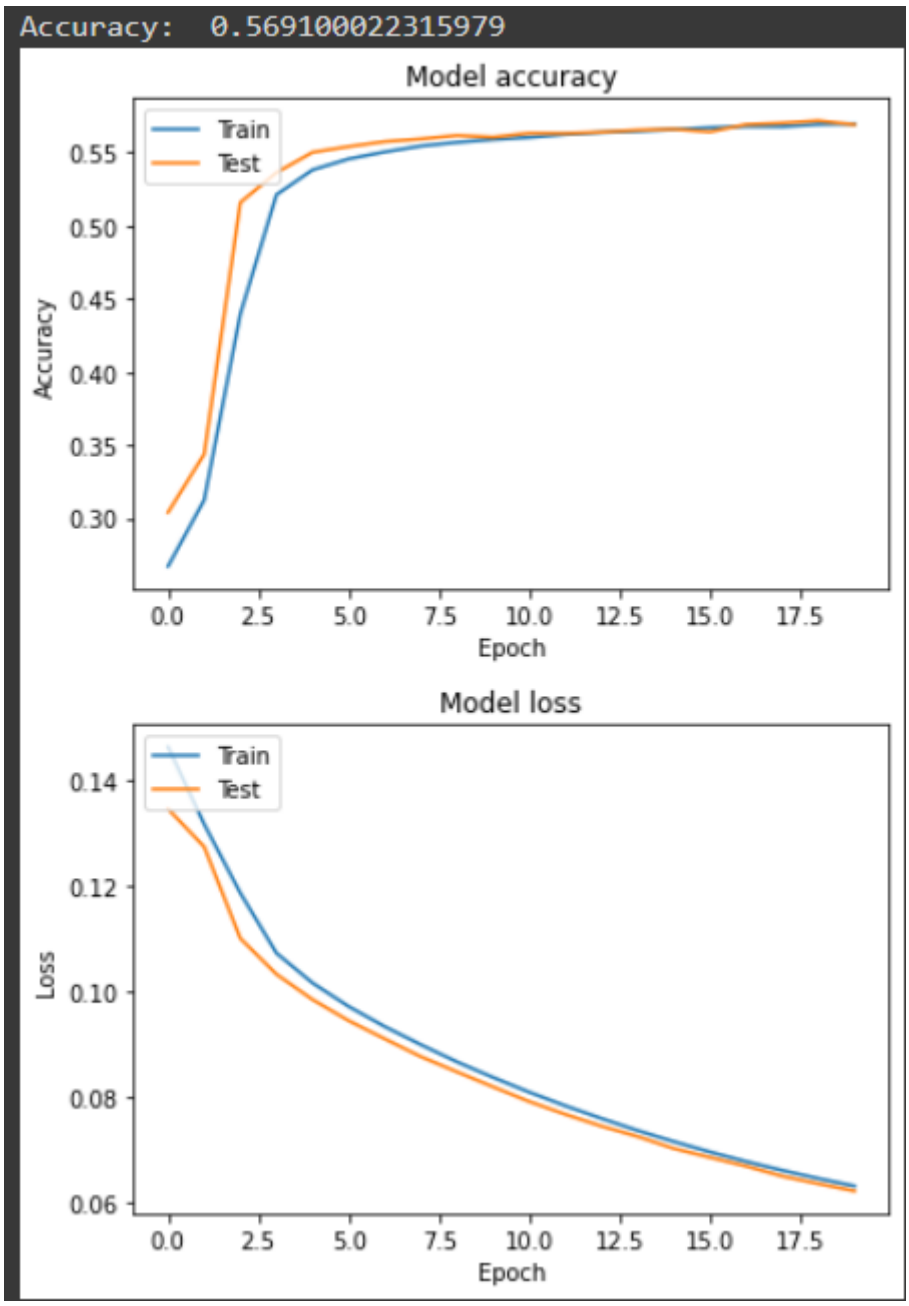
neurons count per = 9:



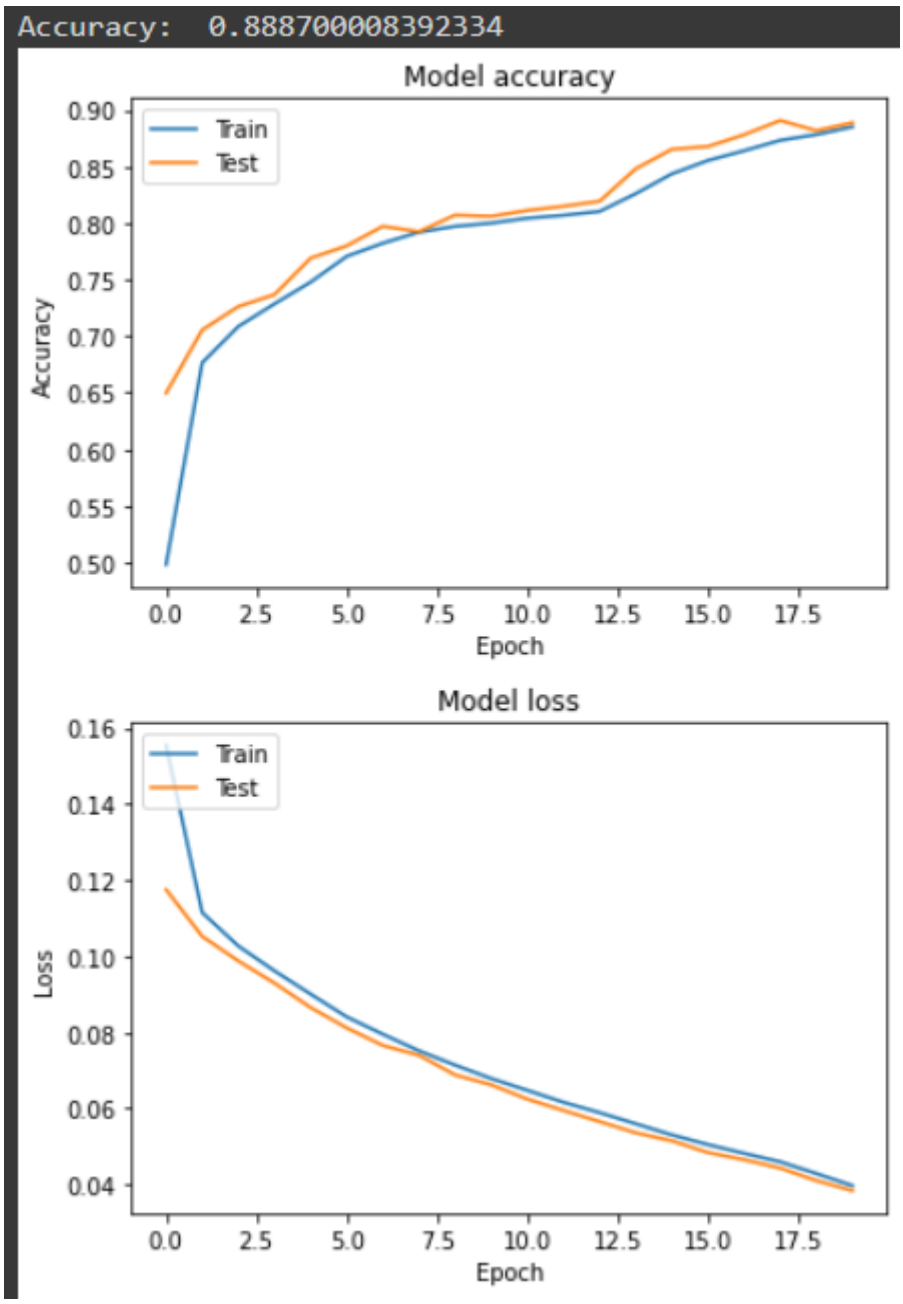
neurons count per = 10:



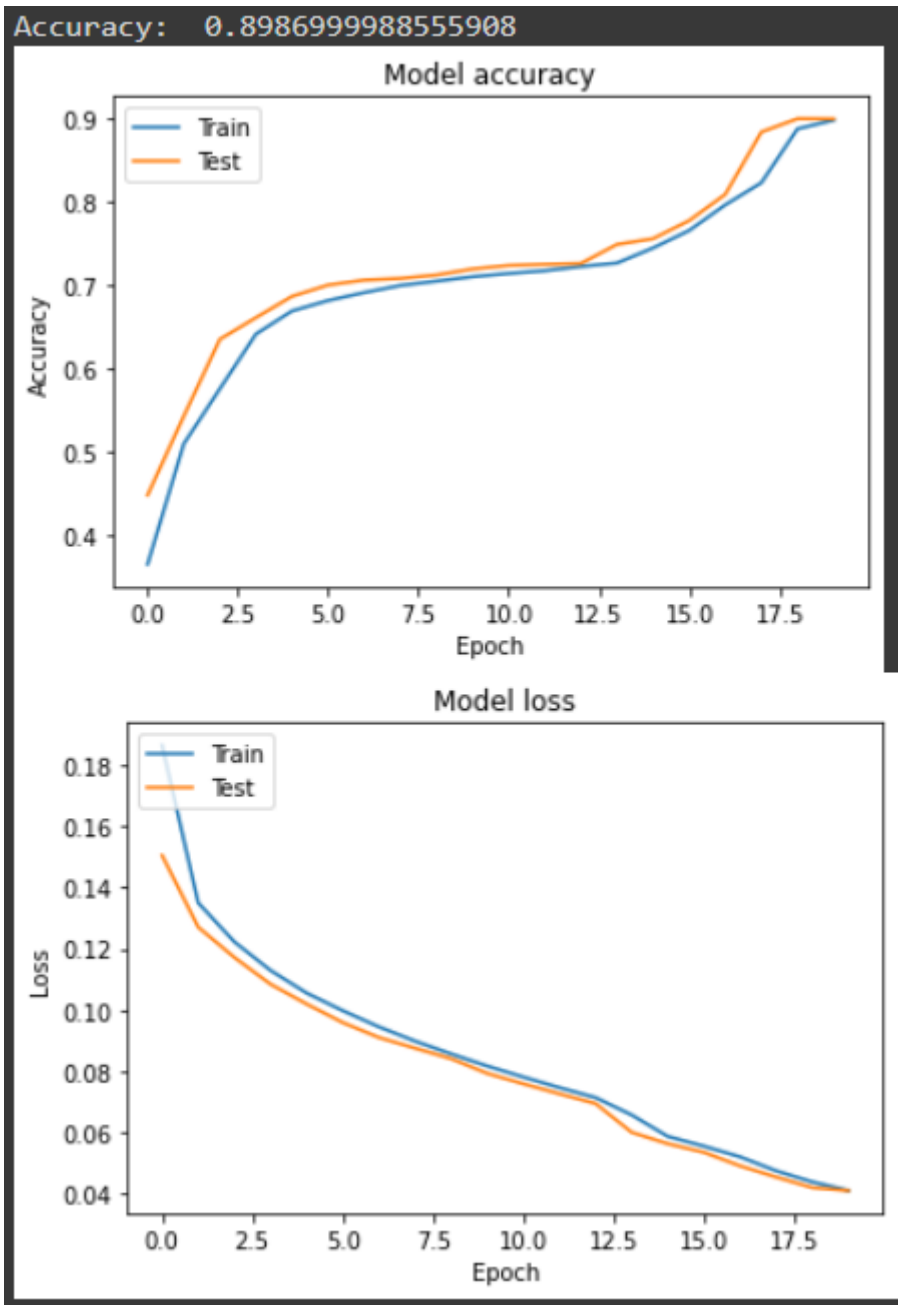
neurons count per = 11:



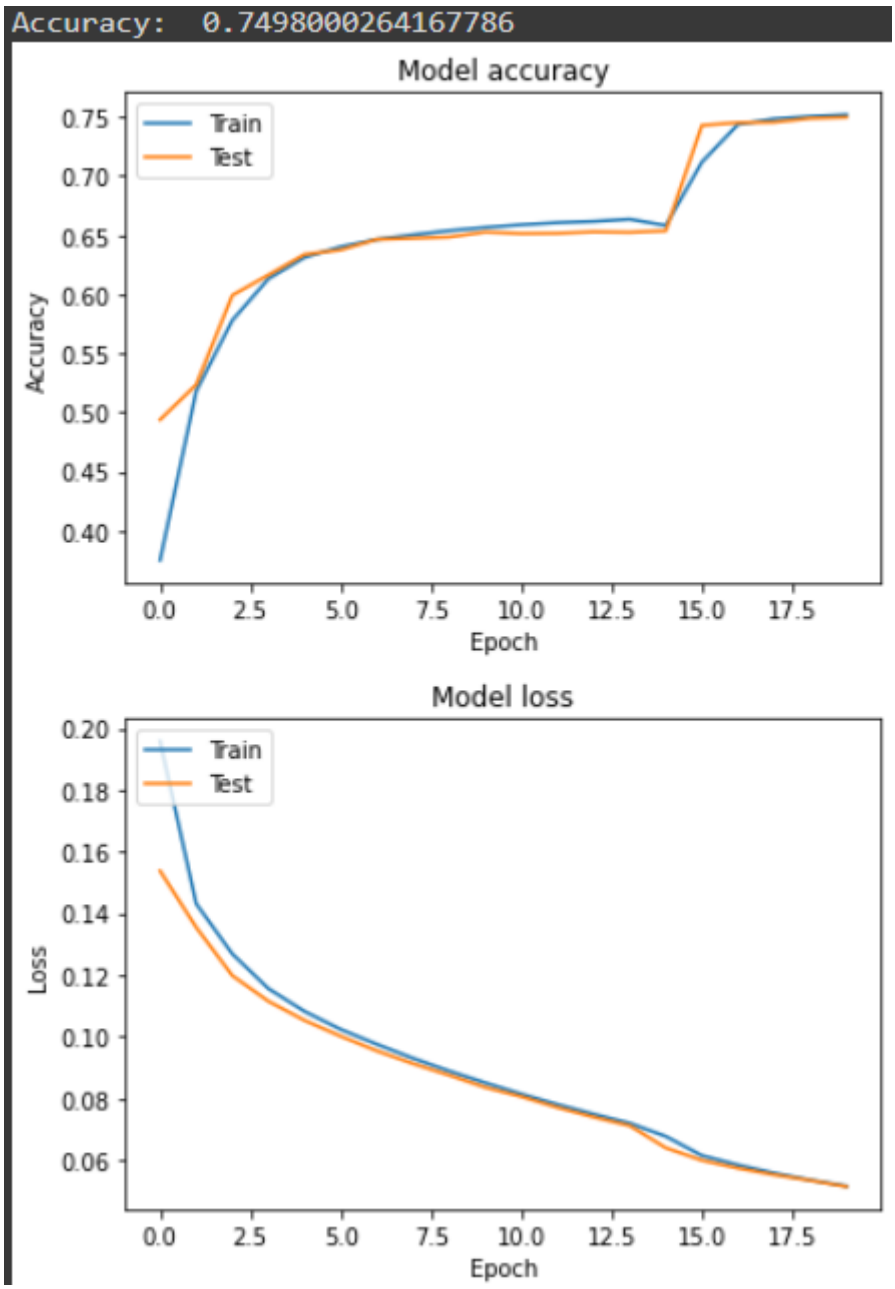
neurons count per = 12:



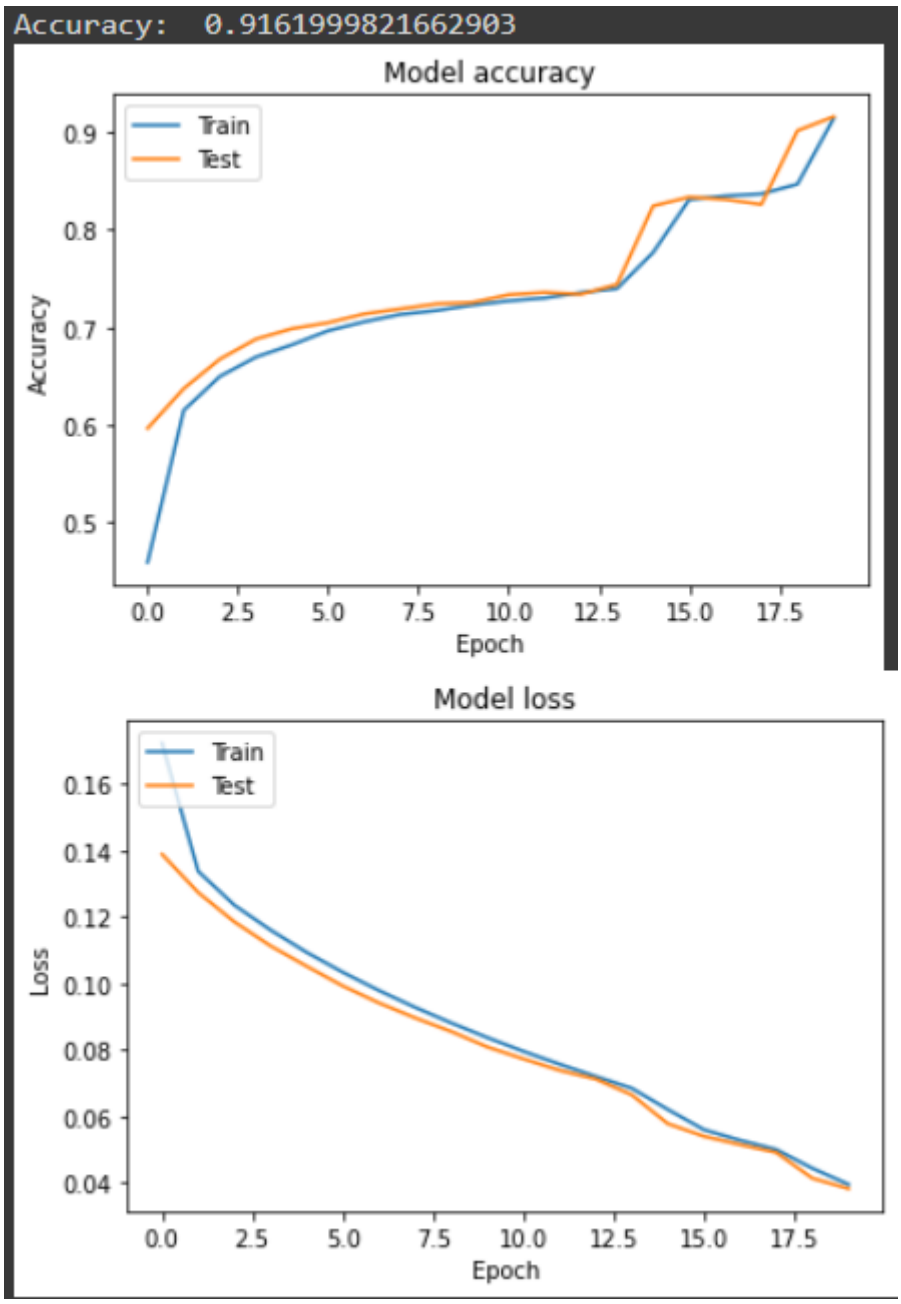
neurons count per = 13:



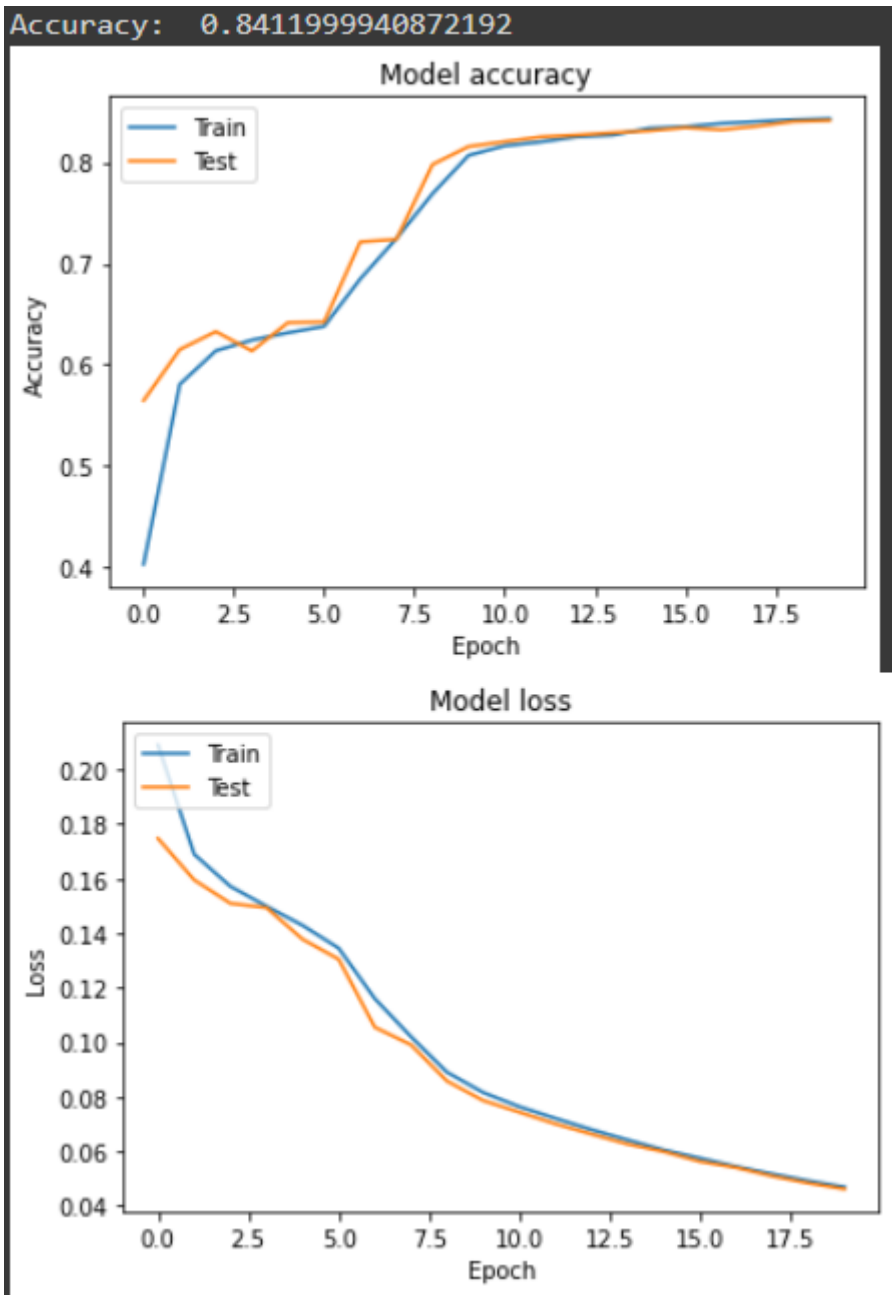
neurons count per = 14:



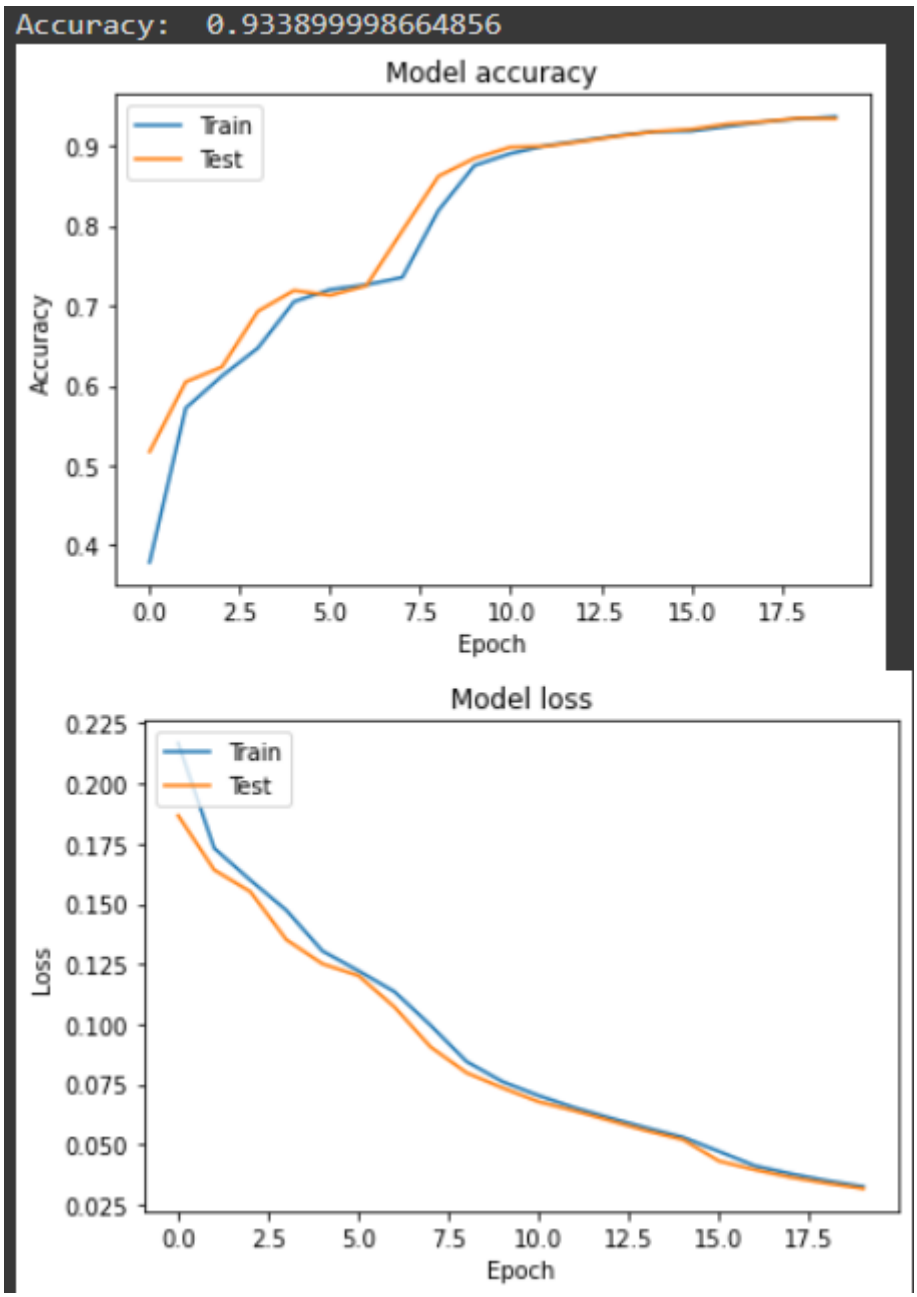
neurons count per = 15:



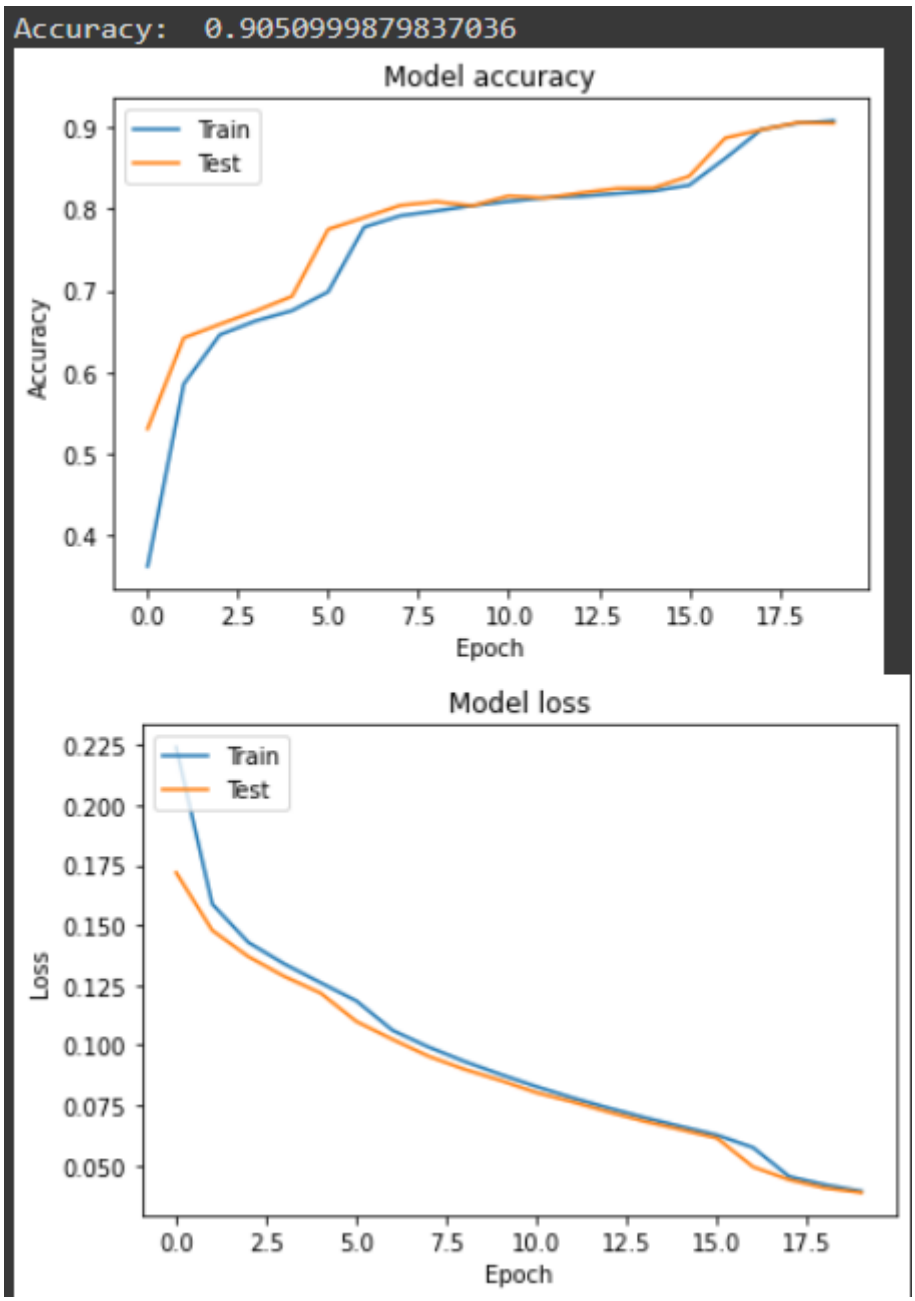
neurons count per = 16:



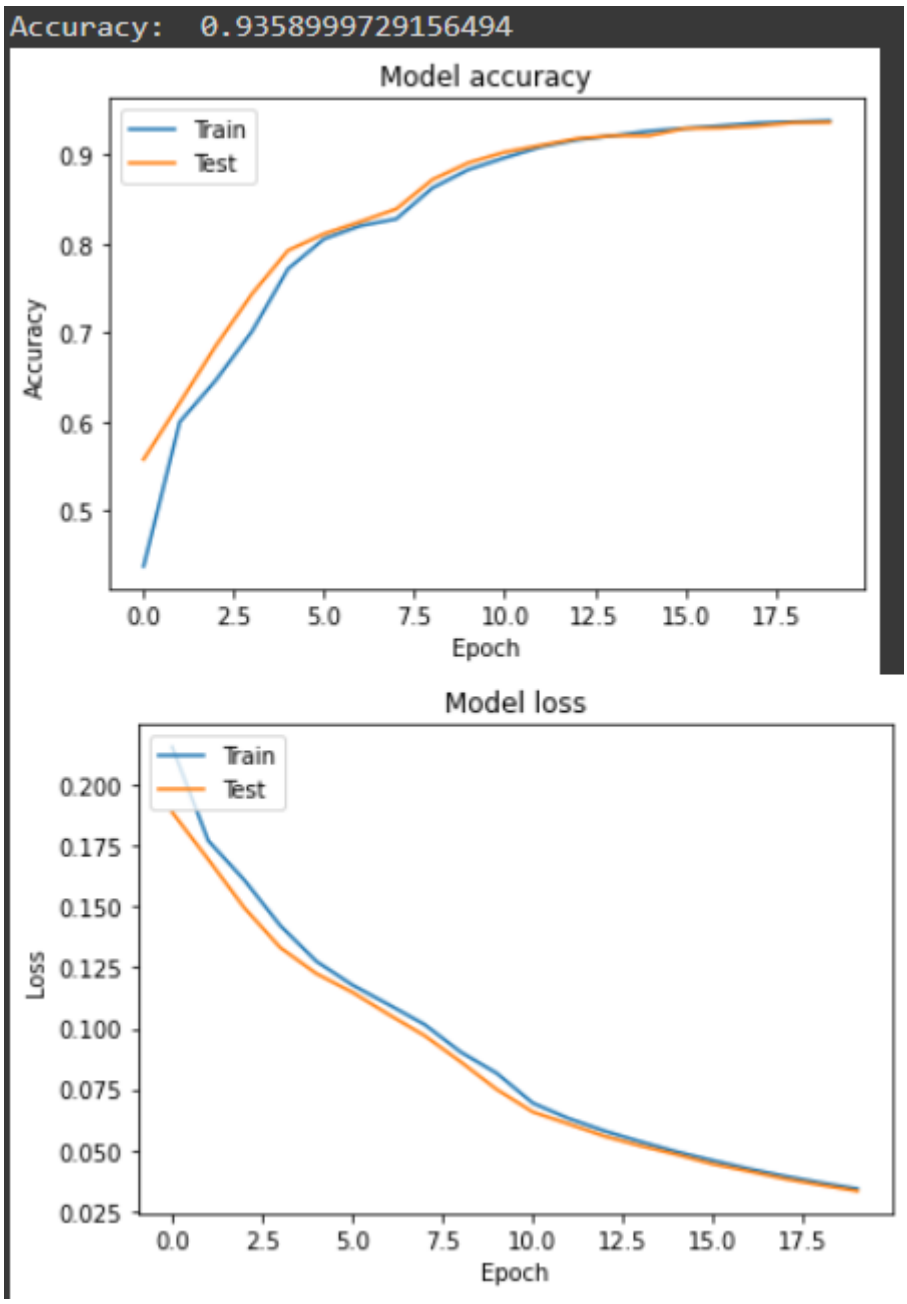
neurons count per = 17:



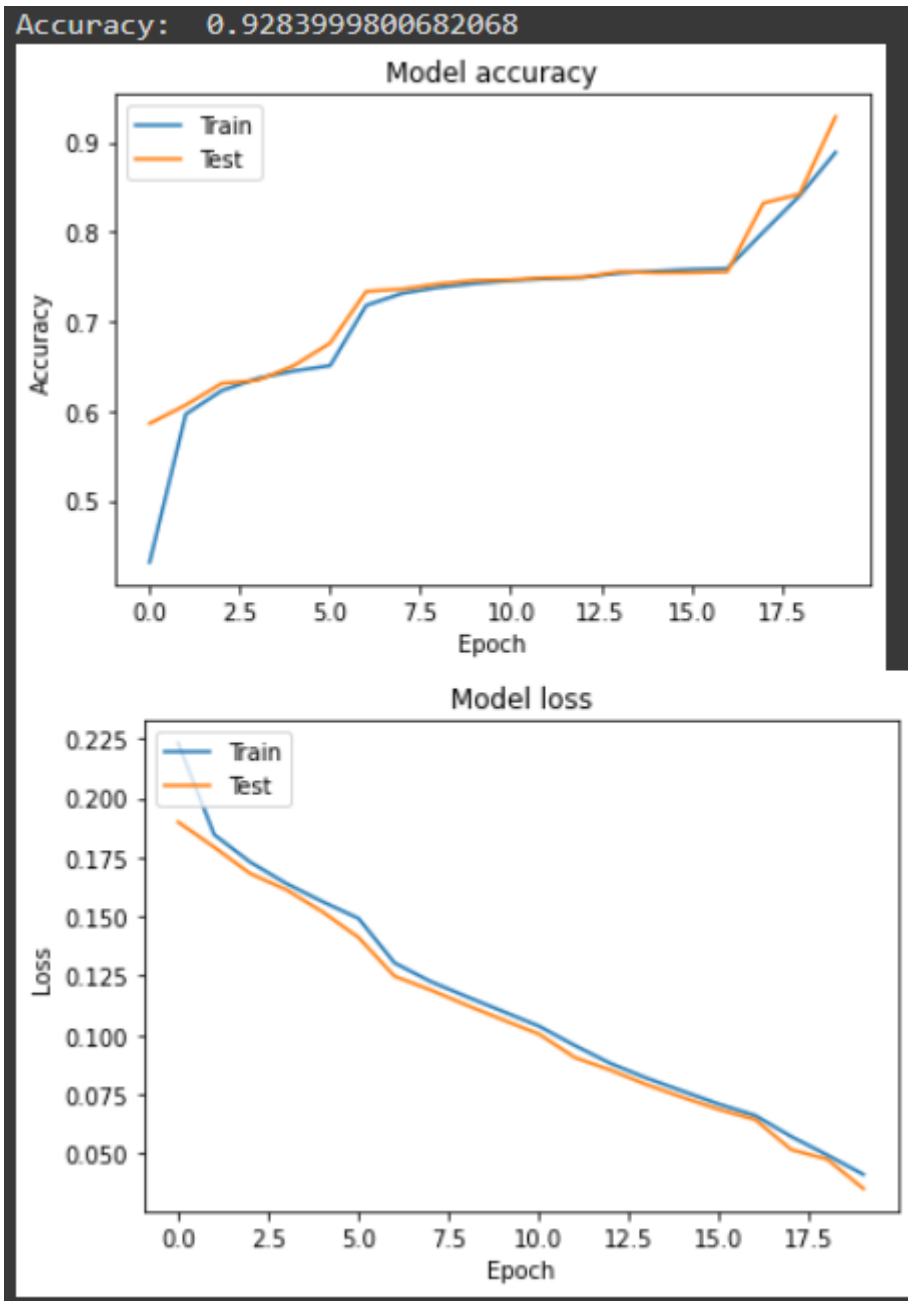
neurons count per = 18:



neurons count per = 19:



neurons count per = 20:



Вывод

В ходе данной лабораторной работы я познакомился с обычными нейронными сетями, посмотрел, как влияют различные параметры и функции (Learn rate, Regularization L1 и L2, Output layer activation type, Layer activation type, Loss function type, Epoch count и в особенности Layer count и Neurons count per layer) на результаты достоверности.