ИТМО

Лабораторная работа №4

по дисциплине: Системы искусственного интеллекта

Вариант: 3 (15 mod 4)

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Санкт-Петербург, 2022

Задание

Var	Part1 func	Part2 data	Hyperparameters
3	Absolute(Sin(x)) X: -6,3..6,3 Y: 0..1,2	Handwritten digits	Regularization L2, output layer activation type

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
- layer activation type
- 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

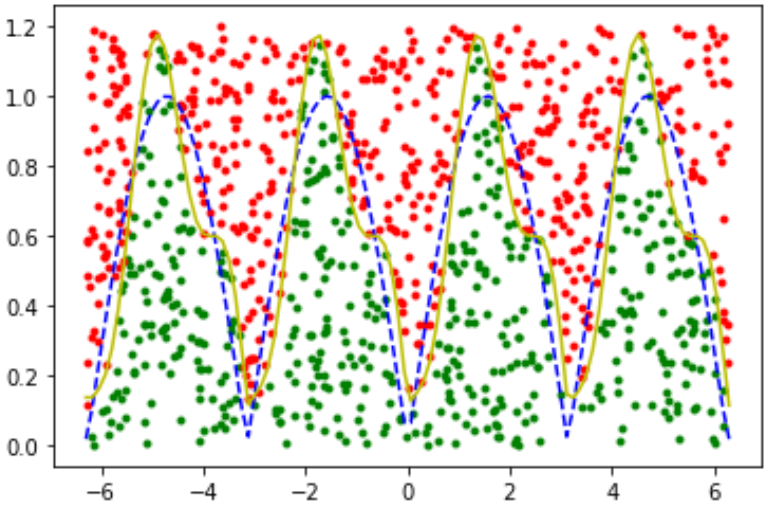
Part 1 (Часть 1)

Исходная функция с шумами:

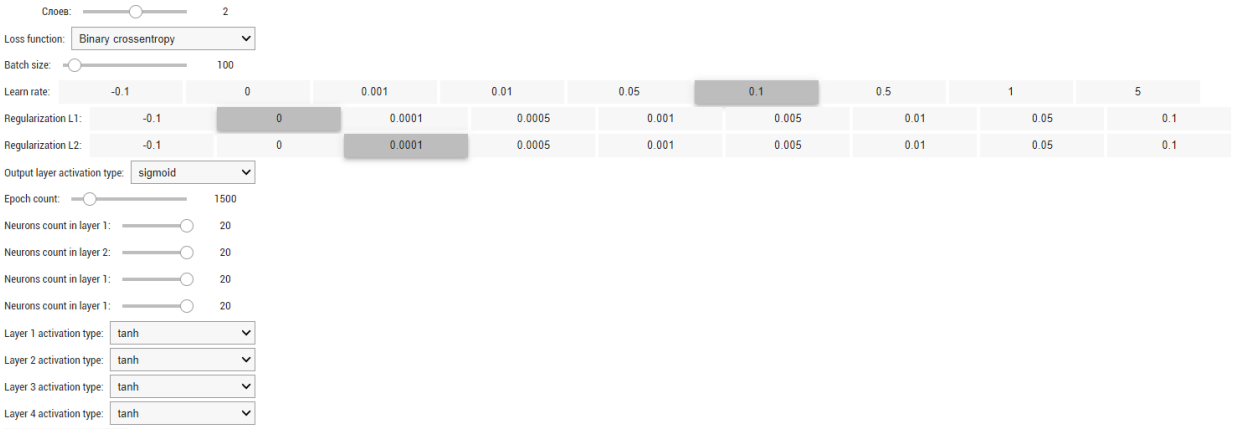
```
# Your variant function
def main_func(x):
    return abs(np.sin(x))
def main_func_noisy(x):
    return main_func(x) + np.cos(4*x + 1) / 5

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

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



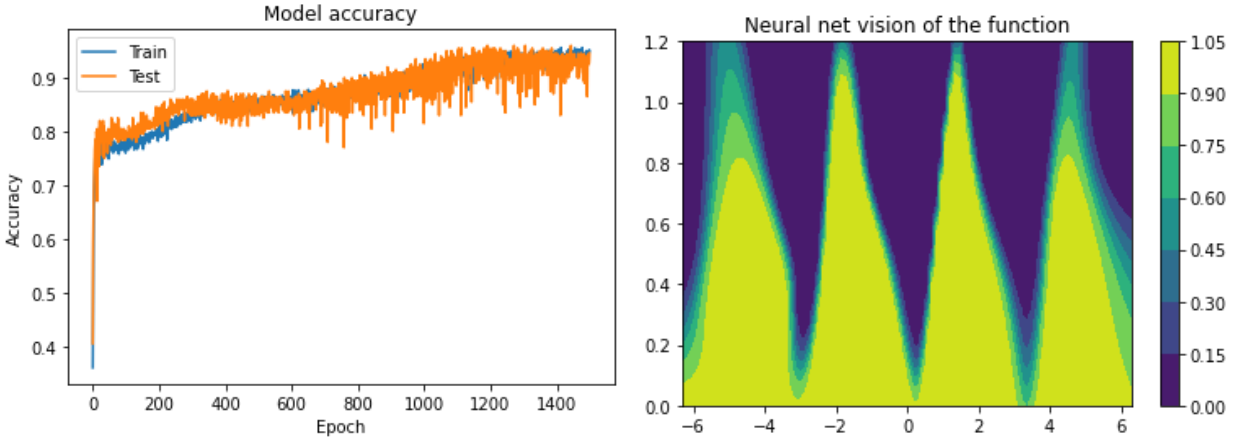
Наибольшей достоверности удалось достичь при следующих параметрах:

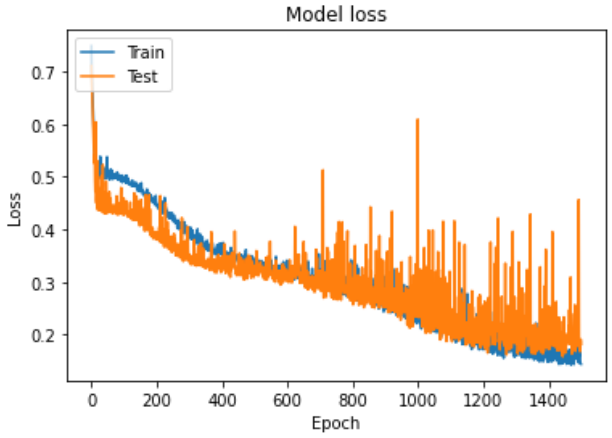


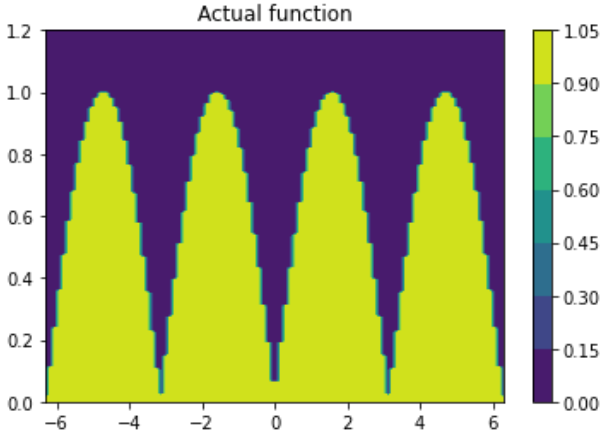
Максимальный результат Accuracy, которого удалось достичь:

```
Accuracy:  0.9449999928474426
```

Графики:

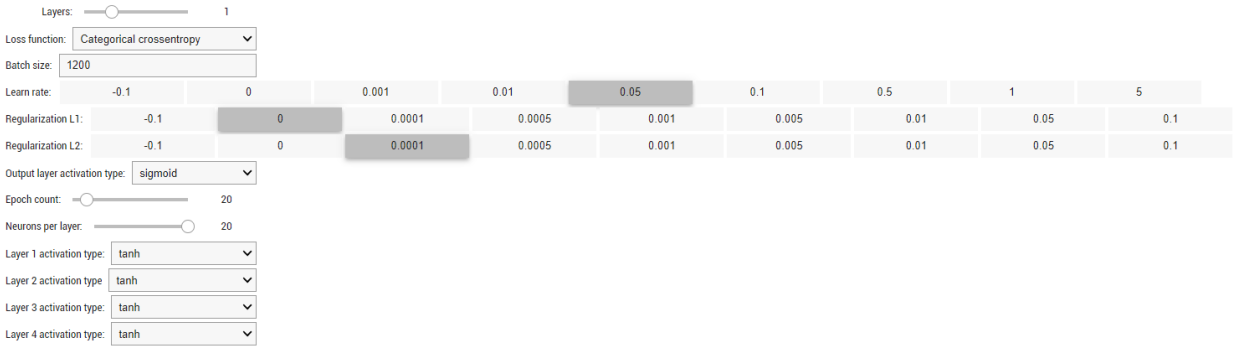




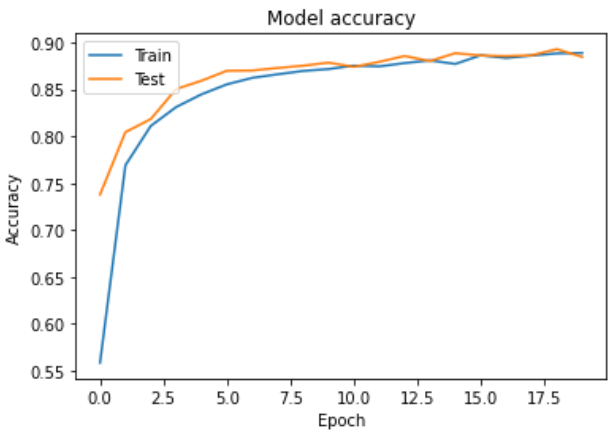


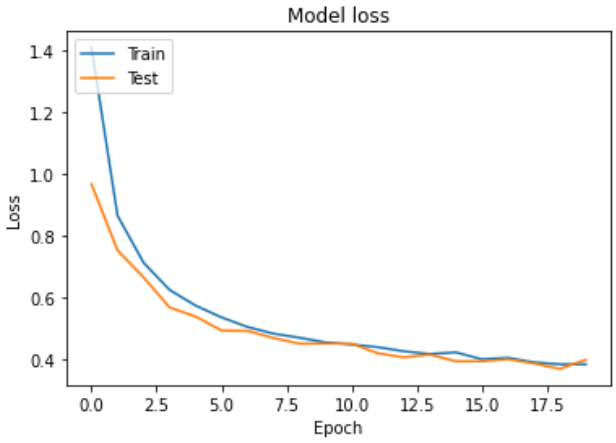
Part 2 (Часть 2)

Параметры, при которых удалось достичь максимальной полноты:



Максимальная достоверность (accuracy): 0.9008

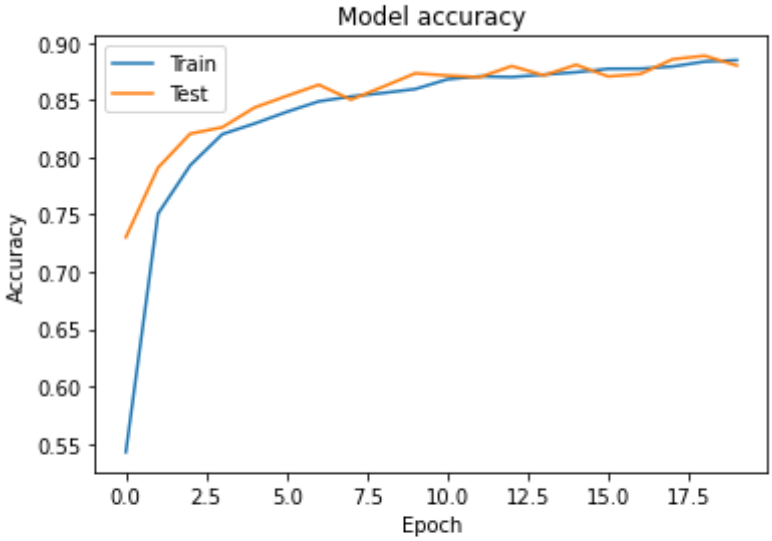


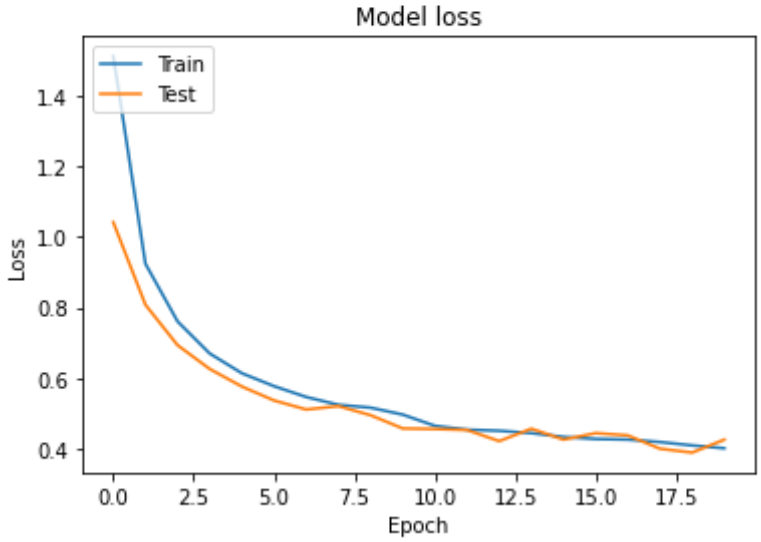


Зависимость accuracy от output layer activation type

softmax

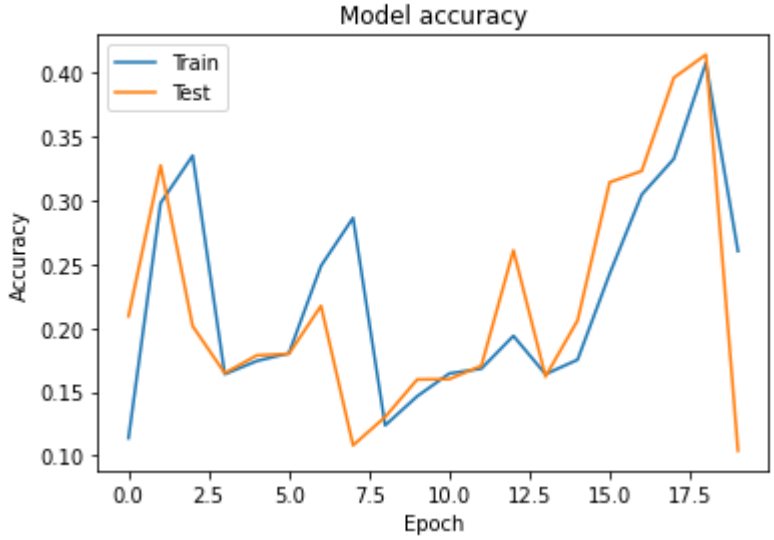
```
Accuracy:  0.8799999952316284
```

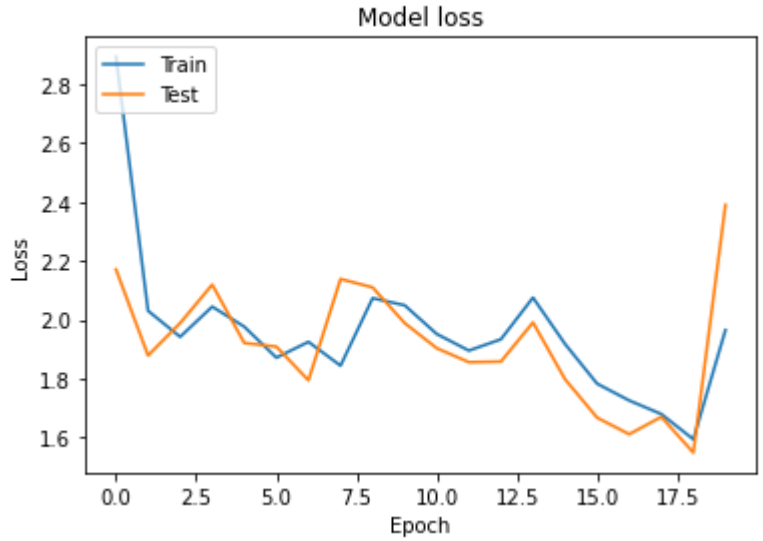




relu

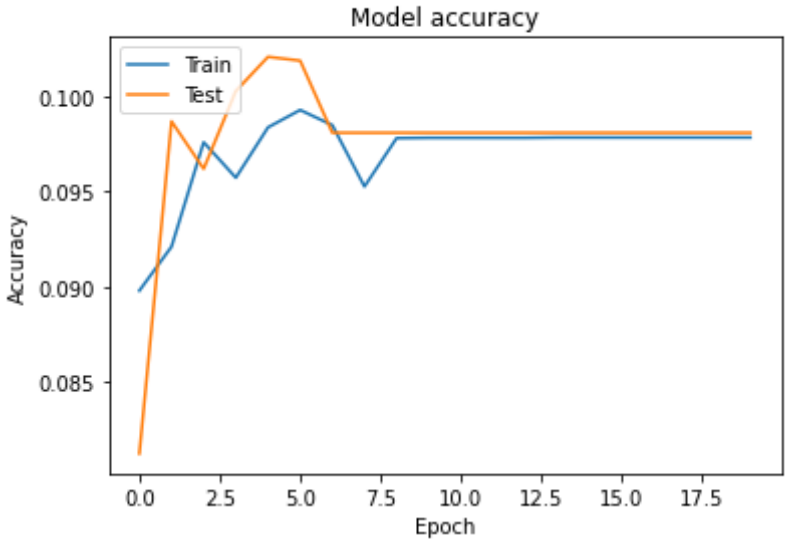
```
Accuracy:  0.1039000004529953
```

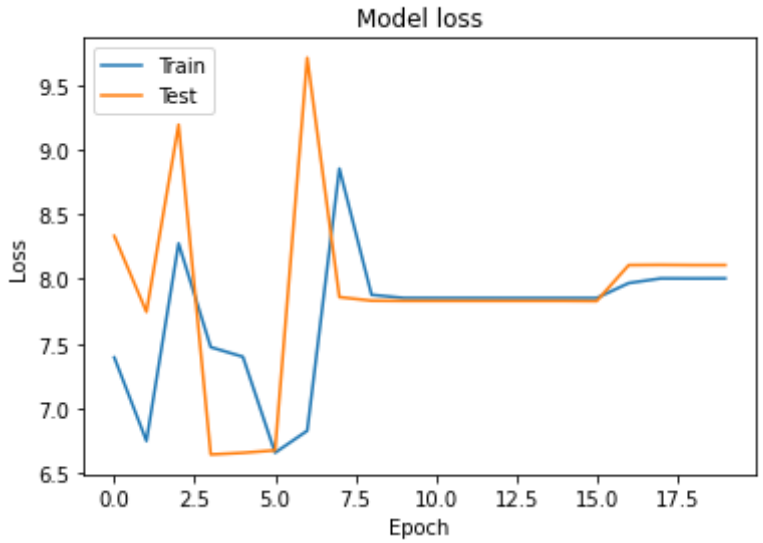




tanh

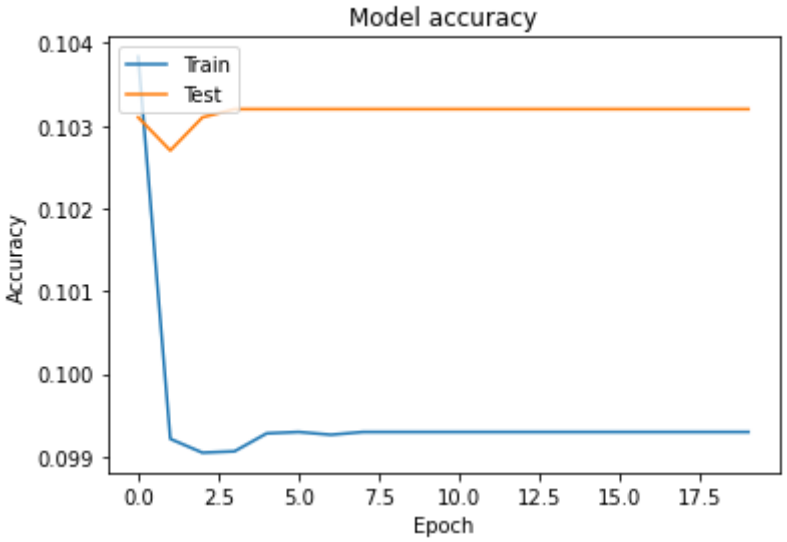
```
Accuracy:  0.09809999912977219
```

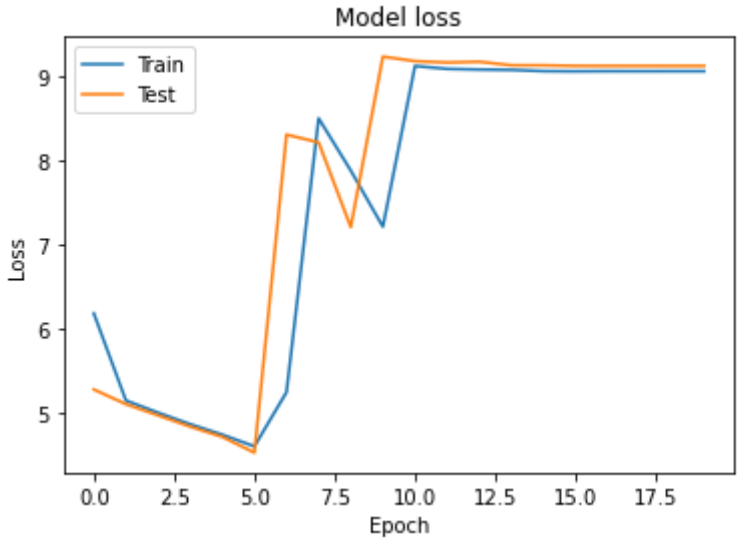




linear

```
Accuracy:  0.10320000350475311
```

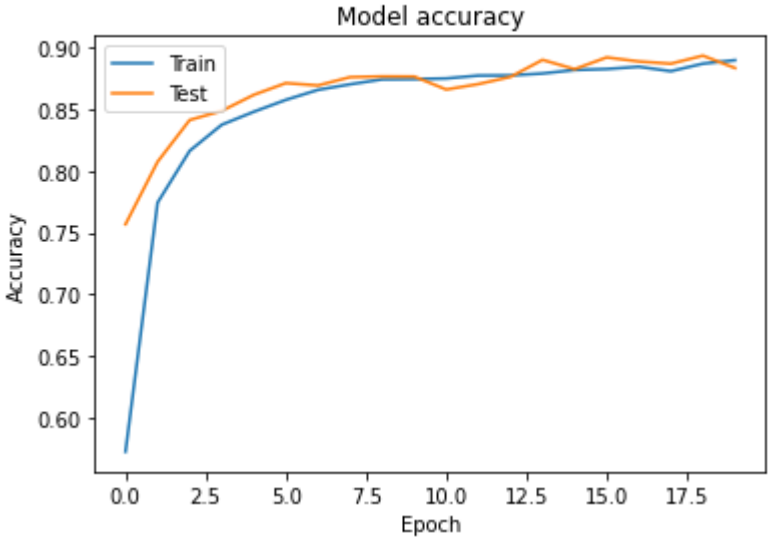


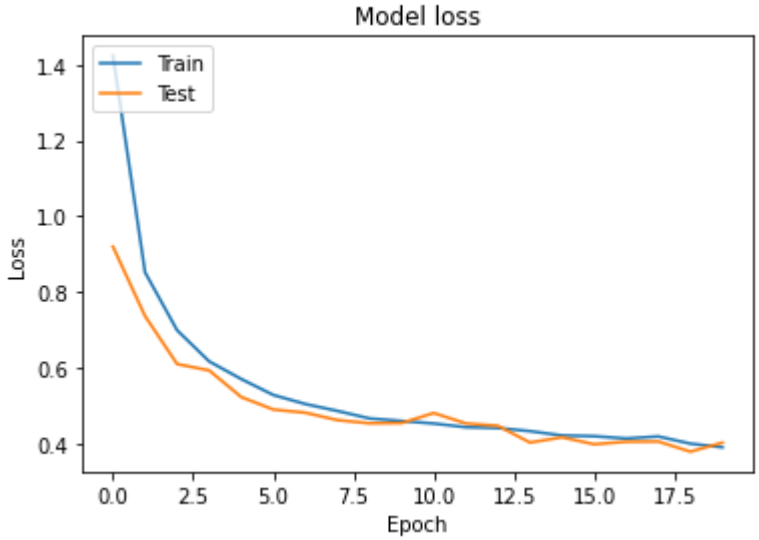


Зависимость accuracy от Regularization L2

L2: -0.1

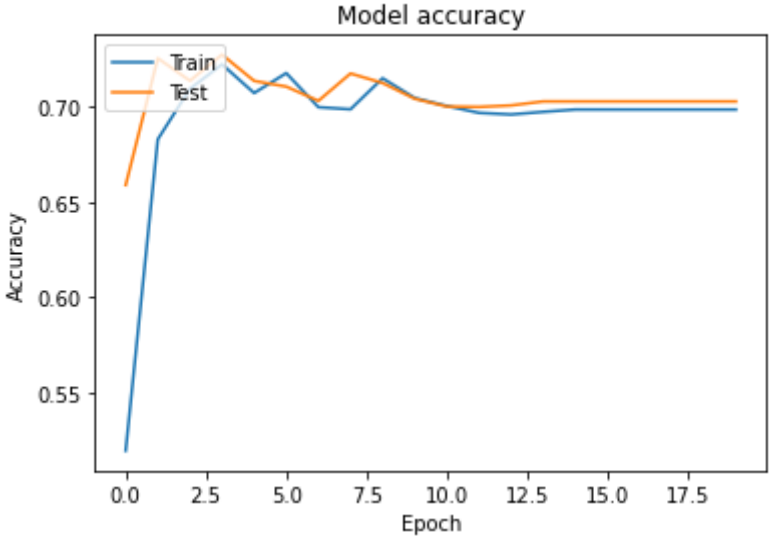
```
Accuracy:  0.8833000063896179
```

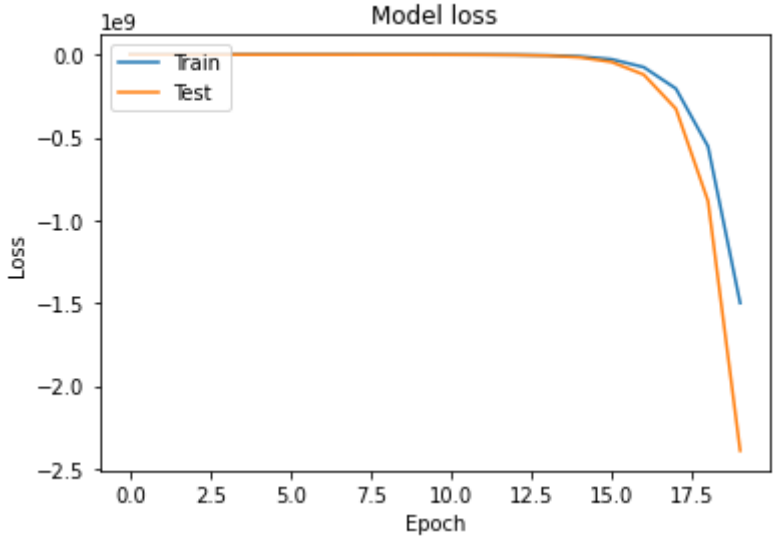




L2: 0.0001

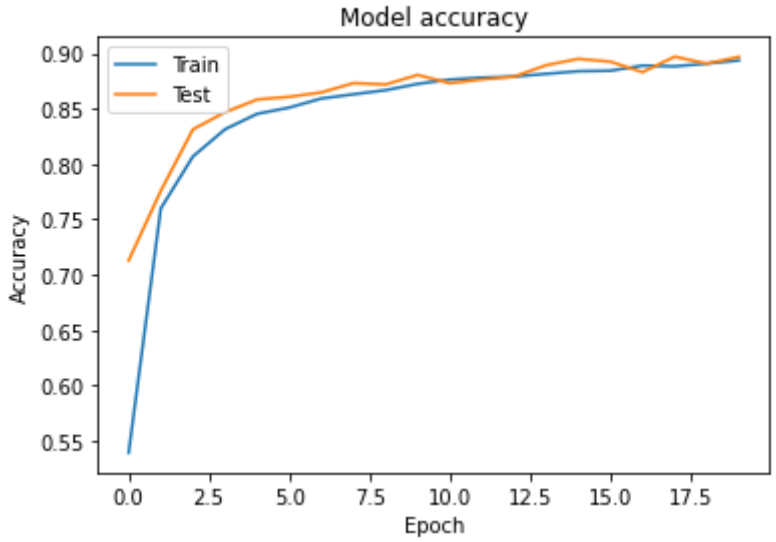
```
Accuracy:  0.7028999924659729
```

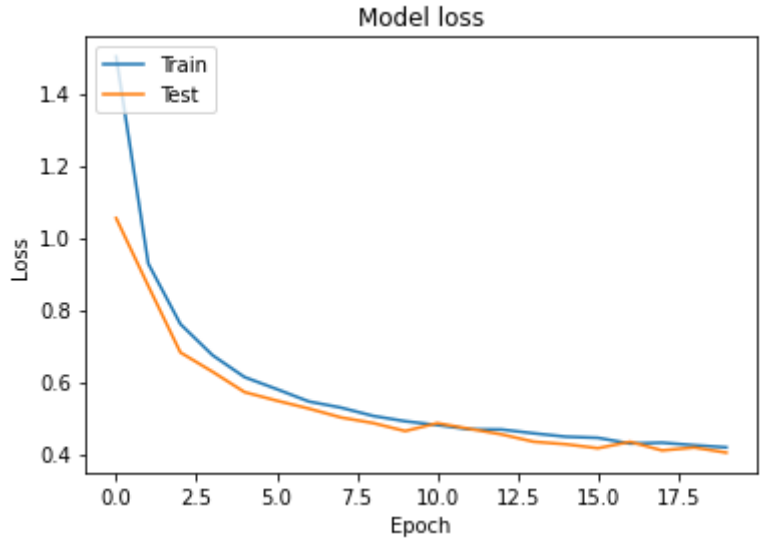




L2: 0.0005

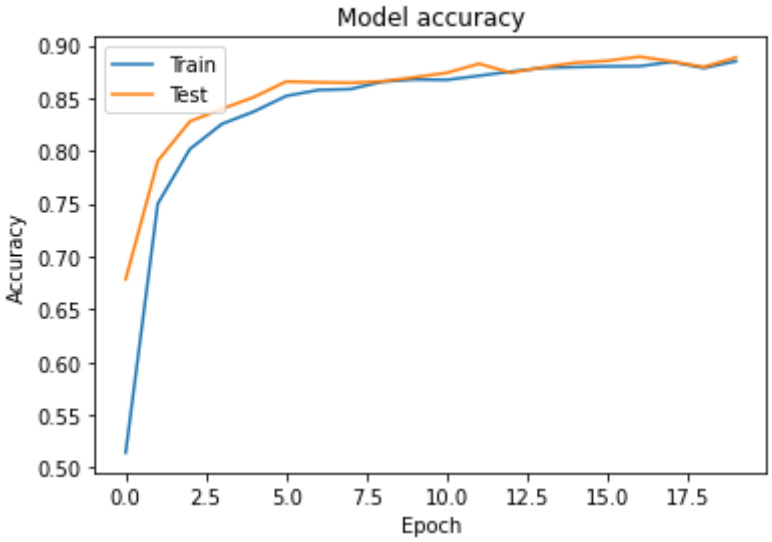
```
Accuracy:  0.8967000246047974
```

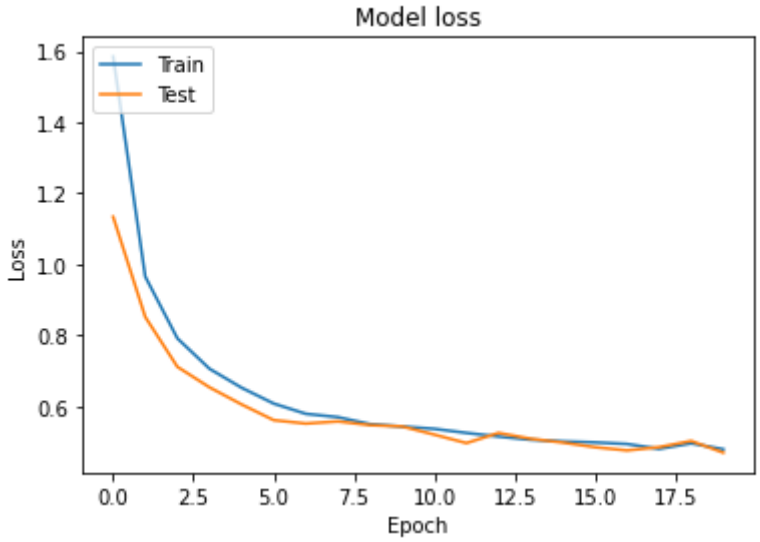




L2: 0.001

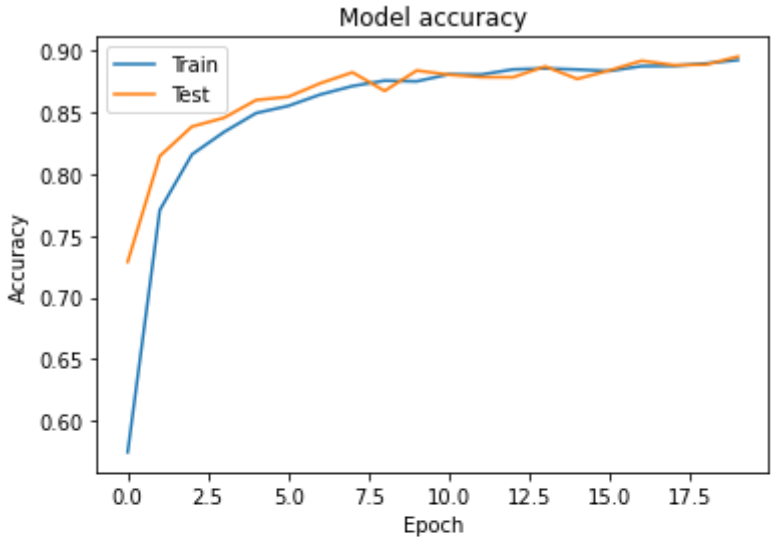
```
Accuracy:  0.8884000182151794
```

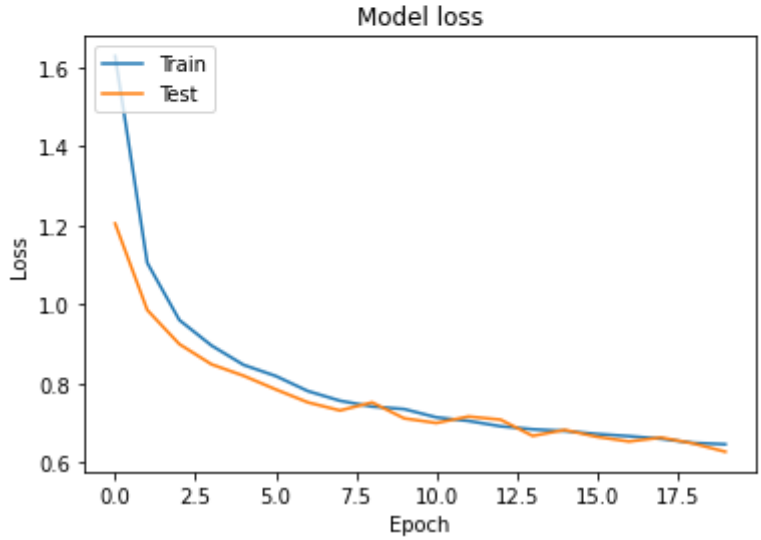




L2: 0.005

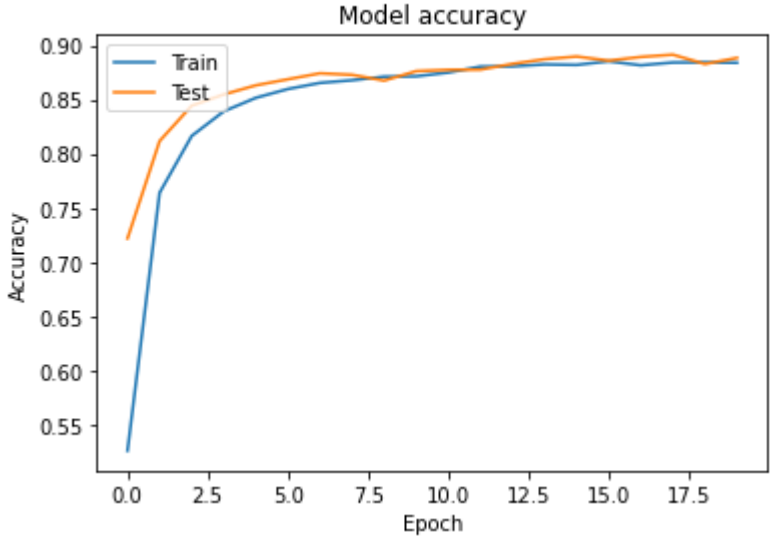
```
Accuracy:  0.8952000141143799
```

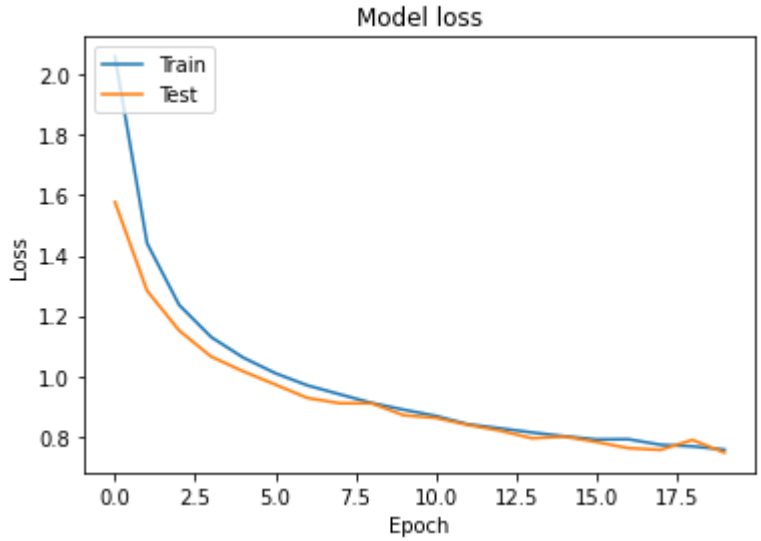




L2: 0.01

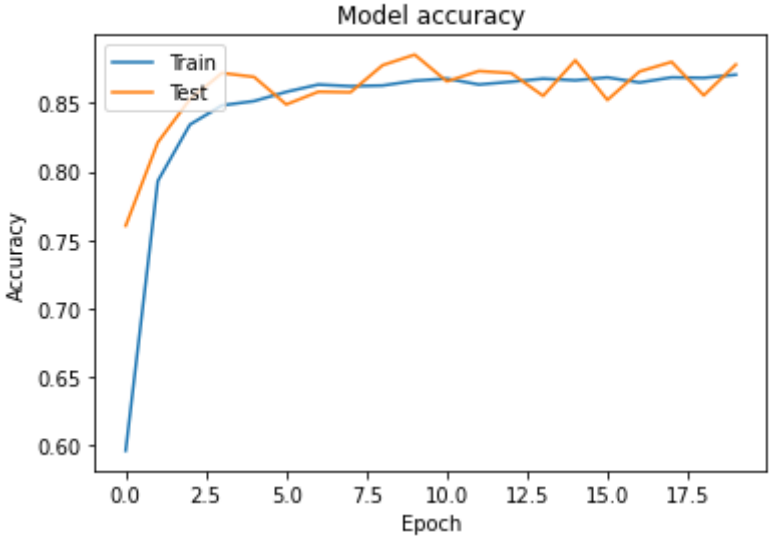
```
Accuracy:  0.8883000016212463
```

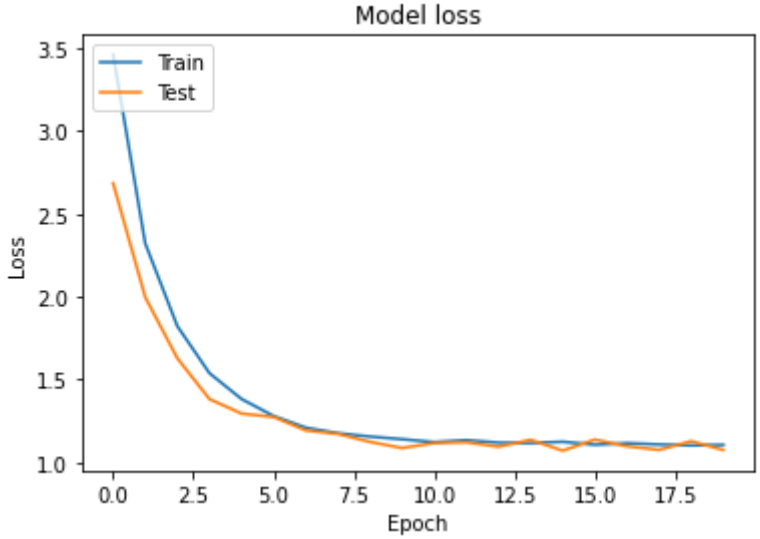




L2: 0.05

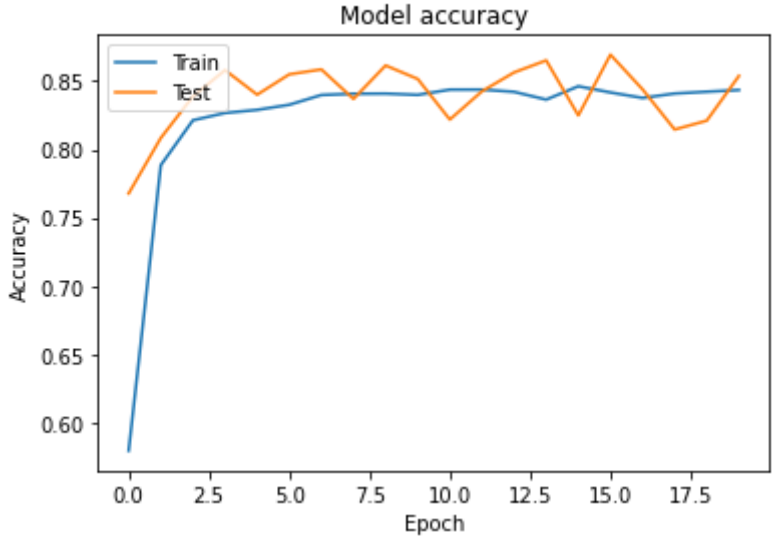
```
Accuracy:  0.8780999779701233
```

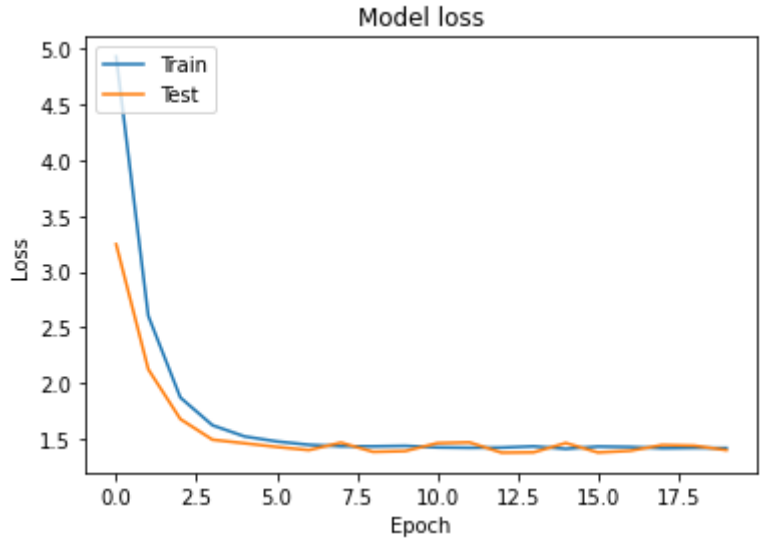




L2: 0.1

```
Accuracy:  0.8537999987602234
```





Вывод

Итак, во время выполнения данной лабораторной работы я познакомился с обычными нейронными сетями, их устройством и влияние на результаты достоверности получаемой нейронной сети различных параметров и функций: layers, loss function, batch size, learn rate, regularization L1 и L2, output layer activation type, epoch count.