Час, два и т,д подразумевает то, что я беру предыдущий час, два и предугадываю таргет на значении 1:15 2:15

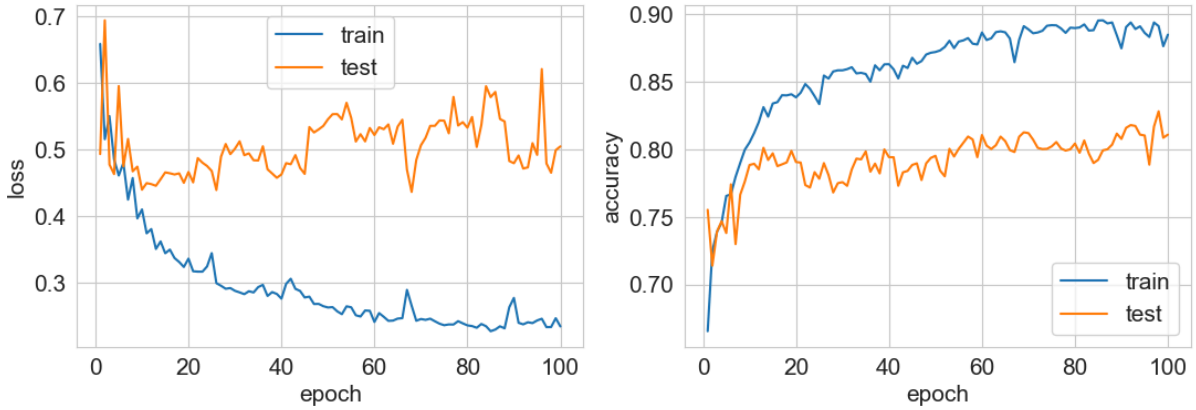
Все делалось через оптимизатор SGD с параметрами: lr = 0,01, momentum = 0,9

Также на некоторых промежутках времени на обычных rnn видно, что градиенты либо затухают, либо взрываются, эта типичная проблема для обычных rnn и зачастую она решается тем, что вместо rnn используют lstm и gru
(конечно есть техника gradient clipping, но справляется она только с взрывающимися градиентами)

Час

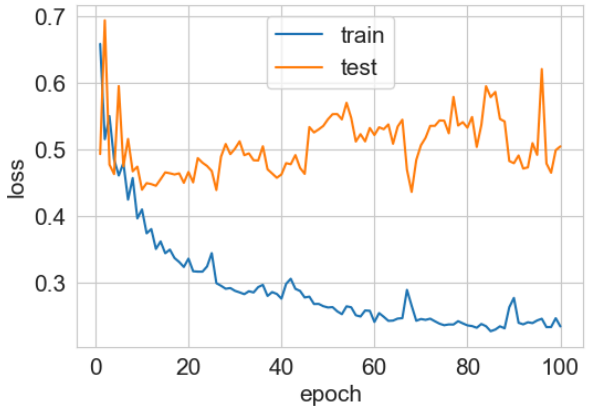
Pytorch

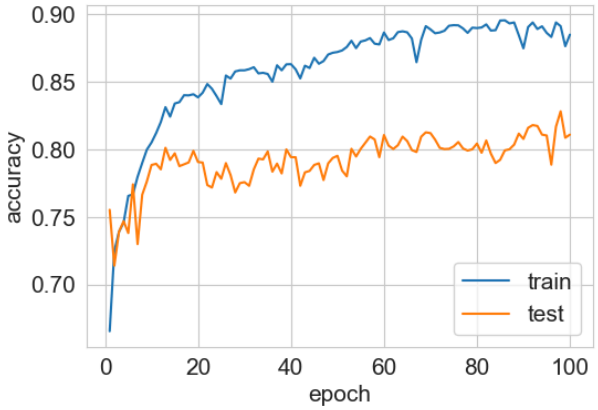
RNN



train loss 0,2340349297731636
test loss 0,5048356212627467
train accuracy 0,8849229011993147
test accuracy 0,810939060939061

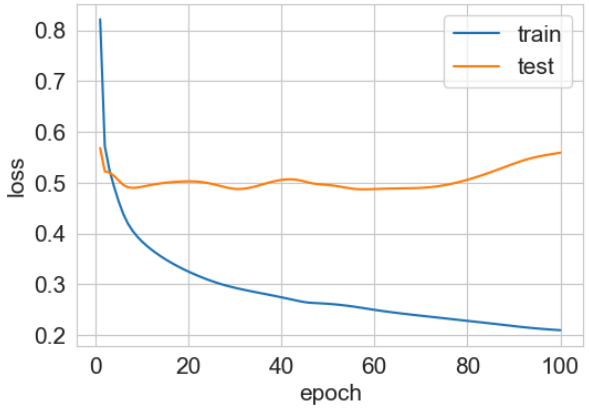
LSTM

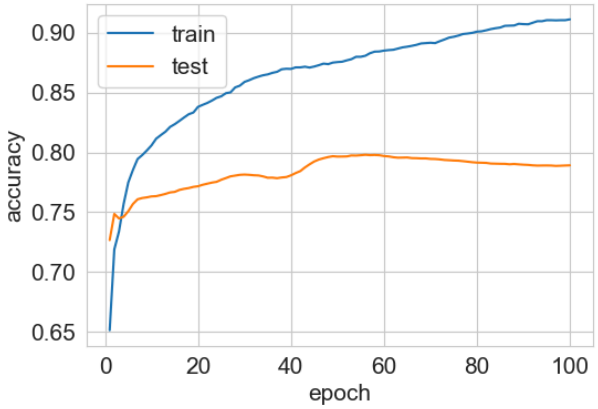




train loss 0,20987696084872032
test loss 0,540049041892264
train accuracy 0,9063392347230155
test accuracy 0,8074425574425574

GRU

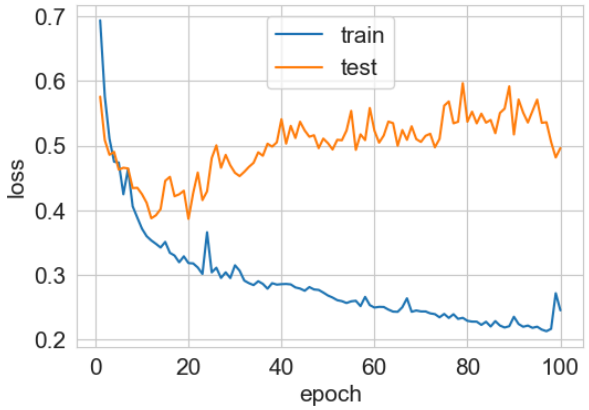


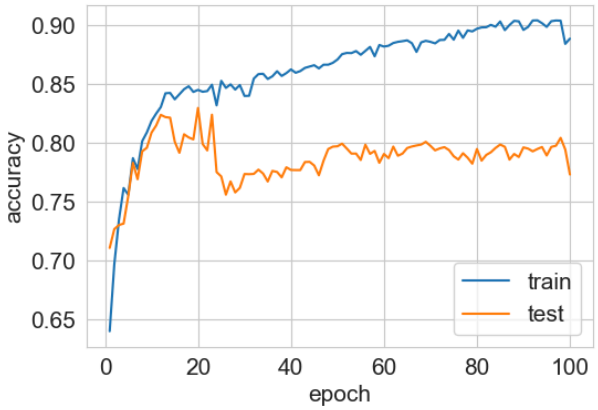


train loss 0,2096407709740047
test loss 0,5592434911597114
train accuracy 0,9110508280982296
test accuracy 0,7891394319965749

Моя реализация

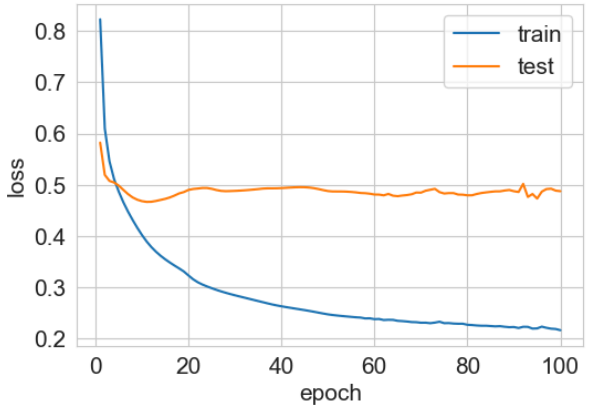
RNN

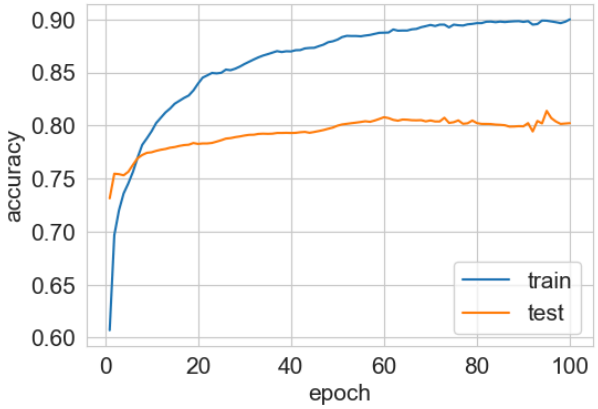




train loss 0,24549268998782595
test loss 0,4962826996204519
train accuracy 0,8886350656767561
test accuracy 0,7731910946196661

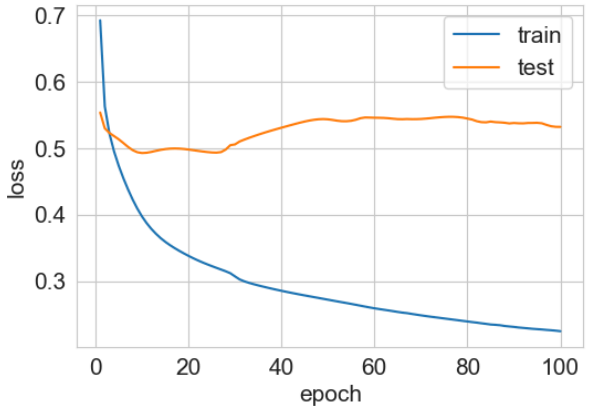
LSTM

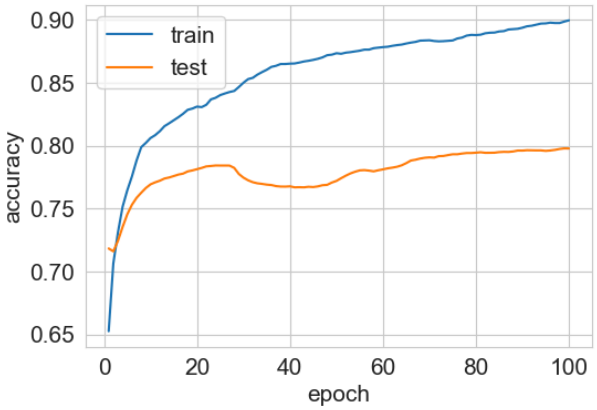




train loss 0,2162706047760018
test loss 0,4875766076479721
train accuracy 0,9001998857795546
test accuracy 0,8023048380191238

GRU



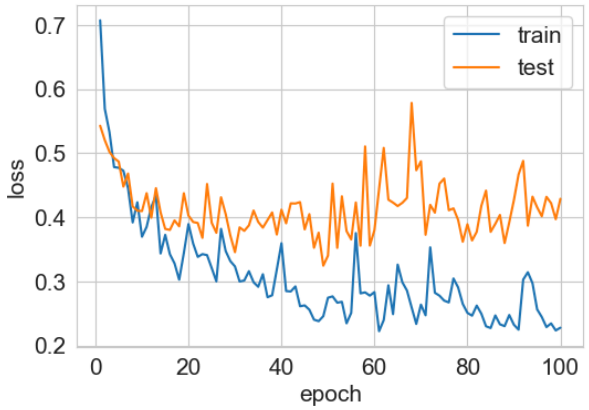


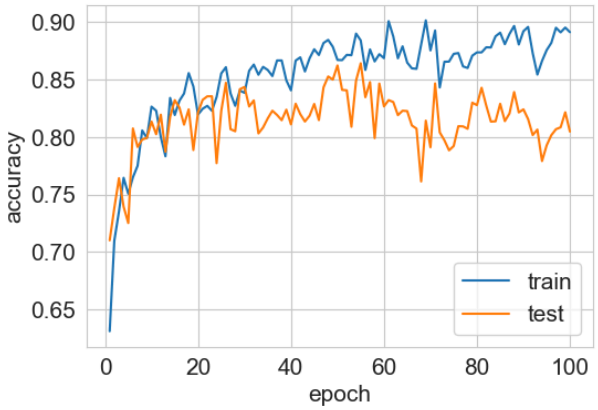
train loss 0,22475816233629659
test loss 0,5318536447149931
train accuracy 0,8996287835522558
test accuracy 0,7978093335236193

Два часа

Pytorch

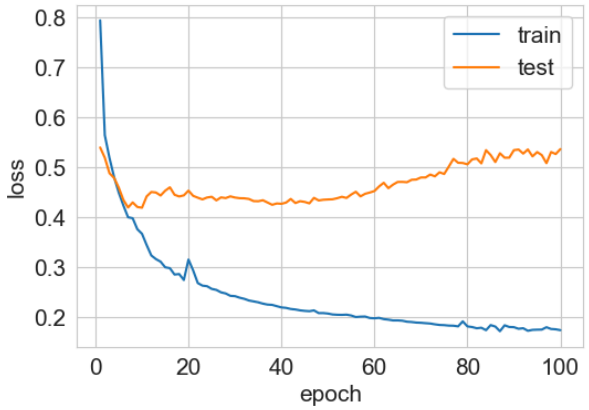
RNN

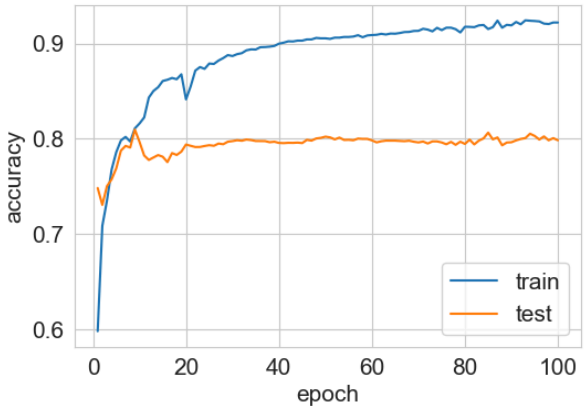




train loss 0,22786007557292634
test loss 0,42890201913765097
train accuracy 0,8911273039005573
test accuracy 0,8047318274274703

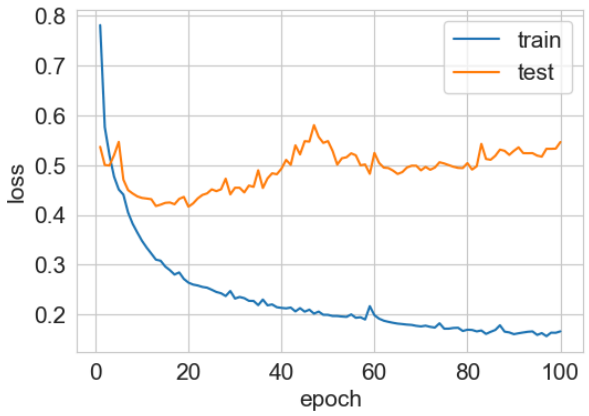
LSTM

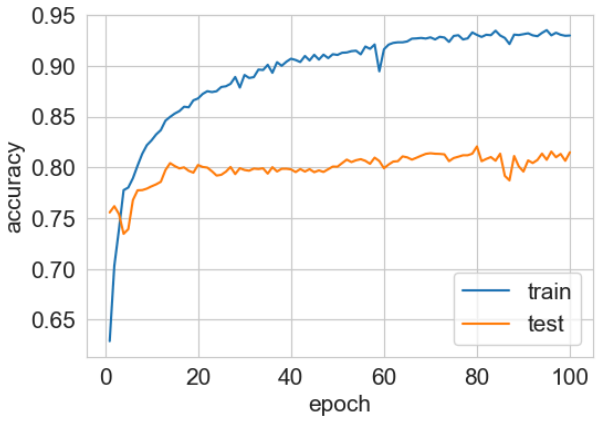




train loss 0,17410701431282388
test loss 0,5363211919685451
train accuracy 0,921988855550793
test accuracy 0,7985226421154052

GRU

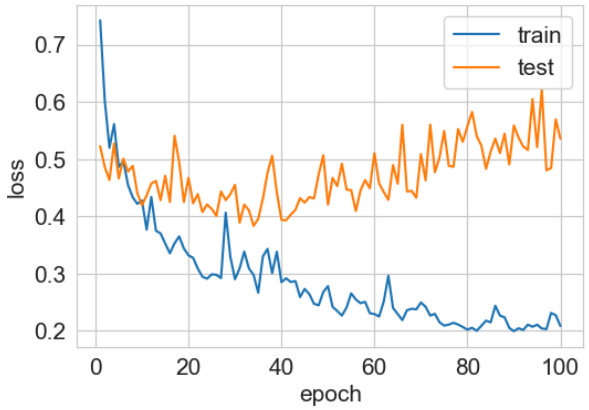


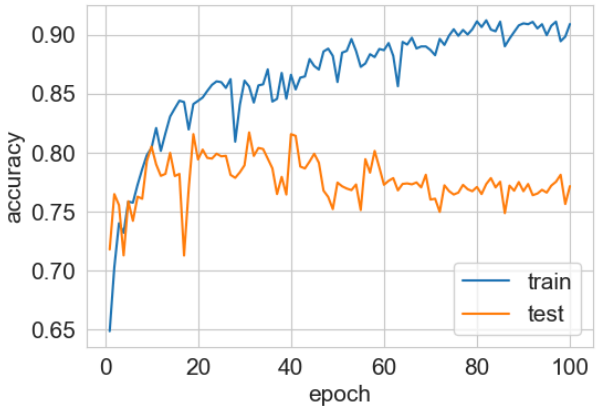


train loss 0,16589235665644173
test loss 0,5464794366630684
train accuracy 0,9299899985712244
test accuracy 0,8149734146950719

Моя реализация

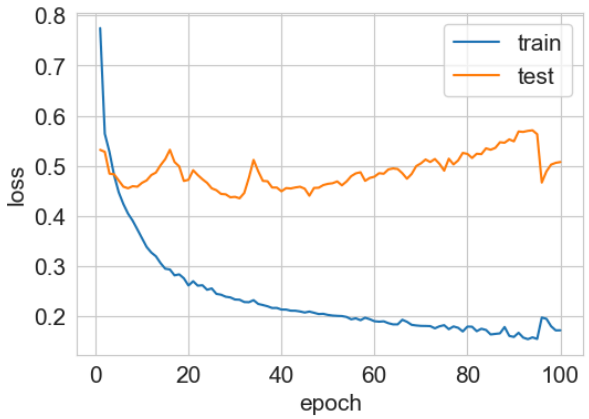
RNN

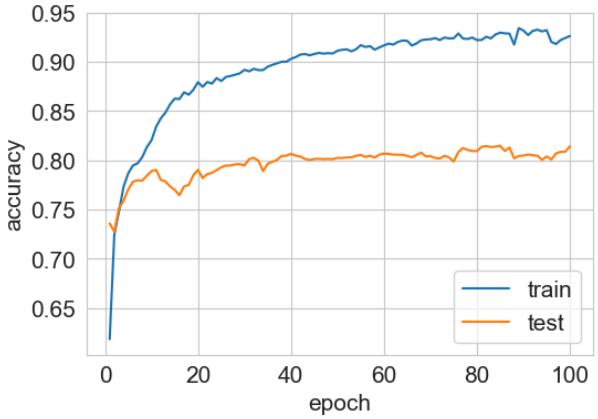




train loss 0,20843093881172517
test loss 0,535788636208238
train accuracy 0,9089869981425918
test accuracy 0,7715448024836741

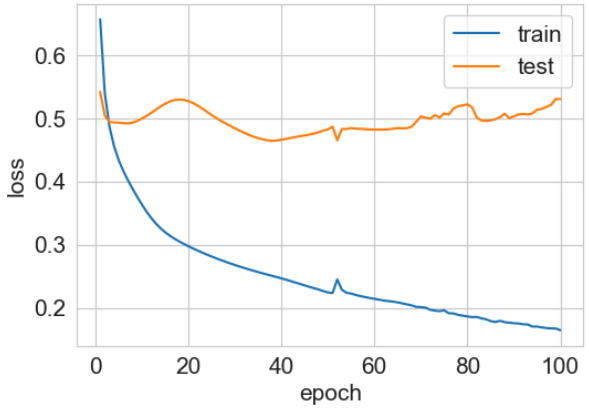
LSTM

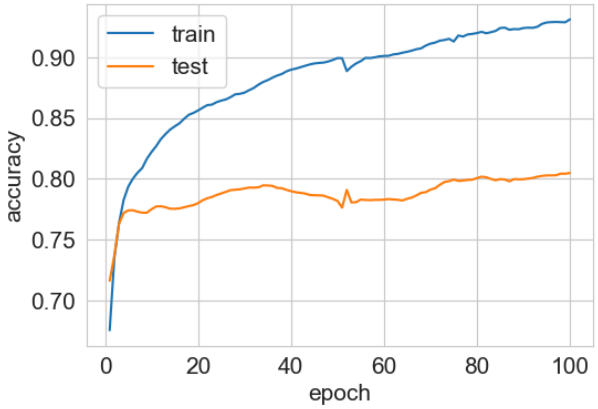




train loss 0,17239616871819588
test loss 0,5075694254109544
train accuracy 0,9262751821688813
test accuracy 0,814259715233915

GRU





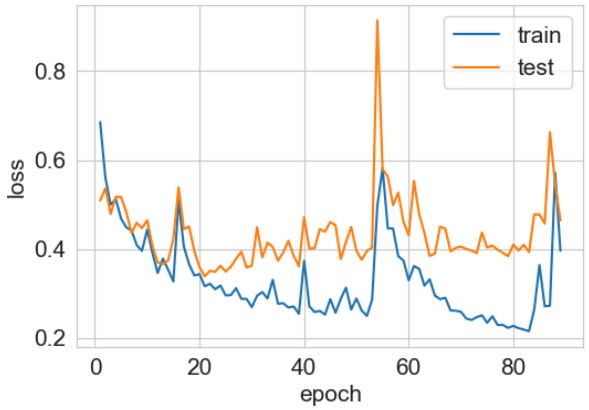
train loss 0,16455820084464934
test loss 0,5301899179379342
train accuracy 0,9311330190027147
test accuracy 0,8047318274274703

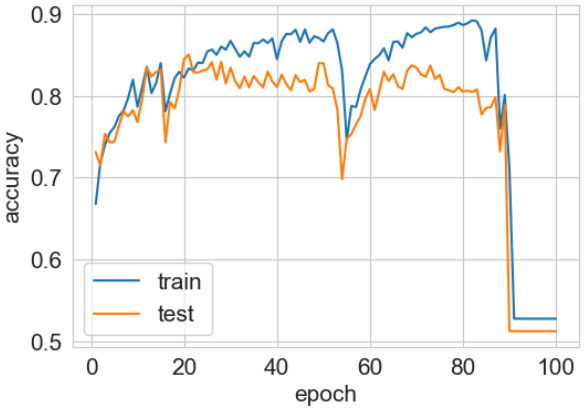
Три часа

Pytorch

RNN

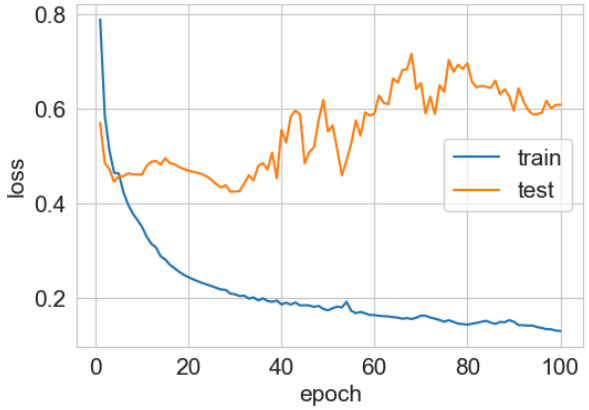
произошел взрыв градиента или же его угасание

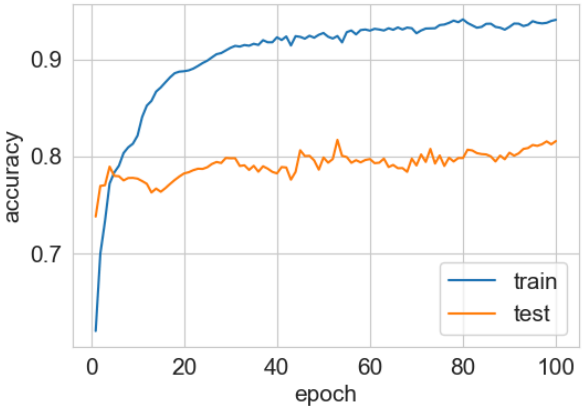




train loss nan
test loss nan
train accuracy 0,5275950814984273
test accuracy 0,5123135127418088

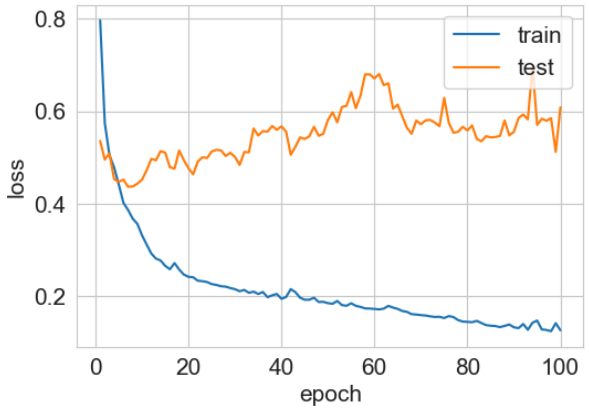
LSTM

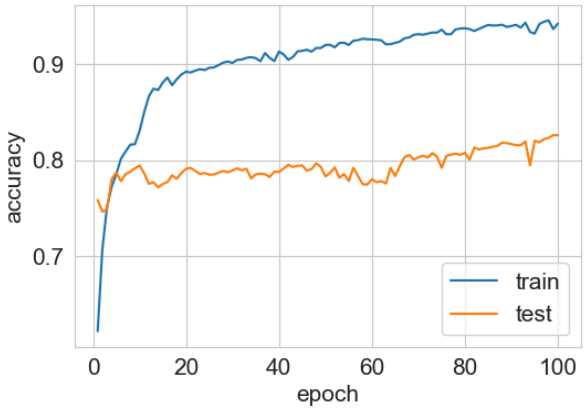




train loss 0,13041931687549826
test loss 0,6089201575858858
train accuracy 0,9406634257935373
test accuracy 0,8155828396031123

GRU



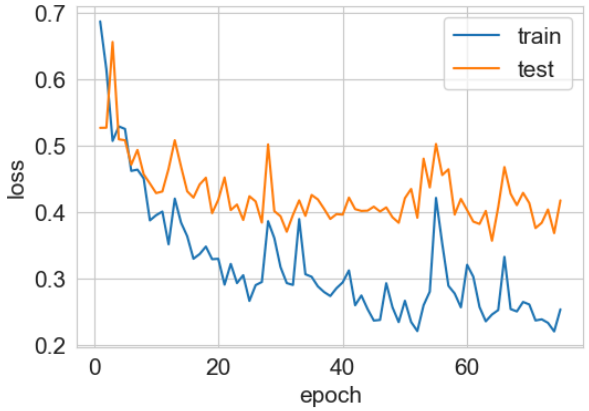


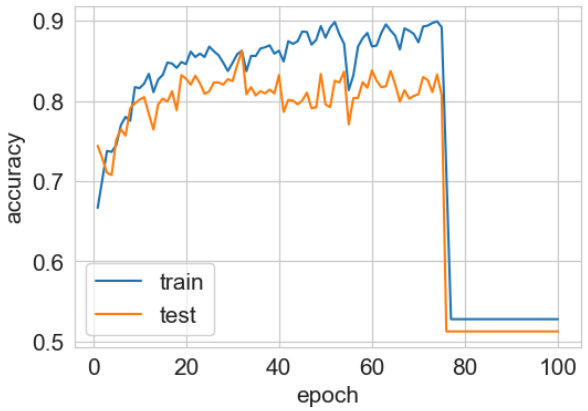
train loss 0,12578782239318434
test loss 0,6084693894722298
train accuracy 0,9426651415498999
test accuracy 0,8258976372332072

Моя реализация

RNN

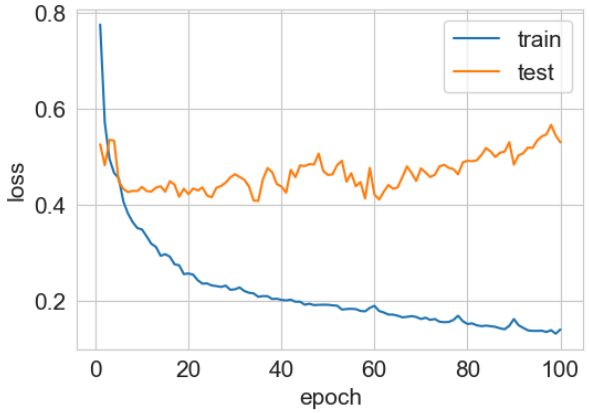
Та же самая проблема

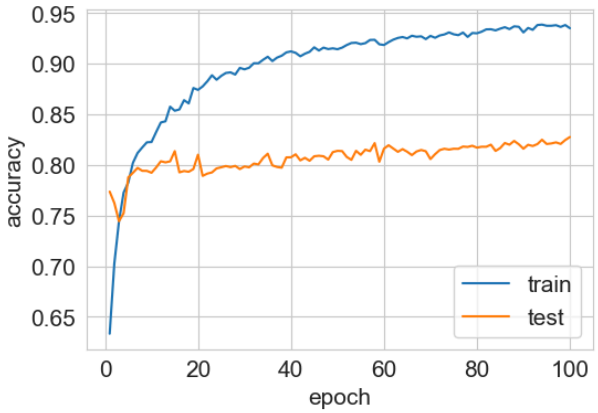




train loss nan
test loss nan
train accuracy 0,5275950814984273
test accuracy 0,5123135127418088

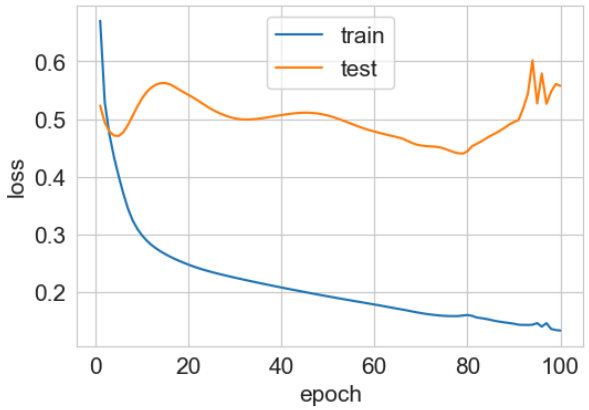
LSTM

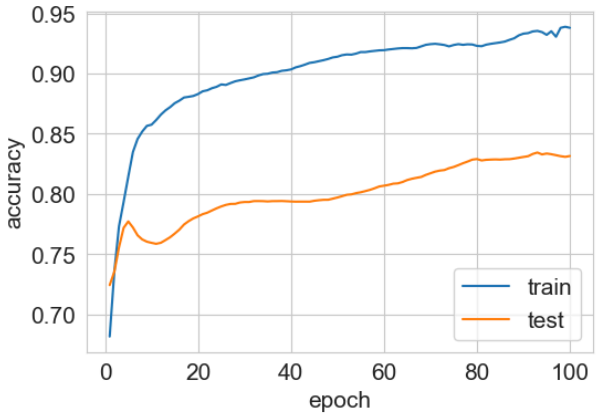




train loss 0,13943093090924533
test loss 0,5290660218555823
train accuracy 0,9349442379182156
test accuracy 0,8275037475908344

GRU





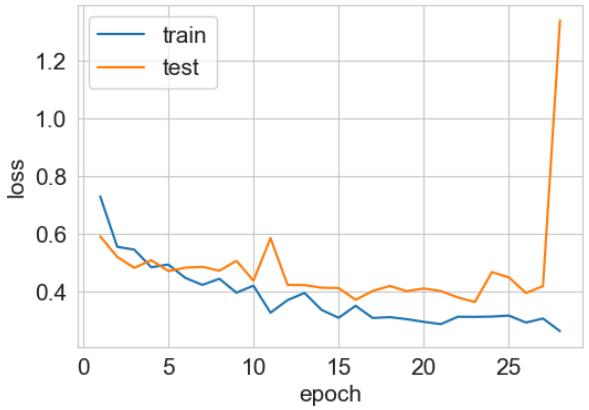
train loss 0,13338223063630966
test loss 0,5576196354590707
train accuracy 0,9380897912496425
test accuracy 0,8315725604968235

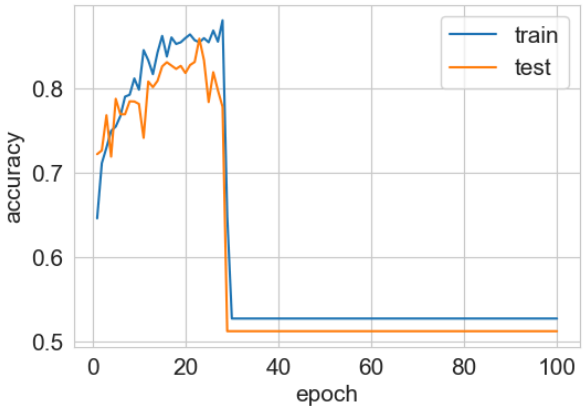
Четыре часа

Pytorch

RNN

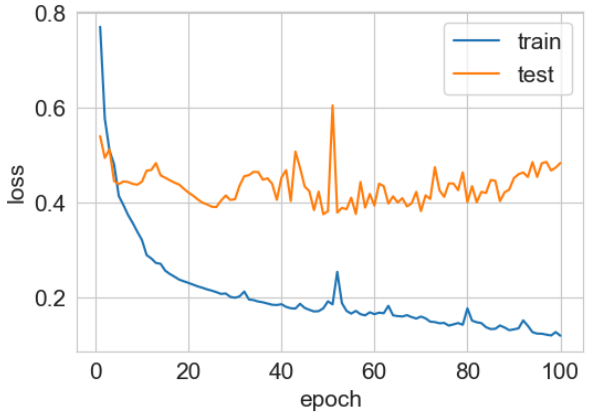
произошел взрыв градиента или же его угасание

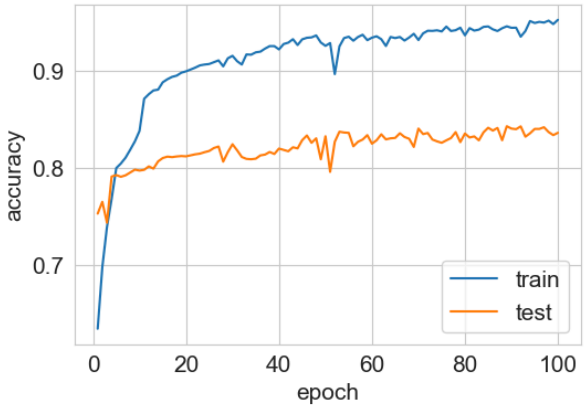




train loss nan
test loss nan
train accuracy 0,5272571183288024
test accuracy 0,5122264662835112

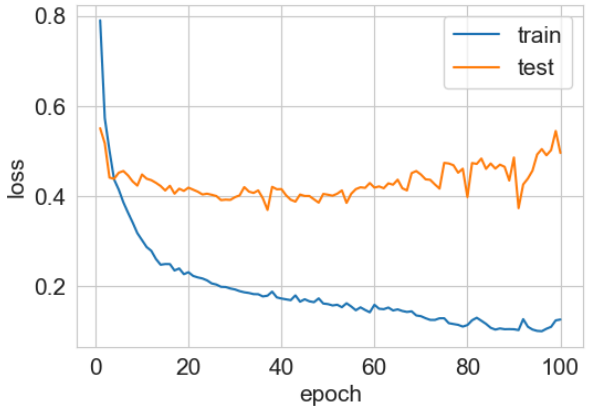
LSTM

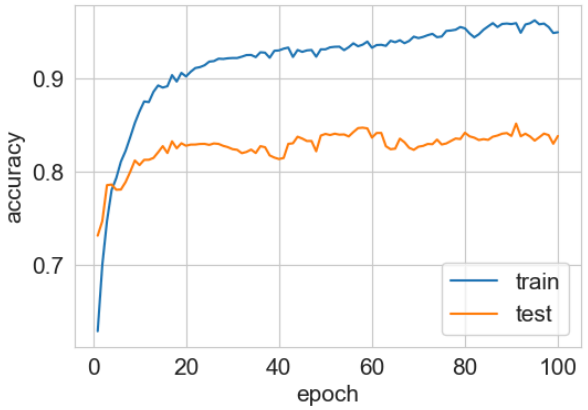




train loss 0,118950365595882
test loss 0,48294288647067185
train accuracy 0,9527829446272714
test accuracy 0,8361118052332845

GRU

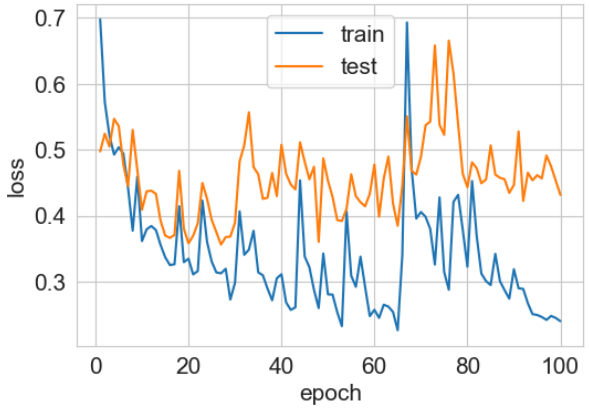


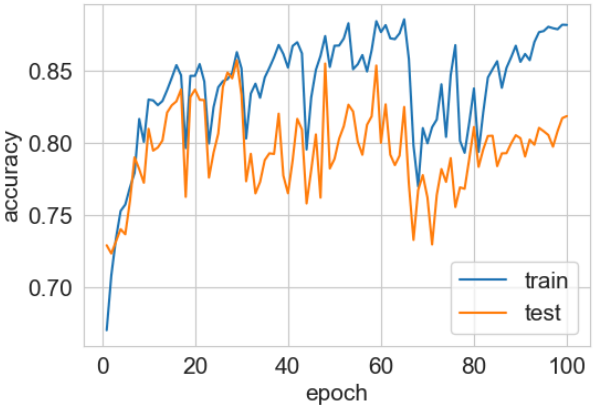


train loss 0,1266496769779682
test loss 0,4958307758725348
train accuracy 0,9494920589497782
test accuracy 0,8384321564987685

Моя реализация

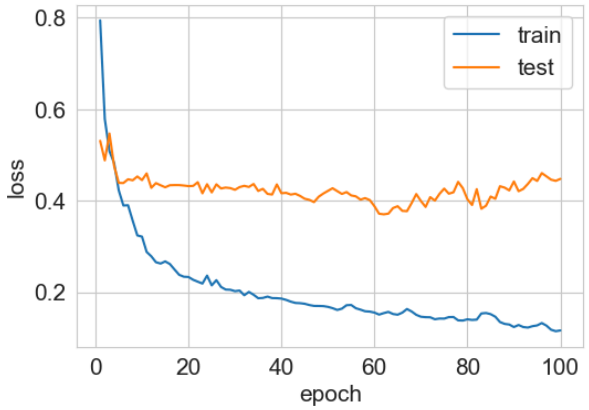
RNN

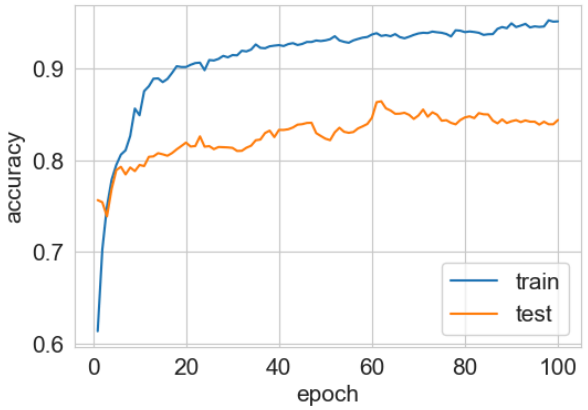




train loss 0,2398789223440964
test loss 0,4314373814597559
train accuracy 0,8821004435541565
test accuracy 0,8188698104451505

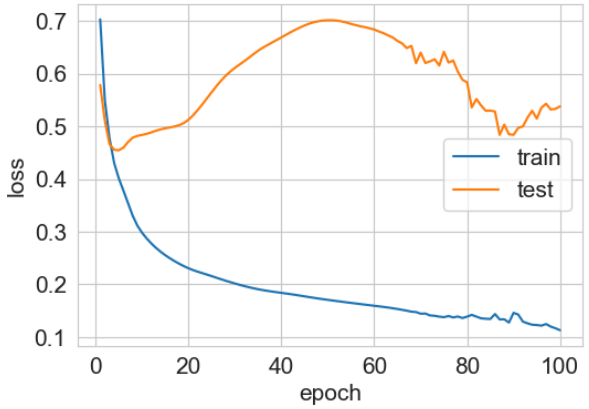
LSTM

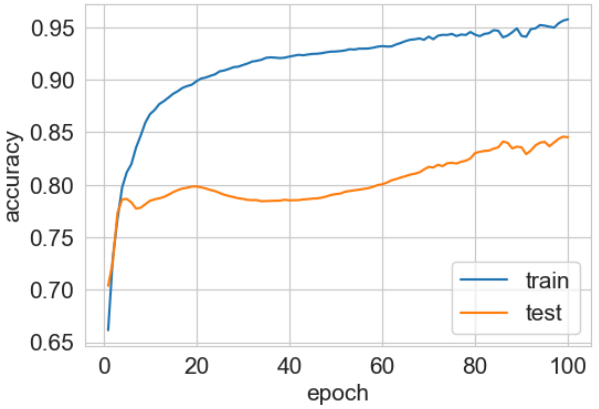




train loss 0,11626390953783561
test loss 0,44781494629067264
train accuracy 0,9516382887394477
test accuracy 0,8440009995359298

GRU





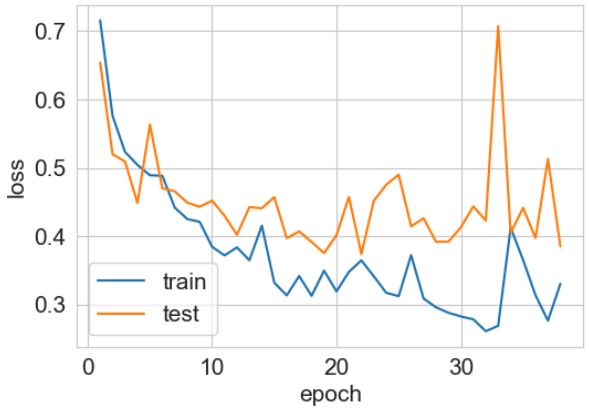
train loss 0,11274436760128423
test loss 0,5379613538074882
train accuracy 0,9575046501645443
test accuracy 0,8452504194481134

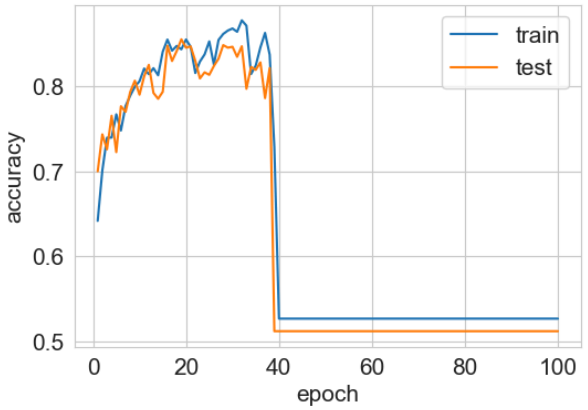
Пять часов

Pytorch

RNN

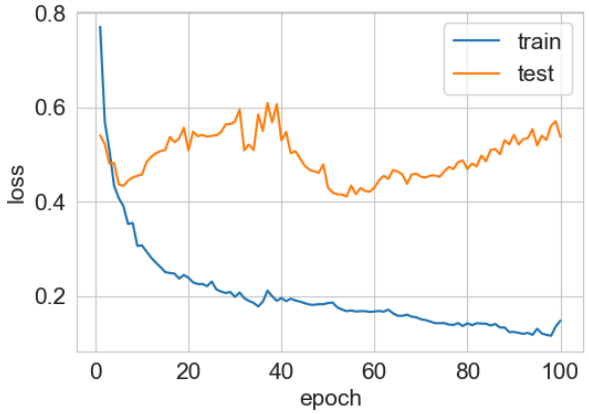
произошел взрыв градиента или же его угасание

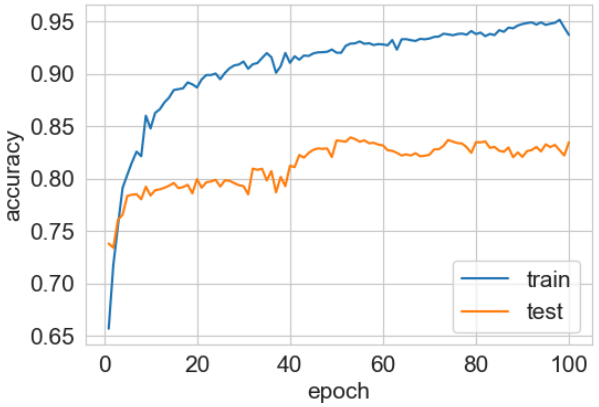




train loss nan
test loss nan
train accuracy 0,5269186712485682
test accuracy 0,5121393887460726

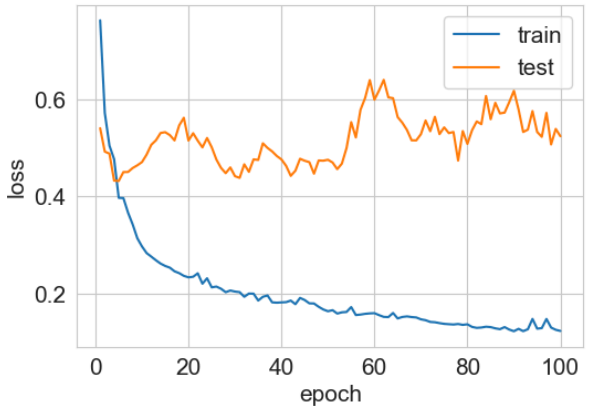
LSTM

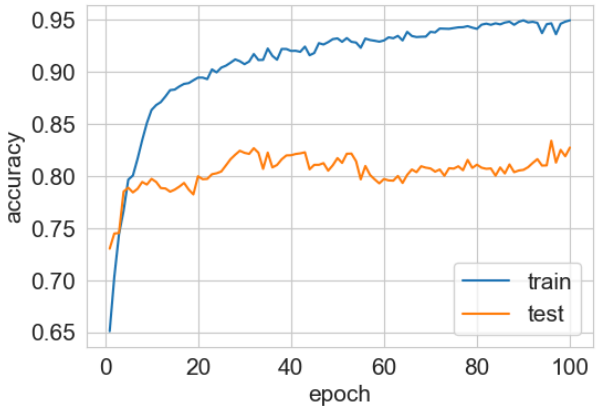




train loss 0,14785321824167127
test loss 0,5374044964342423
train accuracy 0,9369988545246277
test accuracy 0,8346900885461297

GRU

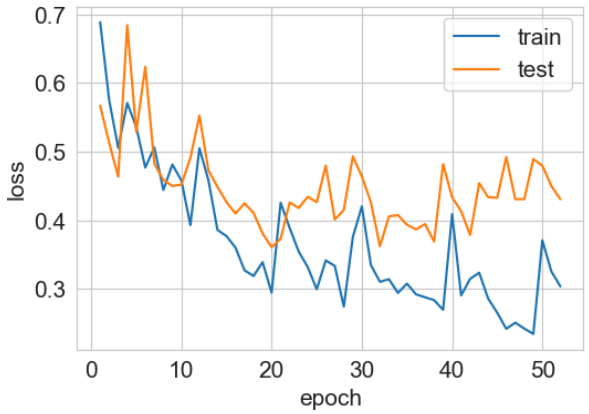


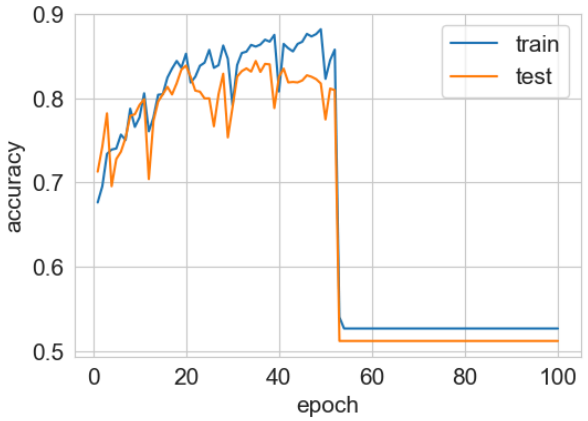


train loss 0,12349553484108805
test loss 0,524025866831051
train accuracy 0,9494558991981672
test accuracy 0,8273350471293917

Моя реализация

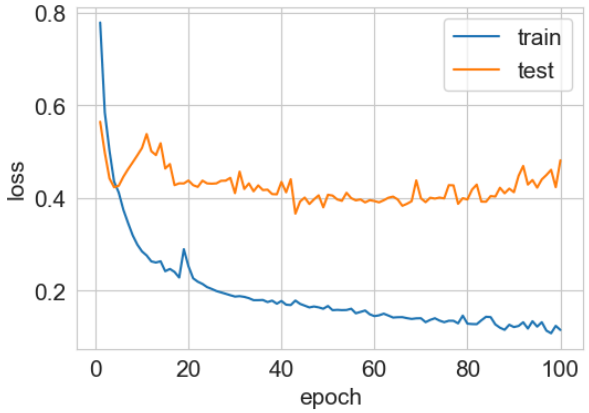
RNN

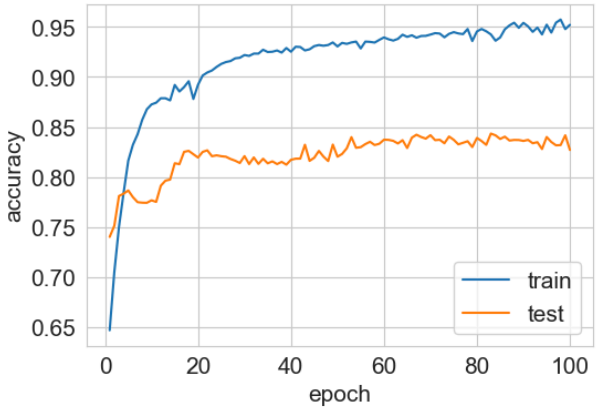




train loss nan
test loss nan
train accuracy 0,5269186712485682
test accuracy 0,5121393887460726

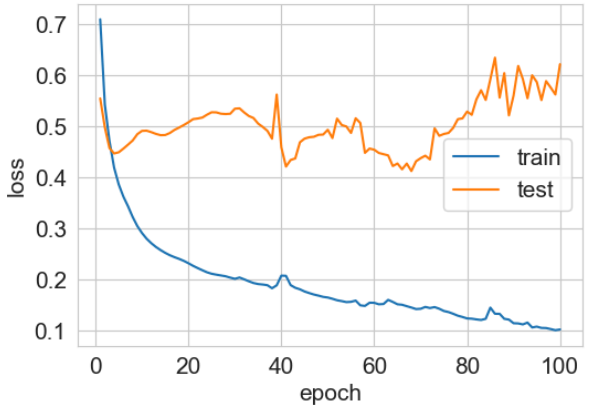
LSTM

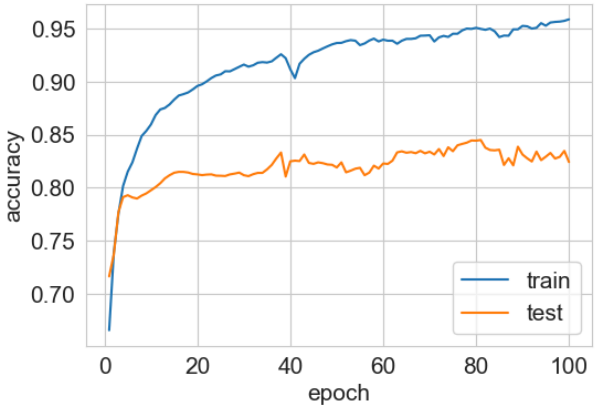




train loss 0,1153687969101595
test loss 0,4813206762827645
train accuracy 0,952176403207331
test accuracy 0,8270137103684662

GRU





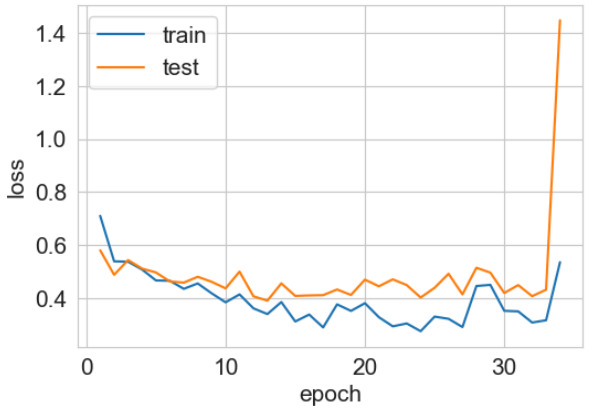
train loss 0,10161284339697982
test loss 0,6216850450633936
train accuracy 0,9589060710194731
test accuracy 0,824228791773779

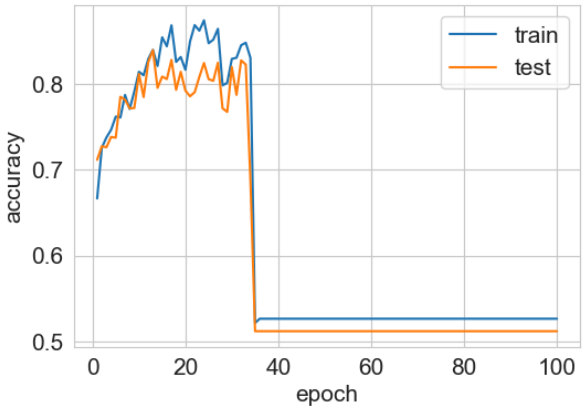
Шесть часов

Pytorch

RNN

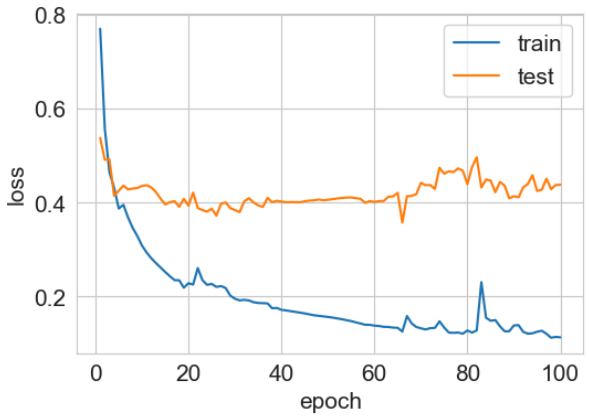
произошел взрыв градиента или же его угасание

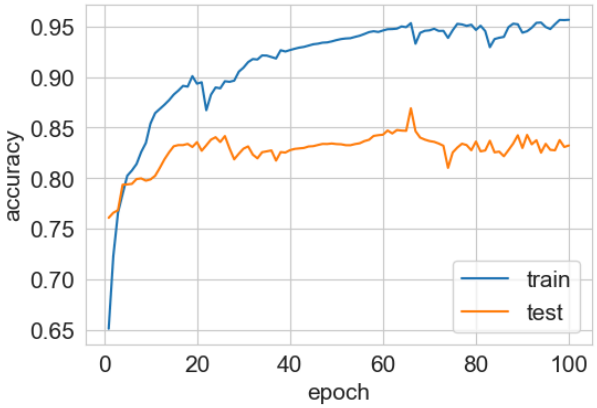




train loss nan
test loss nan
train accuracy 0,526579739217653
test accuracy 0,5120522801128451

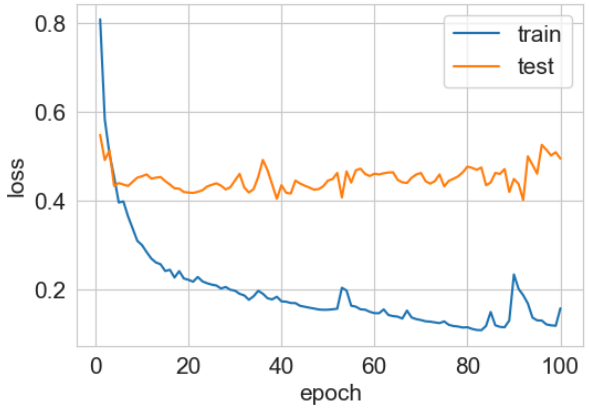
LSTM

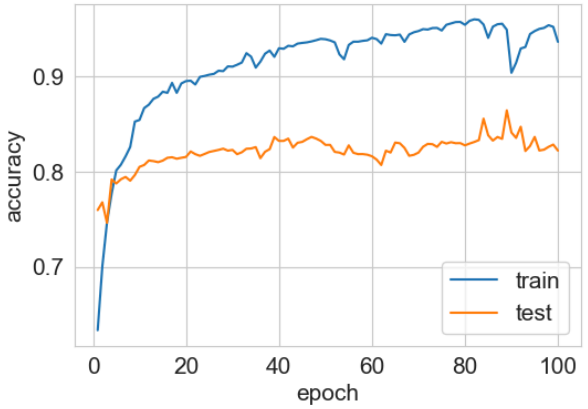




train loss 0,11349091863400859
test loss 0,4377193653606787
train accuracy 0,956584037827769
test accuracy 0,8323393922079777

GRU

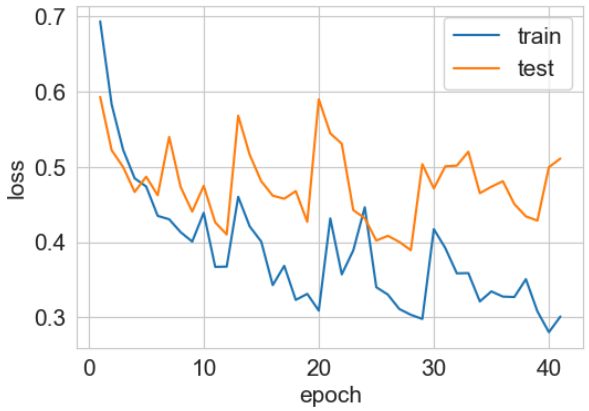


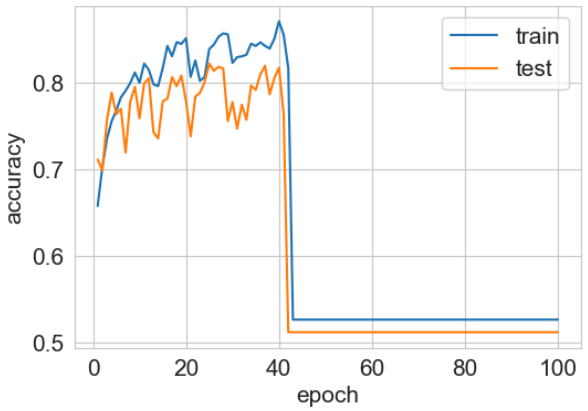


train loss 0,15750482689903128
test loss 0,4942798582956677
train accuracy 0,9363805702822754
test accuracy 0,8220904903046102

Моя реализация

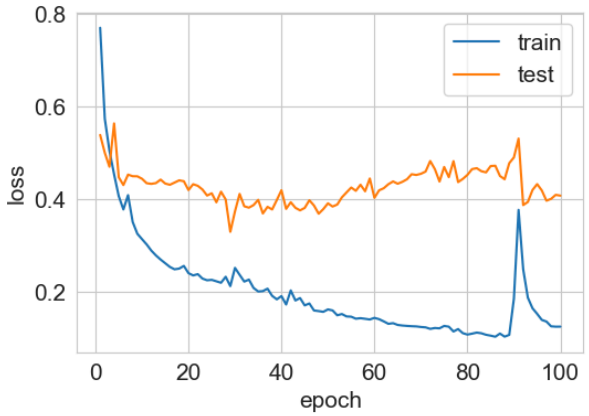
RNN

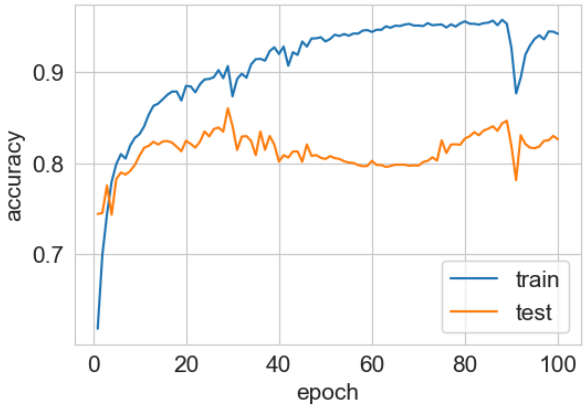




train loss nan
test loss nan
train accuracy 0,526579739217653
test accuracy 0,5120522801128451

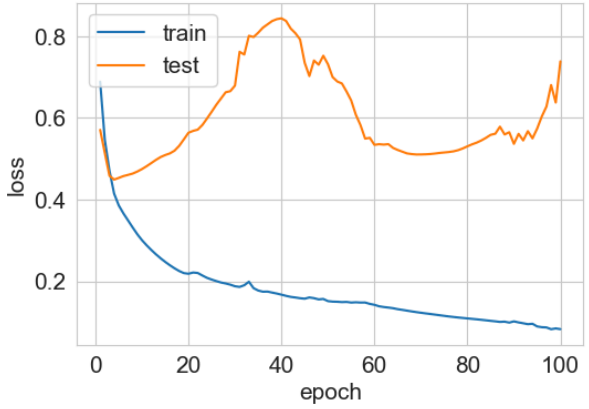
LSTM

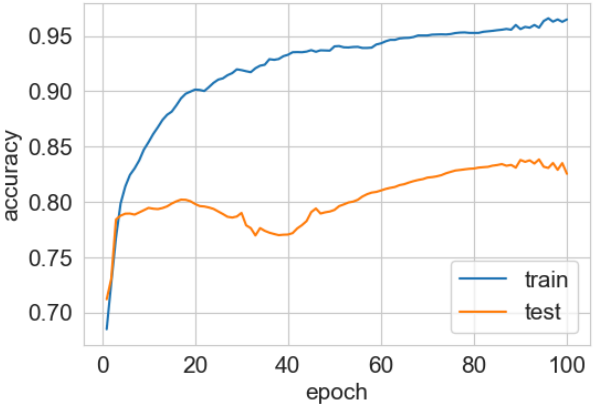




train loss 0,12364494892383533
test loss 0,4067445987844646
train accuracy 0,9421120504370254
test accuracy 0,826375745455844

GRU

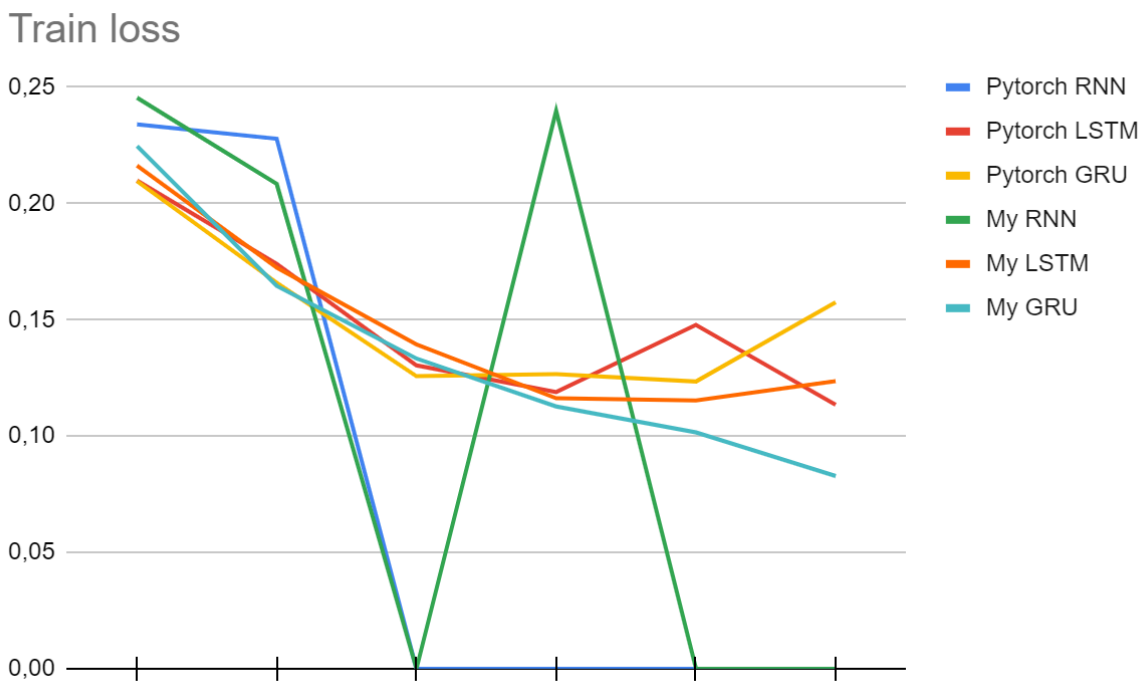




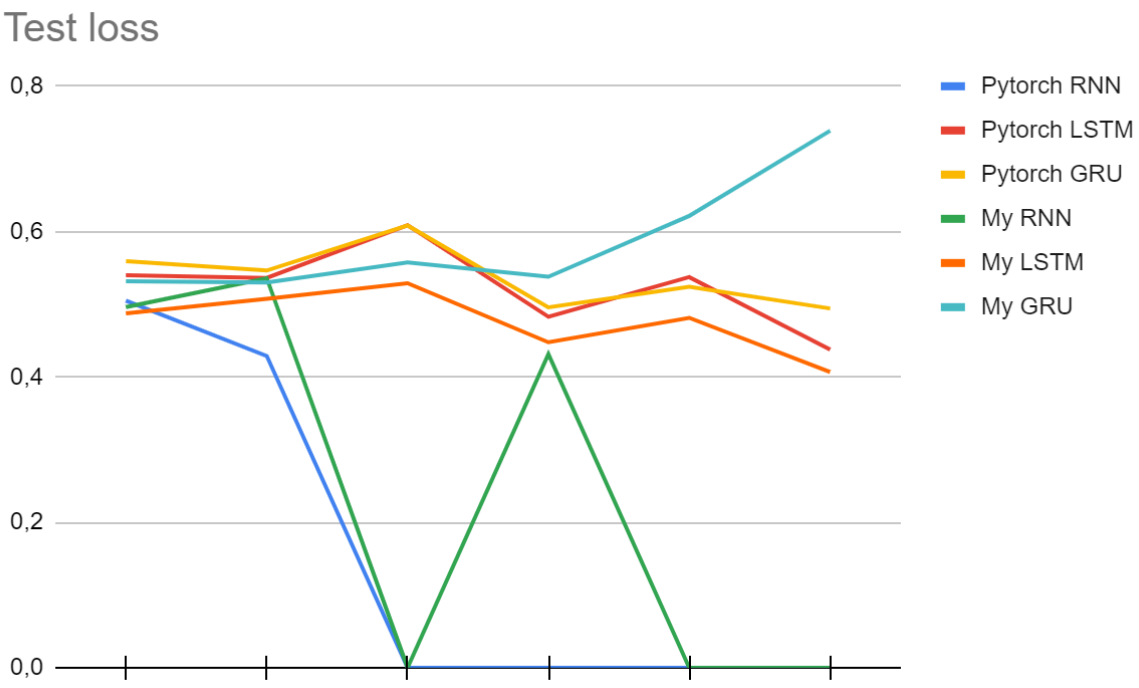
train loss 0,08285692670499988
test loss 0,7387946005504579
train accuracy 0,9650379710560252
test accuracy 0,8253758525872228

Сравнения

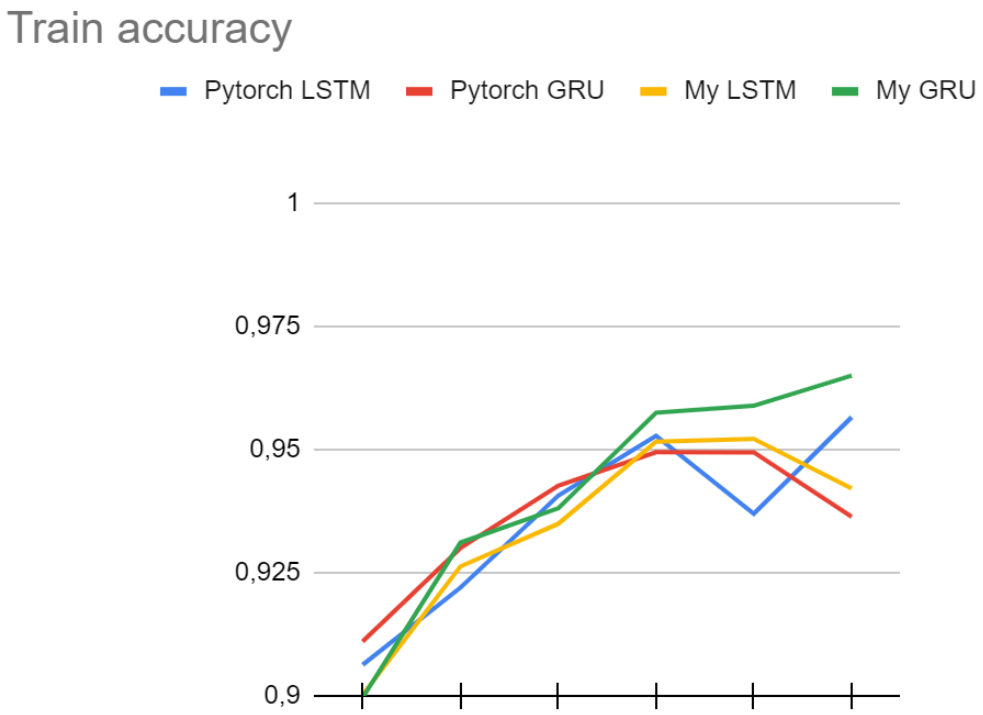
Train loss



Test loss



Train accuracy



Test accuracy