

Report

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1 PART 1

1.1 Network 1 Graph

Figure 1: Arch1 Sigmoid

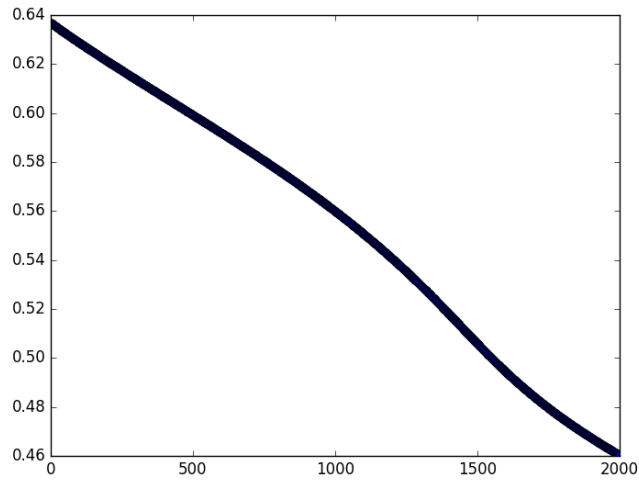


Figure 2: Arch1 Tanh

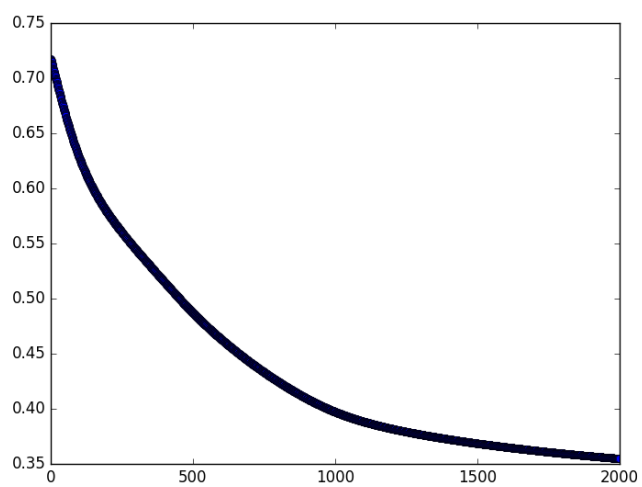
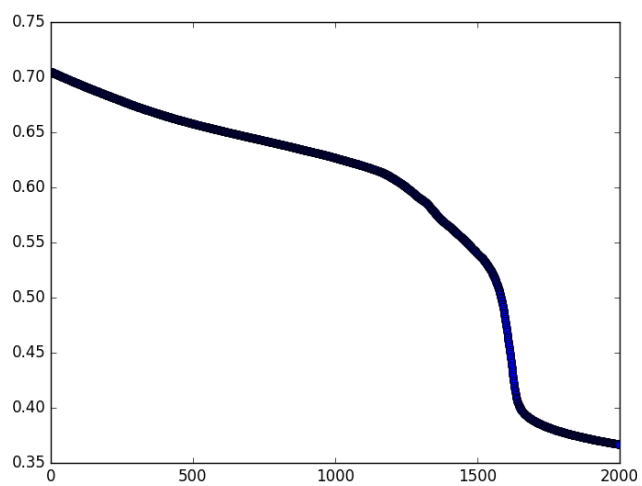


Figure 3: Arch1 Relu



1.2 Network 2 Graph

Figure 4: Arch2 Sigmoid

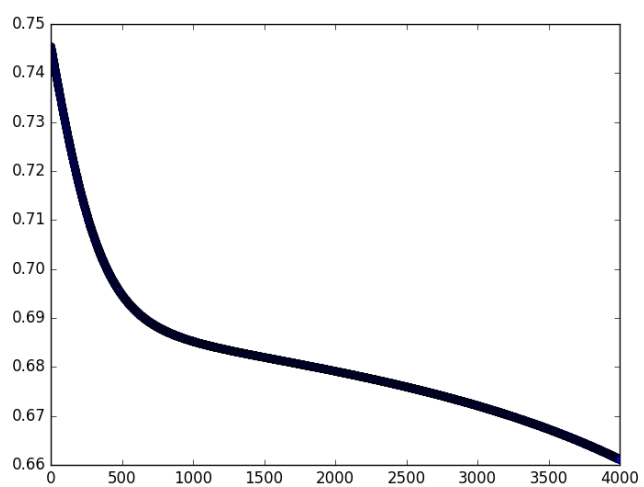


Figure 5: Arch2 Tanh

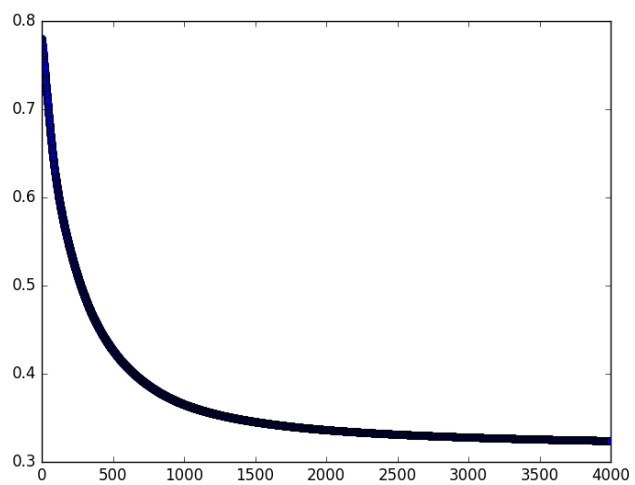
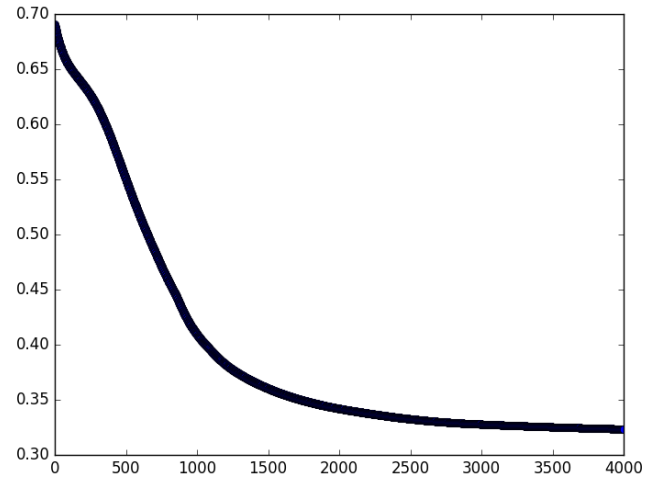


Figure 6: Arch2 Relu



1.3 Network 3 Graph

Figure 7: Arch3 Sigmoid

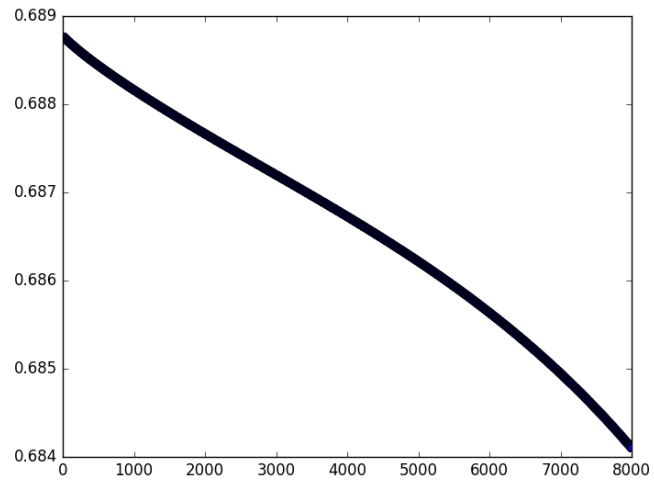


Figure 8: Arch3 Tanh

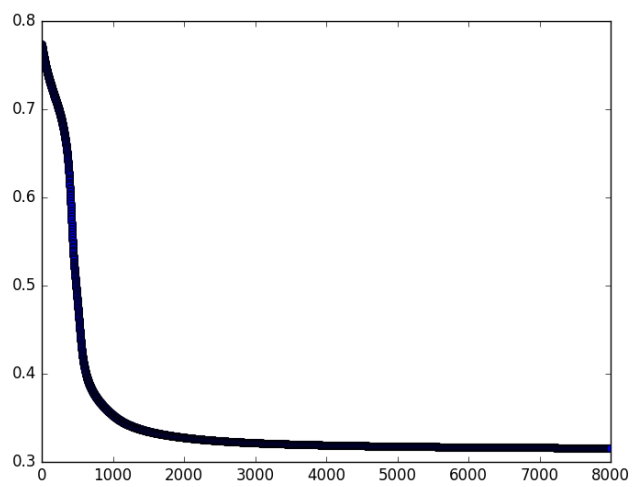
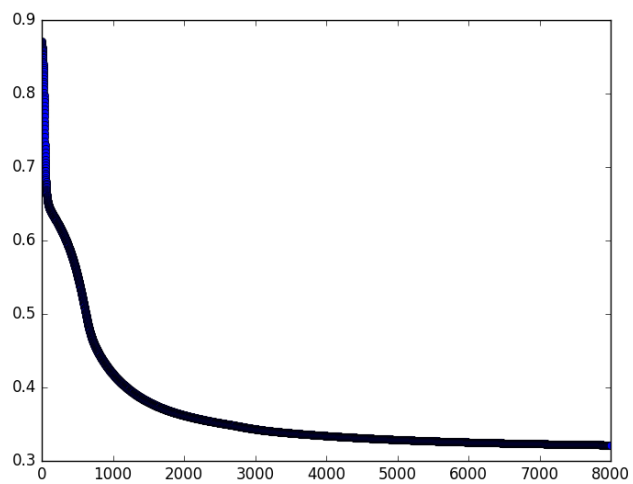


Figure 9: Arch3 Relu



1.4 Final Accuracy For Each Network

Table 1: Final Accuracy For Each Network

	Sigmoid	Tanh	Relu
Network1	0.9628821	0.99126637	0.9737991
Network2	0.55458516	1.0	0.9956332
Network3	0.55458516	1.0	1.0

1.5 Hyperparameter Optimization

1.5.1 Optimization

In the table, xx/yy denotes that: xx is loss value, yy is accuracy rating for epoch at 2000, then testing the data.

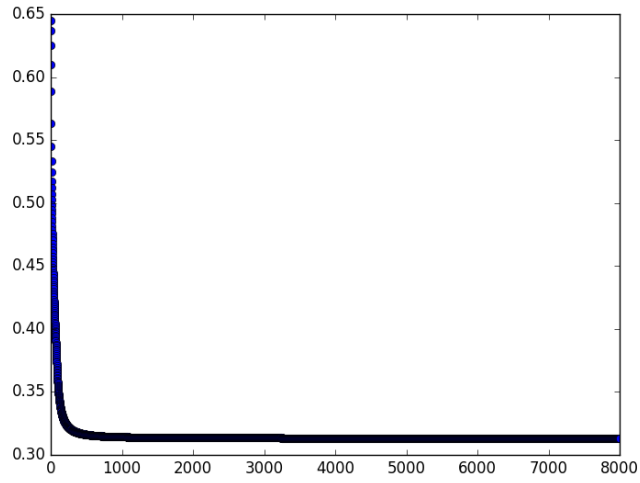
Layer Activations	Learning Rate									
	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.1
SSS	0.68789244/0.55	0.6692991/0.55	0.66720015/0.55	0.68628144/0.55	0.6810556/0.55	0.47050172/0.97	0.6871969/0.55	0.3463915/0.99	0.33197898/0.99	0.33075026/0.99
SST	0.4358933/0.98	0.43045545/0.96	0.38857114/0.98	0.32834312/1.0	0.32441178/1.0	0.319201/1.0	0.3197482/1.0	0.31692475/1.0	0.31690016/1.0	0.3175997/1.0
SSR	0.6850313/0.55	0.38780826/0.99	0.34506504/1.0	0.34083718/0.99	0.32923367/1.0	0.3869073/0.55	0.3213476/1.0	0.327354/1.0	0.317819/1.0	0.3200355/1.0
STS	0.6145127/0.74	0.36037236/0.99	0.34948123/0.99	0.4112389/0.99	0.32826188/1.0	0.32640412/1.0	0.32546172/1.0	0.32089263/1.0	0.32020745/1.0	0.32081103/1.0
STT	0.35425475/0.99	0.32510495/1.0	0.31968254/1.0	0.317732/1.0	0.31772736/1.0	0.31646454/1.0	0.3150846/1.0	0.31529894/1.0	0.31494474/1.0	0.31449395/1.0
STR	0.44032148/0.98	0.3497323/1.0	0.33983186/1.0	0.33689547/1.0	0.31755918/1.0	0.31503657/1.0	0.31482977/1.0	0.31454292/1.0	0.31412834/1.0	0.3140219/1.0
SRS	0.6634242/0.70	0.49922305/0.99	0.39515218/0.99	0.36538285/0.99	0.6546968/0.72	0.33624896/0.99	0.32252526/1.0	0.3191166/1.0	0.32551947/1.0	0.32132214/1.0
SRT	0.48028902/0.87	0.32630733/1.0	0.32088824/1.0	0.32077998/1.0	0.31675193/1.0	0.316255/1.0	0.3157316/1.0	0.31525585/1.0	0.3150004/1.0	0.3151544/1.0
SRR	0.6603494/0.62	0.34231156/0.99	0.33227438/1.0	0.31815103/1.0	0.3214322/1.0	0.32860572/1.0	0.32187757/1.0	0.3145783/1.0	0.31486974/1.0	0.31693384/1.0
TSS	0.6843663/0.55	0.67058444/0.55	0.6176693/0.80	0.6259944/0.56	0.36207137/0.99	0.35972127/0.99	0.34869736/0.99	0.34090557/0.99	0.3292783/1.0	0.3251485/1.0
TST	0.48351938/0.98	0.3431558/0.99	0.32776284/0.99	0.3188361/1.0	0.31751505/1.0	0.3167492/1.0	0.31694236/1.0	0.31781915/1.0	0.31579846/1.0	0.31513965/1.0
TSR	0.4043904/0.98	0.3319224/0.99	0.4032963/0.99	0.3286709/1.0	0.3238838/1.0	0.33062533/1.0	0.31532422/1.0	0.3156018/1.0	0.31606658/1.0	0.31425402/1.0
TTS	0.5588452/0.89	0.34751627/0.99	0.33776295/1.0	0.3259682/1.0	0.32522935/1.0	0.32212046/1.0	0.33072641/1.0	0.31895778/1.0	0.31818497/1.0	0.31753024/1.0
TTT	0.33037642/1.0	0.3198712/1.0	0.31743637/1.0	0.31665117/1.0	0.31565586/1.0	0.31516674/1.0	0.3150601/1.0	0.31431255/1.0	0.3143746/1.0	0.31425974/1.0
TTR	0.571504/0.77	0.3187649/1.0	0.31588382/1.0	0.315084/1.0	0.32032195/1.0	0.31422964/1.0	0.31633186/1.0	0.31378192/1.0	0.31392214/1.0	0.31360024/1.0
TRS	0.32846014/0.91	0.3693901/0.98	0.33349907/1.0	0.33336558/1.0	0.3267495/1.0	0.32285532/1.0	0.32632208/1.0	0.31937024/1.0	0.3235086/1.0	0.31890053/1.0
TRT	0.340546/1.0	0.32522988/1.0	0.3208892/1.0	0.3192825/0.99	0.31573373/1.0	0.31488732/1.0	0.31489557/1.0	0.31482656/1.0	0.3140442/1.0	0.315666/1.0
TBR	0.340073/1.0	0.33295488/1.0	0.3248766/1.0	0.32158422/1.0	0.32900777/1.0	0.31296133/1.0	0.31835827/1.0	0.314066/1.0	0.31660813/1.0	0.3163897/1.0
RSS	0.67796135/0.55	0.6737318/0.55	0.4599986/0.98	0.3500972/1.0	0.33876064/1.0	0.34116995/0.99	0.33178085/1.0	0.33159533/1.0	0.325827/1.0	0.32536262/1.0
RST	0.515099/0.93	0.33028436/1.0	0.32511172/1.0	0.31738698/1.0	0.31828427/1.0	0.3164119/1.0	0.31586108/1.0	0.3151228/1.0	0.3146528/1.0	0.31483337/1.0
RSR	0.41509893/0.99	0.32236278/1.0	0.31979418/1.0	0.31712398/1.0	0.31540766/1.0	0.31569206/1.0	0.31484774/1.0	0.31456298/1.0	0.31373048/1.0	0.31378767/1.0
RTS	0.5428701/0.88	0.3819605/0.99	0.3397086/1.0	0.32761222/1.0	0.32699257/1.0	0.3231281/1.0	0.31967008/1.0	0.31933332/1.0	0.31771137/1.0	0.31755466/1.0
RTT	0.33895338/0.99	0.32027683/1.0	0.31740025/1.0	0.31562398/1.0	0.31539953/1.0	0.31515338/1.0	0.31465614/1.0	0.31485334/1.0	0.31440407/1.0	0.3142189/1.0
RTR	0.3678897/0.99	0.3307278/1.0	0.32895288/1.0	0.31448418/1.0	0.31420946/1.0	0.3140565/1.0	0.31419283/1.0	0.31376797/1.0	0.3155947/1.0	0.3136963/1.0
RRS	0.45061308/0.99	0.36409537/1.0	0.34686592/1.0	0.32555684/1.0	0.32504523/1.0	0.31998438/1.0	0.32159403/1.0	0.32045943/1.0	0.31848156/1.0	0.3129102/1.0
RRT	0.3257437/0.99	0.329249/0.99	0.31823364/1.0	0.31600565/1.0	0.31527776/1.0	0.31876868/0.99	0.31521088/1.0	0.31437874/1.0	0.31411266/1.0	0.31420094/1.0
RRR	0.3644881/0.99	0.3174078/1.0	0.31486298/1.0	0.31403202/1.0	0.31093615/1.0	0.31404272/1.0	0.31381625/1.0	0.31364825/1.0	0.31408548/1.0	0.316223016/1.0

where S is **sigmoid**, T is **tanh** and R is **relu** activation function. For highlighting, I look at the loss and accuracy values of architectures and colored the lowest value of loss and highest value of accuracy. In all 27 architecture, the best values have 1.0 accuracy. In architecture TTR, with 0.1 learning rate, my loss value is the lowest and therefore I choose that architecture to part below.

1.5.2 Training and Test

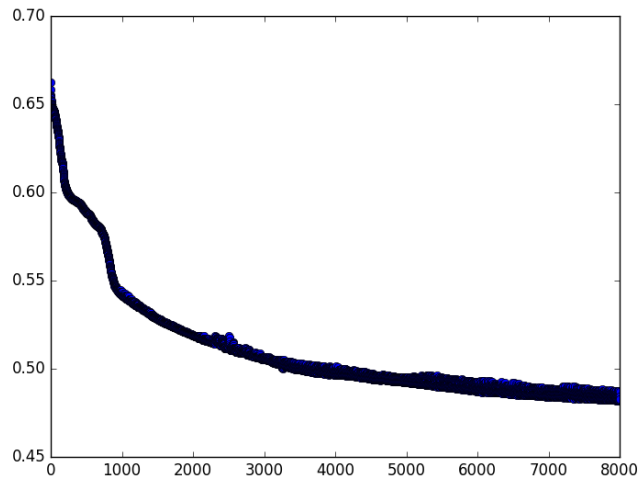
Accuracy is 1.0

Figure 10: Arch3 Optimized, Rate= 0.1, TTR



2 PART 2

Figure 11: Part 2



I've used same architecture in previous parts. Every time I change the units in the layer, I have different results. RRR architecture with 8000 training gave my

best result among others. I've used 0.07 rating rate and obtain 0.83 accuracy rating with the given set.