Exercise 19 - DNN Further Investigations
March 12, 2018

1. Repeating same model as in dataset v1 but with 2 extra weeks of data

1.1 Predicting ETH with exogenous BTC

Accuracy (average of 3 chunks - 3 weeks): 0.55

Accuracy (confidence intervals of 55%): 0.62 (177 predicted of 322)

1.2 Predicting DASH with exogenous BTC

Accuracy (average of 3 chunks - 3 weeks): 0.56

Accuracy (confidence intervals of 55%): 0.61 (524 predicted of 1090)

2. Attempting multiple hidden layers

2.1 Predicting ETH with exogenous BTC

	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19	V20
1	0.4949153	0.5389830	0.4949153	0.5457627	0.5711864	0.5203390	0.5440678	0.5033898	0.5779661	0.5813559	0.5661017	0.5593220	0.5457627	0.5254237	0.5135593	0.5322034	0.5457627	0.5559322	0.5508475	0.5491525
2	0.5576271	0.4949153	0.5237288	0.5050847	0.5576271	0.5559322	0.5305085	0.5000000	0.5372881	0.5152542	0.5016949	0.5338983	0.5152543	0.5474576	0.5508474	0.5491526	0.5542373	0.5169492	0.5271186	0.5254237
3	0.5610170	0.5254237	0.5508475	0.5525424	0.5559322	0.5355932	0.4830508	0.5542373	0.5135593	0.5423729	0.5084746	0.5491525	0.5016949	0.4966102	0.5118644	0.5610169	0.5474576	0.5728813	0.5135593	0.5271186
4	0.5508475	0.5186441	0.5237288	0.5305085	0.5169492	0.5508475	0.5169492	0.5779661	0.5254237	0.5305085	0.5559322	0.5593220	0.5322034	0.5389830	0.5254237	0.5322034	0.5338983	0.5457627	0.5423729	0.5423729
5	0.5322034	0.5728814	0.5389830	0.5457627	0.5372881	0.4966102	0.5322034	0.5474576	0.5305085	0.5271186	0.5677966	0.5254237	0.5237288	0.5542373	0.5372881	0.5254237	0.5661017	0.5830509	0.5661017	0.5677966
6	0.5186441	0.5305085	0.4864407	0.5389830	0.5508475	0.5254237	0.5305085	0.5694915	0.5491525	0.5406780	0.5491525	0.5423729	0.5050848	0.5000000	0.5627119	0.5389831	0.5457627	0.5508475	0.5186441	0.5440678
7	0.5152542	0.5508474	0.5389831	0.5508475	0.5644068	0.5457627	0.5101695	0.5576271	0.5406780	0.5508475	0.5576271	0.5305085	0.5372881	0.5389831	0.5288136	0.5593220	0.4966102	0.5322034	0.5338983	0.5559322
8	0.5389831	0.5491525	0.5627119	0.5508475	0.5406780	0.5423729	0.5677966	0.5372881	0.5576271	0.5254237	0.5694915	0.5288135	0.5711864	0.5813559	0.5542373	0.5186441	0.5508475	0.5542373	0.5661017	0.5644068
9	0.5237288	0.5542373	0.5084746	0.5288136	0.5338983	0.5322034	0.4966102	0.5372881	0.5406780	0.5220339	0.5084746	0.5101695	0.5152542	0.5474576	0.5271186	0.5457627	0.5474576	0.5372881	0.5288135	0.5593220
10	0.5135593	0.4983051	0.5694915	0.5389831	0.5661017	0.5542373	0.5694915	0.5389830	0.5644068	0.5542373	0.5610170	0.5559322	0.5491526	0.5593221	0.5050848	0.5593221	0.5254237	0.5254237	0.5457627	0.5389830
11	0.5389831	0.5389830	0.5101695	0.5576271	0.5542373	0.5440678	0.5457627	0.5457627	0.5610170	0.5220339	0.5508475	0.5203390	0.5728814	0.5474576	0.5542373	0.5372882	0.5423729	0.5525424	0.5322034	0.5440678
12	0.5474576	0.5474576	0.5542373	0.5338983	0.5457627	0.5322034	0.5305085	0.5237288	0.5508475	0.5508475	0.5423729	0.5322034	0.5457627	0.5576271	0.5423729	0.5169491	0.5677966	0.5474576	0.5491525	0.5220339
13	0.5491526	0.5474576	0.5474576	0.5576271	0.5457627	0.5508474	0.5389830	0.5542373	0.5305085	0.5610169	0.5423729	0.5271186	0.5372881	0.5440678	0.5440678	0.5576271	0.5644068	0.5389831	0.5338983	0.5491525
14	0.5305085	0.5372881	0.5762712	0.5440678	0.5355932	0.5220339	0.5508475	0.5254237	0.5050848	0.5576271	0.5389830	0.5186441	0.5508475	0.5457627	0.5423729	0.5542373	0.5593220	0.5677966	0.5135593	0.5169492
15	0.5067797	0.5355932	0.5389830	0.5389830	0.5288136	0.5406780	0.5355932	0.5169491	0.5576271	0.5101695	0.5576271	0.5474576	0.5644068	0.5372881	0.5220339	0.5305085	0.5355932	0.5457627	0.5627119	0.5305085
16	0.5779661	0.5423729	0.5508475	0.5644068	0.5474576	0.5288136	0.5440678	0.5644068	0.5237288	0.5355932	0.5033898	0.5694915	0.5322034	0.5474576	0.5508475	0.5542373	0.5474576	0.5457627	0.5338983	0.5576271
17	0.5186441	0.5237288	0.5508475	0.5644068	0.5101695	0.5508475	0.5559322	0.5610170	0.5440678	0.4932203	0.5542373	0.5389830	0.5372881	0.5711864	0.5322034	0.5542373	0.5491525	0.5559322	0.5186441	0.5237288
18	0.5288136	0.5559322	0.5508475	0.5305085	0.5644068	0.5474576	0.5440678	0.5559322	0.5338983	0.5542373	0.5474576	0.5457627	0.5169492	0.5694915	0.5491525	0.5220339	0.5508474	0.4966102	0.5525424	0.5813559
19	0.5542373	0.5728813	0.5457627	0.5576271	0.5118644	0.5203390	0.5711865	0.5186441	0.5254237	0.5372881	0.5491525	0.5067796	0.5271187	0.5457627	0.5593220	0.5440678	0.5169492	0.5186441	0.5745763	0.5406780
20	0.5542373	0.5406780	0.5220339	0.5525424	0.5610169	0.5152542	0.5271186	0.5457627	0.5389830	0.5254237	0.5576271	0.5542373	0.5237288	0.5457627	0.5593220	0.5406780	0.5508475	0.5559322	0.5440678	0.5474576

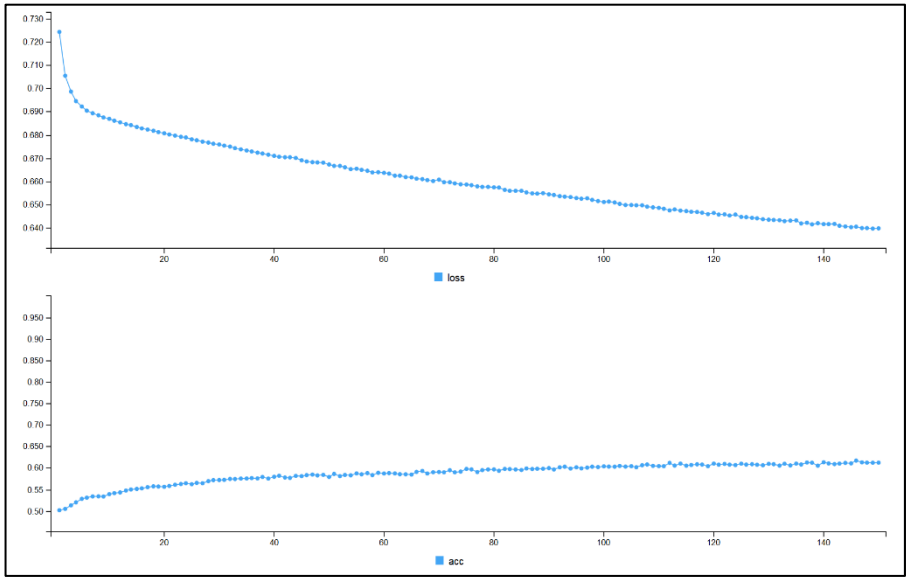
Figure 1 - performance object for various DNN architectures (run time ~24hrs) ETH prediction

2.2 Predicting DASH with exogenous BTC

	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19	V20
1	0.520339	0.516949	0.520339	0.486441	0.520339	0.532203	0.523729	0.542373	0.515254	0.523729	0.523729	0.508475	0.549153	0.561017	0.532203	0.550847	0.525424	0.542373	0.520339	0.518644
2	0.535593	0.505085	0.530508	0.528814	0.554237	0.544068	0.511864	0.525424	0.508475	0.547458	0.527119	0.528814	0.535593	0.545763	0.522034	0.566102	0.528814	0.522034	0.515254	0.513559
3	0.520339	0.515254	0.488136	0.544068	0.498305	0.523729	0.533898	0.522034	0.528814	0.528814	0.522034	0.528814	0.515254	0.513559	0.516949	0.542373	0.549153	0.527119	0.486441	0.538983
4	0.518644	0.533898	0.508475	0.538983	0.540678	0.508475	0.511864	0.532203	0.544068	0.538983	0.520339	0.576271	0.554237	0.486441	0.501695	0.520339	0.50678	0.535593	0.532203	0.515254
5	0.530508	0.537288	0.537288	0.49322	0.549153	0.522034	0.520339	0.547458	0.550847	0.510169	0.527119	0.540678	0.525424	0.484746	0.513559	0.532203	0.510169	0.533898	0.513559	0.510169
6	0.532203	0.474576	0.542373	0.538983	0.540678	0.538983	0.510169	0.561017	0.494915	0.516949	0.554237	0.511864	0.489831	0.540678	0.484746	0.533898	0.511864	0.545763	0.530508	0.528814
7	0.518644	0.50678	0.50678	0.520339	0.525424	0.544068	0.566102	0.516949	0.530508	0.564407	0.513559	0.532203	0.533898	0.501695	0.533898	0.530508	0.532203	0.532203	0.5	0.542373
8	0.527119	0.505085	0.518644	0.561017	0.513559	0.537288	0.530508	0.515254	0.535593	0.555932	0.528814	0.538983	0.520339	0.528814	0.522034	0.527119	0.501695	0.544068	0.527119	0.522034
9	0.50339	0.491525	0.542373	0.510169	0.522034	0.544068	0.510169	0.561017	0.484746	0.550847	0.557627	0.522034	0.538983	0.545763	0.530508	0.530508	0.523729	0.528814	0.561017	0.525424
10	0.523729	0.527119	0.533898	0.535593	0.522034	0.474576	0.522034	0.513559	0.527119	0.510169	0.538983	0.518644	0.513559	0.527119	0.540678	0.518644	0.533898	0.49661	0.564407	0.525424
11	0.527119	0.528814	0.508475	0.528814	0.511864	0.505085	0.522034	0.483051	0.544068	0.518644	0.520339	0.513559	0.537288	0.494915	0.532203	0.525424	0.547458	0.520339	0.516949	0.542373
12	0.511864	0.49661	0.532203	0.510169	0.532203	0.525424	0.544068	0.527119	0.547458	0.491525	0.533898	0.525424	0.542373	0.533898	0.555932	0.513559	0.527119	0.513559	0.533898	0.510169
13	0.477966	0.537288	0.505085	0.510169	0.49322	0.522034	0.516949	0.511864	0.518644	0.523729	0.518644	0.527119	0.533898	0.535593	0.511864	0.520339	0.547458	0.491525	0.542373	0.49661
14	0.511864	0.537288	0.491525	0.525424	0.516949	0.49661	0.549153	0.515254	0.533898	0.554237	0.533898	0.508475	0.542373	0.535593	0.549153	0.528814	0.520339	0.518644	0.525424	0.508475
15	0.513559	0.535593	0.533898	0.511864	0.527119	0.525424	0.538983	0.511864	0.537288	0.523729	0.520339	0.510169	0.523729	0.513559	0.544068	0.530508	0.532203	0.530508	0.50339	0.522034
16	0.477966	0.533898	0.516949	0.50678	0.525424	0.535593	0.523729	0.542373	0.508475	0.520339	0.532203	0.515254	0.555932	0.532203	0.538983	0.530508	0.550847	0.549153	0.547458	0.527119
17	0.518644	0.511864	0.505085	0.520339	0.522034	0.538983	0.537288	0.522034	0.518644	0.50339	0.532203	0.562712	0.508475	0.520339	0.505085	0.511864	0.510169	0.550847	0.542373	0.538983
18	0.513559	0.516949	0.523729	0.559322	0.540678	0.532203	0.522034	0.50339	0.533898	0.522034	0.508475	0.528814	0.515254	0.535593	0.525424	0.532203	0.547458	0.518644	0.513559	0.515254
19	0.532203	0.532203	0.523729	0.538983	0.561017	0.528814	0.527119	0.537288	0.515254	0.511864	0.530508	0.528814	0.516949	0.530508	0.518644	0.494915	0.508475	0.520339	0.532203	0.527119
20	0.528814	0.518644	0.515254	0.520339	0.50339	0.515254	0.544068	0.511864	0.530508	0.545763	0.530508	0.533898	0.508475	0.515254	0.525424	0.518644	0.523729	0.544068	0.511864	0.545763

Figure 2 - performance object for various DNN architectures (run time ~24hrs) DASH prediction

Model params:
- relu activation for hidden layers
- softmax for output layer
- no dropout
- adam optimiser rather than gradient descent (better speed)
- batch size of 200, shuffle TRUE for training (try without?)
- loss is categorical cross entropy (instead of classification error or mean squared error)



Further investigations to undertake:

- Impact of more than 2 hidden layers
- Try with a larger range of time inputs and plot in a graph
- Tweak further specs to get best *dev* performances (dropout ect)
- Summarise all models
- Test models on live data

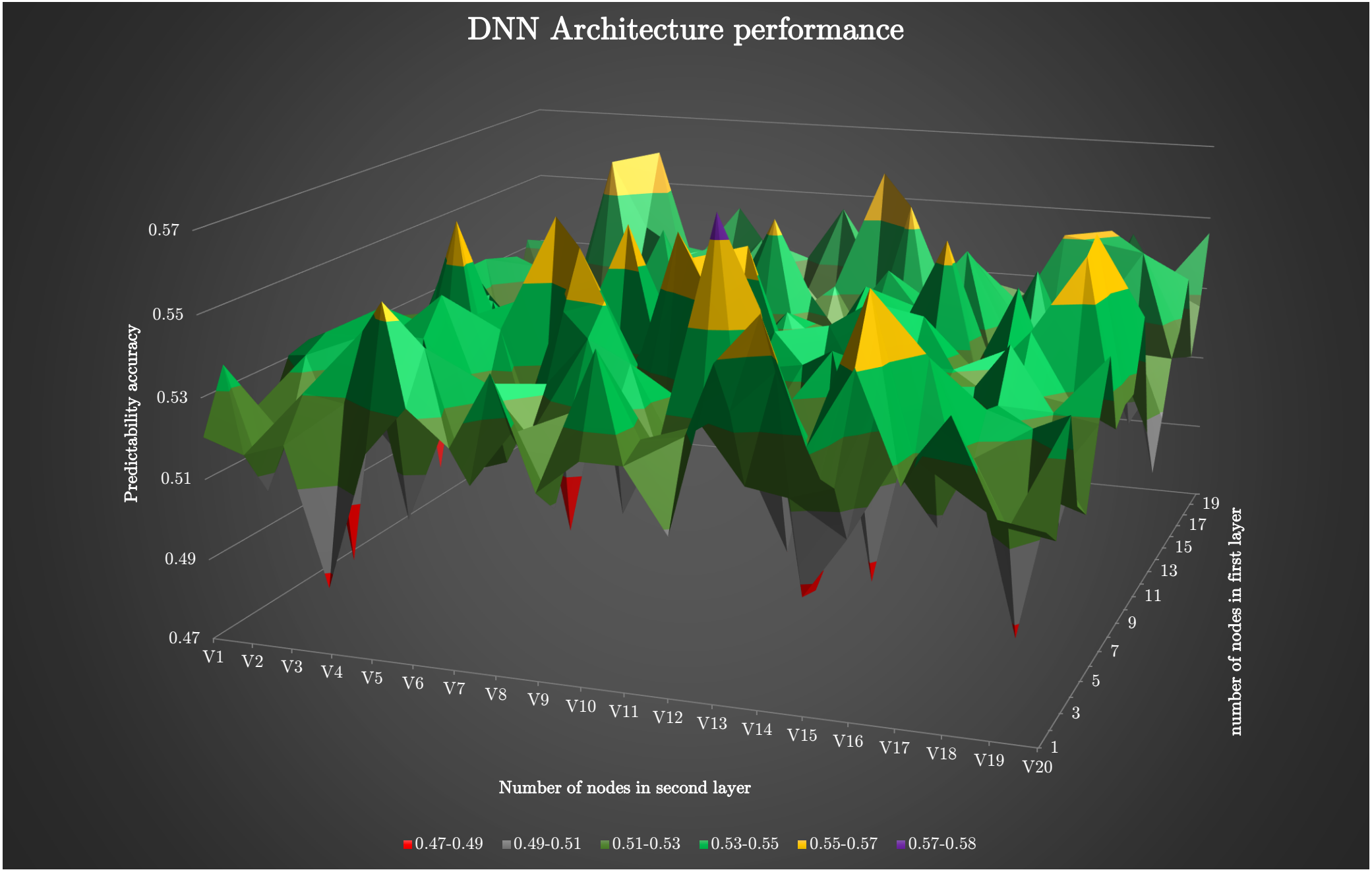


Figure 3 - 3D plot of various DNN architecture performance