San Diego Calibration Results

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1 Data

We have been collecting data from nine boards from three sites in southern California.

1. El Cajon
2. Donovan
3. Shafter

We have split up the boards and rotated the boards between locations every two weeks (see Table 1).

	Round 1	**Round 2**	**Round 3**
Board 17	N/A	El Cajon	Shafter
Board 19	Donovan	El Cajon	Shafter
Board 21	Donovan	El Cajon	Shafter
Board 11	El Cajon	Shafter	Donovan
Board 12	El Cajon	Shafter	Donovan
Board 13	El Cajon	Shafter	Donovan
Board 15	Shafter	Donovan	El Cajon
Board 18	Shafter	Donovan	El Cajon
Board 20	N/A	Donovan	El Cajon

Table 1: Board locations for each round

We do not have CO data for Shafter and Donovan, so we will focus only on O3 and NO2.

2 Distributions

In this section, we describe and visualize the distributions of various values in the data.

Preprint. Work in progress.

2.1 Environment

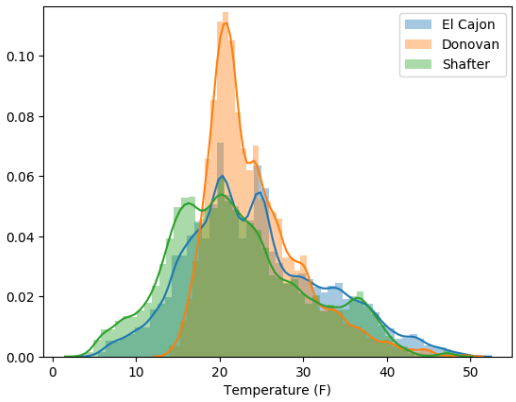


Figure 1: Temperature distribution based based on location

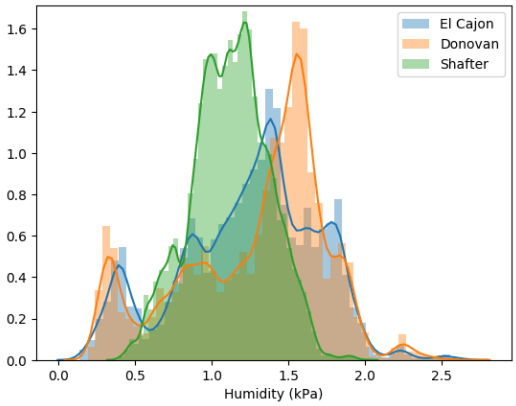
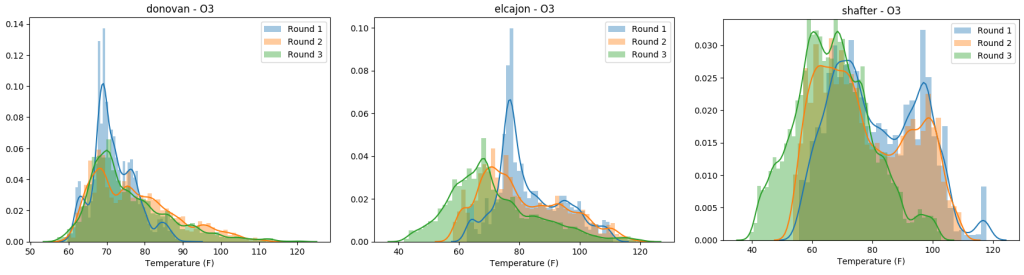
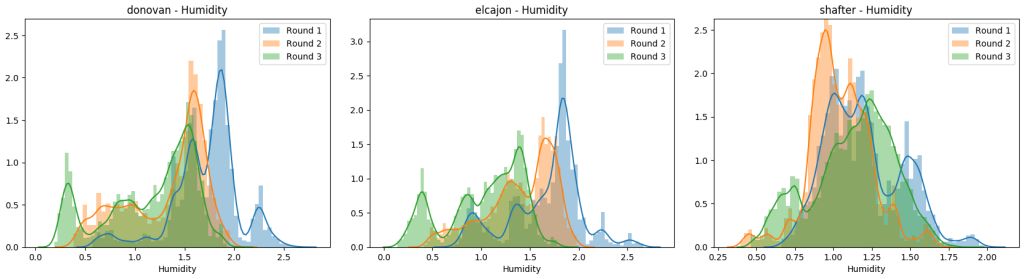


Figure 2: Absolute humidity distribution based on location



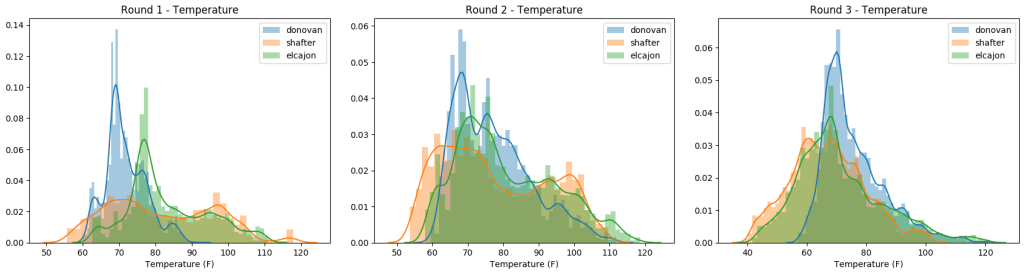
(a) Donovan (b) El Cajon (c) Shafter

Figure 3: Temperature at locations



(a) Donovan (b) El Cajon (c) Shafter

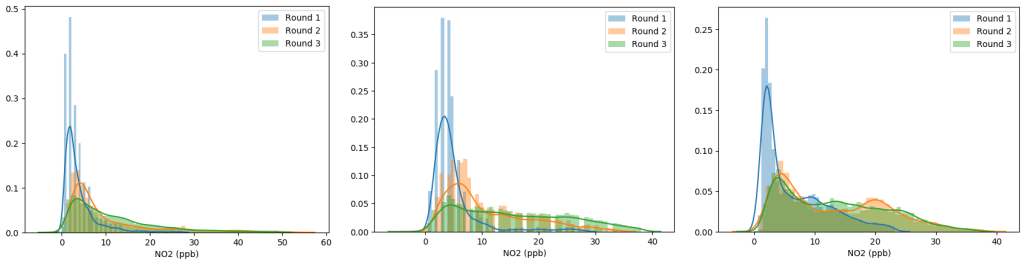
Figure 4: Absolute humidity at locations



(a) Round 1 (b) Round 2 (c) Round 3

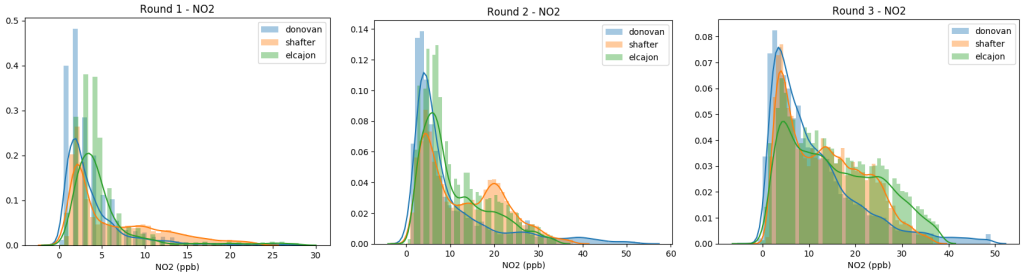
Figure 5: Temperature over rounds

2.2 Pollutant values



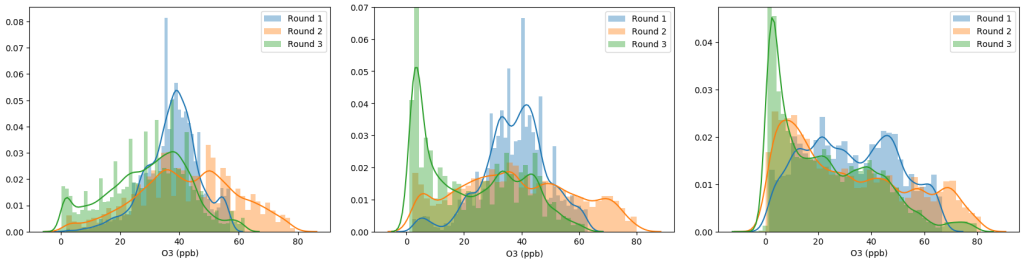
(a) Round 1 (b) Round 2 (c) Round 3

Figure 6: NO2 at locations



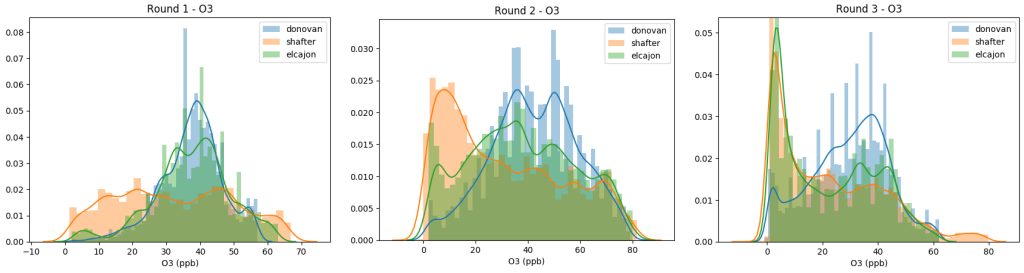
(a) Round 1 (b) Round 2 (c) Round 3

Figure 7: NO2 over rounds



(a) Round 1 (b) Round 2 (c) Round 3

Figure 8: O3 at locations



(a) Round 1 (b) Round 2 (c) Round 3

Figure 9: O3 over rounds

3 Basic calibration results

A calibration model takes in sensor readings and environment variables and outputs pollutant levels. In this basic setup, we train a model for each board. We aim to train models that are robust after moving location.

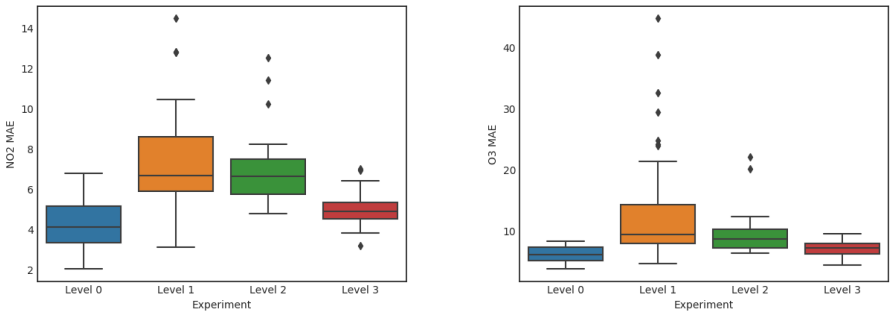
Level 0	Train on location A and test on location A
Level 1	Train on location A and test on location B
Level 2	Train on location A and B and test on location C
Level 3	Train on location A, B, and C and test on location A

Table 2: Description of different types of benchmarks.

We benchmark four different models: linear regression (linear), random forest regressors based on **?**(Subu), a 2-layer neural network (NN[2]), and a 4-layer neural network (NN[4]). The ideal model will both predict pollutant levels accurately and generalize across locations.

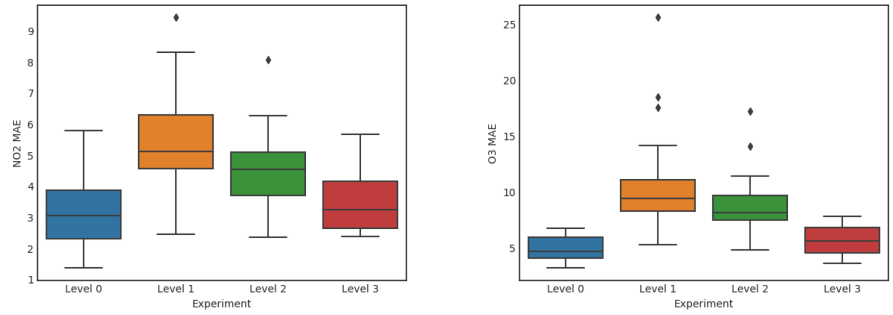
To benchmark, we first take our datasets (25 total, see Table 1), and partition each into training and test sets (20% reserved for testing). We perform several types of benchmarks, each to learn about the transferrability of each model (see Table 2). In general, we expect Level 0 and Level 3 performance to be the best, as they involve training and testing on data from the same distribution. Furthermore, we expected Level 2 to have lower error than Level 1, because Level 2 is trained on more data and a wider distribution of data (two locations vs one location). If a model's Level 1 and Level 2 error are close to Level 0 and Level 3, then the model transfers well. Otherwise, the model overfits to its location.

These raw results are in Appendix A. We split results into train vs. test results, where we expect train performance to be better than test. Overall, we see that random forests have the lowest Level 0 and Level 3 error. This is consistent with results we see in **?**.



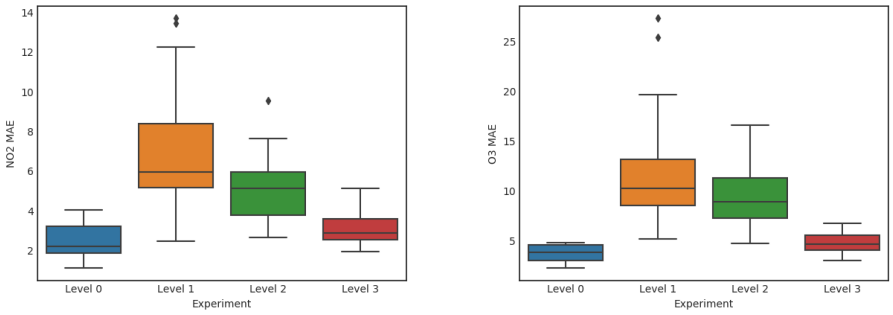
(a) NO2 (b) O3

Figure 10: Results for linear regression. Error is in parts per billion



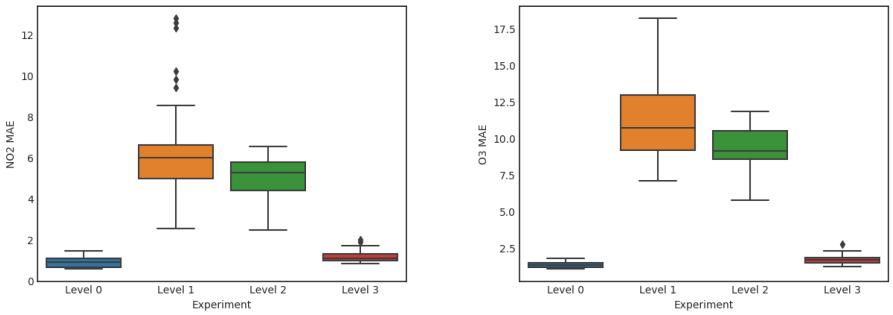
(a) NO2 (b) O3

Figure 11: Results for NN[2]. Error is in parts per billion



(a) NO2 (b) O3

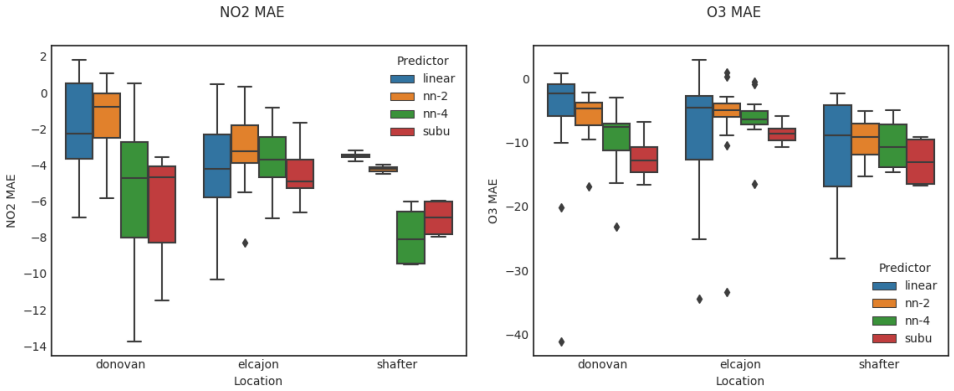
Figure 12: Results for NN[4]. Error is in parts per billion



(a) NO2 (b) O3

Figure 13: Results for Subu. Error is in parts per billion

We observe when comparing Level 1 error difference (Level 1 train minus Level 1 test), random forests suffer great drops in performance. This hints that RFs are overfitting to the training data, even if they report the lowest test error for Level 0 and Level 3. See Figure 14 for details.



(a) NO2 (b) O3

Figure 14: Level 1 difference plots. Train minus test errors for various models. A smaller value means that the models transfer better.

4 Neural representation learning

We now present split-neural network results: we split up calibration into two stages, a sensor model and a pollutant model, which we will call s_i and c respectively. Given a sensor readings x from board i, and environment readings e we obtain a calibrated reading y by simply passing it through the sensor model, then the pollutant model, i.e.

$$y = c(s_i(x), e)$$

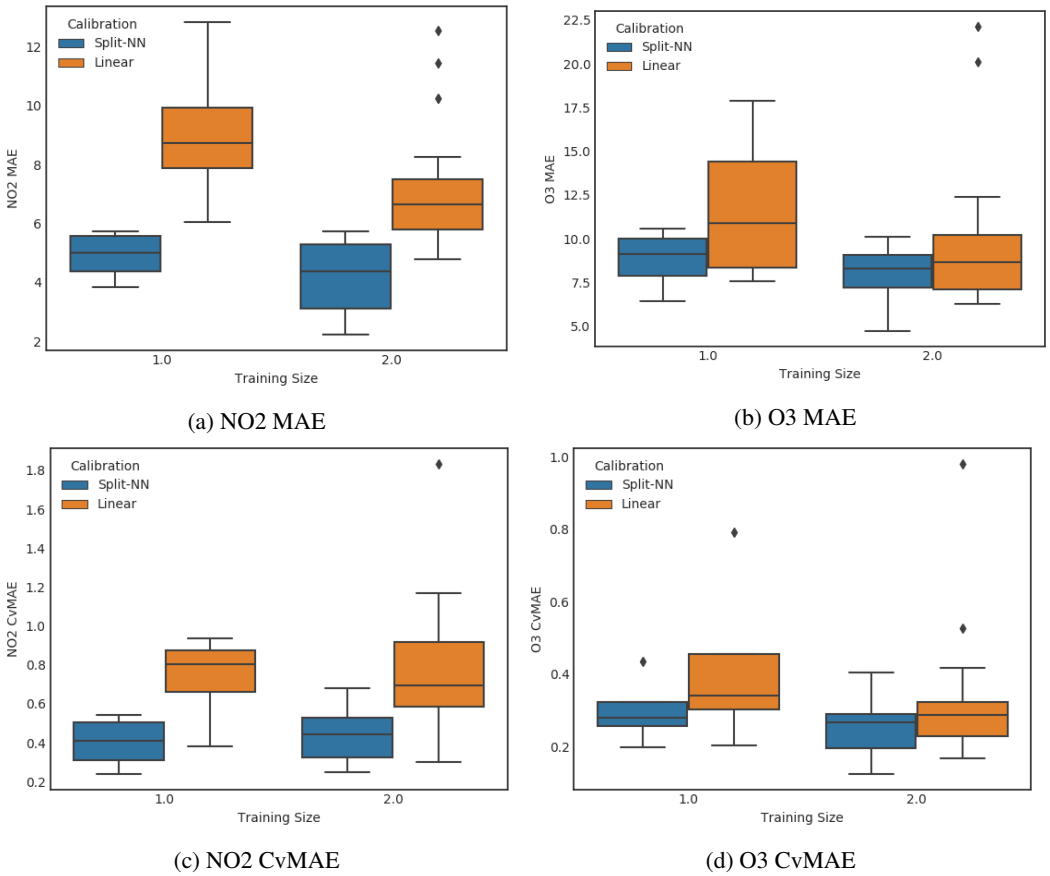
We can learn individual sensor models for each board, but the pollutant model is shared across boards. This allows us to pool data across boards to learn the pollutant model. Furthermore, environment variables are only included in the pollutant model, which hopefully enables a stronger fit with a very complex pollutant model.

Each $s_i(x)$ outputs a "sensor representation", which is chosen to be some fixed dimension d. We hope that the sensor representation contains the minimal information to produce calibrated readings.

We experiment with each s_i being a linear regression model, and c being a deep neural network (two layers, 100 width ReLU). Each set of data we collect is identified by a triplet of information (round, location, board number). In total, we have 25 of such datasets as defined in Table 1. To

benchmark these split models, we train on all of these datasets, but hold one triple out, resulting in a total training set size of 24 datasets and test size of 1 dataset. This results in a total of 25 experiments for which we boxplot the results. We compare the split models to our four static models (Linear, NN[2], NN[4], Subu) by comparing the Split-NN performance on the held out dataset to the Level 2 performance of the four models. Level 2 performance corresponds to training on two locations and testing on the third. The split model has access to the same training data as the Level 2 models, but with the addition of data from other boards. The hope is this additional board data can help improve upon Level 2 performance, which can be thought of as the "best" possible transfer performance.

Notice that for some boards, we do not have the full three rounds of data (Boards 17 and 20). Therefore, there are no Level 2 results for these boards, but there are Level 1. For these two boards, in particular, we compare the split model to the Level 1 performance for a fair benchmark. This corresponds to the "Training Size" of 1.0 or 2.0 (Level 1 and Level 2).



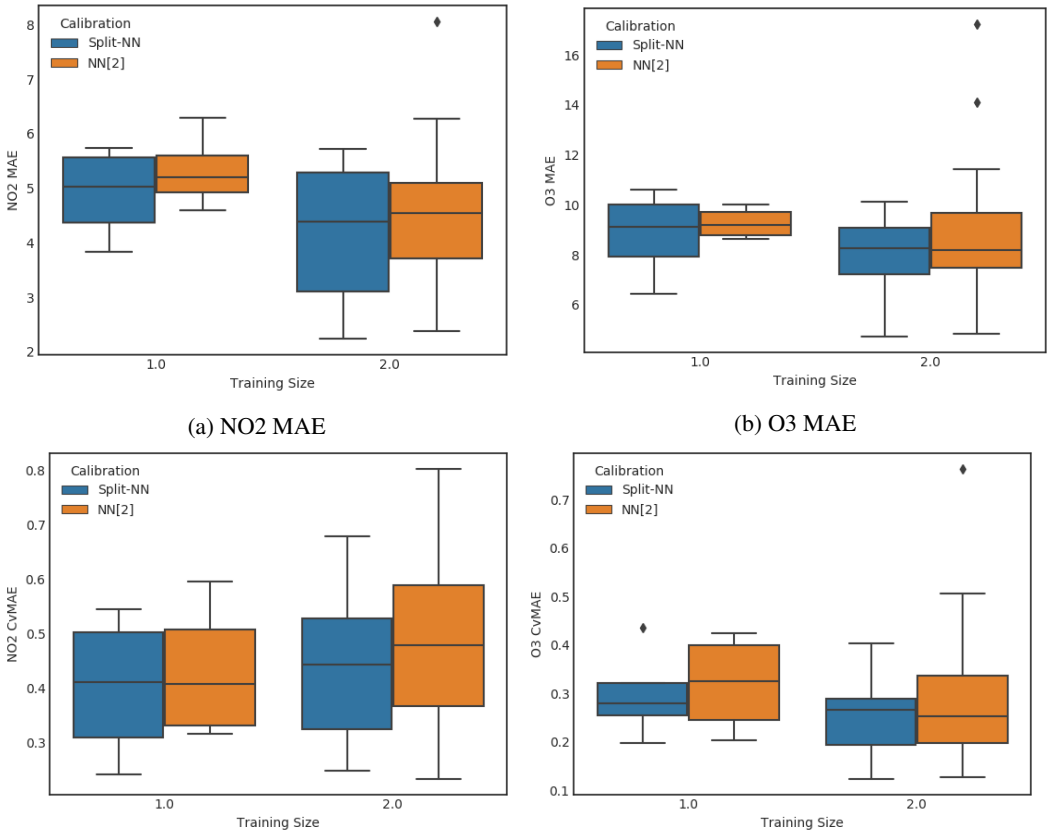
(a) NO2 MAE

(b) O3 MAE

(c) NO2 CvMAE

(d) O3 CvMAE

Figure 15: Comparison of errors of Split NN and Linear. Training size corresponds to a Level 1 or Level 2 comparison.



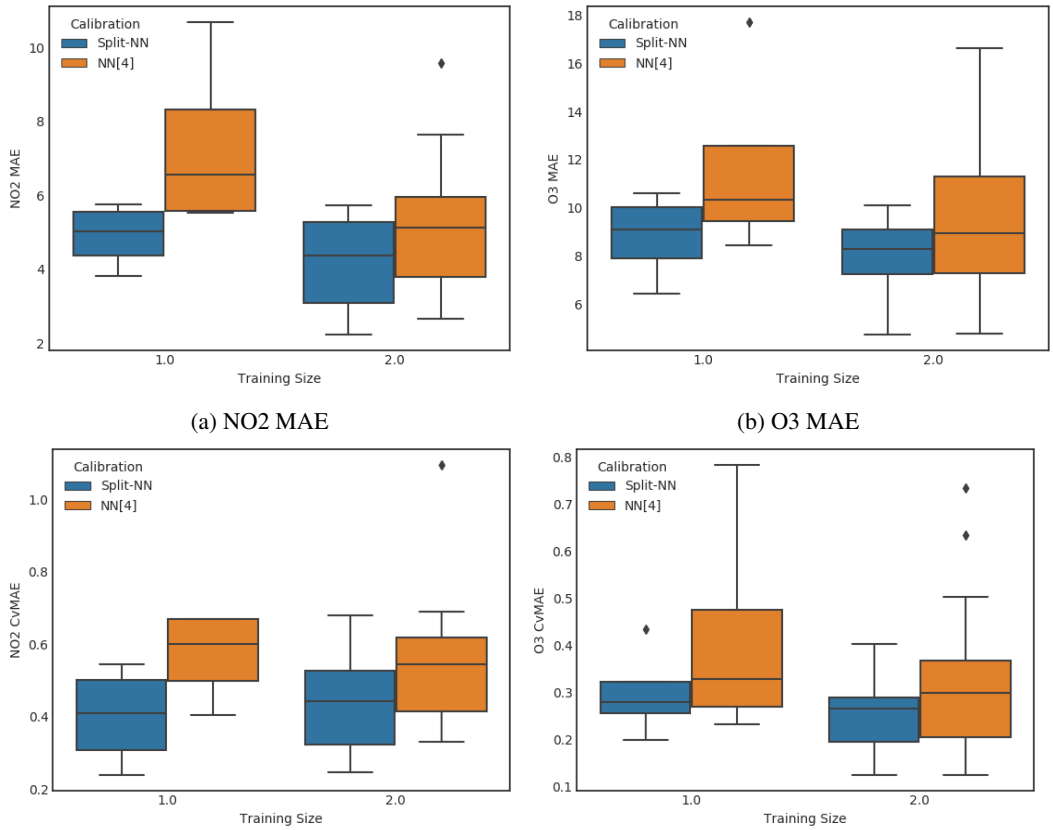
(a) NO2 MAE

(b) O3 MAE

(c) NO2 CvMAE

(d) O3 CvMAE

Figure 16: Comparison of errors of Split NN and NN[2]. Training size corresponds to a Level 1 or Level 2 comparison.



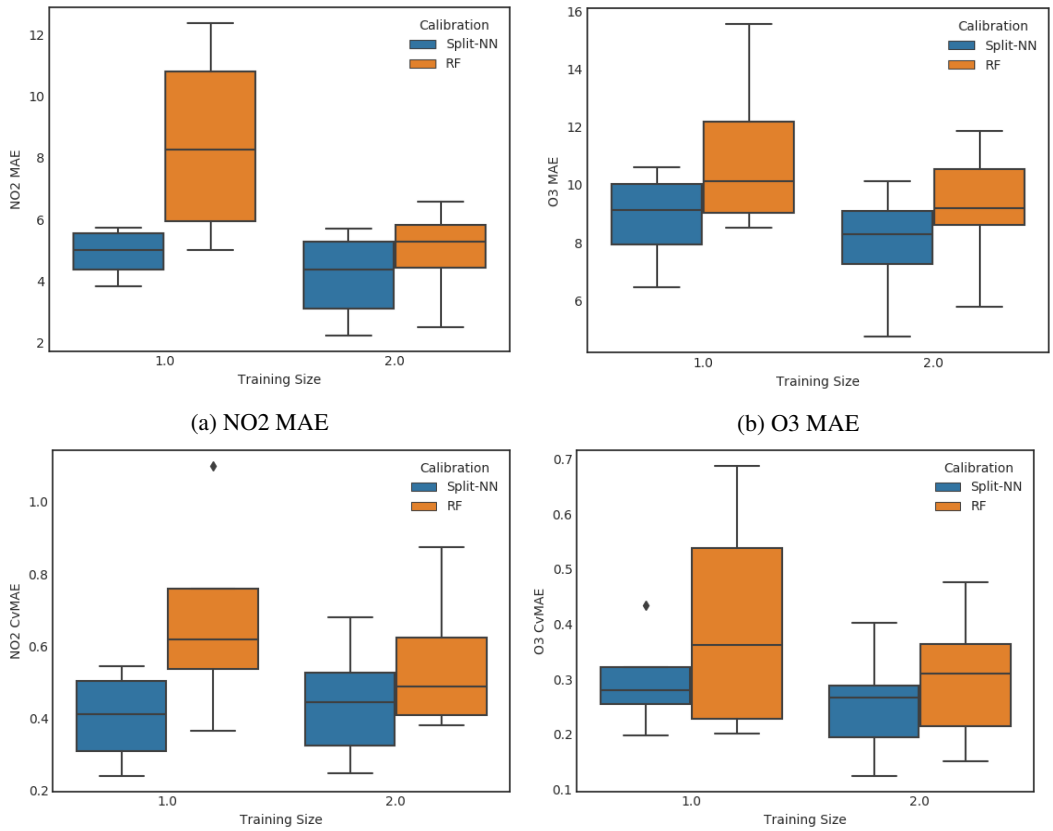
(a) NO2 MAE

(b) O3 MAE

(c) NO2 CvMAE

(d) O3 CvMAE

Figure 17: Comparison of errors of Split NN and NN[4]. Training size corresponds to a Level 1 or Level 2 comparison.



(a) NO2 MAE

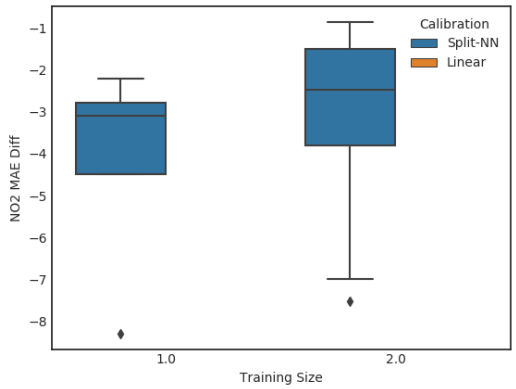
(b) O3 MAE

(c) NO2 CvMAE

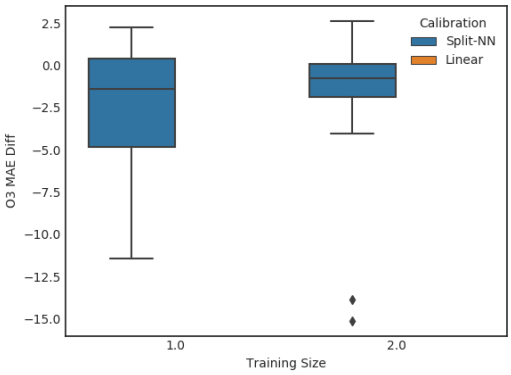
(d) O3 CvMAE

Figure 18: Comparison of errors of Split NN and Subu. Training size corresponds to a Level 1 or Level 2 comparison.

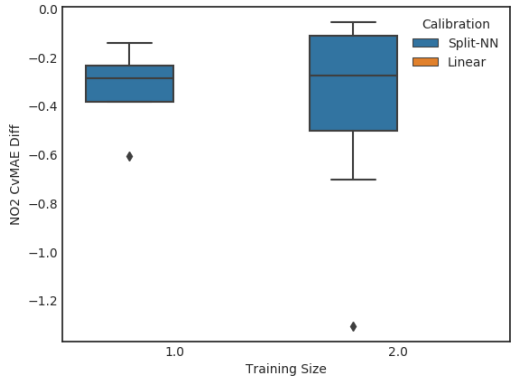
To further accentuate the improvement, we can compare the difference in performance between Split-NN and the four models. In these plots, a more negative value corresponds to a larger improvement.



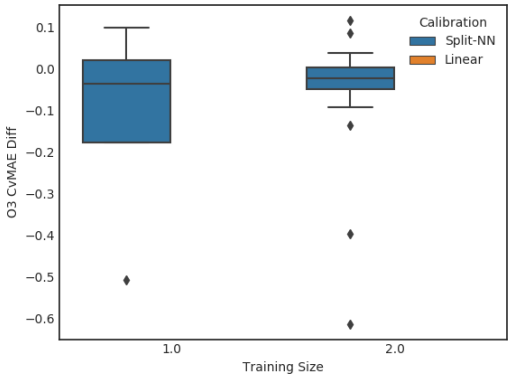
(a) NO2 MAE Difference



(b) O3 MAE Difference

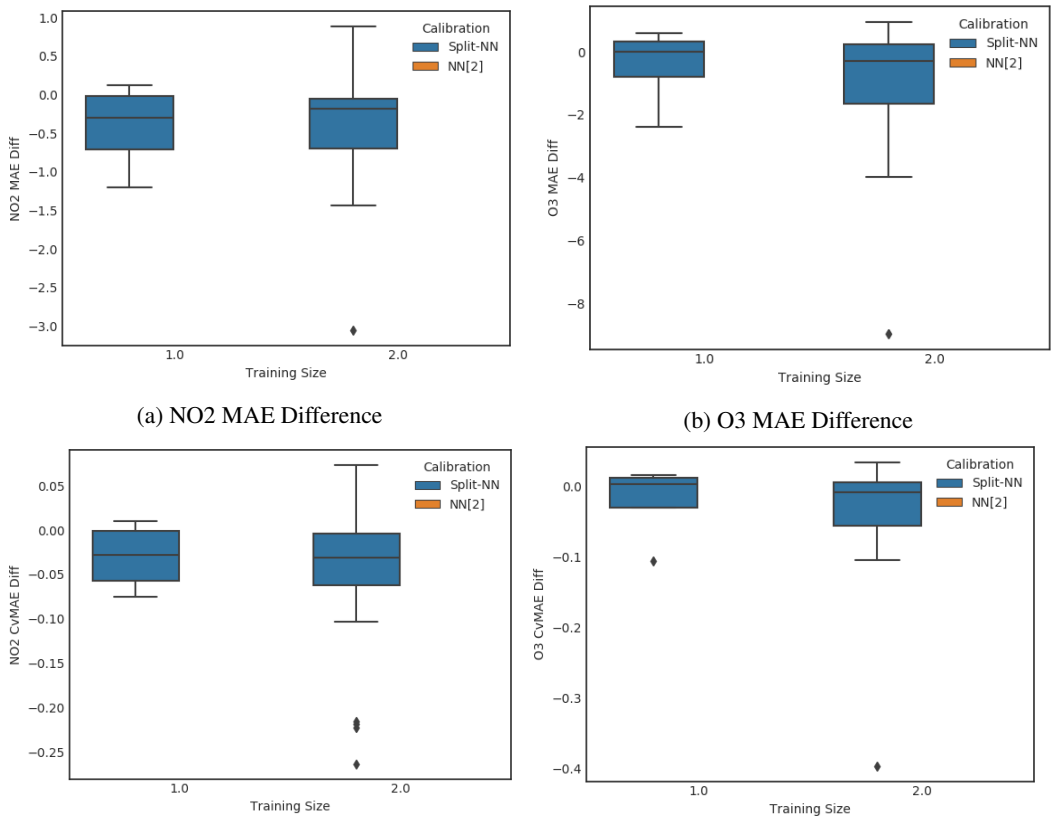


(c) NO2 CvMAE Difference



(d) O3 CvMAE Difference

Figure 19: Comparison of errors of Split NN and Linear. Training size corresponds to a Level 1 or Level 2 comparison.



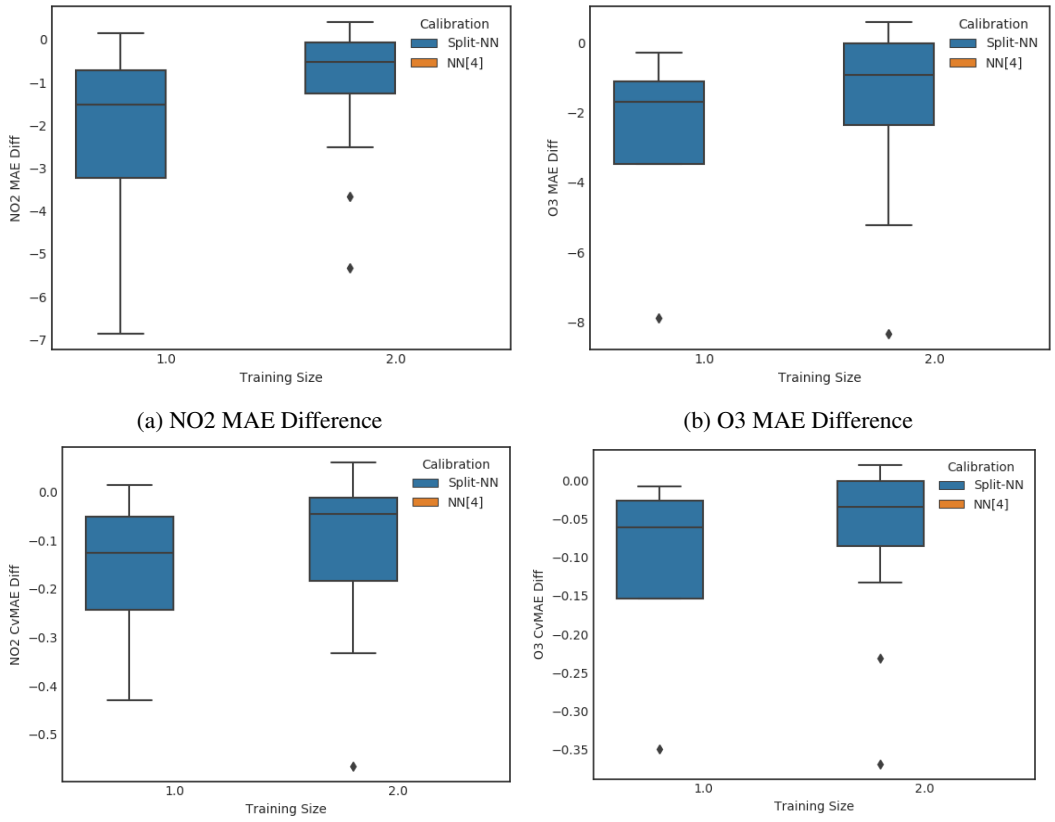
(a) NO2 MAE Difference

(b) O3 MAE Difference

(c) NO2 CvMAE Difference

(d) O3 CvMAE Difference

Figure 20: Comparison of errors of Split NN and NN[2]. Training size corresponds to a Level 1 or Level 2 comparison.



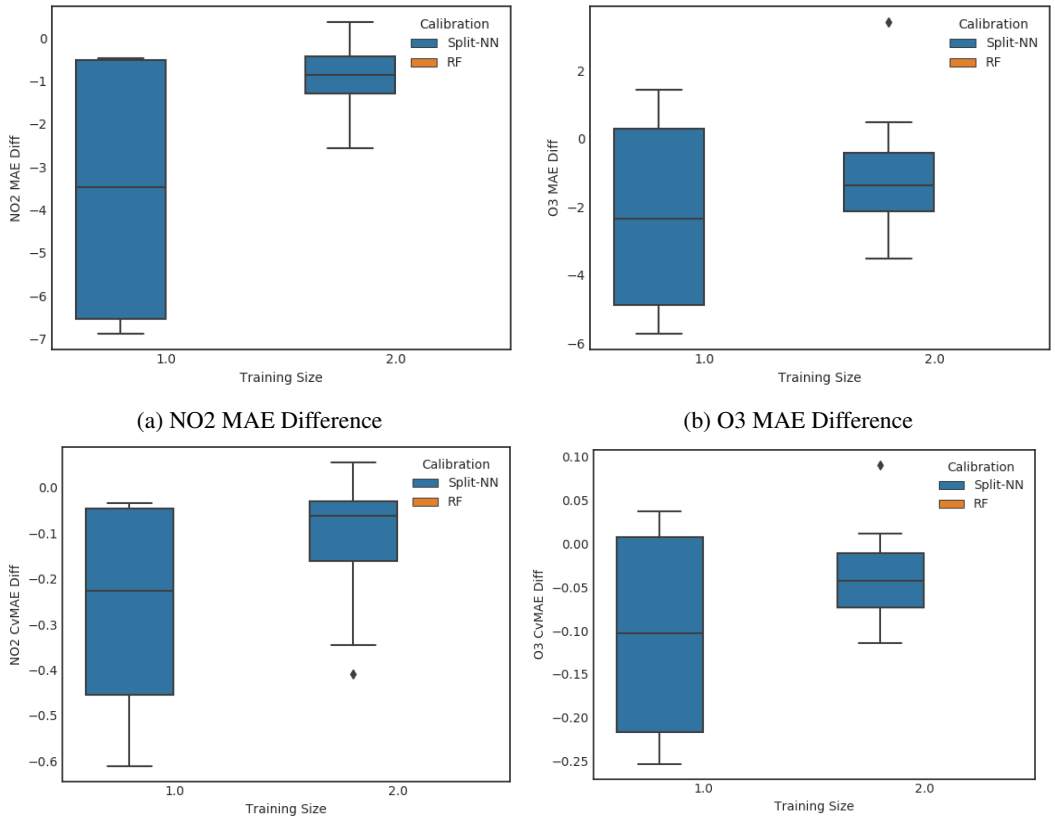
(a) NO2 MAE Difference

(b) O3 MAE Difference

(c) NO2 CvMAE Difference

(d) O3 CvMAE Difference

Figure 21: Comparison of errors of Split NN and NN[4]. Training size corresponds to a Level 1 or Level 2 comparison.



(a) NO2 MAE Difference

(b) O3 MAE Difference

(c) NO2 CvMAE Difference

(d) O3 CvMAE Difference

Figure 22: Comparison of errors of Split NN and Subu. Training size corresponds to a Level 1 or Level 2 comparison.

A Raw results for simple calibration models

A.1 Benchmarks for linear regression

	Model	Testing Location	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
16	(1, donovan, 19)	(1, donovan, 19)	2.817624	3.748897	0.669465	0.098983
5	(1, donovan, 21)	(1, donovan, 21)	2.532854	4.071486	0.601804	0.107501
8	(1, elcajon, 11)	(1, elcajon, 11)	2.042837	5.212672	0.380986	0.137718
2	(1, elcajon, 12)	(1, elcajon, 12)	2.196888	5.192453	0.409716	0.137184
9	(1, elcajon, 13)	(1, elcajon, 13)	2.087088	4.383210	0.389238	0.115804
0	(1, shafter, 15)	(1, shafter, 15)	3.353189	5.572850	0.496553	0.169842
6	(1, shafter, 18)	(1, shafter, 18)	2.309084	4.330305	0.413509	0.131661
14	(2, donovan, 15)	(2, donovan, 15)	6.698192	7.547663	0.630592	0.175792
22	(2, donovan, 18)	(2, donovan, 18)	6.324331	6.607726	0.609086	0.154963
4	(2, donovan, 20)	(2, donovan, 20)	6.775750	7.562647	0.652561	0.177358
13	(2, elcajon, 17)	(2, elcajon, 17)	3.379753	7.288420	0.300214	0.191092
1	(2, elcajon, 19)	(2, elcajon, 19)	4.038051	7.618134	0.359570	0.199615
3	(2, elcajon, 21)	(2, elcajon, 21)	3.970448	7.246587	0.353550	0.189880
20	(2, shafter, 11)	(2, shafter, 11)	4.479276	7.245613	0.333649	0.229641
21	(2, shafter, 12)	(2, shafter, 12)	4.569744	7.011483	0.339964	0.221728
11	(2, shafter, 13)	(2, shafter, 13)	4.606628	7.362080	0.339699	0.234408
23	(3, donovan, 11)	(3, donovan, 11)	5.146091	5.509514	0.433960	0.184209
15	(3, donovan, 12)	(3, donovan, 12)	3.858934	6.274502	0.325327	0.209866
12	(3, donovan, 13)	(3, donovan, 13)	6.397274	8.225554	0.544893	0.276492
24	(3, elcajon, 15)	(3, elcajon, 15)	3.956452	5.724768	0.249405	0.253835
17	(3, elcajon, 18)	(3, elcajon, 18)	3.635693	4.002478	0.227972	0.177812
10	(3, elcajon, 20)	(3, elcajon, 20)	4.175166	5.877268	0.261707	0.261232
18	(3, shafter, 17)	(3, shafter, 17)	5.368314	6.129523	0.392191	0.268804
7	(3, shafter, 19)	(3, shafter, 19)	6.024958	7.073150	0.440164	0.310186
19	(3, shafter, 21)	(3, shafter, 21)	4.817992	5.120017	0.351987	0.224533

Table A.1: Level 0 train results for linear regression

	Model	Testing Location	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
16	(1, donovan, 19)	(1, donovan, 19)	2.850930	3.710558	0.673331	0.097286
5	(1, donovan, 21)	(1, donovan, 21)	2.543194	4.096572	0.600650	0.107407
8	(1, elcajon, 11)	(1, elcajon, 11)	2.053270	5.128018	0.378209	0.135625
2	(1, elcajon, 12)	(1, elcajon, 12)	2.181817	5.183898	0.401887	0.137103
9	(1, elcajon, 13)	(1, elcajon, 13)	2.072161	4.386177	0.381688	0.116005
0	(1, shafter, 15)	(1, shafter, 15)	3.386877	5.589703	0.500763	0.171725
6	(1, shafter, 18)	(1, shafter, 18)	2.313071	4.412545	0.419196	0.134887
14	(2, donovan, 15)	(2, donovan, 15)	6.652718	7.528181	0.624712	0.175110
22	(2, donovan, 18)	(2, donovan, 18)	6.385480	6.706138	0.605916	0.158235
4	(2, donovan, 20)	(2, donovan, 20)	6.803972	7.533899	0.645627	0.177766
13	(2, elcajon, 17)	(2, elcajon, 17)	3.350610	7.275296	0.297892	0.187986
1	(2, elcajon, 19)	(2, elcajon, 19)	4.136211	7.747041	0.363729	0.200693
3	(2, elcajon, 21)	(2, elcajon, 21)	4.037583	7.344045	0.355056	0.190253
20	(2, shafter, 11)	(2, shafter, 11)	4.416675	7.262233	0.325816	0.230545
21	(2, shafter, 12)	(2, shafter, 12)	4.619718	6.987870	0.344165	0.221812
11	(2, shafter, 13)	(2, shafter, 13)	4.576023	7.411089	0.339026	0.233867
23	(3, donovan, 11)	(3, donovan, 11)	5.193754	5.600240	0.431705	0.188033
15	(3, donovan, 12)	(3, donovan, 12)	3.967916	6.324312	0.330162	0.212043
12	(3, donovan, 13)	(3, donovan, 13)	6.487443	8.338580	0.544654	0.280263
24	(3, elcajon, 15)	(3, elcajon, 15)	3.975396	5.762910	0.249059	0.256456
17	(3, elcajon, 18)	(3, elcajon, 18)	3.618518	4.013838	0.226705	0.178048
10	(3, elcajon, 20)	(3, elcajon, 20)	4.169921	5.865262	0.261620	0.259674
18	(3, shafter, 17)	(3, shafter, 17)	5.385507	6.088492	0.393443	0.269503
7	(3, shafter, 19)	(3, shafter, 19)	5.993148	6.998718	0.437834	0.309794
19	(3, shafter, 21)	(3, shafter, 21)	4.812474	5.096993	0.351579	0.225615

Table A.2: Level 0 test results for linear regression

	Model	Testing Location	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
29	(1, donovan, 19)	(2, elcajon)	2.850930	3.710558	0.673331	0.097286
30	(1, donovan, 19)	(3, shafter)	2.850930	3.710558	0.673331	0.097286
9	(1, donovan, 21)	(2, elcajon)	2.543194	4.096572	0.600650	0.107407
10	(1, donovan, 21)	(3, shafter)	2.543194	4.096572	0.600650	0.107407
15	(1, elcajon, 11)	(2, shafter)	2.053270	5.128018	0.378209	0.135625
16	(1, elcajon, 11)	(3, donovan)	2.053270	5.128018	0.378209	0.135625
4	(1, elcajon, 12)	(2, shafter)	2.181817	5.183898	0.401887	0.137103
5	(1, elcajon, 12)	(3, donovan)	2.181817	5.183898	0.401887	0.137103
17	(1, elcajon, 13)	(2, shafter)	2.072161	4.386177	0.381688	0.116005
18	(1, elcajon, 13)	(3, donovan)	2.072161	4.386177	0.381688	0.116005
0	(1, shafter, 15)	(2, donovan)	3.386877	5.589703	0.500763	0.171725
1	(1, shafter, 15)	(3, elcajon)	3.386877	5.589703	0.500763	0.171725
11	(1, shafter, 18)	(2, donovan)	2.313071	4.412545	0.419196	0.134887
12	(1, shafter, 18)	(3, elcajon)	2.313071	4.412545	0.419196	0.134887
25	(2, donovan, 15)	(1, shafter)	6.652718	7.528181	0.624712	0.175110
26	(2, donovan, 15)	(3, elcajon)	6.652718	7.528181	0.624712	0.175110
40	(2, donovan, 18)	(1, shafter)	6.385480	6.706138	0.605916	0.158235
41	(2, donovan, 18)	(3, elcajon)	6.385480	6.706138	0.605916	0.158235
8	(2, donovan, 20)	(3, elcajon)	6.803972	7.533899	0.645627	0.177766
24	(2, elcajon, 17)	(3, shafter)	3.350610	7.275296	0.297892	0.187986
2	(2, elcajon, 19)	(1, donovan)	4.136211	7.747041	0.363729	0.200693
3	(2, elcajon, 19)	(3, shafter)	4.136211	7.747041	0.363729	0.200693
6	(2, elcajon, 21)	(1, donovan)	4.037583	7.344045	0.355056	0.190253
7	(2, elcajon, 21)	(3, shafter)	4.037583	7.344045	0.355056	0.190253
36	(2, shafter, 11)	(1, elcajon)	4.416675	7.262233	0.325816	0.230545
37	(2, shafter, 11)	(3, donovan)	4.416675	7.262233	0.325816	0.230545
38	(2, shafter, 12)	(1, elcajon)	4.619718	6.987870	0.344165	0.221812
39	(2, shafter, 12)	(3, donovan)	4.619718	6.987870	0.344165	0.221812
20	(2, shafter, 13)	(1, elcajon)	4.576023	7.411089	0.339026	0.233867
21	(2, shafter, 13)	(3, donovan)	4.576023	7.411089	0.339026	0.233867
42	(3, donovan, 11)	(1, elcajon)	5.193754	5.600240	0.431705	0.188033
43	(3, donovan, 11)	(2, shafter)	5.193754	5.600240	0.431705	0.188033
27	(3, donovan, 12)	(1, elcajon)	3.967916	6.324312	0.330162	0.212043
28	(3, donovan, 12)	(2, shafter)	3.967916	6.324312	0.330162	0.212043
22	(3, donovan, 13)	(1, elcajon)	6.487443	8.338580	0.544654	0.280263
23	(3, donovan, 13)	(2, shafter)	6.487443	8.338580	0.544654	0.280263
44	(3, elcajon, 15)	(1, shafter)	3.975396	5.762910	0.249059	0.256456
45	(3, elcajon, 15)	(2, donovan)	3.975396	5.762910	0.249059	0.256456
31	(3, elcajon, 18)	(1, shafter)	3.618518	4.013838	0.226705	0.178048
32	(3, elcajon, 18)	(2, donovan)	3.618518	4.013838	0.226705	0.178048
19	(3, elcajon, 20)	(2, donovan)	4.169921	5.865262	0.261620	0.259674
33	(3, shafter, 17)	(2, elcajon)	5.385507	6.088492	0.393443	0.269503
13	(3, shafter, 19)	(1, donovan)	5.993148	6.998718	0.437834	0.309794
14	(3, shafter, 19)	(2, elcajon)	5.993148	6.998718	0.437834	0.309794
34	(3, shafter, 21)	(1, donovan)	4.812474	5.096993	0.351579	0.225615
35	(3, shafter, 21)	(2, elcajon)	4.812474	5.096993	0.351579	0.225615

Table A.3: Level 1 train results for linear regression

	Model	Testing Location	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
29	(1, donovan, 19)	(2, elcajon)	4.721054	13.743547	0.415159	0.356037
30	(1, donovan, 19)	(3, shafter)	9.750380	44.837383	0.712322	1.984698
9	(1, donovan, 21)	(2, elcajon)	5.435679	11.265806	0.478001	0.291849
10	(1, donovan, 21)	(3, shafter)	8.163074	24.216401	0.596360	1.071923
15	(1, elcajon, 11)	(2, shafter)	5.859866	23.973826	0.432280	0.761068
16	(1, elcajon, 11)	(3, donovan)	6.238380	11.191060	0.518534	0.375750
4	(1, elcajon, 12)	(2, shafter)	6.504934	17.526472	0.484612	0.556333
5	(1, elcajon, 12)	(3, donovan)	6.446498	10.332413	0.536399	0.346427
17	(1, elcajon, 13)	(2, shafter)	6.987382	29.507606	0.517678	0.931151
18	(1, elcajon, 13)	(3, donovan)	10.459595	38.840301	0.878137	1.305440
0	(1, shafter, 15)	(2, donovan)	6.879212	18.603261	0.645980	0.432722
1	(1, shafter, 15)	(3, elcajon)	6.870887	7.834289	0.430462	0.348635
11	(1, shafter, 18)	(2, donovan)	6.108138	32.634696	0.579599	0.770032
12	(1, shafter, 18)	(3, elcajon)	5.490944	9.172539	0.344015	0.406881
25	(2, donovan, 15)	(1, shafter)	9.377802	8.475076	1.386546	0.260368
26	(2, donovan, 15)	(3, elcajon)	6.425870	7.199287	0.402582	0.320377
40	(2, donovan, 18)	(1, shafter)	8.651816	8.316647	1.567962	0.254231
41	(2, donovan, 18)	(3, elcajon)	6.229479	5.859996	0.390285	0.259941
8	(2, donovan, 20)	(3, elcajon)	6.052090	7.586682	0.379707	0.335886
24	(2, elcajon, 17)	(3, shafter)	12.827964	17.886811	0.937158	0.791748
2	(2, elcajon, 19)	(1, donovan)	4.800626	4.762190	1.133809	0.124859
3	(2, elcajon, 19)	(3, shafter)	14.483825	21.333860	1.058128	0.944329
6	(2, elcajon, 21)	(1, donovan)	3.583996	4.596593	0.846466	0.120517
7	(2, elcajon, 21)	(3, shafter)	12.789354	9.587360	0.934337	0.424378
36	(2, shafter, 11)	(1, elcajon)	7.210789	7.536208	1.328214	0.199317
37	(2, shafter, 11)	(3, donovan)	6.656738	9.714873	0.553308	0.326186
38	(2, shafter, 12)	(1, elcajon)	6.664027	7.139145	1.227502	0.188815
39	(2, shafter, 12)	(3, donovan)	6.732293	9.466997	0.560180	0.317411
20	(2, shafter, 13)	(1, elcajon)	9.198244	9.330914	1.694300	0.246783
21	(2, shafter, 13)	(3, donovan)	9.655395	14.511711	0.810620	0.487745
42	(3, donovan, 11)	(1, elcajon)	3.692888	7.873262	0.680223	0.208231
43	(3, donovan, 11)	(2, shafter)	9.106516	7.761055	0.671783	0.246381
27	(3, donovan, 12)	(1, elcajon)	7.332869	8.791024	1.350701	0.232504
28	(3, donovan, 12)	(2, shafter)	9.222817	9.973596	0.687092	0.316586
22	(3, donovan, 13)	(1, elcajon)	4.669914	8.973694	0.860190	0.237335
23	(3, donovan, 13)	(2, shafter)	5.636151	12.978008	0.417569	0.409538
44	(3, elcajon, 15)	(1, shafter)	4.827194	8.805387	0.713720	0.270516
45	(3, elcajon, 15)	(2, donovan)	6.621335	8.375271	0.621765	0.194813
31	(3, elcajon, 18)	(1, shafter)	4.991286	6.798044	0.904567	0.207809
32	(3, elcajon, 18)	(2, donovan)	7.125273	7.871634	0.676115	0.185735
19	(3, elcajon, 20)	(2, donovan)	8.969028	8.574747	0.851068	0.202325
33	(3, shafter, 17)	(2, elcajon)	8.463228	13.245548	0.752440	0.342250
13	(3, shafter, 19)	(1, donovan)	7.840513	24.786326	1.851768	0.649866
14	(3, shafter, 19)	(2, elcajon)	6.344760	10.436176	0.557944	0.270357
34	(3, shafter, 21)	(1, donovan)	3.141038	8.195038	0.741848	0.214863
35	(3, shafter, 21)	(2, elcajon)	8.051262	8.951980	0.708009	0.231908

Table A.4: Level 1 test results for linear regression

	Model	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
0	(13, {(3, donovan), (2, shafter)})	6.355285	9.091896	0.511315	0.299221
1	(18, {(1, shafter), (2, donovan)})	5.871708	6.760317	0.616786	0.167255
2	(12, {(1, elcajon), (3, donovan)})	4.127693	6.698369	0.384564	0.213444
3	(19, {(3, shafter), (1, donovan)})	5.569429	7.871177	0.463862	0.310413
4	(15, {(2, donovan), (3, elcajon)})	4.952119	6.508162	0.340535	0.232814
5	(15, {(1, shafter), (2, donovan)})	5.273225	7.551699	0.599360	0.198638
6	(19, {(3, shafter), (2, elcajon)})	5.982334	7.782698	0.457800	0.289529
7	(13, {(1, elcajon), (2, shafter)})	4.597032	7.339406	0.432687	0.216700
8	(11, {(1, elcajon), (2, shafter)})	4.064288	6.914293	0.381481	0.204848
9	(11, {(3, donovan), (2, shafter)})	5.395918	6.412672	0.431885	0.211607
10	(12, {(3, donovan), (2, shafter)})	5.010363	7.233493	0.402190	0.238330
11	(21, {(1, donovan), (2, elcajon)})	3.746372	6.286799	0.429642	0.163590
12	(19, {(1, donovan), (2, elcajon)})	3.874982	6.455872	0.444391	0.167989
13	(15, {(1, shafter), (3, elcajon)})	3.995235	6.143927	0.292257	0.245933
14	(11, {(1, elcajon), (3, donovan)})	4.764080	5.866409	0.443432	0.187137
15	(12, {(1, elcajon), (2, shafter)})	4.486508	6.936752	0.421359	0.205881
16	(13, {(1, elcajon), (3, donovan)})	5.755871	8.116783	0.546095	0.258029
17	(21, {(3, shafter), (2, elcajon)})	5.272058	6.103408	0.403446	0.227056
18	(21, {(3, shafter), (1, donovan)})	4.537362	5.222198	0.377904	0.205946
19	(18, {(1, shafter), (3, elcajon)})	3.686667	4.247455	0.244767	0.181365
20	(18, {(2, donovan), (3, elcajon)})	4.559396	5.117607	0.314524	0.183405

Table A.5: Level 2 train results for linear regression

	Model	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
0	(13, {(3, donovan), (2, shafter)})	5.505224	6.289160	1.014052	0.166335
1	(18, {(1, shafter), (2, donovan)})	4.802131	6.440659	0.300860	0.285699
2	(12, {(1, elcajon), (3, donovan)})	7.415449	10.241837	0.552444	0.325101
3	(19, {(3, shafter), (1, donovan)})	6.659709	11.538081	0.585639	0.298903
4	(15, {(2, donovan), (3, elcajon)})	5.694266	9.038393	0.841920	0.277674
5	(15, {(1, shafter), (2, donovan)})	5.834374	7.015913	0.365524	0.312216
6	(19, {(3, shafter), (2, elcajon)})	7.764816	20.111992	1.833890	0.527311
7	(13, {(1, elcajon), (2, shafter)})	8.263537	12.377433	0.693766	0.416011
8	(11, {(1, elcajon), (2, shafter)})	7.121864	8.613436	0.591969	0.289204
9	(11, {(3, donovan), (2, shafter)})	6.348127	7.131942	1.169314	0.188625
10	(12, {(3, donovan), (2, shafter)})	5.783538	8.638525	1.065317	0.228471
11	(21, {(1, donovan), (2, elcajon)})	11.431724	8.581921	0.835154	0.379873
12	(19, {(1, donovan), (2, elcajon)})	12.538608	22.143983	0.916019	0.980189
13	(15, {(1, shafter), (3, elcajon)})	6.481640	11.151591	0.608647	0.259392
14	(11, {(1, elcajon), (3, donovan)})	10.252120	8.292078	0.756294	0.263238
15	(12, {(1, elcajon), (2, shafter)})	6.375411	9.626814	0.530484	0.322770
16	(13, {(1, elcajon), (3, donovan)})	7.016030	9.984391	0.519801	0.315071
17	(21, {(3, shafter), (2, elcajon)})	4.948163	6.625629	1.168654	0.173715
18	(21, {(3, shafter), (1, donovan)})	7.504964	8.789476	0.659969	0.227698
19	(18, {(1, shafter), (3, elcajon)})	6.873614	7.939836	0.652235	0.187344
20	(18, {(2, donovan), (3, elcajon)})	4.799088	6.939131	0.869735	0.212122

Table A.6: Level 2 test results for linear regression

	Model	Test	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
0	11	(1, elcajon)	4.697781	6.444363	0.876128	0.170259
1	11	(3, donovan)	5.522252	6.028935	0.465681	0.201576
2	11	(2, shafter)	4.963687	7.589506	0.369731	0.240540
3	17	(3, shafter)	5.382709	6.816198	0.393243	0.298917
4	17	(2, elcajon)	4.467562	8.433621	0.396841	0.221118
5	18	(1, shafter)	4.306174	6.852810	0.771146	0.208356
6	18	(2, donovan)	6.348767	7.071557	0.611439	0.165841
7	18	(3, elcajon)	3.827298	4.371915	0.239986	0.194224
8	13	(1, elcajon)	4.466222	6.222771	0.832942	0.164404
9	13	(3, donovan)	6.928068	9.174213	0.590104	0.308380
10	13	(2, shafter)	4.700801	8.639669	0.346643	0.275086
11	12	(1, elcajon)	4.807731	6.856014	0.896633	0.181135
12	12	(3, donovan)	4.931128	7.150968	0.415718	0.239182
13	12	(2, shafter)	5.003767	8.154915	0.372253	0.257888
14	20	(2, donovan)	6.927276	7.646314	0.667154	0.179320
15	20	(3, elcajon)	4.535472	6.149316	0.284291	0.273324
16	15	(1, shafter)	4.202212	7.293891	0.622279	0.222294
17	15	(2, donovan)	6.447277	7.991731	0.606970	0.186135
18	15	(3, elcajon)	4.356170	6.147377	0.274603	0.272574
19	19	(3, shafter)	6.319686	8.076446	0.461695	0.354184
20	19	(1, donovan)	4.330704	9.153789	1.028971	0.241691
21	19	(2, elcajon)	5.037780	9.303649	0.448591	0.243780
22	21	(3, shafter)	5.365747	5.566882	0.392004	0.244130
23	21	(1, donovan)	3.230923	4.987529	0.767664	0.131688
24	21	(2, elcajon)	4.971744	7.792549	0.442711	0.204185

Table A.7: Level 3 train results for linear regression

	Model	Test	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
0	11	(1, elcajon)	4.786708	6.411199	0.881703	0.169563
1	11	(3, donovan)	5.559995	6.068253	0.462147	0.203747
2	11	(2, shafter)	4.910759	7.574027	0.362264	0.240443
3	17	(3, shafter)	5.377550	6.764763	0.392861	0.299438
4	17	(2, elcajon)	4.537174	8.539158	0.403386	0.220642
5	18	(1, shafter)	4.547233	6.491199	0.824092	0.198429
6	18	(2, donovan)	6.439269	7.183452	0.611020	0.169497
7	18	(3, elcajon)	3.826094	4.370092	0.239710	0.193851
8	13	(1, elcajon)	4.537953	6.181242	0.835883	0.163481
9	13	(3, donovan)	7.022886	9.302385	0.589607	0.312657
10	13	(2, shafter)	4.708530	8.672204	0.348844	0.273663
11	12	(1, elcajon)	4.896463	6.899156	0.901920	0.182468
12	12	(3, donovan)	5.034365	7.162217	0.418899	0.240136
13	12	(2, shafter)	5.025221	8.150344	0.374375	0.258712
14	20	(2, donovan)	6.956268	7.573315	0.660078	0.178696
15	20	(3, elcajon)	4.540978	6.151124	0.284900	0.272330
16	15	(1, shafter)	4.222153	7.308019	0.624262	0.224514
17	15	(2, donovan)	6.364974	7.939930	0.597692	0.184687
18	15	(3, elcajon)	4.369725	6.194737	0.273764	0.275673
19	19	(3, shafter)	6.290076	7.964287	0.459527	0.352534
20	19	(1, donovan)	4.316830	9.360724	1.019546	0.245426
21	19	(2, elcajon)	5.207876	9.523878	0.457968	0.246723
22	21	(3, shafter)	5.370388	5.512022	0.392338	0.243986
23	21	(1, donovan)	3.215714	5.063684	0.759485	0.132763
24	21	(2, elcajon)	5.113928	7.945304	0.449707	0.205829

Table A.8: Level 3 test results for linear regression

A.2 Benchmarks for NN[2]

	Model	Testing Location	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
16	(1, donovan, 19)	(1, donovan, 19)	2.376601	4.059605	0.564678	0.107187
5	(1, donovan, 21)	(1, donovan, 21)	2.106573	3.643729	0.500520	0.096207
8	(1, elcajon, 11)	(1, elcajon, 11)	1.363333	4.308309	0.254259	0.113825
2	(1, elcajon, 12)	(1, elcajon, 12)	1.731689	3.433356	0.322957	0.090709
9	(1, elcajon, 13)	(1, elcajon, 13)	1.592846	3.237433	0.297063	0.085532
0	(1, shafter, 15)	(1, shafter, 15)	2.197847	3.945468	0.325466	0.120245
6	(1, shafter, 18)	(1, shafter, 18)	2.200961	4.377567	0.394146	0.133098
14	(2, donovan, 15)	(2, donovan, 15)	5.774000	6.602082	0.543585	0.153768
22	(2, donovan, 18)	(2, donovan, 18)	5.147102	6.150489	0.495709	0.144240
4	(2, donovan, 20)	(2, donovan, 20)	5.239533	6.653606	0.504610	0.156039
13	(2, elcajon, 17)	(2, elcajon, 17)	2.531008	5.177073	0.224822	0.135736
1	(2, elcajon, 19)	(2, elcajon, 19)	3.021720	6.658900	0.269070	0.174481
3	(2, elcajon, 21)	(2, elcajon, 21)	2.697276	5.373738	0.240180	0.140806
20	(2, shafter, 11)	(2, shafter, 11)	3.871853	5.892196	0.288404	0.186746
21	(2, shafter, 12)	(2, shafter, 12)	4.011850	6.202820	0.298460	0.196155
11	(2, shafter, 13)	(2, shafter, 13)	3.847771	6.404214	0.283740	0.203909
23	(3, donovan, 11)	(3, donovan, 11)	3.364954	4.612540	0.283760	0.154219
15	(3, donovan, 12)	(3, donovan, 12)	3.123734	4.774751	0.263346	0.159704
12	(3, donovan, 13)	(3, donovan, 13)	3.544877	5.484555	0.301938	0.184356
24	(3, elcajon, 15)	(3, elcajon, 15)	2.328371	4.167490	0.146775	0.184786
17	(3, elcajon, 18)	(3, elcajon, 18)	2.520757	3.234963	0.158061	0.143715
10	(3, elcajon, 20)	(3, elcajon, 20)	2.357596	3.846291	0.147778	0.170959
18	(3, shafter, 17)	(3, shafter, 17)	3.481401	4.433496	0.254340	0.194426
7	(3, shafter, 19)	(3, shafter, 19)	3.921369	4.727419	0.286482	0.207316
19	(3, shafter, 21)	(3, shafter, 21)	3.053778	4.597083	0.223099	0.201600

Table A.9: Level 0 train results for NN[2]

	Model	Testing Location	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
16	(1, donovan, 19)	(1, donovan, 19)	2.406302	4.068393	0.568319	0.106668
5	(1, donovan, 21)	(1, donovan, 21)	2.121591	3.700573	0.501076	0.097024
8	(1, elcajon, 11)	(1, elcajon, 11)	1.372707	4.321155	0.252850	0.114286
2	(1, elcajon, 12)	(1, elcajon, 12)	1.751919	3.411224	0.322700	0.090220
9	(1, elcajon, 13)	(1, elcajon, 13)	1.587393	3.206342	0.292395	0.084801
0	(1, shafter, 15)	(1, shafter, 15)	2.201070	3.989497	0.325437	0.122564
6	(1, shafter, 18)	(1, shafter, 18)	2.302697	4.502786	0.417316	0.137645
14	(2, donovan, 15)	(2, donovan, 15)	5.782659	6.622596	0.543010	0.154045
22	(2, donovan, 18)	(2, donovan, 18)	5.275075	6.264368	0.500550	0.147811
4	(2, donovan, 20)	(2, donovan, 20)	5.336130	6.772800	0.506344	0.159808
13	(2, elcajon, 17)	(2, elcajon, 17)	2.556621	5.126892	0.227301	0.132473
1	(2, elcajon, 19)	(2, elcajon, 19)	3.082288	6.774753	0.271049	0.175505
3	(2, elcajon, 21)	(2, elcajon, 21)	2.762940	5.463632	0.242967	0.141540
20	(2, shafter, 11)	(2, shafter, 11)	3.874197	5.946993	0.285798	0.188792
21	(2, shafter, 12)	(2, shafter, 12)	4.048163	6.254481	0.301585	0.198533
11	(2, shafter, 13)	(2, shafter, 13)	3.882250	6.439484	0.287627	0.203206
23	(3, donovan, 11)	(3, donovan, 11)	3.447279	4.675427	0.286538	0.156982
15	(3, donovan, 12)	(3, donovan, 12)	3.205964	4.806858	0.266761	0.161165
12	(3, donovan, 13)	(3, donovan, 13)	3.665248	5.595738	0.307716	0.188075
24	(3, elcajon, 15)	(3, elcajon, 15)	2.317087	4.174768	0.145166	0.185782
17	(3, elcajon, 18)	(3, elcajon, 18)	2.540051	3.222305	0.159138	0.142937
10	(3, elcajon, 20)	(3, elcajon, 20)	2.365656	3.836465	0.148421	0.169852
18	(3, shafter, 17)	(3, shafter, 17)	3.498404	4.454751	0.255579	0.197187
7	(3, shafter, 19)	(3, shafter, 19)	3.902972	4.688188	0.285135	0.207520
19	(3, shafter, 21)	(3, shafter, 21)	3.050720	4.577955	0.222873	0.202640

Table A.10: Level 0 test results for NN[2]

	Model	Testing Location	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
29	(1, donovan, 19)	(2, elcajon)	2.406302	4.068393	0.568319	0.106668
30	(1, donovan, 19)	(3, shafter)	2.406302	4.068393	0.568319	0.106668
9	(1, donovan, 21)	(2, elcajon)	2.121591	3.700573	0.501076	0.097024
10	(1, donovan, 21)	(3, shafter)	2.121591	3.700573	0.501076	0.097024
15	(1, elcajon, 11)	(2, shafter)	1.372707	4.321155	0.252850	0.114286
16	(1, elcajon, 11)	(3, donovan)	1.372707	4.321155	0.252850	0.114286
4	(1, elcajon, 12)	(2, shafter)	1.751919	3.411224	0.322700	0.090220
5	(1, elcajon, 12)	(3, donovan)	1.751919	3.411224	0.322700	0.090220
17	(1, elcajon, 13)	(2, shafter)	1.587393	3.206342	0.292395	0.084801
18	(1, elcajon, 13)	(3, donovan)	1.587393	3.206342	0.292395	0.084801
0	(1, shafter, 15)	(2, donovan)	2.201070	3.989497	0.325437	0.122564
1	(1, shafter, 15)	(3, elcajon)	2.201070	3.989497	0.325437	0.122564
11	(1, shafter, 18)	(2, donovan)	2.302697	4.502786	0.417316	0.137645
12	(1, shafter, 18)	(3, elcajon)	2.302697	4.502786	0.417316	0.137645
25	(2, donovan, 15)	(1, shafter)	5.782659	6.622596	0.543010	0.154045
26	(2, donovan, 15)	(3, elcajon)	5.782659	6.622596	0.543010	0.154045
40	(2, donovan, 18)	(1, shafter)	5.275075	6.264368	0.500550	0.147811
41	(2, donovan, 18)	(3, elcajon)	5.275075	6.264368	0.500550	0.147811
8	(2, donovan, 20)	(3, elcajon)	5.336130	6.772800	0.506344	0.159808
24	(2, elcajon, 17)	(3, shafter)	2.556621	5.126892	0.227301	0.132473
2	(2, elcajon, 19)	(1, donovan)	3.082288	6.774753	0.271049	0.175505
3	(2, elcajon, 19)	(3, shafter)	3.082288	6.774753	0.271049	0.175505
6	(2, elcajon, 21)	(1, donovan)	2.762940	5.463632	0.242967	0.141540
7	(2, elcajon, 21)	(3, shafter)	2.762940	5.463632	0.242967	0.141540
36	(2, shafter, 11)	(1, elcajon)	3.874197	5.946993	0.285798	0.188792
37	(2, shafter, 11)	(3, donovan)	3.874197	5.946993	0.285798	0.188792
38	(2, shafter, 12)	(1, elcajon)	4.048163	6.254481	0.301585	0.198533
39	(2, shafter, 12)	(3, donovan)	4.048163	6.254481	0.301585	0.198533
20	(2, shafter, 13)	(1, elcajon)	3.882250	6.439484	0.287627	0.203206
21	(2, shafter, 13)	(3, donovan)	3.882250	6.439484	0.287627	0.203206
42	(3, donovan, 11)	(1, elcajon)	3.447279	4.675427	0.286538	0.156982
43	(3, donovan, 11)	(2, shafter)	3.447279	4.675427	0.286538	0.156982
27	(3, donovan, 12)	(1, elcajon)	3.205964	4.806858	0.266761	0.161165
28	(3, donovan, 12)	(2, shafter)	3.205964	4.806858	0.266761	0.161165
22	(3, donovan, 13)	(1, elcajon)	3.665248	5.595738	0.307716	0.188075
23	(3, donovan, 13)	(2, shafter)	3.665248	5.595738	0.307716	0.188075
44	(3, elcajon, 15)	(1, shafter)	2.317087	4.174768	0.145166	0.185782
45	(3, elcajon, 15)	(2, donovan)	2.317087	4.174768	0.145166	0.185782
31	(3, elcajon, 18)	(1, shafter)	2.540051	3.222305	0.159138	0.142937
32	(3, elcajon, 18)	(2, donovan)	2.540051	3.222305	0.159138	0.142937
19	(3, elcajon, 20)	(2, donovan)	2.365656	3.836465	0.148421	0.169852
33	(3, shafter, 17)	(2, elcajon)	3.498404	4.454751	0.255579	0.197187
13	(3, shafter, 19)	(1, donovan)	3.902972	4.688188	0.285135	0.207520
14	(3, shafter, 19)	(2, elcajon)	3.902972	4.688188	0.285135	0.207520
34	(3, shafter, 21)	(1, donovan)	3.050720	4.577955	0.222873	0.202640
35	(3, shafter, 21)	(2, elcajon)	3.050720	4.577955	0.222873	0.202640

Table A.11: Level 1 train results for NN[2]

	Model	Testing Location	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
29	(1, donovan, 19)	(2, elcajon)	5.134639	8.755749	0.451528	0.226824
30	(1, donovan, 19)	(3, shafter)	6.802980	11.229848	0.496997	0.497082
9	(1, donovan, 21)	(2, elcajon)	6.302867	9.073648	0.554260	0.235060
10	(1, donovan, 21)	(3, shafter)	6.861204	10.712444	0.501251	0.474179
15	(1, elcajon, 11)	(2, shafter)	4.968091	7.887446	0.366494	0.250393
16	(1, elcajon, 11)	(3, donovan)	7.224501	9.784096	0.600500	0.328510
4	(1, elcajon, 12)	(2, shafter)	5.610890	9.828816	0.418006	0.311991
5	(1, elcajon, 12)	(3, donovan)	6.955194	8.949848	0.578727	0.300072
17	(1, elcajon, 13)	(2, shafter)	5.697346	11.389310	0.422103	0.359405
18	(1, elcajon, 13)	(3, donovan)	9.429429	25.605083	0.791649	0.860599
0	(1, shafter, 15)	(2, donovan)	7.109383	13.646573	0.667594	0.317427
1	(1, shafter, 15)	(3, elcajon)	8.304187	8.563508	0.520259	0.381086
11	(1, shafter, 18)	(2, donovan)	6.454810	17.571709	0.612495	0.414613
12	(1, shafter, 18)	(3, elcajon)	5.089697	10.255388	0.318876	0.454915
25	(2, donovan, 15)	(1, shafter)	5.275595	13.681765	0.780018	0.420326
26	(2, donovan, 15)	(3, elcajon)	4.287193	11.513810	0.268593	0.512378
40	(2, donovan, 18)	(1, shafter)	4.843460	12.159185	0.877776	0.371693
41	(2, donovan, 18)	(3, elcajon)	4.729539	10.632584	0.296312	0.471647
8	(2, donovan, 20)	(3, elcajon)	5.027690	9.593812	0.315437	0.424748
24	(2, elcajon, 17)	(3, shafter)	4.597712	8.822307	0.335890	0.390514
2	(2, elcajon, 19)	(1, donovan)	3.028045	9.188633	0.715162	0.240914
3	(2, elcajon, 19)	(3, shafter)	6.272729	18.500586	0.458260	0.818916
6	(2, elcajon, 21)	(1, donovan)	2.714843	5.373346	0.641190	0.140882
7	(2, elcajon, 21)	(3, shafter)	5.310176	8.188990	0.387939	0.362480
36	(2, shafter, 11)	(1, elcajon)	3.531377	8.246743	0.650473	0.218109
37	(2, shafter, 11)	(3, donovan)	5.107910	9.440920	0.424569	0.316988
38	(2, shafter, 12)	(1, elcajon)	7.611102	7.141164	1.401951	0.188869
39	(2, shafter, 12)	(3, donovan)	6.811990	10.139974	0.566811	0.339975
20	(2, shafter, 13)	(1, elcajon)	3.594666	9.400319	0.662131	0.248619
21	(2, shafter, 13)	(3, donovan)	6.562045	14.190906	0.550917	0.476963
42	(3, donovan, 11)	(1, elcajon)	4.749039	7.010736	0.874764	0.185419
43	(3, donovan, 11)	(2, shafter)	4.647006	8.227307	0.342807	0.261182
27	(3, donovan, 12)	(1, elcajon)	3.829366	11.821455	0.705362	0.312653
28	(3, donovan, 12)	(2, shafter)	5.428079	9.846886	0.404387	0.312564
22	(3, donovan, 13)	(1, elcajon)	2.922798	6.948662	0.538374	0.183778
23	(3, donovan, 13)	(2, shafter)	4.915272	10.086451	0.364161	0.318291
44	(3, elcajon, 15)	(1, shafter)	3.848275	9.300784	0.568983	0.285735
45	(3, elcajon, 15)	(2, donovan)	5.445693	9.280018	0.511368	0.215858
31	(3, elcajon, 18)	(1, shafter)	3.436002	6.966556	0.622704	0.212960
32	(3, elcajon, 18)	(2, donovan)	5.867377	8.000551	0.556754	0.188777
19	(3, elcajon, 20)	(2, donovan)	6.283092	8.643630	0.596201	0.203951
33	(3, shafter, 17)	(2, elcajon)	5.380627	10.015951	0.478375	0.258801
13	(3, shafter, 19)	(1, donovan)	4.562242	12.421615	1.077508	0.325679
14	(3, shafter, 19)	(2, elcajon)	4.567906	8.747117	0.401691	0.226601
34	(3, shafter, 21)	(1, donovan)	2.472530	5.272441	0.583961	0.138237
35	(3, shafter, 21)	(2, elcajon)	3.904857	8.212767	0.343384	0.212758

Table A.12: Level 1 test results for NN[2]

	Model	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
0	(19, {(2, elcajon), (3, shafter)})	3.579481	5.447313	0.273921	0.202649
1	(11, {(1, elcajon), (3, donovan)})	3.169342	4.875661	0.294996	0.155532
2	(18, {(1, shafter), (2, donovan)})	4.870031	6.100239	0.511566	0.150924
3	(21, {(1, donovan), (3, shafter)})	2.822966	4.494040	0.235117	0.177230
4	(21, {(2, elcajon), (3, shafter)})	3.091625	4.936010	0.236587	0.183627
5	(18, {(1, shafter), (3, elcajon)})	2.735242	3.647341	0.181600	0.155741
6	(15, {(2, donovan), (3, elcajon)})	3.286026	5.096093	0.225966	0.182301
7	(15, {(1, shafter), (2, donovan)})	4.378920	6.446860	0.497713	0.169577
8	(13, {(1, elcajon), (3, donovan)})	3.636403	5.216625	0.345008	0.165834
9	(19, {(2, elcajon), (1, donovan)})	2.482502	5.602203	0.284698	0.145776
10	(13, {(1, elcajon), (2, shafter)})	3.426837	5.935795	0.322545	0.175258
11	(15, {(1, shafter), (3, elcajon)})	2.698654	4.406276	0.197410	0.176377
12	(11, {(1, elcajon), (2, shafter)})	3.232376	5.738309	0.303397	0.170007
13	(21, {(2, elcajon), (1, donovan)})	2.486580	4.844045	0.285166	0.126048
14	(12, {(1, elcajon), (3, donovan)})	3.188672	5.214622	0.297078	0.166164
15	(19, {(1, donovan), (3, shafter)})	3.385280	4.464468	0.281950	0.176064
16	(12, {(1, elcajon), (2, shafter)})	3.328357	5.788535	0.312589	0.171802
17	(12, {(2, shafter), (3, donovan)})	3.665436	5.837726	0.294231	0.192342
18	(13, {(2, shafter), (3, donovan)})	3.996602	5.927786	0.321547	0.195088
19	(11, {(2, shafter), (3, donovan)})	4.001666	5.471811	0.320290	0.180560
20	(18, {(2, donovan), (3, elcajon)})	3.533796	4.612615	0.243774	0.165307

Table A.13: Level 2 train results for NN[2]

	Model	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
0	(19, {(2, elcajon), (3, shafter)})	2.373550	7.266813	0.560584	0.190526
1	(11, {(1, elcajon), (3, donovan)})	4.549925	7.985116	0.335646	0.253494
2	(18, {(1, shafter), (2, donovan)})	4.741835	11.409282	0.297082	0.506100
3	(21, {(1, donovan), (3, shafter)})	3.705380	7.675690	0.325843	0.198845
4	(21, {(2, elcajon), (3, shafter)})	3.399830	4.850157	0.802970	0.127165
5	(18, {(1, shafter), (3, elcajon)})	5.894304	8.719824	0.559309	0.205748
6	(15, {(2, donovan), (3, elcajon)})	5.295040	10.981164	0.782893	0.337360
7	(15, {(1, shafter), (2, donovan)})	3.711464	8.185195	0.232524	0.364251
8	(13, {(1, elcajon), (3, donovan)})	5.023021	9.784768	0.372143	0.308771
9	(19, {(2, elcajon), (1, donovan)})	8.061956	17.242193	0.588973	0.763214
10	(13, {(1, elcajon), (2, shafter)})	5.707391	9.536752	0.479165	0.320535
11	(15, {(1, shafter), (3, elcajon)})	6.276467	9.469940	0.589380	0.220276
12	(11, {(1, elcajon), (2, shafter)})	4.695954	7.486622	0.390328	0.251370
13	(21, {(2, elcajon), (1, donovan)})	4.491042	8.159803	0.328097	0.361188
14	(12, {(1, elcajon), (3, donovan)})	5.102687	9.683788	0.380146	0.307387
15	(19, {(1, donovan), (3, shafter)})	4.164542	7.623360	0.366220	0.197489
16	(12, {(1, elcajon), (2, shafter)})	4.567355	8.576255	0.380040	0.287546
17	(12, {(2, shafter), (3, donovan)})	3.198907	14.094113	0.589233	0.372760
18	(13, {(2, shafter), (3, donovan)})	2.876621	6.602479	0.529868	0.174622
19	(11, {(2, shafter), (3, donovan)})	3.966730	6.155831	0.730665	0.162809
20	(18, {(2, donovan), (3, elcajon)})	4.010872	7.496820	0.726887	0.229170

Table A.14: Level 2 test results for NN[2]

	Model	Test	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
0	11	(1, elcajon)	3.173101	5.872229	0.591778	0.155143
1	11	(2, shafter)	4.409531	6.775849	0.328454	0.214752
2	11	(3, donovan)	3.922034	5.339839	0.330738	0.178536
3	17	(2, elcajon)	2.955358	6.165248	0.262516	0.161644
4	17	(3, shafter)	3.350838	4.616605	0.244801	0.202457
5	18	(1, shafter)	4.096399	5.806290	0.733579	0.176537
6	18	(2, donovan)	5.569259	7.102985	0.536366	0.166578
7	18	(3, elcajon)	3.033130	3.628862	0.190189	0.161214
8	13	(1, elcajon)	2.323125	5.245631	0.433259	0.138589
9	13	(2, shafter)	4.088218	7.283178	0.301471	0.231895
10	13	(3, donovan)	3.769121	5.326865	0.321038	0.179056
11	12	(1, elcajon)	2.598519	5.277011	0.484619	0.139418
12	12	(2, shafter)	4.271281	7.070381	0.317760	0.223591
13	12	(3, donovan)	3.382912	5.636255	0.285196	0.188519
14	20	(2, donovan)	5.252292	7.218747	0.505839	0.169292
15	20	(3, elcajon)	2.442996	4.016499	0.153131	0.178525
16	15	(1, shafter)	2.699768	5.826666	0.399792	0.177578
17	15	(2, donovan)	5.408650	7.886630	0.509190	0.183687
18	15	(3, elcajon)	2.456339	4.464521	0.154842	0.197956
19	19	(2, elcajon)	3.012143	6.764404	0.268217	0.177245
20	19	(1, donovan)	2.551161	4.156917	0.606153	0.109757
21	19	(3, shafter)	3.929016	4.890630	0.287041	0.214474
22	21	(2, elcajon)	3.001148	5.918162	0.267238	0.155071
23	21	(1, donovan)	2.527782	4.175303	0.600599	0.110242
24	21	(3, shafter)	3.072097	4.516221	0.224437	0.198054

Table A.15: Level 3 train results for NN[2]

	Model	Test	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
0	11	(1, elcajon)	3.245365	5.861372	0.597790	0.155021
1	11	(2, shafter)	4.378560	6.801784	0.323004	0.215928
2	11	(3, donovan)	4.007137	5.382204	0.333073	0.180713
3	17	(2, elcajon)	2.977442	6.265252	0.264715	0.161887
4	17	(3, shafter)	3.370350	4.584191	0.246224	0.202916
5	18	(1, shafter)	4.295421	5.609364	0.778456	0.171472
6	18	(2, donovan)	5.674487	7.123759	0.538450	0.168089
7	18	(3, elcajon)	3.048276	3.613052	0.190979	0.160270
8	13	(1, elcajon)	2.391122	5.148101	0.440440	0.136157
9	13	(2, shafter)	4.158671	7.285971	0.308106	0.229918
10	13	(3, donovan)	3.877199	5.463355	0.325511	0.183626
11	12	(1, elcajon)	2.654926	5.250398	0.489033	0.138862
12	12	(2, shafter)	4.294420	7.097388	0.319930	0.225289
13	12	(3, donovan)	3.475930	5.653553	0.289225	0.189553
14	20	(2, donovan)	5.368790	7.241123	0.509443	0.170858
15	20	(3, elcajon)	2.447356	3.989309	0.153547	0.176619
16	15	(1, shafter)	2.660708	5.801376	0.393396	0.178228
17	15	(2, donovan)	5.308188	7.801077	0.498456	0.181457
18	15	(3, elcajon)	2.459961	4.508457	0.154117	0.200632
19	19	(2, elcajon)	3.110442	6.931818	0.273525	0.179574
20	19	(1, donovan)	2.559724	4.198430	0.604554	0.110077
21	19	(3, shafter)	3.906775	4.834592	0.285413	0.214000
22	21	(2, elcajon)	3.101439	6.094371	0.272733	0.157879
23	21	(1, donovan)	2.546790	4.222770	0.601499	0.110716
24	21	(3, shafter)	3.062655	4.502458	0.223745	0.199298

Table A.16: Level 3 test results for NN[2]

A.3 Benchmarks for NN[4]

	Model	Testing Location	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
16	(1, donovan, 19)	(1, donovan, 19)	1.598798	2.655370	0.379873	0.070111
5	(1, donovan, 21)	(1, donovan, 21)	1.579410	2.631647	0.375266	0.069484
8	(1, elcajon, 11)	(1, elcajon, 11)	1.090424	3.075850	0.203362	0.081263
2	(1, elcajon, 12)	(1, elcajon, 12)	1.073017	2.392930	0.200116	0.063221
9	(1, elcajon, 13)	(1, elcajon, 13)	1.149510	2.716713	0.214382	0.071775
0	(1, shafter, 15)	(1, shafter, 15)	1.839555	3.078209	0.272408	0.093814
6	(1, shafter, 18)	(1, shafter, 18)	1.133296	2.087040	0.202950	0.063455
14	(2, donovan, 15)	(2, donovan, 15)	3.620364	4.510126	0.340834	0.105045
22	(2, donovan, 18)	(2, donovan, 18)	3.867774	4.618096	0.372499	0.108303
4	(2, donovan, 20)	(2, donovan, 20)	3.535354	4.564998	0.340484	0.107057
13	(2, elcajon, 17)	(2, elcajon, 17)	2.060804	3.941635	0.183055	0.103344
1	(2, elcajon, 19)	(2, elcajon, 19)	2.090866	4.521853	0.186182	0.118484
3	(2, elcajon, 21)	(2, elcajon, 21)	2.049768	3.927825	0.182522	0.102919
20	(2, shafter, 11)	(2, shafter, 11)	3.215755	4.713431	0.239533	0.149387
21	(2, shafter, 12)	(2, shafter, 12)	3.465279	4.671965	0.257798	0.147744
11	(2, shafter, 13)	(2, shafter, 13)	3.077443	4.555251	0.226935	0.145039
23	(3, donovan, 11)	(3, donovan, 11)	3.134097	3.745577	0.264293	0.125233
15	(3, donovan, 12)	(3, donovan, 12)	2.598337	3.872787	0.219052	0.129535
12	(3, donovan, 13)	(3, donovan, 13)	2.858027	3.910363	0.243435	0.131442
24	(3, elcajon, 15)	(3, elcajon, 15)	2.195624	3.413974	0.138407	0.151375
17	(3, elcajon, 18)	(3, elcajon, 18)	2.072834	2.718973	0.129975	0.120792
10	(3, elcajon, 20)	(3, elcajon, 20)	1.909335	2.984222	0.119680	0.132642
18	(3, shafter, 17)	(3, shafter, 17)	2.910655	3.553848	0.212643	0.155850
7	(3, shafter, 19)	(3, shafter, 19)	3.250766	4.017558	0.237490	0.176186
19	(3, shafter, 21)	(3, shafter, 21)	2.507448	3.801003	0.183186	0.166689

Table A.17: Level 0 train results for NN[4]

	Model	Testing Location	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
16	(1, donovan, 19)	(1, donovan, 19)	1.646639	2.677330	0.388902	0.070196
5	(1, donovan, 21)	(1, donovan, 21)	1.639563	2.700179	0.387231	0.070795
8	(1, elcajon, 11)	(1, elcajon, 11)	1.131059	3.251013	0.208339	0.085982
2	(1, elcajon, 12)	(1, elcajon, 12)	1.107206	2.463823	0.203945	0.065163
9	(1, elcajon, 13)	(1, elcajon, 13)	1.204358	2.809111	0.221840	0.074295
0	(1, shafter, 15)	(1, shafter, 15)	1.856185	3.185708	0.274445	0.097870
6	(1, shafter, 18)	(1, shafter, 18)	1.256305	2.275298	0.227679	0.069553
14	(2, donovan, 15)	(2, donovan, 15)	3.680800	4.625006	0.345639	0.107580
22	(2, donovan, 18)	(2, donovan, 18)	4.032552	4.812236	0.382648	0.113547
4	(2, donovan, 20)	(2, donovan, 20)	3.619083	4.609697	0.343414	0.108768
13	(2, elcajon, 17)	(2, elcajon, 17)	2.130942	4.010484	0.189456	0.103626
1	(2, elcajon, 19)	(2, elcajon, 19)	2.164384	4.600333	0.190331	0.119175
3	(2, elcajon, 21)	(2, elcajon, 21)	2.171034	4.047821	0.190916	0.104862
20	(2, shafter, 11)	(2, shafter, 11)	3.204198	4.767020	0.236372	0.151333
21	(2, shafter, 12)	(2, shafter, 12)	3.546977	4.753282	0.264247	0.150881
11	(2, shafter, 13)	(2, shafter, 13)	3.124168	4.599609	0.231462	0.145147
23	(3, donovan, 11)	(3, donovan, 11)	3.227730	3.858718	0.268289	0.129560
15	(3, donovan, 12)	(3, donovan, 12)	2.697892	3.924738	0.224486	0.131589
12	(3, donovan, 13)	(3, donovan, 13)	2.972283	4.047961	0.249538	0.136054
24	(3, elcajon, 15)	(3, elcajon, 15)	2.227096	3.465248	0.139528	0.154208
17	(3, elcajon, 18)	(3, elcajon, 18)	2.116246	2.784545	0.132586	0.123519
10	(3, elcajon, 20)	(3, elcajon, 20)	1.943790	3.016136	0.121953	0.133534
18	(3, shafter, 17)	(3, shafter, 17)	2.934812	3.598334	0.214405	0.159278
7	(3, shafter, 19)	(3, shafter, 19)	3.235436	3.980017	0.236368	0.176173
19	(3, shafter, 21)	(3, shafter, 21)	2.511674	3.819862	0.183492	0.169084

Table A.18: Level 0 test results for NN[4]

	Model	Testing Location	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
29	(1, donovan, 19)	(2, elcajon)	1.646639	2.677330	0.388902	0.070196
30	(1, donovan, 19)	(3, shafter)	1.646639	2.677330	0.388902	0.070196
9	(1, donovan, 21)	(2, elcajon)	1.639563	2.700179	0.387231	0.070795
10	(1, donovan, 21)	(3, shafter)	1.639563	2.700179	0.387231	0.070795
15	(1, elcajon, 11)	(2, shafter)	1.131059	3.251013	0.208339	0.085982
16	(1, elcajon, 11)	(3, donovan)	1.131059	3.251013	0.208339	0.085982
4	(1, elcajon, 12)	(2, shafter)	1.107206	2.463823	0.203945	0.065163
5	(1, elcajon, 12)	(3, donovan)	1.107206	2.463823	0.203945	0.065163
17	(1, elcajon, 13)	(2, shafter)	1.204358	2.809111	0.221840	0.074295
18	(1, elcajon, 13)	(3, donovan)	1.204358	2.809111	0.221840	0.074295
0	(1, shafter, 15)	(2, donovan)	1.856185	3.185708	0.274445	0.097870
1	(1, shafter, 15)	(3, elcajon)	1.856185	3.185708	0.274445	0.097870
11	(1, shafter, 18)	(2, donovan)	1.256305	2.275298	0.227679	0.069553
12	(1, shafter, 18)	(3, elcajon)	1.256305	2.275298	0.227679	0.069553
25	(2, donovan, 15)	(1, shafter)	3.680800	4.625006	0.345639	0.107580
26	(2, donovan, 15)	(3, elcajon)	3.680800	4.625006	0.345639	0.107580
40	(2, donovan, 18)	(1, shafter)	4.032552	4.812236	0.382648	0.113547
41	(2, donovan, 18)	(3, elcajon)	4.032552	4.812236	0.382648	0.113547
8	(2, donovan, 20)	(3, elcajon)	3.619083	4.609697	0.343414	0.108768
24	(2, elcajon, 17)	(3, shafter)	2.130942	4.010484	0.189456	0.103626
2	(2, elcajon, 19)	(1, donovan)	2.164384	4.600333	0.190331	0.119175
3	(2, elcajon, 19)	(3, shafter)	2.164384	4.600333	0.190331	0.119175
6	(2, elcajon, 21)	(1, donovan)	2.171034	4.047821	0.190916	0.104862
7	(2, elcajon, 21)	(3, shafter)	2.171034	4.047821	0.190916	0.104862
36	(2, shafter, 11)	(1, elcajon)	3.204198	4.767020	0.236372	0.151333
37	(2, shafter, 11)	(3, donovan)	3.204198	4.767020	0.236372	0.151333
38	(2, shafter, 12)	(1, elcajon)	3.546977	4.753282	0.264247	0.150881
39	(2, shafter, 12)	(3, donovan)	3.546977	4.753282	0.264247	0.150881
20	(2, shafter, 13)	(1, elcajon)	3.124168	4.599609	0.231462	0.145147
21	(2, shafter, 13)	(3, donovan)	3.124168	4.599609	0.231462	0.145147
42	(3, donovan, 11)	(1, elcajon)	3.227730	3.858718	0.268289	0.129560
43	(3, donovan, 11)	(2, shafter)	3.227730	3.858718	0.268289	0.129560
27	(3, donovan, 12)	(1, elcajon)	2.697892	3.924738	0.224486	0.131589
28	(3, donovan, 12)	(2, shafter)	2.697892	3.924738	0.224486	0.131589
22	(3, donovan, 13)	(1, elcajon)	2.972283	4.047961	0.249538	0.136054
23	(3, donovan, 13)	(2, shafter)	2.972283	4.047961	0.249538	0.136054
44	(3, elcajon, 15)	(1, shafter)	2.227096	3.465248	0.139528	0.154208
45	(3, elcajon, 15)	(2, donovan)	2.227096	3.465248	0.139528	0.154208
31	(3, elcajon, 18)	(1, shafter)	2.116246	2.784545	0.132586	0.123519
32	(3, elcajon, 18)	(2, donovan)	2.116246	2.784545	0.132586	0.123519
19	(3, elcajon, 20)	(2, donovan)	1.943790	3.016136	0.121953	0.133534
33	(3, shafter, 17)	(2, elcajon)	2.934812	3.598334	0.214405	0.159278
13	(3, shafter, 19)	(1, donovan)	3.235436	3.980017	0.236368	0.176173
14	(3, shafter, 19)	(2, elcajon)	3.235436	3.980017	0.236368	0.176173
34	(3, shafter, 21)	(1, donovan)	2.511674	3.819862	0.183492	0.169084
35	(3, shafter, 21)	(2, elcajon)	2.511674	3.819862	0.183492	0.169084

Table A.19: Level 1 train results for NN[4]

	Model	Testing Location	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
29	(1, donovan, 19)	(2, elcajon)	6.536488	12.553209	0.574804	0.325200
30	(1, donovan, 19)	(3, shafter)	13.700890	27.299761	1.000930	1.208406
9	(1, donovan, 21)	(2, elcajon)	5.214600	10.052968	0.458560	0.260430
10	(1, donovan, 21)	(3, shafter)	12.256566	17.817916	0.895414	0.788698
15	(1, elcajon, 11)	(2, shafter)	5.422440	10.004261	0.400011	0.317593
16	(1, elcajon, 11)	(3, donovan)	8.208423	8.845048	0.682284	0.296981
4	(1, elcajon, 12)	(2, shafter)	5.608348	9.634313	0.417817	0.305817
5	(1, elcajon, 12)	(3, donovan)	8.477711	10.724476	0.705412	0.359572
17	(1, elcajon, 13)	(2, shafter)	6.514591	12.232702	0.482650	0.386019
18	(1, elcajon, 13)	(3, donovan)	8.772513	25.361335	0.736498	0.852406
0	(1, shafter, 15)	(2, donovan)	7.423044	17.263673	0.697048	0.401562
1	(1, shafter, 15)	(3, elcajon)	8.519809	10.013927	0.533767	0.445632
11	(1, shafter, 18)	(2, donovan)	8.798300	14.402095	0.834868	0.339824
12	(1, shafter, 18)	(3, elcajon)	9.134043	8.499010	0.572260	0.377004
25	(2, donovan, 15)	(1, shafter)	9.677780	16.192526	1.430899	0.497461
26	(2, donovan, 15)	(3, elcajon)	13.446282	19.687384	0.842412	0.876112
40	(2, donovan, 18)	(1, shafter)	8.160203	11.658369	1.478867	0.356384
41	(2, donovan, 18)	(3, elcajon)	9.481830	14.012520	0.594049	0.621576
8	(2, donovan, 20)	(3, elcajon)	10.685807	17.723073	0.670426	0.784656
24	(2, elcajon, 17)	(3, shafter)	5.529337	8.433496	0.403950	0.373303
2	(2, elcajon, 19)	(1, donovan)	2.475568	5.260309	0.584678	0.137919
3	(2, elcajon, 19)	(3, shafter)	6.018672	10.428402	0.439699	0.461606
6	(2, elcajon, 21)	(1, donovan)	2.689363	5.657763	0.635172	0.148339
7	(2, elcajon, 21)	(3, shafter)	4.932580	8.294777	0.360354	0.367163
36	(2, shafter, 11)	(1, elcajon)	4.162390	11.913171	0.766705	0.315078
37	(2, shafter, 11)	(3, donovan)	6.892461	13.430554	0.572901	0.450944
38	(2, shafter, 12)	(1, elcajon)	7.077577	7.467346	1.303677	0.197496
39	(2, shafter, 12)	(3, donovan)	7.651623	10.861686	0.636675	0.364173
20	(2, shafter, 13)	(1, elcajon)	4.690778	16.533990	0.864033	0.437289
21	(2, shafter, 13)	(3, donovan)	9.141173	16.189858	0.767448	0.544149
42	(3, donovan, 11)	(1, elcajon)	4.724865	6.984454	0.870312	0.184724
43	(3, donovan, 11)	(2, shafter)	5.837603	9.234832	0.430637	0.293167
27	(3, donovan, 12)	(1, elcajon)	5.174095	11.562465	0.953059	0.305803
28	(3, donovan, 12)	(2, shafter)	5.907204	10.736715	0.440081	0.340810
22	(3, donovan, 13)	(1, elcajon)	5.288720	8.103993	0.974173	0.214334
23	(3, donovan, 13)	(2, shafter)	6.176490	10.697359	0.457601	0.337569
44	(3, elcajon, 15)	(1, shafter)	3.710342	9.753052	0.548589	0.299630
45	(3, elcajon, 15)	(2, donovan)	5.661848	9.526385	0.531666	0.221589
31	(3, elcajon, 18)	(1, shafter)	3.642625	7.919467	0.660150	0.242089
32	(3, elcajon, 18)	(2, donovan)	5.831023	8.934960	0.553304	0.210825
19	(3, elcajon, 20)	(2, donovan)	5.605986	9.792729	0.531950	0.231064
33	(3, shafter, 17)	(2, elcajon)	7.525477	10.878168	0.669067	0.281080
13	(3, shafter, 19)	(1, donovan)	2.731428	6.203572	0.645107	0.162650
14	(3, shafter, 19)	(2, elcajon)	5.168947	8.853443	0.454545	0.229355
34	(3, shafter, 21)	(1, donovan)	3.538180	5.242839	0.835645	0.137460
35	(3, shafter, 21)	(2, elcajon)	4.334550	8.161131	0.381170	0.211420

Table A.20: Level 1 test results for NN[4]

	Model	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
0	(13, {(3, donovan), (2, shafter)})	3.370171	4.823963	0.271147	0.158760
1	(12, {(3, donovan), (1, elcajon)})	2.950991	5.682814	0.274935	0.181083
2	(19, {(1, donovan), (3, shafter)})	3.115379	4.201793	0.259471	0.165705
3	(15, {(3, elcajon), (2, donovan)})	3.008622	4.273620	0.206890	0.152879
4	(19, {(2, elcajon), (3, shafter)})	3.478385	4.752491	0.266184	0.176800
5	(19, {(2, elcajon), (1, donovan)})	2.066151	4.039185	0.236950	0.105104
6	(13, {(2, shafter), (1, elcajon)})	2.668262	4.658689	0.251145	0.137550
7	(11, {(2, shafter), (1, elcajon)})	2.664860	4.835774	0.250129	0.143268
8	(11, {(3, donovan), (2, shafter)})	3.360152	4.849313	0.268944	0.160019
9	(12, {(3, donovan), (2, shafter)})	3.179092	5.337817	0.255191	0.175871
10	(21, {(2, elcajon), (1, donovan)})	2.117772	4.094078	0.242870	0.106533
11	(15, {(1, shafter), (2, donovan)})	3.294208	5.478238	0.374423	0.144099
12	(15, {(1, shafter), (3, elcajon)})	2.199234	3.437771	0.160877	0.137609
13	(11, {(3, donovan), (1, elcajon)})	2.698117	4.004875	0.251136	0.127755
14	(12, {(2, shafter), (1, elcajon)})	2.741305	4.409537	0.257455	0.130874
15	(13, {(3, donovan), (1, elcajon)})	2.850300	4.108897	0.270426	0.130620
16	(21, {(2, elcajon), (3, shafter)})	2.792276	4.338721	0.213680	0.161407
17	(18, {(1, shafter), (2, donovan)})	4.058987	4.831247	0.426371	0.119528
18	(21, {(1, donovan), (3, shafter)})	2.558208	3.843982	0.213066	0.151594
19	(18, {(1, shafter), (3, elcajon)})	2.213259	2.843124	0.146944	0.121401
20	(18, {(3, elcajon), (2, donovan)})	2.959820	3.710114	0.204179	0.132963

Table A.21: Level 2 train results for NN[4]

	Model	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
0	(13, {(3, donovan), (2, shafter)})	2.792064	6.224904	0.514293	0.164636
1	(12, {(3, donovan), (1, elcajon)})	5.476274	11.574257	0.407978	0.367395
2	(19, {(1, donovan), (3, shafter)})	4.420274	8.130268	0.388709	0.210621
3	(15, {(3, elcajon), (2, donovan)})	4.184162	10.880935	0.618645	0.334280
4	(19, {(2, elcajon), (3, shafter)})	4.635999	7.141031	1.094928	0.187229
5	(19, {(2, elcajon), (1, donovan)})	7.527315	16.615371	0.549914	0.735469
6	(13, {(2, shafter), (1, elcajon)})	7.650637	12.276027	0.642310	0.412603
7	(11, {(2, shafter), (1, elcajon)})	5.955793	9.775859	0.495045	0.328234
8	(11, {(3, donovan), (2, shafter)})	3.614645	6.248505	0.665811	0.165260
9	(12, {(3, donovan), (2, shafter)})	3.170380	14.017473	0.583978	0.370733
10	(21, {(2, elcajon), (1, donovan)})	5.689720	7.288073	0.415667	0.322602
11	(15, {(1, shafter), (2, donovan)})	9.573528	11.301923	0.599783	0.502949
12	(15, {(1, shafter), (3, elcajon)})	5.796918	10.611551	0.544349	0.246830
13	(11, {(3, donovan), (1, elcajon)})	4.883372	8.827300	0.360244	0.280230
14	(12, {(2, shafter), (1, elcajon)})	5.489282	8.923448	0.456751	0.299187
15	(13, {(3, donovan), (1, elcajon)})	5.118306	10.194459	0.379203	0.321700
16	(21, {(2, elcajon), (3, shafter)})	2.653859	4.748847	0.626787	0.124509
17	(18, {(1, shafter), (2, donovan)})	7.611452	14.293644	0.476868	0.634046
18	(21, {(1, donovan), (3, shafter)})	3.775207	7.088697	0.331983	0.183638
19	(18, {(1, shafter), (3, elcajon)})	6.076278	8.620554	0.576576	0.203406
20	(18, {(3, elcajon), (2, donovan)})	3.802080	7.824485	0.689048	0.239186

Table A.22: Level 2 test results for NN[4]

	Model	Test	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
0	11	(2, shafter)	3.803538	5.549903	0.283315	0.175898
1	11	(3, donovan)	3.054310	4.151130	0.257564	0.138792
2	11	(1, elcajon)	2.296139	4.627076	0.428226	0.122247
3	17	(2, elcajon)	2.697029	4.757676	0.239570	0.124740
4	17	(3, shafter)	3.179543	3.712308	0.232287	0.162799
5	18	(1, shafter)	3.502196	4.946127	0.627170	0.150384
6	18	(3, elcajon)	2.602726	2.991688	0.163201	0.132907
7	18	(2, donovan)	4.943300	5.840910	0.476081	0.136980
8	13	(2, shafter)	3.698847	5.887221	0.272758	0.187448
9	13	(3, donovan)	3.262873	4.653230	0.277918	0.156412
10	13	(1, elcajon)	1.930914	4.264095	0.360112	0.112657
11	12	(2, shafter)	3.624222	5.723144	0.269622	0.180986
12	12	(3, donovan)	2.921068	4.779876	0.246260	0.159875
13	12	(1, elcajon)	1.900706	4.465228	0.354478	0.117971
14	20	(3, elcajon)	2.423089	3.718384	0.151883	0.165274
15	20	(2, donovan)	4.802678	6.190695	0.462538	0.145183
16	15	(1, shafter)	2.656244	4.699894	0.393347	0.143238
17	15	(3, elcajon)	2.511351	3.678134	0.158310	0.163088
18	15	(2, donovan)	5.136696	6.775231	0.483587	0.157801
19	19	(2, elcajon)	2.861018	5.902118	0.254760	0.154651
20	19	(1, donovan)	2.409992	3.858104	0.572612	0.101867
21	19	(3, shafter)	3.334381	4.154406	0.243599	0.182187
22	21	(2, elcajon)	2.577120	4.999255	0.229481	0.130994
23	21	(1, donovan)	2.025689	3.832054	0.481302	0.101179
24	21	(3, shafter)	2.684415	4.075558	0.196115	0.178729

Table A.23: Level 3 train results for NN[4]

	Model	Test	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
0	11	(2, shafter)	3.785909	5.571542	0.279285	0.176873
1	11	(3, donovan)	3.128972	4.261275	0.260080	0.143076
2	11	(1, elcajon)	2.395545	4.643186	0.441255	0.122803
3	17	(2, elcajon)	2.789838	4.855454	0.248036	0.125460
4	17	(3, shafter)	3.179432	3.713830	0.232276	0.164390
5	18	(1, shafter)	3.589393	4.833384	0.650503	0.147751
6	18	(3, elcajon)	2.633660	3.054478	0.165002	0.135492
7	18	(2, donovan)	5.146393	6.007977	0.488340	0.141761
8	13	(2, shafter)	3.758660	6.008720	0.278470	0.189613
9	13	(3, donovan)	3.369203	4.768787	0.282862	0.160281
10	13	(1, elcajon)	1.973535	4.303369	0.363522	0.113815
11	12	(2, shafter)	3.662015	5.779022	0.272817	0.183440
12	12	(3, donovan)	3.004468	4.848420	0.249995	0.162559
13	12	(1, elcajon)	1.928919	4.379425	0.355303	0.115827
14	20	(3, elcajon)	2.453035	3.756120	0.153903	0.166295
15	20	(2, donovan)	4.915355	6.268962	0.466417	0.147919
16	15	(1, shafter)	2.660068	4.721541	0.393302	0.145054
17	15	(3, elcajon)	2.534112	3.706481	0.158763	0.164943
18	15	(2, donovan)	5.053953	6.761611	0.474582	0.157279
19	19	(2, elcajon)	2.896744	5.960401	0.254733	0.154409
20	19	(1, donovan)	2.426516	3.863463	0.573093	0.101295
21	19	(3, shafter)	3.324459	4.105700	0.242871	0.181736
22	21	(2, elcajon)	2.654727	5.091330	0.233451	0.131895
23	21	(1, donovan)	2.081497	3.823015	0.491607	0.100235
24	21	(3, shafter)	2.673825	4.067595	0.195339	0.180049

Table A.24: Level 3 test results for NN[4]

A.4 Benchmarks for Subu

	Model	Testing Location	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
16	(1, donovan, 19)	(1, donovan, 19)	0.337740	0.546776	0.080247	0.014437
5	(1, donovan, 21)	(1, donovan, 21)	0.323311	0.535830	0.076818	0.014148
8	(1, elcajon, 11)	(1, elcajon, 11)	0.301001	0.513528	0.056136	0.013567
2	(1, elcajon, 12)	(1, elcajon, 12)	0.301750	0.515531	0.056276	0.013620
9	(1, elcajon, 13)	(1, elcajon, 13)	0.306623	0.546167	0.057185	0.014430
0	(1, shafter, 15)	(1, shafter, 15)	0.323170	0.566483	0.047856	0.017265
6	(1, shafter, 18)	(1, shafter, 18)	0.290350	0.553727	0.051996	0.016836
14	(2, donovan, 15)	(2, donovan, 15)	0.730868	0.911470	0.068807	0.021229
22	(2, donovan, 18)	(2, donovan, 18)	0.720733	0.887428	0.069413	0.020812
4	(2, donovan, 20)	(2, donovan, 20)	0.753036	0.891266	0.072524	0.020902
13	(2, elcajon, 17)	(2, elcajon, 17)	0.392235	0.644277	0.034841	0.016892
1	(2, elcajon, 19)	(2, elcajon, 19)	0.445999	0.739044	0.039714	0.019365
3	(2, elcajon, 21)	(2, elcajon, 21)	0.432871	0.715783	0.038545	0.018755
20	(2, shafter, 11)	(2, shafter, 11)	0.447909	0.686391	0.033364	0.021754
21	(2, shafter, 12)	(2, shafter, 12)	0.434242	0.688316	0.032305	0.021767
11	(2, shafter, 13)	(2, shafter, 13)	0.451918	0.699876	0.033325	0.022284
23	(3, donovan, 11)	(3, donovan, 11)	0.650381	0.712277	0.054845	0.023815
15	(3, donovan, 12)	(3, donovan, 12)	0.664451	0.773984	0.056016	0.025888
12	(3, donovan, 13)	(3, donovan, 13)	0.683324	0.772968	0.058203	0.025982
24	(3, elcajon, 15)	(3, elcajon, 15)	0.509041	0.623718	0.032089	0.027656
17	(3, elcajon, 18)	(3, elcajon, 18)	0.523014	0.644509	0.032795	0.028633
10	(3, elcajon, 20)	(3, elcajon, 20)	0.500819	0.603558	0.031392	0.026827
18	(3, shafter, 17)	(3, shafter, 17)	0.507571	0.628832	0.037081	0.027577
7	(3, shafter, 19)	(3, shafter, 19)	0.568689	0.631523	0.041547	0.027695
19	(3, shafter, 21)	(3, shafter, 21)	0.541210	0.659544	0.039539	0.028924

Table A.25: Level 0 train results for Subu

	Model	Testing Location	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
16	(1, donovan, 19)	(1, donovan, 19)	0.686943	1.089861	0.162242	0.028575
5	(1, donovan, 21)	(1, donovan, 21)	0.684105	1.103839	0.161572	0.028941
8	(1, elcajon, 11)	(1, elcajon, 11)	0.641704	1.055547	0.118201	0.027917
2	(1, elcajon, 12)	(1, elcajon, 12)	0.641610	1.068369	0.118183	0.028256
9	(1, elcajon, 13)	(1, elcajon, 13)	0.631901	1.119980	0.116395	0.029621
0	(1, shafter, 15)	(1, shafter, 15)	0.679875	1.183327	0.100522	0.036354
6	(1, shafter, 18)	(1, shafter, 18)	0.594978	1.066344	0.107827	0.032597
14	(2, donovan, 15)	(2, donovan, 15)	1.486924	1.773774	0.139627	0.041259
22	(2, donovan, 18)	(2, donovan, 18)	1.419766	1.732250	0.134721	0.040873
4	(2, donovan, 20)	(2, donovan, 20)	1.486669	1.757857	0.141070	0.041477
13	(2, elcajon, 17)	(2, elcajon, 17)	0.817639	1.318731	0.072694	0.034075
1	(2, elcajon, 19)	(2, elcajon, 19)	0.944004	1.510398	0.083014	0.039128
3	(2, elcajon, 21)	(2, elcajon, 21)	0.915845	1.486031	0.080537	0.038497
20	(2, shafter, 11)	(2, shafter, 11)	0.874304	1.308987	0.064497	0.041555
21	(2, shafter, 12)	(2, shafter, 12)	0.894952	1.383831	0.066673	0.043926
11	(2, shafter, 13)	(2, shafter, 13)	0.902136	1.363251	0.066837	0.043019
23	(3, donovan, 11)	(3, donovan, 11)	1.351965	1.470374	0.112375	0.049369
15	(3, donovan, 12)	(3, donovan, 12)	1.393470	1.564269	0.115948	0.052447
12	(3, donovan, 13)	(3, donovan, 13)	1.458868	1.615901	0.122480	0.054311
24	(3, elcajon, 15)	(3, elcajon, 15)	1.012644	1.253725	0.063442	0.055792
17	(3, elcajon, 18)	(3, elcajon, 18)	1.069426	1.314976	0.067001	0.058331
10	(3, elcajon, 20)	(3, elcajon, 20)	1.002429	1.211804	0.062892	0.053650
18	(3, shafter, 17)	(3, shafter, 17)	1.005406	1.272671	0.073451	0.056334
7	(3, shafter, 19)	(3, shafter, 19)	1.122436	1.269373	0.082001	0.056188
19	(3, shafter, 21)	(3, shafter, 21)	1.070099	1.312395	0.078177	0.058092

Table A.26: Level 0 test results for Subu

	Model	Testing Location	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
29	(1, donovan, 19)	(2, elcajon)	0.686943	1.089861	0.162242	0.028575
30	(1, donovan, 19)	(3, shafter)	0.686943	1.089861	0.162242	0.028575
9	(1, donovan, 21)	(2, elcajon)	0.684105	1.103839	0.161572	0.028941
10	(1, donovan, 21)	(3, shafter)	0.684105	1.103839	0.161572	0.028941
15	(1, elcajon, 11)	(2, shafter)	0.641704	1.055547	0.118201	0.027917
16	(1, elcajon, 11)	(3, donovan)	0.641704	1.055547	0.118201	0.027917
4	(1, elcajon, 12)	(2, shafter)	0.641610	1.068369	0.118183	0.028256
5	(1, elcajon, 12)	(3, donovan)	0.641610	1.068369	0.118183	0.028256
17	(1, elcajon, 13)	(2, shafter)	0.631901	1.119980	0.116395	0.029621
18	(1, elcajon, 13)	(3, donovan)	0.631901	1.119980	0.116395	0.029621
0	(1, shafter, 15)	(2, donovan)	0.679875	1.183327	0.100522	0.036354
1	(1, shafter, 15)	(3, elcajon)	0.679875	1.183327	0.100522	0.036354
11	(1, shafter, 18)	(2, donovan)	0.594978	1.066344	0.107827	0.032597
12	(1, shafter, 18)	(3, elcajon)	0.594978	1.066344	0.107827	0.032597
25	(2, donovan, 15)	(1, shafter)	1.486924	1.773774	0.139627	0.041259
26	(2, donovan, 15)	(3, elcajon)	1.486924	1.773774	0.139627	0.041259
40	(2, donovan, 18)	(1, shafter)	1.419766	1.732250	0.134721	0.040873
41	(2, donovan, 18)	(3, elcajon)	1.419766	1.732250	0.134721	0.040873
8	(2, donovan, 20)	(3, elcajon)	1.486669	1.757857	0.141070	0.041477
24	(2, elcajon, 17)	(3, shafter)	0.817639	1.318731	0.072694	0.034075
2	(2, elcajon, 19)	(1, donovan)	0.944004	1.510398	0.083014	0.039128
3	(2, elcajon, 19)	(3, shafter)	0.944004	1.510398	0.083014	0.039128
6	(2, elcajon, 21)	(1, donovan)	0.915845	1.486031	0.080537	0.038497
7	(2, elcajon, 21)	(3, shafter)	0.915845	1.486031	0.080537	0.038497
36	(2, shafter, 11)	(1, elcajon)	0.874304	1.308987	0.064497	0.041555
37	(2, shafter, 11)	(3, donovan)	0.874304	1.308987	0.064497	0.041555
38	(2, shafter, 12)	(1, elcajon)	0.894952	1.383831	0.066673	0.043926
39	(2, shafter, 12)	(3, donovan)	0.894952	1.383831	0.066673	0.043926
20	(2, shafter, 13)	(1, elcajon)	0.902136	1.363251	0.066837	0.043019
21	(2, shafter, 13)	(3, donovan)	0.902136	1.363251	0.066837	0.043019
42	(3, donovan, 11)	(1, elcajon)	1.351965	1.470374	0.112375	0.049369
43	(3, donovan, 11)	(2, shafter)	1.351965	1.470374	0.112375	0.049369
27	(3, donovan, 12)	(1, elcajon)	1.393470	1.564269	0.115948	0.052447
28	(3, donovan, 12)	(2, shafter)	1.393470	1.564269	0.115948	0.052447
22	(3, donovan, 13)	(1, elcajon)	1.458868	1.615901	0.122480	0.054311
23	(3, donovan, 13)	(2, shafter)	1.458868	1.615901	0.122480	0.054311
44	(3, elcajon, 15)	(1, shafter)	1.012644	1.253725	0.063442	0.055792
45	(3, elcajon, 15)	(2, donovan)	1.012644	1.253725	0.063442	0.055792
31	(3, elcajon, 18)	(1, shafter)	1.069426	1.314976	0.067001	0.058331
32	(3, elcajon, 18)	(2, donovan)	1.069426	1.314976	0.067001	0.058331
19	(3, elcajon, 20)	(2, donovan)	1.002429	1.211804	0.062892	0.053650
33	(3, shafter, 17)	(2, elcajon)	1.005406	1.272671	0.073451	0.056334
13	(3, shafter, 19)	(1, donovan)	1.122436	1.269373	0.082001	0.056188
14	(3, shafter, 19)	(2, elcajon)	1.122436	1.269373	0.082001	0.056188
34	(3, shafter, 21)	(1, donovan)	1.070099	1.312395	0.078177	0.058092
35	(3, shafter, 21)	(2, elcajon)	1.070099	1.312395	0.078177	0.058092

Table A.27: Level 1 train results for Subu

	Model	Testing Location	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
29	(1, donovan, 19)	(2, elcajon)	4.548739	13.040042	0.400006	0.337812
30	(1, donovan, 19)	(3, shafter)	6.430897	17.207219	0.469815	0.761666
9	(1, donovan, 21)	(2, elcajon)	4.628104	11.087694	0.406985	0.287235
10	(1, donovan, 21)	(3, shafter)	6.245997	14.178070	0.456307	0.627583
15	(1, elcajon, 11)	(2, shafter)	6.425524	11.656469	0.474008	0.370044
16	(1, elcajon, 11)	(3, donovan)	5.872511	9.176037	0.488123	0.308094
4	(1, elcajon, 12)	(2, shafter)	7.107676	10.408003	0.529516	0.330376
5	(1, elcajon, 12)	(3, donovan)	5.674140	9.372290	0.472133	0.314236
17	(1, elcajon, 13)	(2, shafter)	6.387216	11.043109	0.473213	0.348480
18	(1, elcajon, 13)	(3, donovan)	6.069123	9.190969	0.509534	0.308913
0	(1, shafter, 15)	(2, donovan)	6.673201	17.456510	0.626635	0.406048
1	(1, shafter, 15)	(3, elcajon)	8.403197	10.208219	0.526462	0.454278
11	(1, shafter, 18)	(2, donovan)	6.585418	17.837065	0.624888	0.420874
12	(1, shafter, 18)	(3, elcajon)	8.577247	10.682684	0.537376	0.473869
25	(2, donovan, 15)	(1, shafter)	12.816896	17.248354	1.895030	0.529898
26	(2, donovan, 15)	(3, elcajon)	9.852659	15.055316	0.617271	0.669980
40	(2, donovan, 18)	(1, shafter)	12.596284	18.240040	2.282815	0.557578
41	(2, donovan, 18)	(3, elcajon)	9.437416	17.082216	0.591267	0.757744
8	(2, donovan, 20)	(3, elcajon)	10.262604	15.545443	0.643874	0.688246
24	(2, elcajon, 17)	(3, shafter)	5.001351	11.036541	0.365378	0.488525
2	(2, elcajon, 19)	(1, donovan)	2.688701	8.998898	0.635016	0.235940
3	(2, elcajon, 19)	(3, shafter)	5.374128	10.411363	0.392611	0.460852
6	(2, elcajon, 21)	(1, donovan)	2.561278	7.119226	0.604921	0.186657
7	(2, elcajon, 21)	(3, shafter)	4.825603	9.827513	0.352538	0.435008
36	(2, shafter, 11)	(1, elcajon)	5.440025	8.687982	1.002043	0.229779
37	(2, shafter, 11)	(3, donovan)	6.109806	10.817213	0.507847	0.363198
38	(2, shafter, 12)	(1, elcajon)	7.236435	7.370941	1.332938	0.194946
39	(2, shafter, 12)	(3, donovan)	6.565731	11.044249	0.546320	0.370294
20	(2, shafter, 13)	(1, elcajon)	5.047813	7.137374	0.929798	0.188769
21	(2, shafter, 13)	(3, donovan)	7.238050	10.896927	0.607672	0.366251
42	(3, donovan, 11)	(1, elcajon)	5.414360	9.470893	0.997315	0.250485
43	(3, donovan, 11)	(2, shafter)	5.855176	12.843536	0.431934	0.407728
27	(3, donovan, 12)	(1, elcajon)	4.990963	8.438502	0.919326	0.223181
28	(3, donovan, 12)	(2, shafter)	5.430235	14.340338	0.404548	0.455198
22	(3, donovan, 13)	(1, elcajon)	6.148712	10.626142	1.132582	0.281039
23	(3, donovan, 13)	(2, shafter)	6.024530	13.621861	0.446343	0.429856
44	(3, elcajon, 15)	(1, shafter)	4.075606	11.045242	0.602595	0.339328
45	(3, elcajon, 15)	(2, donovan)	5.746909	8.007475	0.539653	0.186258
31	(3, elcajon, 18)	(1, shafter)	3.788585	11.402470	0.686602	0.348561
32	(3, elcajon, 18)	(2, donovan)	6.251020	9.282483	0.593157	0.219025
19	(3, elcajon, 20)	(2, donovan)	6.257977	8.508006	0.593817	0.200751
33	(3, shafter, 17)	(2, elcajon)	12.373480	9.177104	1.100088	0.237126
13	(3, shafter, 19)	(1, donovan)	5.981890	12.574814	1.412799	0.329695
14	(3, shafter, 19)	(2, elcajon)	4.868913	9.773720	0.428161	0.253196
34	(3, shafter, 21)	(1, donovan)	3.875599	10.156520	0.915337	0.266291
35	(3, shafter, 21)	(2, elcajon)	4.768892	8.668683	0.419365	0.224569

Table A.28: Level 1 test results for Subu

	Model	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
0	(19, {(3, shafter), (2, elcajon)})	1.151536	1.419818	0.088122	0.052819
1	(13, {(2, shafter), (3, donovan)})	1.370916	1.596229	0.110297	0.052533
2	(12, {(3, donovan), (1, elcajon)})	1.374757	1.729670	0.128082	0.055116
3	(19, {(1, donovan), (3, shafter)})	1.208029	1.606529	0.100613	0.063356
4	(18, {(3, elcajon), (2, donovan)})	1.275981	1.494079	0.088022	0.053545
5	(21, {(3, shafter), (2, elcajon)})	1.102141	1.430002	0.084342	0.053198
6	(11, {(2, shafter), (1, elcajon)})	0.801864	1.291776	0.075264	0.038271
7	(11, {(2, shafter), (3, donovan)})	1.291893	1.529065	0.103402	0.050457
8	(12, {(2, shafter), (3, donovan)})	1.330020	1.651226	0.106763	0.054405
9	(15, {(3, elcajon), (2, donovan)})	1.243857	1.477873	0.085535	0.052867
10	(21, {(1, donovan), (2, elcajon)})	0.857213	1.410411	0.098307	0.036701
11	(15, {(2, donovan), (1, shafter)})	1.145883	1.549991	0.130242	0.040771
12	(19, {(1, donovan), (2, elcajon)})	0.874947	1.443156	0.100341	0.037553
13	(15, {(3, elcajon), (1, shafter)})	0.982328	1.329509	0.071859	0.053218
14	(11, {(3, donovan), (1, elcajon)})	1.374018	1.695738	0.127891	0.054094
15	(12, {(2, shafter), (1, elcajon)})	0.827297	1.312652	0.077697	0.038959
16	(13, {(3, donovan), (1, elcajon)})	1.337952	1.681822	0.126940	0.053464
17	(18, {(2, donovan), (1, shafter)})	1.433064	1.757262	0.150534	0.043476
18	(21, {(1, donovan), (3, shafter)})	1.118296	1.558826	0.093140	0.061475
19	(18, {(3, elcajon), (1, shafter)})	1.106928	1.503584	0.073492	0.064203
20	(13, {(2, shafter), (1, elcajon)})	0.823050	1.313720	0.077468	0.038788

Table A.29: Level 2 train results for NN[4]

	Model	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
0	(19, {(3, shafter), (2, elcajon)})	3.137674	6.351407	0.741054	0.166526
1	(13, {(2, shafter), (3, donovan)})	4.651131	8.868903	0.856730	0.234564
2	(12, {(3, donovan), (1, elcajon)})	5.682068	11.668071	0.423309	0.370373
3	(19, {(1, donovan), (3, shafter)})	4.432476	8.590061	0.389782	0.222532
4	(18, {(3, elcajon), (2, donovan)})	4.108798	11.508869	0.744634	0.351814
5	(21, {(3, shafter), (2, elcajon)})	2.492172	5.758543	0.588600	0.150982
6	(11, {(2, shafter), (1, elcajon)})	5.825626	9.175662	0.484226	0.308082
7	(11, {(2, shafter), (3, donovan)})	4.750976	8.049299	0.875121	0.212887
8	(12, {(2, shafter), (3, donovan)})	4.742718	6.688396	0.873600	0.176894
9	(15, {(3, elcajon), (2, donovan)})	4.216605	11.854280	0.623442	0.364183
10	(21, {(1, donovan), (2, elcajon)})	5.284189	9.095722	0.386041	0.402616
11	(15, {(2, donovan), (1, shafter)})	6.567984	8.748012	0.411485	0.389297
12	(19, {(1, donovan), (2, elcajon)})	5.433307	8.957338	0.396935	0.396491
13	(15, {(3, elcajon), (1, shafter)})	5.618010	9.218762	0.527549	0.214433
14	(11, {(3, donovan), (1, elcajon)})	5.171241	10.513997	0.381480	0.333775
15	(12, {(2, shafter), (1, elcajon)})	5.943280	9.256847	0.494528	0.310365
16	(13, {(3, donovan), (1, elcajon)})	5.510705	10.832096	0.408275	0.341821
17	(18, {(2, donovan), (1, shafter)})	6.504384	10.732303	0.407508	0.476070
18	(21, {(1, donovan), (3, shafter)})	4.350293	6.969905	0.382555	0.180561
19	(18, {(3, elcajon), (1, shafter)})	6.188687	9.421610	0.587243	0.222307
20	(13, {(2, shafter), (1, elcajon)})	5.819184	9.588067	0.488550	0.322259

Table A.30: Level 2 test results for Subu

	Model	Test	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
0	11	(1, elcajon)	0.773795	1.202687	0.144311	0.031775
1	11	(3, donovan)	0.662781	0.753751	0.055891	0.025202
2	11	(2, shafter)	0.644449	0.967031	0.048003	0.030649
3	17	(3, shafter)	0.521591	0.645156	0.038106	0.028293
4	17	(2, elcajon)	0.473650	0.807448	0.042073	0.021170
5	18	(2, donovan)	1.069535	1.180637	0.103005	0.027688
6	18	(3, elcajon)	0.543236	0.690348	0.034063	0.030669
7	18	(1, shafter)	1.001742	2.266284	0.179391	0.068905
8	13	(1, elcajon)	0.467283	0.802379	0.087147	0.021199
9	13	(3, donovan)	0.686838	0.821361	0.058502	0.027609
10	13	(2, shafter)	0.611719	0.893012	0.045109	0.028433
11	12	(1, elcajon)	0.587826	0.901611	0.109628	0.023820
12	12	(3, donovan)	0.686243	0.847030	0.057854	0.028331
13	12	(2, shafter)	0.638737	0.946143	0.047518	0.029920
14	20	(2, donovan)	0.979052	1.107171	0.094291	0.025965
15	20	(3, elcajon)	0.510226	0.614387	0.031982	0.027308
16	15	(2, donovan)	1.252504	1.474653	0.117915	0.034346
17	15	(3, elcajon)	0.522866	0.675943	0.032960	0.029971
18	15	(1, shafter)	0.610343	1.040490	0.090382	0.031711
19	19	(2, elcajon)	0.620961	1.114138	0.055294	0.029193
20	19	(3, shafter)	0.599770	0.661586	0.043817	0.029013
21	19	(1, donovan)	0.731875	1.436958	0.173893	0.037941
22	21	(2, elcajon)	0.623377	1.076748	0.055509	0.028214
23	21	(3, shafter)	0.568822	0.697244	0.041556	0.030577
24	21	(1, donovan)	0.657051	1.306630	0.156115	0.034499

Table A.31: Level 3 train results for Subu

	Model	Test	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE
0	11	(1, elcajon)	1.144603	1.788728	0.210834	0.047308
1	11	(3, donovan)	1.358176	1.527444	0.112892	0.051285
2	11	(2, shafter)	1.107853	1.692843	0.081726	0.053741
3	17	(3, shafter)	1.022709	1.297421	0.074715	0.057430
4	17	(2, elcajon)	0.901411	1.490457	0.080142	0.038512
5	18	(2, donovan)	1.933470	2.133191	0.183466	0.050334
6	18	(3, elcajon)	1.102905	1.394137	0.069099	0.061842
7	18	(1, shafter)	1.347664	2.764470	0.244236	0.084507
8	13	(1, elcajon)	0.858543	1.460417	0.158142	0.038625
9	13	(3, donovan)	1.456883	1.699123	0.122313	0.057108
10	13	(2, shafter)	1.115493	1.619787	0.082644	0.051114
11	12	(1, elcajon)	0.988537	1.516457	0.182087	0.040107
12	12	(3, donovan)	1.405047	1.700141	0.116911	0.057003
13	12	(2, shafter)	1.179107	1.704056	0.087842	0.054091
14	20	(2, donovan)	1.751808	2.043606	0.166229	0.048220
15	20	(3, elcajon)	1.025672	1.227611	0.064351	0.054350
16	15	(2, donovan)	2.012921	2.311905	0.189020	0.053776
17	15	(3, elcajon)	1.019862	1.330576	0.063895	0.059212
18	15	(1, shafter)	1.002678	1.619914	0.148250	0.049766
19	19	(2, elcajon)	1.134940	1.897080	0.099804	0.049145
20	19	(3, shafter)	1.179567	1.310237	0.086174	0.057997
21	19	(1, donovan)	1.035754	1.847683	0.244624	0.048444
22	21	(2, elcajon)	1.139746	1.895852	0.100227	0.049113
23	21	(3, shafter)	1.116244	1.375853	0.081548	0.060901
24	21	(1, donovan)	0.980173	1.775715	0.231497	0.046557

Table A.32: Level 3 test results for Subu

B Split neural network results

	Model	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE	Calibration	NO2 CvMAE Diff	NO2 MAE Diff	O3 CvMAE Diff	O3 MAE Diff	Training Size	Board	Testing Location
22	(3, shafter, 17)	4.539401	6.433578	0.331630	0.284778	Split-NN	-0.605528	-8.288563	-0.506970	-11.453233	1.0	NaN	NaN
19	(3, shafter, 17)	12.827964	17.886811	0.937158	0.791748	Linear	NaN	NaN	NaN	NaN	1.0	17.0	(3, shafter)
17	(3, donovan, 12)	5.454275	9.532250	0.453839	0.319599	Split-NN	-0.076646	-0.921136	-0.003171	-0.094564	2.0	NaN	NaN
15	(3, donovan, 12)	6.375411	9.626814	0.530484	0.322770	Linear	NaN	NaN	NaN	NaN	2.0	NaN	NaN
7	(2, donovan, 15)	5.614835	9.699231	0.527251	0.225609	Split-NN	-0.081396	-0.866804	-0.033783	-1.452359	2.0	NaN	NaN
13	(2, donovan, 15)	6.481640	11.151591	0.608647	0.259392	Linear	NaN	NaN	NaN	NaN	2.0	NaN	NaN
10	(2, elcajon, 17)	5.498597	10.599397	0.488863	0.273877	Split-NN	-0.263576	-2.964631	-0.068374	-2.646151	1.0	NaN	NaN
41	(2, elcajon, 17)	8.463228	13.245548	0.752440	0.342250	Linear	NaN	NaN	NaN	NaN	1.0	17.0	(2, elcajon)
21	(3, elcajon, 20)	3.828413	9.825537	0.240194	0.435007	Split-NN	-0.139513	-2.223677	0.099121	2.238855	1.0	NaN	NaN
18	(3, elcajon, 20)	6.052090	7.586682	0.379707	0.335886	Linear	NaN	NaN	NaN	NaN	1.0	20.0	(3, elcajon)
4	(1, elcajon, 13)	2.779693	5.929340	0.512014	0.156819	Split-NN	-0.502038	-2.725531	-0.009516	-0.359820	2.0	NaN	NaN
0	(1, elcajon, 13)	5.505224	6.289160	1.014052	0.166335	Linear	NaN	NaN	NaN	NaN	2.0	NaN	NaN
11	(2, elcajon, 19)	3.546681	8.182002	0.311887	0.211961	Split-NN	-0.273752	-3.113028	-0.086942	-3.356080	2.0	NaN	NaN
3	(2, elcajon, 19)	6.659709	11.538081	0.585639	0.298903	Linear	NaN	NaN	NaN	NaN	2.0	NaN	NaN
3	(1, elcajon, 12)	3.102751	10.112155	0.571521	0.267445	Split-NN	-0.493796	-2.680787	0.038974	1.473629	2.0	NaN	NaN
10	(1, elcajon, 12)	5.783538	8.638525	1.065317	0.228471	Linear	NaN	NaN	NaN	NaN	2.0	NaN	NaN
13	(2, shafter, 11)	4.383100	8.380669	0.323339	0.266051	Split-NN	-0.432955	-5.869021	0.002812	0.088592	2.0	NaN	NaN
14	(2, shafter, 11)	10.252120	8.292078	0.756294	0.263238	Linear	NaN	NaN	NaN	NaN	2.0	NaN	NaN
24	(3, shafter, 21)	4.435111	6.514425	0.324011	0.288357	Split-NN	-0.511143	-6.996613	-0.091516	-2.067496	2.0	NaN	NaN
11	(3, shafter, 21)	11.431724	8.581921	0.835154	0.379873	Linear	NaN	NaN	NaN	NaN	2.0	NaN	NaN
2	(1, elcajon, 11)	2.534280	6.362458	0.466810	0.168274	Split-NN	-0.702504	-3.813847	-0.020351	-0.769484	2.0	NaN	NaN
9	(1, elcajon, 11)	6.348127	7.131942	1.169314	0.188625	Linear	NaN	NaN	NaN	NaN	2.0	NaN	NaN
16	(3, donovan, 11)	4.921720	7.233713	0.409093	0.242879	Split-NN	-0.182876	-2.200144	-0.046325	-1.379723	2.0	NaN	NaN
8	(3, donovan, 11)	7.121864	8.613436	0.591969	0.289204	Linear	NaN	NaN	NaN	NaN	2.0	NaN	NaN
8	(2, donovan, 18)	5.717653	8.253025	0.542546	0.194734	Split-NN	-0.109689	-1.155961	0.007390	0.313190	2.0	NaN	NaN
19	(2, donovan, 18)	6.873614	7.939836	0.652235	0.187344	Linear	NaN	NaN	NaN	NaN	2.0	NaN	NaN
6	(1, shafter, 18)	2.819569	7.991201	0.510988	0.244282	Split-NN	-0.358747	-1.979519	0.032161	1.052070	2.0	NaN	NaN
20	(1, shafter, 18)	4.799088	6.939131	0.869735	0.212122	Linear	NaN	NaN	NaN	NaN	2.0	NaN	NaN
9	(2, donovan, 20)	5.744374	8.402593	0.545082	0.198263	Split-NN	-0.305986	-3.224653	-0.004062	-0.172154	1.0	NaN	NaN
40	(2, donovan, 20)	8.969028	8.574747	0.851068	0.202325	Linear	NaN	NaN	NaN	NaN	1.0	20.0	(2, donovan)
0	(1, donovan, 19)	2.241761	4.981540	0.529458	0.130610	Split-NN	-1.304432	-5.523055	-0.396701	-15.130452	2.0	NaN	NaN
6	(1, donovan, 19)	7.764816	20.111992	1.833890	0.527311	Linear	NaN	NaN	NaN	NaN	2.0	NaN	NaN
14	(2, shafter, 12)	5.456625	9.521890	0.406514	0.302248	Split-NN	-0.145931	-1.958824	-0.022853	-0.719947	2.0	NaN	NaN
2	(2, shafter, 12)	7.415449	10.241837	0.552444	0.325101	Linear	NaN	NaN	NaN	NaN	2.0	NaN	NaN
5	(1, shafter, 15)	4.595032	9.147087	0.679394	0.281014	Split-NN	-0.162526	-1.099233	0.003339	0.108694	2.0	NaN	NaN
4	(1, shafter, 15)	5.694266	9.038393	0.841920	0.277674	Linear	NaN	NaN	NaN	NaN	2.0	NaN	NaN
15	(2, shafter, 13)	5.512790	8.449433	0.408429	0.266633	Split-NN	-0.111371	-1.503240	-0.048438	-1.534958	2.0	NaN	NaN
16	(2, shafter, 13)	7.016030	9.984391	0.519801	0.315071	Linear	NaN	NaN	NaN	NaN	2.0	NaN	NaN
1	(1, donovan, 21)	2.471294	4.735241	0.583669	0.124152	Split-NN	-0.584985	-2.476869	-0.049564	-1.890388	2.0	NaN	NaN
17	(1, donovan, 21)	4.948163	6.625629	1.168654	0.173715	Linear	NaN	NaN	NaN	NaN	2.0	NaN	NaN
12	(2, elcajon, 21)	3.245558	7.386588	0.285407	0.191355	Split-NN	-0.374562	-4.259406	-0.036343	-1.402888	2.0	NaN	NaN
18	(2, elcajon, 21)	7.504964	8.789476	0.659969	0.227698	Linear	NaN	NaN	NaN	NaN	2.0	NaN	NaN
19	(3, elcajon, 15)	4.253159	8.947055	0.266461	0.398155	Split-NN	-0.099063	-1.581215	0.085938	1.931142	2.0	NaN	NaN
5	(3, elcajon, 15)	5.834374	7.015913	0.365524	0.312216	Linear	NaN	NaN	NaN	NaN	2.0	NaN	NaN
23	(3, shafter, 19)	5.013481	8.280473	0.366264	0.366530	Split-NN	-0.549754	-7.525127	-0.613659	-13.863510	2.0	NaN	NaN
12	(3, shafter, 19)	12.538608	22.143983	0.916019	0.980189	Linear	NaN	NaN	NaN	NaN	2.0	NaN	NaN
18	(3, donovan, 13)	5.281705	8.331434	0.443426	0.280023	Split-NN	-0.250340	-2.981832	-0.135988	-4.045999	2.0	NaN	NaN
7	(3, donovan, 13)	8.263537	12.377433	0.693766	0.416011	Linear	NaN	NaN	NaN	NaN	2.0	NaN	NaN
20	(3, elcajon, 18)	3.941489	9.080589	0.246940	0.402802	Split-NN	-0.053920	-0.860641	0.117104	2.639931	2.0	NaN	NaN
1	(3, elcajon, 18)	4.802131	6.440659	0.300860	0.285699	Linear	NaN	NaN	NaN	NaN	2.0	NaN	NaN

Table B.33: Comparison of Split NN vs Linear

	Model	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE	Calibration	NO2 CvMAE Diff	NO2 MAE Diff	O3 CvMAE Diff	O3 MAE Diff	Training Size	Board	Testing Location
17	(3, donovan, 12)	5.454275	9.532250	0.453839	0.319599	Split-NN	0.073799	0.886920	0.032053	0.955996	2.0	NaN	NaN
16	(3, donovan, 12)	4.567355	8.576255	0.380040	0.287546	NN[2]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
7	(2, donovan, 15)	5.614835	9.699231	0.527251	0.225609	Split-NN	-0.062129	-0.661631	0.005333	0.229291	2.0	NaN	NaN
11	(2, donovan, 15)	6.276467	9.469940	0.589380	0.220276	NN[2]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
14	(2, shafter, 12)	5.456625	9.521890	0.406514	0.302248	Split-NN	0.026368	0.353938	-0.005139	-0.161898	2.0	NaN	NaN
14	(2, shafter, 12)	5.102687	9.683788	0.380146	0.307387	NN[2]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
5	(1, shafter, 15)	4.595032	9.147087	0.679394	0.281014	Split-NN	-0.103499	-0.700008	-0.056346	-1.834076	2.0	NaN	NaN
6	(1, shafter, 15)	5.295040	10.981164	0.782893	0.337360	NN[2]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
15	(2, shafter, 13)	5.512790	8.449433	0.408429	0.266633	Split-NN	0.036286	0.489769	-0.042138	-1.335335	2.0	NaN	NaN
8	(2, shafter, 13)	5.023021	9.784768	0.372143	0.308771	NN[2]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
12	(2, elcajon, 21)	3.245558	7.386588	0.285407	0.191355	Split-NN	-0.040436	-0.459822	-0.007489	-0.289102	2.0	NaN	NaN
3	(2, elcajon, 21)	3.705380	7.675690	0.325843	0.198845	NN[2]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
16	(3, donovan, 11)	4.921720	7.233713	0.409093	0.242879	Split-NN	0.018766	0.225766	-0.008492	-0.252909	2.0	NaN	NaN
12	(3, donovan, 11)	4.695954	7.486622	0.390328	0.251370	NN[2]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
19	(3, elcajon, 15)	4.253159	8.947055	0.266461	0.398155	Split-NN	0.033937	0.541695	0.033904	0.761859	2.0	NaN	NaN
7	(3, elcajon, 15)	3.711464	8.185195	0.232524	0.364251	NN[2]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
8	(2, donovan, 18)	5.717653	8.253025	0.542546	0.194734	Split-NN	-0.016762	-0.176651	-0.011014	-0.466799	2.0	NaN	NaN
5	(2, donovan, 18)	5.894304	8.719824	0.559309	0.205748	NN[2]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
9	(2, donovan, 20)	5.744374	8.402593	0.545082	0.198263	Split-NN	-0.051119	-0.538718	-0.005687	-0.241037	1.0	NaN	NaN
40	(2, donovan, 20)	6.283092	8.643630	0.596201	0.203951	NN[2]	NaN	NaN	NaN	NaN	1.0	20.0	(2, donovan)
4	(1, elcajon, 13)	2.779693	5.929340	0.512014	0.156819	Split-NN	-0.017854	-0.096929	-0.017803	-0.673139	2.0	NaN	NaN
18	(1, elcajon, 13)	2.876621	6.602479	0.529868	0.174622	NN[2]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
0	(1, donovan, 19)	2.241761	4.981540	0.529458	0.130610	Split-NN	-0.031126	-0.131789	-0.059917	-2.285272	2.0	NaN	NaN
0	(1, donovan, 19)	2.373550	7.266813	0.560584	0.190526	NN[2]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
10	(2, elcajon, 17)	5.498597	10.599397	0.488863	0.273877	Split-NN	0.010488	0.117970	0.015076	0.583446	1.0	NaN	NaN
41	(2, elcajon, 17)	5.380627	10.015951	0.478375	0.258801	NN[2]	NaN	NaN	NaN	NaN	1.0	17.0	(2, elcajon)
3	(1, elcajon, 12)	3.102751	10.112155	0.571521	0.267445	Split-NN	-0.017712	-0.096156	-0.105314	-3.981959	2.0	NaN	NaN
17	(1, elcajon, 12)	3.198907	14.094113	0.589233	0.372760	NN[2]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
23	(3, shafter, 19)	5.013481	8.280473	0.366264	0.366530	Split-NN	-0.222709	-3.048475	-0.396685	-8.961720	2.0	NaN	NaN
9	(3, shafter, 19)	8.061956	17.242193	0.588973	0.763214	NN[2]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
2	(1, elcajon, 11)	2.534280	6.362458	0.466810	0.168274	Split-NN	-0.263855	-1.432451	0.005465	0.206627	2.0	NaN	NaN
19	(1, elcajon, 11)	3.966730	6.155831	0.730665	0.162809	NN[2]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
20	(3, elcajon, 18)	3.941489	9.080589	0.246940	0.402802	Split-NN	-0.050143	-0.800345	-0.103298	-2.328693	2.0	NaN	NaN
2	(3, elcajon, 18)	4.741835	11.409282	0.297082	0.506100	NN[2]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
11	(2, elcajon, 19)	3.546681	8.182002	0.311887	0.211961	Split-NN	-0.054333	-0.617861	0.014472	0.558642	2.0	NaN	NaN
15	(2, elcajon, 19)	4.164542	7.623360	0.366220	0.197489	NN[2]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
22	(3, shafter, 17)	4.539401	6.433578	0.331630	0.284778	Split-NN	-0.004260	-0.058311	-0.105736	-2.388729	1.0	NaN	NaN
19	(3, shafter, 17)	4.597712	8.822307	0.335890	0.390514	NN[2]	NaN	NaN	NaN	NaN	1.0	17.0	(3, shafter)
21	(3, elcajon, 20)	3.828413	9.825537	0.240194	0.435007	Split-NN	-0.075242	-1.199277	0.010259	0.231725	1.0	NaN	NaN
18	(3, elcajon, 20)	5.027690	9.593812	0.315437	0.424748	NN[2]	NaN	NaN	NaN	NaN	1.0	20.0	(3, elcajon)
6	(1, shafter, 18)	2.819569	7.991201	0.510988	0.244282	Split-NN	-0.215899	-1.191303	0.015113	0.494381	2.0	NaN	NaN
20	(1, shafter, 18)	4.010872	7.496820	0.726887	0.229170	NN[2]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
1	(1, donovan, 21)	2.471294	4.735241	0.583669	0.124152	Split-NN	-0.219301	-0.928536	-0.003013	-0.114915	2.0	NaN	NaN
4	(1, donovan, 21)	3.399830	4.850157	0.802970	0.127165	NN[2]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
13	(2, shafter, 11)	4.383100	8.380669	0.323339	0.266051	Split-NN	-0.012307	-0.166826	0.012557	0.395553	2.0	NaN	NaN
1	(2, shafter, 11)	4.549925	7.985116	0.335646	0.253494	NN[2]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
24	(3, shafter, 21)	4.435111	6.514425	0.324011	0.288357	Split-NN	-0.004086	-0.055930	-0.072832	-1.645378	2.0	NaN	NaN
13	(3, shafter, 21)	4.491042	8.159803	0.328097	0.361188	NN[2]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
18	(3, donovan, 13)	5.281705	8.331434	0.443426	0.280023	Split-NN	-0.035739	-0.425686	-0.040511	-1.205318	2.0	NaN	NaN
10	(3, donovan, 13)	5.707391	9.536752	0.479165	0.320535	NN[2]	NaN	NaN	NaN	NaN	2.0	NaN	NaN

Table B.34: Comparison of Split NN vs NN[2]

	Model	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE	Calibration	NO2 CvMAE Diff	NO2 MAE Diff	O3 CvMAE Diff	O3 MAE Diff	Training Size	Board	Testing Location
8	(2, donovan, 18)	5.717653	8.253025	0.542546	0.194734	Split-NN	-0.034030	-0.358625	-0.008672	-0.367529	2.0	NaN	NaN
19	(2, donovan, 18)	6.076278	8.620554	0.576576	0.203406	NN[4]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
21	(3, elcajon, 20)	3.828413	9.825537	0.240194	0.435007	Split-NN	-0.430232	-6.857393	-0.349649	-7.897536	1.0	NaN	NaN
18	(3, elcajon, 20)	10.685807	17.723073	0.670426	0.784656	NN[4]	NaN	NaN	NaN	NaN	1.0	20.0	(3, elcajon)
14	(2, shafter, 12)	5.456625	9.521890	0.406514	0.302248	Split-NN	-0.001464	-0.019649	-0.065147	-2.052368	2.0	NaN	NaN
1	(2, shafter, 12)	5.476274	11.574257	0.407978	0.367395	NN[4]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
15	(2, shafter, 13)	5.512790	8.449433	0.408429	0.266633	Split-NN	0.029226	0.394484	-0.055067	-1.745027	2.0	NaN	NaN
15	(2, shafter, 13)	5.118306	10.194459	0.379203	0.321700	NN[4]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
0	(1, donovan, 19)	2.241761	4.981540	0.529458	0.130610	Split-NN	-0.565470	-2.394239	-0.056619	-2.159491	2.0	NaN	NaN
4	(1, donovan, 19)	4.635999	7.141031	1.094928	0.187229	NN[4]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
24	(3, shafter, 21)	4.435111	6.514425	0.324011	0.288357	Split-NN	-0.091657	-1.254609	-0.034245	-0.773648	2.0	NaN	NaN
10	(3, shafter, 21)	5.689720	7.288073	0.415667	0.322602	NN[4]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
13	(2, shafter, 11)	4.383100	8.380669	0.323339	0.266051	Split-NN	-0.036905	-0.500272	-0.014179	-0.446631	2.0	NaN	NaN
13	(2, shafter, 11)	4.883372	8.827300	0.360244	0.280230	NN[4]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
1	(1, donovan, 21)	2.471294	4.735241	0.583669	0.124152	Split-NN	-0.043118	-0.182564	-0.000357	-0.013606	2.0	NaN	NaN
16	(1, donovan, 21)	2.653859	4.748847	0.626787	0.124509	NN[4]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
23	(3, shafter, 19)	5.013481	8.280473	0.366264	0.366530	Split-NN	-0.183650	-2.513834	-0.368939	-8.334898	2.0	NaN	NaN
5	(3, shafter, 19)	7.527315	16.615371	0.549914	0.735469	NN[4]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
18	(3, donovan, 13)	5.281705	8.331434	0.443426	0.280023	Split-NN	-0.198884	-2.368932	-0.132580	-3.944593	2.0	NaN	NaN
6	(3, donovan, 13)	7.650637	12.276027	0.642310	0.412603	NN[4]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
20	(3, elcajon, 18)	3.941489	9.080589	0.246940	0.402802	Split-NN	-0.229928	-3.669963	-0.231244	-5.213055	2.0	NaN	NaN
17	(3, elcajon, 18)	7.611452	14.293644	0.476868	0.634046	NN[4]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
22	(3, shafter, 17)	4.539401	6.433578	0.331630	0.284778	Split-NN	-0.072321	-0.989936	-0.088525	-1.999918	1.0	NaN	NaN
19	(3, shafter, 17)	5.529337	8.433496	0.403950	0.373303	NN[4]	NaN	NaN	NaN	NaN	1.0	17.0	(3, shafter)
17	(3, donovan, 12)	5.454275	9.532250	0.453839	0.319599	Split-NN	-0.002913	-0.035007	0.020412	0.608803	2.0	NaN	NaN
14	(3, donovan, 12)	5.489282	8.923448	0.456751	0.299187	NN[4]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
16	(3, donovan, 11)	4.921720	7.233713	0.409093	0.242879	Split-NN	-0.085952	-1.034073	-0.085355	-2.542146	2.0	NaN	NaN
7	(3, donovan, 11)	5.955793	9.775859	0.495045	0.328234	NN[4]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
10	(2, elcajon, 17)	5.498597	10.599397	0.488863	0.273877	Split-NN	-0.180204	-2.026880	-0.007203	-0.278771	1.0	NaN	NaN
41	(2, elcajon, 17)	7.525477	10.878168	0.669067	0.281080	NN[4]	NaN	NaN	NaN	NaN	1.0	17.0	(2, elcajon)
7	(2, donovan, 15)	5.614835	9.699231	0.527251	0.225609	Split-NN	-0.017098	-0.182082	-0.021221	-0.912320	2.0	NaN	NaN
12	(2, donovan, 15)	5.796918	10.611551	0.544349	0.246830	NN[4]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
5	(1, shafter, 15)	4.595032	9.147087	0.679394	0.281014	Split-NN	0.060749	0.410870	-0.053267	-1.733848	2.0	NaN	NaN
3	(1, shafter, 15)	4.184162	10.880935	0.618645	0.334280	NN[4]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
11	(2, elcajon, 19)	3.546681	8.182002	0.311887	0.211961	Split-NN	-0.076822	-0.873593	0.001340	0.051733	2.0	NaN	NaN
2	(2, elcajon, 19)	4.420274	8.130268	0.388709	0.210621	NN[4]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
3	(1, elcajon, 12)	3.102751	10.112155	0.571521	0.267445	Split-NN	-0.012457	-0.067629	-0.103287	-3.905318	2.0	NaN	NaN
9	(1, elcajon, 12)	3.170380	14.017473	0.583978	0.370733	NN[4]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
12	(2, elcajon, 21)	3.245558	7.386588	0.285407	0.191355	Split-NN	-0.046576	-0.529649	0.007717	0.297891	2.0	NaN	NaN
18	(2, elcajon, 21)	3.775207	7.088697	0.331983	0.183638	NN[4]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
6	(1, shafter, 18)	2.819569	7.991201	0.510988	0.244282	Split-NN	-0.178060	-0.982511	0.005096	0.166716	2.0	NaN	NaN
20	(1, shafter, 18)	3.802080	7.824485	0.689048	0.239186	NN[4]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
4	(1, elcajon, 13)	2.779693	5.929340	0.512014	0.156819	Split-NN	-0.002279	-0.012371	-0.007817	-0.295564	2.0	NaN	NaN
0	(1, elcajon, 13)	2.792064	6.224904	0.514293	0.164636	NN[4]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
2	(1, elcajon, 11)	2.534280	6.362458	0.466810	0.168274	Split-NN	-0.199001	-1.080365	0.003014	0.113953	2.0	NaN	NaN
8	(1, elcajon, 11)	3.614645	6.248505	0.665811	0.165260	NN[4]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
19	(3, elcajon, 15)	4.253159	8.947055	0.266461	0.398155	Split-NN	-0.333322	-5.320369	-0.104794	-2.354868	2.0	NaN	NaN
11	(3, elcajon, 15)	9.573528	11.301923	0.599783	0.502949	NN[4]	NaN	NaN	NaN	NaN	2.0	NaN	NaN
9	(2, donovan, 20)	5.744374	8.402593	0.545082	0.198263	Split-NN	0.013132	0.138388	-0.032801	-1.390135	1.0	NaN	NaN
40	(2, donovan, 20)	5.605986	9.792729	0.531950	0.231064	NN[4]	NaN	NaN	NaN	NaN	1.0	20.0	(2, donovan)

Table B.35: Comparison of Split NN vs NN[4]

	Model	NO2 MAE	O3 MAE	NO2 CvMAE	O3 CvMAE	Calibration	NO2 CvMAE Diff	NO2 MAE Diff	O3 CvMAE Diff	O3 MAE Diff	Training Size	Board	Testing Location
10	(2, elcajon, 17)	5.498597	10.599397	0.488863	0.273877	Split-NN	-0.611225	-6.874883	0.036750	1.422293	1.0	NaN	NaN
41	(2, elcajon, 17)	12.373480	9.177104	1.100088	0.237126	RF	NaN	NaN	NaN	NaN	1.0	17.0	(2, elcajon)
8	(2, donovan, 18)	5.717653	8.253025	0.542546	0.194734	Split-NN	-0.044696	-0.471034	-0.027573	-1.168585	2.0	NaN	NaN
19	(2, donovan, 18)	6.188687	9.421610	0.587243	0.222307	RF	NaN	NaN	NaN	NaN	2.0	NaN	NaN
16	(3, donovan, 11)	4.921720	7.233713	0.409093	0.242879	Split-NN	-0.075133	-0.903906	-0.065203	-1.941949	2.0	NaN	NaN
6	(3, donovan, 11)	5.825626	9.175662	0.484226	0.308082	RF	NaN	NaN	NaN	NaN	2.0	NaN	NaN
22	(3, shafter, 17)	4.539401	6.433578	0.331630	0.284778	Split-NN	-0.033748	-0.461950	-0.203747	-4.602963	1.0	NaN	NaN
19	(3, shafter, 17)	5.001351	11.036541	0.365378	0.488525	RF	NaN	NaN	NaN	NaN	1.0	17.0	(3, shafter)
17	(3, donovan, 12)	5.454275	9.532250	0.453839	0.319599	Split-NN	-0.040689	-0.489005	0.009234	0.275404	2.0	NaN	NaN
15	(3, donovan, 12)	5.943280	9.256847	0.494528	0.310365	RF	NaN	NaN	NaN	NaN	2.0	NaN	NaN
11	(2, elcajon, 19)	3.546681	8.182002	0.311887	0.211961	Split-NN	-0.077895	-0.885795	-0.010571	-0.408059	2.0	NaN	NaN
3	(2, elcajon, 19)	4.432476	8.590061	0.389782	0.222532	RF	NaN	NaN	NaN	NaN	2.0	NaN	NaN
18	(3, donovan, 13)	5.281705	8.331434	0.443426	0.280023	Split-NN	-0.045124	-0.537479	-0.042236	-1.256633	2.0	NaN	NaN
20	(3, donovan, 13)	5.819184	9.588067	0.488550	0.322259	RF	NaN	NaN	NaN	NaN	2.0	NaN	NaN
3	(1, elcajon, 12)	3.102751	10.112155	0.571521	0.267445	Split-NN	-0.302079	-1.639967	0.090551	3.423759	2.0	NaN	NaN
8	(1, elcajon, 12)	4.742718	6.688396	0.873600	0.176894	RF	NaN	NaN	NaN	NaN	2.0	NaN	NaN
23	(3, shafter, 19)	5.013481	8.280473	0.366264	0.366530	Split-NN	-0.030671	-0.419826	-0.029961	-0.676865	2.0	NaN	NaN
12	(3, shafter, 19)	5.433307	8.957338	0.396935	0.396491	RF	NaN	NaN	NaN	NaN	2.0	NaN	NaN
12	(2, elcajon, 21)	3.245558	7.386588	0.285407	0.191355	Split-NN	-0.097148	-1.104735	0.010794	0.416683	2.0	NaN	NaN
18	(2, elcajon, 21)	4.350293	6.969905	0.382555	0.180561	RF	NaN	NaN	NaN	NaN	2.0	NaN	NaN
4	(1, elcajon, 13)	2.779693	5.929340	0.512014	0.156819	Split-NN	-0.344716	-1.871438	-0.077745	-2.939563	2.0	NaN	NaN
1	(1, elcajon, 13)	4.651131	8.868903	0.856730	0.234564	RF	NaN	NaN	NaN	NaN	2.0	NaN	NaN
5	(1, shafter, 15)	4.595032	9.147087	0.679394	0.281014	Split-NN	0.055952	0.378427	-0.083169	-2.707192	2.0	NaN	NaN
9	(1, shafter, 15)	4.216605	11.854280	0.623442	0.364183	RF	NaN	NaN	NaN	NaN	2.0	NaN	NaN
24	(3, shafter, 21)	4.435111	6.514425	0.324011	0.288357	Split-NN	-0.062030	-0.849077	-0.114259	-2.581296	2.0	NaN	NaN
10	(3, shafter, 21)	5.284189	9.095722	0.386041	0.402616	RF	NaN	NaN	NaN	NaN	2.0	NaN	NaN
7	(2, donovan, 15)	5.614835	9.699231	0.527251	0.225609	Split-NN	-0.000298	-0.003175	0.011176	0.480469	2.0	NaN	NaN
13	(2, donovan, 15)	5.618010	9.218762	0.527549	0.214433	RF	NaN	NaN	NaN	NaN	2.0	NaN	NaN
14	(2, shafter, 12)	5.456625	9.521890	0.406514	0.302248	Split-NN	-0.016795	-0.225443	-0.068125	-2.146181	2.0	NaN	NaN
2	(2, shafter, 12)	5.682068	11.668071	0.423309	0.370373	RF	NaN	NaN	NaN	NaN	2.0	NaN	NaN
2	(1, elcajon, 11)	2.534280	6.362458	0.466810	0.168274	Split-NN	-0.408311	-2.216696	-0.044613	-1.686840	2.0	NaN	NaN
7	(1, elcajon, 11)	4.750976	8.049299	0.875121	0.212887	RF	NaN	NaN	NaN	NaN	2.0	NaN	NaN
15	(2, shafter, 13)	5.512790	8.449433	0.408429	0.266633	Split-NN	0.000154	0.002085	-0.075188	-2.382663	2.0	NaN	NaN
16	(2, shafter, 13)	5.510705	10.832096	0.408275	0.341821	RF	NaN	NaN	NaN	NaN	2.0	NaN	NaN
19	(3, elcajon, 15)	4.253159	8.947055	0.266461	0.398155	Split-NN	-0.145024	-2.314825	0.008858	0.199042	2.0	NaN	NaN
11	(3, elcajon, 15)	6.567984	8.748012	0.411485	0.389297	RF	NaN	NaN	NaN	NaN	2.0	NaN	NaN
0	(1, donovan, 19)	2.241761	4.981540	0.529458	0.130610	Split-NN	-0.211596	-0.895913	-0.035916	-1.369867	2.0	NaN	NaN
0	(1, donovan, 19)	3.137674	6.351407	0.741054	0.166526	RF	NaN	NaN	NaN	NaN	2.0	NaN	NaN
21	(3, elcajon, 20)	3.828413	9.825537	0.240194	0.435007	Split-NN	-0.403680	-6.434191	-0.253238	-5.719905	1.0	NaN	NaN
18	(3, elcajon, 20)	10.262604	15.545443	0.643874	0.688246	RF	NaN	NaN	NaN	NaN	1.0	20.0	(3, elcajon)
9	(2, donovan, 20)	5.744374	8.402593	0.545082	0.198263	Split-NN	-0.048736	-0.513603	-0.002487	-0.105412	1.0	NaN	NaN
40	(2, donovan, 20)	6.257977	8.508006	0.593817	0.200751	RF	NaN	NaN	NaN	NaN	1.0	20.0	(2, donovan)
13	(2, shafter, 11)	4.383100	8.380669	0.323339	0.266051	Split-NN	-0.058141	-0.788141	-0.067724	-2.133328	2.0	NaN	NaN
14	(2, shafter, 11)	5.171241	10.513997	0.381480	0.333775	RF	NaN	NaN	NaN	NaN	2.0	NaN	NaN
1	(1, donovan, 21)	2.471294	4.735241	0.583669	0.124152	Split-NN	-0.004931	-0.020877	-0.026830	-1.023302	2.0	NaN	NaN
5	(1, donovan, 21)	2.492172	5.758543	0.588600	0.150982	RF	NaN	NaN	NaN	NaN	2.0	NaN	NaN
6	(1, shafter, 18)	2.819569	7.991201	0.510988	0.244282	Split-NN	-0.233646	-1.289229	-0.107531	-3.517668	2.0	NaN	NaN
4	(1, shafter, 18)	4.108798	11.508869	0.744634	0.351814	RF	NaN	NaN	NaN	NaN	2.0	NaN	NaN
20	(3, elcajon, 18)	3.941489	9.080589	0.246940	0.402802	Split-NN	-0.160569	-2.562895	-0.073268	-1.651714	2.0	NaN	NaN
17	(3, elcajon, 18)	6.504384	10.732303	0.407508	0.476070	RF	NaN	NaN	NaN	NaN	2.0	NaN	NaN

Table B.36: Comparison of Split NN vs Subu