```
*-------------------------------------------------------------*
User:                 dwijd
Date:                 11 August 2021
Time:                 14:45:38
*-------------------------------------------------------------*
* Training Output
*-------------------------------------------------------------*



Variable Summary

           Measurement    Frequency
 Role         Level          Count

INPUT      INTERVAL           5
TARGET     INTERVAL           1



Predicted and decision variables

Type         Variable         Label

TARGET       UCity
PREDICTED    P_UCity     Predicted: UCity
RESIDUAL     R_UCity     Residual: UCity


```

The NEURAL Procedure

Preliminary Training Run	Starting Random Seed	Objective Function Value	Number of Terminating Iterations	Criteria
1	12345	0.450767730873	10	
2	463937847	2.975359660058	10	
3	866987325	0.196692049094	10	
4	998823970	0.446959827205	10	
5	734635899	0.30691386277	10	

The NEURAL Procedure

Optimization Start Parameter Estimates

N	Parameter	Estimate	Gradient Objective Function
1	PWR_barrels08_H11	0.022994	-1.172842
2	PWR_city08_H11	-0.428730	1.112540
3	SQRT_comb08_H11	-0.174197	1.138935
4	SQRT_highway08_H11	0.178182	1.048064
5	UHighway_H11	-0.057520	1.165074
6	PWR_barrels08_H12	0.021310	-0.596679
7	PWR_city08_H12	-0.208289	0.617454
8	SQRT_comb08_H12	-0.127446	0.611960
9	SQRT_highway08_H12	0.128656	0.587181

10	UHighway_H12	-0.100642	0.566801
11	PWR_barrels08_H13	-0.105780	0.004988
12	PWR_city08_H13	0.244895	-0.004432
13	SQRT_comb08_H13	-0.195191	-0.005623
14	SQRT_highway08_H13	-0.228352	-0.006855
15	UHighway_H13	-0.443353	-0.006298
16	BIAS_H11	1.415413	1.004042
17	BIAS_H12	-0.098496	1.514898
18	BIAS_H13	-2.717011	0.017255
19	H11_UCity	-17.181534	-0.112410
20	H12_UCity	-11.663106	0.037943
21	H13_UCity	-6.772159	0.150388
22	BIAS_UCity	29.090698	-0.151677

Value of Objective Function = 0.1966920491

The NEURAL Procedure

Levenberg-Marquardt Optimization

Minimum Iterations	0
Maximum Iterations	50
Maximum Function Calls	2147483647
Maximum CPU Time	14400
ABSGCONV Gradient Criterion	0.00001
GCONV Gradient Criterion	1E-8
GCONV2 Gradient Criterion	0
ABSFCONV Function Criterion	0
FCONV Function Criterion	0.0001
FCONV2 Function Criterion	0

```
104 FSIZE Parameter                                    0
105 ABSXCONV Parameter Change Criterion                0
106 XCONV Parameter Change Criterion                   0
107 XSIZE Parameter                                    0
108 ABSCONV Function Criterion              0.037179532
109 Trust Region Initial Radius Factor                 1
110 Singularity Tolerance (SINGULAR)                1E-8
111
112 Levenberg-Marquardt Optimization
113
114 Scaling Update of More (1978)
115
116 Parameter Estimates              22
117
118                                              Optimization St
    art
119
120 Active Constraints                                    0  Objec
    tive Function                          0.1966920491
121 Max Abs Gradient Element                1.5148981902  Radiu
    s                                      43.365101749
122
123
124
                                                    Ratio
125
                                                  Between
126
                                                   Actual
127
         Objective     Max Abs                       and
128                      Function         Active        Objectiv
    e     Function    Gradient                Predicted
129 Iter     Restarts       Calls    Constraints         Functio
    n       Change     Element     Lambda       Change
130
```

131	1	0	4	0	0.1884	5	0.00824	0.0987	0.00240	0.990
132	2	0	5	0	0.1876	5	0.000796	0.2348	0.00098	0.788
133	3	0	7	0	0.1870	9	0.000567	0.0863	0.00130	0.932
134	4	0	8	0	0.1866	1	0.000478	0.2753	0.00055	0.688
135	5	0	9	0	0.1862	3	0.000380	0.3827	0.00038	0.550
136	6	0	10	0	0.1857	1	0.000518	0.2369	0.00029	0.787
137	7	0	12	0	0.1855	4	0.000175	0.0110	0.00141	0.927
138	8	0	13	0	0.1854	3	0.000111	0.0273	0.00062	0.916
139	9	0	14	0	0.1854	2	4.843E-6	0.3444	0.00026	0.0235
140	10	0	15	0	0.1851	4	0.000281	0.0363	0.00046	0.979
141	11	0	17	0	0.1850	9	0.000050	0.0221	0.00082	0.959
142	12	0	18	0	0.1850	3	0.000058	0.1100	0.00042	0.711
143	13	0	19	0	0.1849	6	0.000074	0.1204	0.00036	0.749
144	14	0	20	0	0.1849	0	0.000060	0.1434	0.00035	0.621
145	15	0	21	0	0.1848	3	0.000069	0.1415	0.00032	0.671
146	16	0	23	0	0.1847	7	0.000054	0.00789	0.00109	0.998
147	17	0	24	0	0.1847	4	0.000032	0.0600	0.00051	0.847
148	18	0	26	0	0.1847	1	0.000028	0.0182	0.00085	0.989

149	19	0	27	0	0.1846		
	9	0.000027	0.0950	0.00041	0.639		
150	20	0	28	0	0.1846		
	5	0.000042	0.0917	0.00040	0.750		
151	21	0	29	0	0.1846		
	1	0.000039	0.0934	0.00039	0.727		
152	22	0	30	0	0.1845		
	7	0.000038	0.0945	0.00038	0.718		
153	23	0	32	0	0.1845		
	4	0.000027	0.00598	0.00125	1.003		
154	24	0	33	0	0.1845		
	2	0.000021	0.0329	0.00062	0.925		
155	25	0	34	0	0.1845		
	2	6.022E-6	0.1500	0.00030	0.135		
156	26	0	35	0	0.1844		
	7	0.000046	0.1428	0.00029	0.571		
157	27	0	36	0	0.1844		
	3	0.000042	0.1415	0.00029	0.553		
158	28	0	37	0	0.1843		
	8	0.000042	0.1401	0.00028	0.555		
159	29	0	38	0	0.1843		
	4	0.000041	0.1389	0.00028	0.555		
160	30	0	40	0	0.1843		
	0	0.000047	0.00946	0.00094	1.001		
161	31	0	41	0	0.1842		
	8	0.000020	0.0477	0.00046	0.849		
162	32	0	43	0	0.1842		
	6	0.000020	0.0215	0.00067	0.973		
163	33	0	44	0	0.1842		
	4	0.000018	0.0956	0.00034	0.527		
164	34	0	45	0	0.1842		
	0	0.000034	0.0924	0.00033	0.702		
165	35	0	46	0	0.1841		
	7	0.000034	0.0904	0.00033	0.709		
166	36	0	47	0	0.1841		
	4	0.000034	0.0885	0.00034	0.719		

```
167   37            0          49              0          0.1841
    1     0.000025     0.00619    0.00114        1.003
168   38            0          50              0          0.1840
    9     0.000019      0.0299    0.00057        0.938
169   39            0          51              0          0.1840
    8     0.000013      0.1273    0.00028        0.304
170   40            0          52              0          0.1840
    3     0.000045      0.1202    0.00029        0.638
171   41            0          53              0          0.1839
    9     0.000045      0.1154    0.00029        0.656
172   42            0          54              0          0.1839
    4     0.000046      0.1106    0.00030        0.681
173   43            0          55              0          0.1839
    0     0.000047      0.1058    0.00030        0.707
174   44            0          57              0          0.1838
    6     0.000036     0.00717    0.00107        1.006
175   45            0          58              0          0.1838
    3     0.000027      0.0352    0.00052        0.947
176   46            0          59              0          0.1838
    1     0.000019      0.1461    0.00027        0.329
177   47            0          60              0          0.1837
    4     0.000071      0.1289    0.00028        0.704
178   48            0          61              0          0.1836
    7     0.000072      0.1173    0.00029        0.751
179   49            0          63              0          0.1836
    2     0.000057      0.0132    0.00081        1.014
180   50            0          64              0          0.1835
    6     0.000053      0.0655    0.00039        0.908
181
182                                                 Optimization Res
    ults
183
184  Iterations                                          50  Funct
    ion Calls                                        66
185  Jacobian Calls                                      52  Activ
    e Constraints                                     0
```

```
186 Objective Function                          0.1835620397  Max A
    bs Gradient Element                  0.0655083428
187 Lambda                                      0.0003879444  Actua
    l Over Pred Change                   0.9083819368
188 Radius                                      0.6949389437
189
190 LEVMAR needs more than 50 iterations or 2147483647 function
    calls.
191
192 WARNING: LEVMAR Optimization cannot be completed.
193
194
195
196
197
198
199 The NEURAL Procedure
200
201                  Optimization Results
202                   Parameter Estimates
203                                                  Gradient
204                                                 Objective
205    N Parameter                  Estimate         Function
206
207    1 PWR_barrels08_H11           0.029375       -0.016231
208    2 PWR_city08_H11             -0.387805        0.015735
209    3 SQRT_comb08_H11            -0.030939        0.015717
210    4 SQRT_highway08_H11          0.097516        0.014662
211    5 UHighway_H11               -0.075477        0.015800
212    6 PWR_barrels08_H12          -0.037160       -0.007635
213    7 PWR_city08_H12             -0.227482        0.009574
214    8 SQRT_comb08_H12            -0.213641        0.009364
215    9 SQRT_highway08_H12          0.135575        0.007969
216   10 UHighway_H12                0.001723        0.005510
217   11 PWR_barrels08_H13           0.055256        0.010360
218   12 PWR_city08_H13             -0.016090       -0.009809
```

```
 13 SQRT_comb08_H13           0.021656       -0.010433
 14 SQRT_highway08_H13        0.018936       -0.010541
 15 UHighway_H13             -0.128277       -0.010859
 16 BIAS_H11                  1.522268        0.025432
 17 BIAS_H12                  0.383272        0.065508
 18 BIAS_H13                 -0.763999        0.049041
 19 H11_UCity               -19.507807       -0.005417
 20 H12_UCity               -13.124139       -0.002146
 21 H13_UCity               -13.827879        0.003949
 22 BIAS_UCity               35.358360       -0.006168

Value of Objective Function = 0.1835620397



*-------------------------------------------------------------
-*
* Score Output
*-------------------------------------------------------------
-*


*-------------------------------------------------------------
-*
* Report Output
*-------------------------------------------------------------
-*



Fit Statistics

Target=UCity Target Label=' '

   Fit
```

	Statistics	Statistics Label	Train	Test
252				
253	_DFT_	Total Degrees of Freedom	31790.00	.
254	_DFE_	Degrees of Freedom for Error	31768.00	.
255	_DFM_	Model Degrees of Freedom	22.00	.
256	_NW_	Number of Estimated Weights	22.00	.
257	_AIC_	Akaike's Information Criterion	-53846.49	.
258	_SBC_	Schwarz's Bayesian Criterion	-53662.42	.
259	_ASE_	Average Squared Error	0.18	0.19
260	_MAX_	Maximum Absolute Error	9.79	8.24
261	_DIV_	Divisor for ASE	31790.00	7947.00
262	_NOBS_	Sum of Frequencies	31790.00	7947.00
263	_RASE_	Root Average Squared Error	0.43	0.43
264	_SSE_	Sum of Squared Errors	5835.44	1470.33
265	_SUMW_	Sum of Case Weights Times Freq	31790.00	7947.00
266	_FPE_	Final Prediction Error	0.18	.
267	_MSE_	Mean Squared Error	0.18	0.19
268	_RFPE_	Root Final Prediction Error	0.43	.
269	_RMSE_	Root Mean Squared Error	0.43	

```
         0.43
270   _AVERR_       Average Error Function                    0.18
         0.19
271   _ERR_         Error Function                         5835.44
       1470.33
272   _MISC_        Misclassification Rate                     .
            .
273   _WRONG_       Number of Wrong Classifications            .
            .
274
275
276
277
278  Assessment Score Rankings
279
280  Data Role=TRAIN Target Variable=UCity Target Label=' '
281
282              Number of        Mean         Mean
283  Depth     Observations      Target     Predicted
284
285     5          1590         38.2808      38.2949
286    10          1590         32.0425      31.9968
287    15          1603         29.2583      29.2348
288    20          1576         27.6218      27.6150
289    25          1593         26.3845      26.4171
290    30          1587         25.1348      25.1976
291    35          1662         24.1727      24.0970
292    40          1698         23.2842      23.2538
293    45          1432         22.5189      22.5381
294    50          1734         21.8408      21.8781
295    55          1459         21.0888      21.1850
296    60          1616         20.5476      20.5629
297    65          1588         19.9137      19.9093
298    70          1734         19.2823      19.2044
299    75          1385         18.6708      18.6489
300    80          1615         18.1297      18.1010
```

85	1574	17.1541	17.1966	
90	1725	16.1919	16.1233	
95	1452	14.6581	14.6634	
100	1577	12.6623	12.6823	

Assessment Score Distribution

Data Role=TRAIN Target Variable=UCity Target Label=' '

Range for Predicted	Mean Target	Mean Predicted	Number of Observations	Model Score
57.325 - 60.014	59.0000	58.9018	9	58.6698
54.636 - 57.325	55.5000	55.2139	2	55.9806
51.947 - 54.636	52.6667	52.7927	9	53.2914
49.258 - 51.947	50.2692	50.1822	39	50.6022
46.568 - 49.258	48.2778	48.1182	27	47.9130
43.879 - 46.568	45.1000	44.9865	60	45.2238
41.190 - 43.879	42.1840	42.3153	125	42.5346
38.501 - 41.190	39.8601	39.9543	293	39.8454
35.812 - 38.501	37.1178	37.1343	488	37.1562
33.122 - 35.812	34.3090	34.2689	882	

	34.4670				
326	30.433 -	33.122	31.5817	31.5372	1297
	31.7778				
327	27.744 -	30.433	28.7691	28.7630	2406
	29.0886				
328	25.055 -	27.744	26.1616	26.1986	3471
	26.3994				
329	22.366 -	25.055	23.4608	23.4348	5384
	23.7101				
330	19.676 -	22.366	20.7835	20.8073	6537
	21.0209				
331	16.987 -	19.676	18.2729	18.2551	5885
	18.3317				
332	14.298 -	16.987	15.6656	15.6302	3077
	15.6425				
333	11.609 -	14.298	13.1877	13.2049	1542
	12.9533				
334	8.920 -	11.609	10.6420	10.7355	243
	10.2641				
335	6.230 -	8.920	8.3571	7.8458	14
	7.5749				