Distracted Driving Project Outline

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Model Training Update

- Reorganized Model table into 3 rounds of iterations: 100, 250, 500
- Limited model search grid to Size = 50 (significantly longer training times and little performance impact > 50)
- Took the best 3 models from the 100 Iteration run and increased the iterations to 250 and 500.
- Selected model 12 as the best model which topped out at 82% accuracy for 250 Iteractions, increasing to 500 iterations did not improve the accuracy for the testing set

Round 1, 100 Iterations

Model	Data Processing	Data Split	MaxItr	Converged	Size	Decay	Training	Testing
Model 1:	Original	365 Split	100	No	50	.20	.760	.676
Model 2:	Original	Entire Sim	100	No	50	.20	.754	.754
Model 3:	Differencing	365 Split	100	Yes	10	.00	.518	.516
Model 4:	Differencing	Entire Sim	100	Yes	25	.10	.572	.571
Model 5:	Moving Avg	365 Split	100	Yes	10	.00	.503	.502
Model 6:	Moving Avg	Entire Sim	100	Yes	10	.00	.528	.528
Model 7:	1/2 Sec Cut	365 Split	100	Yes	50	.10	.820	.698
Model 8:	1/2 Sec Cut	Entire Sim	100	Yes	50	.20	.788	.779
Model 9:	1/2 Sec Diff	365 Split	100	Yes	50	.10	.716	.647
Model 10:	1/2 Sec Diff	Entire Sim	100	Yes	50	.20	.682	.622
Model 11:	1/2 Sec Cut Stat	365 Split	100	Yes	50	.10	.846	.716
Model 12:	1/2 Sec Cut Stat	Entire Sim	100	Yes	50	.20	.820	.803

Continued Further Training Best Models

Model	Data Processing	Data Split	MaxItr	Converged	Size	Decay	Training	Testing
Model 2:	Original	Entire Sim	250	No	50	.10	.782	.781
Model 2:	Original	Entire Sim	500	No	50	.00	.796	.794
Model 8:	1/2 Sec Cut	Entire Sim	250	Yes	50	.10	.816	.804
Model 8:	1/2 Sec Cut	Entire Sim	500	Yes	50	.10	.828	.810
Model 12:	1/2 Sec Cut Stat	Entire Sim	250	Yes	50	.10	.858	.823
Model 12:	1/2 Sec Cut Stat	Entire Sim	500	Yes	50	.20	.864	.823

Sample Data (first 3 rows)

Table 3: Model 08 Data (continued below)

Subject	Age_Old	Gender_Male	Texting	Time	Anger	Contempt	Disgust	Fear
T051	1	1	1	571.5	0.061	0	-0.124	-0.001
T074	1	1	1	471.5	-0.118	0.065	-0.686	-0.003
T076	1	1	0	298	0.122	-0.004	-0.017	-0.002

Joy	Sad	Surprise	Neutral
0	0.029	0	0.044
-0.001	-0.043	0.002	0.109
-0.001	-0.063	0	-0.015

Table 5: Model 12 Data (continued below)

Subject	Age_Old	Gender_Male	Texting	Time	Anger.mu	Anger.sd	Anger.min
T051	1	1	1	569.5	0.066	0.041	0.005
T074	1	1	1	470.5	-0.079	0.031	-0.122
T076	1	1	0	297	0.106	0.051	0.043

Table 6: Table continues below

Anger.max	Anger.med	Anger.iqr	Contempt.mu	Contempt.sd	Contempt.min	Contempt.max
0.136	0.057	0.069	0.002	0.002	0	0.006
-0.036	-0.064	0.045	0.035	0.041	-0.02	0.104
0.193	0.093	0.075	-0.004	0	-0.004	-0.004

Table 7: Table continues below

Contempt.med	Contempt.iqr	Disgust.mu	Disgust.sd	Disgust.min	Disgust.max	Disgust.med
0.002	0.002	-0.178	0.055	-0.267	-0.099	-0.173
0.046	0.046	-0.537	0.105	-0.691	-0.395	-0.5
-0.004	0	-0.001	0.049	-0.088	0.055	0.008

Table 8: Table continues below

Disgust.iqr	Fear.mu	Fear.sd	Fear.min	Fear.max	Fear.med	Fear.iqr	Joy.mu
0.085	-0.001	0	-0.001	0	-0.001	0	0
0.125	0.008	0.013	-0.004	0.042	0.005	0.012	-0.001

Disgust.iqr	Fear.mu	Fear.sd	Fear.min	Fear.max	Fear.med	Fear.iqr	Joy.mu
0.073	-0.002	0	-0.002	-0.002	-0.002	0	-0.001

Table 9: Table continues below

Joy.sd	Joy.min	Joy.max	Joy.med	Joy.iqr	Sad.mu	Sad.sd	Sad.min	Sad.max
0	0	0.001	0	0	0.051	0.032	-0.003	0.115
0.002	-0.003	0.002	-0.001	0.002	0.144	0.147	-0.066	0.315
0	-0.001	0	-0.001	0	-0.063	0.006	-0.071	-0.053

Table 10: Table continues below

Sad.med	Sad.iqr	Surprise.mu	Surprise.sd	Surprise.min	Surprise.max	Surprise.med
0.054	0.019	0	0	0	0	0
0.209	0.24	0	0.001	-0.001	0.002	0
-0.064	0.006	0	0	0	0	0

Surprise.iqr	Neutral.mu	Neutral.sd	Neutral.min	Neutral.max	Neutral.med	Neutral.iqr
0	0.068	0.029	0.026	0.118	0.069	0.042
0.001	0.182	0.166	-0.068	0.375	0.251	0.185
0	-0.016	0	-0.016	-0.015	-0.016	0

Final Model

```
Neural Network

44440 samples
   52 predictors
    2 classes: '0', '1'

No pre-processing
Resampling: Cross-Validated (10 fold)
Summary of sample sizes: 39996, 39997, 39996, 39996, 39996, 39996, ...
Resampling results across tuning parameters:

  decay  size  Accuracy   Kappa
  0.0     1    0.7014172  0.3591283
  0.0    10    0.7847207  0.5490042
  0.0    25    0.8058052  0.5957420
  0.0    50    0.8112732  0.6075406
  0.1     1    0.7012142  0.3577323
  0.1    10    0.7874660  0.5552213
  0.1    25    0.8065929  0.5969837
  0.1    50    0.8149861  0.6150667
  0.2     1    0.6899178  0.3411074
  0.2    10    0.7886360  0.5574788
  0.2    25    0.8041852  0.5917997
  0.2    50    0.8162013  0.6174508

Accuracy was used to select the optimal model using  the largest value.
The final values used for the model were size = 50 and decay = 0.2.
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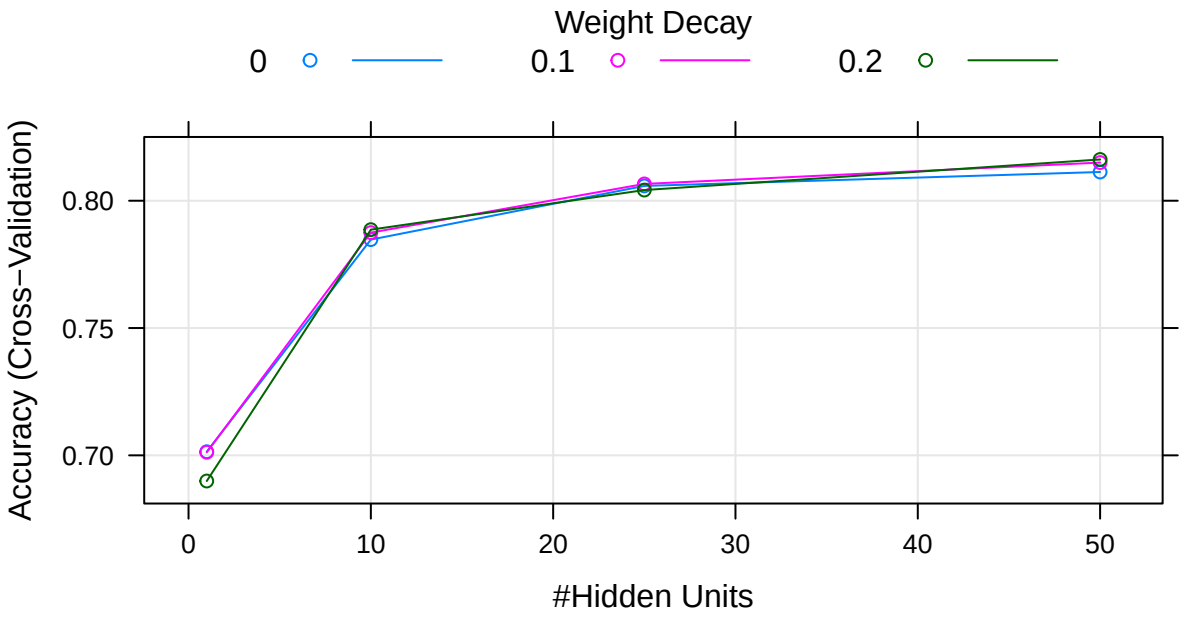
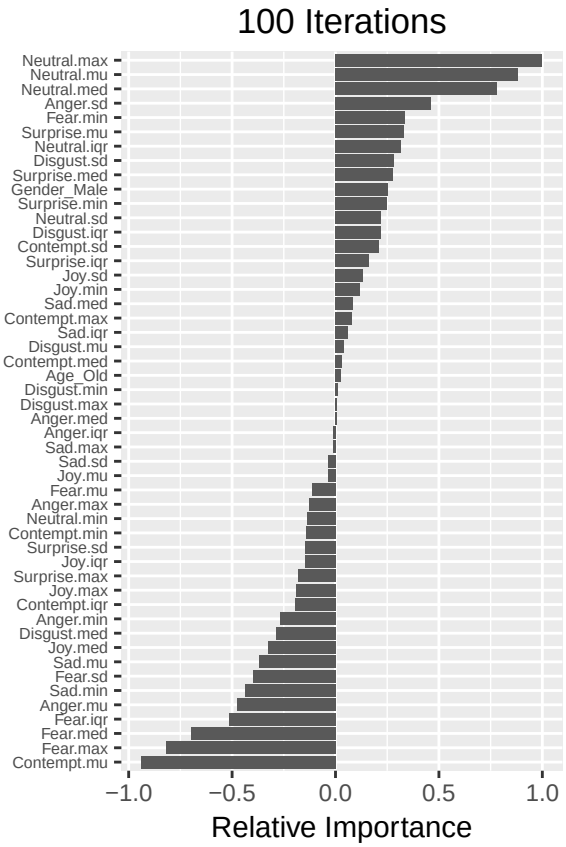
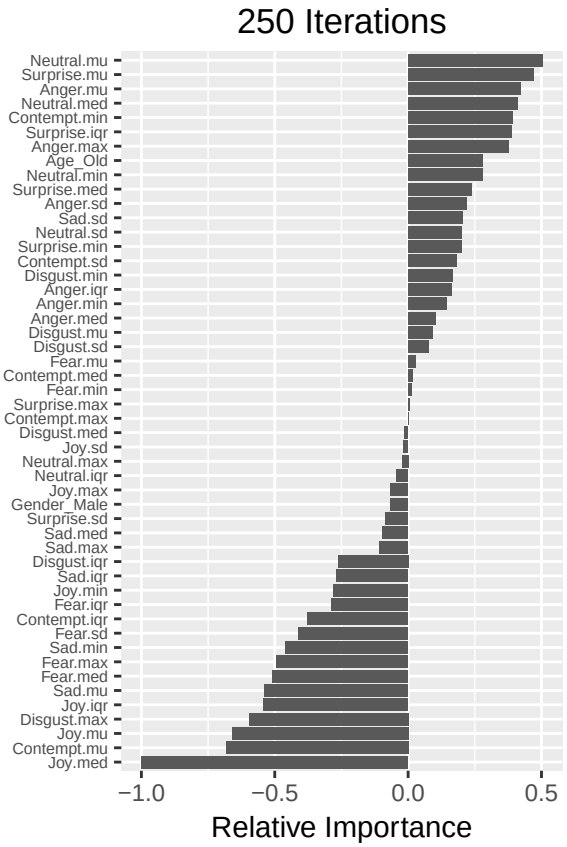
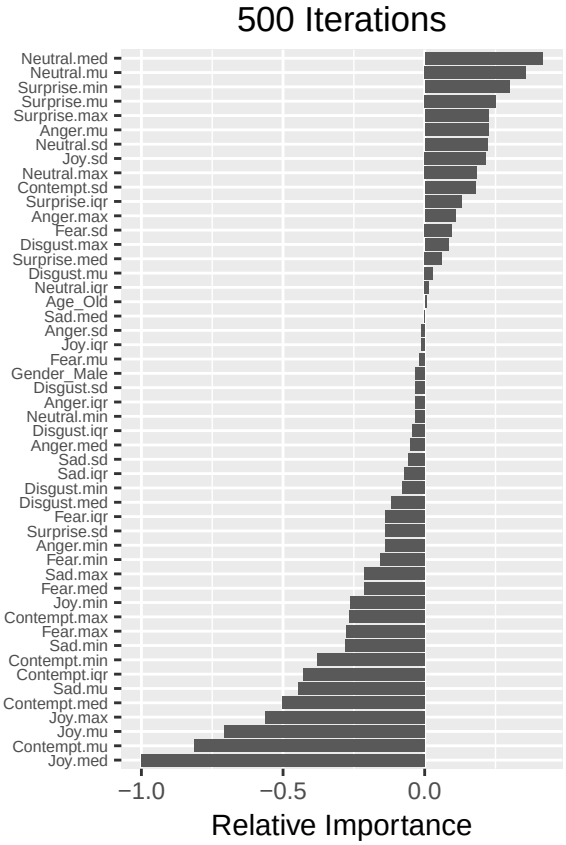


- Increasing node size (Hidden Units) increases model accuracy with diminishing return
- The increase in accuracy after 50 nodes is very small and takes a long time to compute
- A positive decay (coefficient penalty) helps model accuracy, but the difference in decay of .1 and .2 is neglible


100 Iterations
Neutral.max
Neutral.mu
Neutral.med
Anger.sd
Fear.min
Surprise.mu
Neutral.iqr
Disgust.sd
Surprise.med
Gender_Male
Surprise.min
Neutral.sd
Disgust.iqr
Contempt.sd
Surprise.iqr
Joy.sd
Joy.min
Sad.med
Contempt.max
Sad.iqr
Disgust.mu
Contempt.med
Age_Old
Disgust.min
Disgust.max
Anger.med
Anger.iqr
Sad.max
Sad.sd
Joy.mu
Fear.mu
Anger.max
Neutral.min
Contempt.min
Surprise.sd
Joy.iqr
Surprise.max
Joy.max
Contempt.iqr
Anger.min
Disgust.med
Joy.med
Sad.mu
Fear.sd
Sad.min
Anger.mu
Fear.iqr
Fear.med
Fear.max
Contempt.mu
−1.0
−0.5
0.0
0.5
1.0
Relative Importance


250 Iterations
Neutral.mu
Surprise.mu
Anger.mu
Neutral.med
Contempt.min
Surprise.iqr
Anger.max
Age_Old
Neutral.min
Surprise.med
Anger.sd
Sad.sd
Neutral.sd
Surprise.min
Contempt.sd
Disgust.min
Anger.iqr
Anger.min
Anger.med
Disgust.mu
Disgust.sd
Fear.mu
Contempt.med
Fear.min
Surprise.max
Contempt.max
Disgust.med
Joy.sd
Neutral.max
Neutral.iqr
Joy.max
Gender_Male
Surprise.sd
Sad.med
Sad.max
Disgust.iqr
Sad.iqr
Joy.min
Fear.iqr
Contempt.iqr
Fear.sd
Sad.min
Fear.max
Fear.med
Sad.mu
Joy.iqr
Disgust.max
Joy.mu
Contempt.mu
Joy.med
−1.0
−0.5
0.0
0.5
Relative Importance


500 Iterations
Neutral.med
Neutral.mu
Surprise.min
Surprise.mu
Surprise.max
Anger.mu
Neutral.sd
Joy.sd
Neutral.max
Contempt.sd
Surprise.iqr
Anger.max
Fear.sd
Disgust.max
Surprise.med
Disgust.mu
Neutral.iqr
Age_Old
Sad.med
Anger.sd
Joy.iqr
Fear.mu
Gender_Male
Disgust.sd
Anger.iqr
Neutral.min
Disgust.iqr
Anger.med
Sad.sd
Sad.iqr
Disgust.min
Disgust.med
Fear.iqr
Surprise.sd
Anger.min
Fear.min
Sad.max
Fear.med
Joy.min
Contempt.max
Fear.max
Sad.min
Contempt.min
Contempt.iqr
Sad.mu
Contempt.med
Joy.max
Joy.mu
Contempt.mu
Joy.med
−1.0
−0.5
0.0
Relative Importance

Variable Importance

- As the nnet continues to train it finds fewer variables are important
- 100 Iterations: 26 variables have relative importance > 0
- 250 Iterations: 25 variables have relative importance > 0
- 500 Iterations: 18 variables have relative importance > 0
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Demographic Effects (Model 08)

Variable	Neutral	Surprise	Anger	Disgust	Fear	Sad	Joy	Conte
Age	.	**	***	***	***		***	*
Gender	***	***			**		***	.
Age*Gender	***		***	*			.	***
Emotion*Age		**	.	***	***	***	***	**
Emotion*Gender	***				***	***	*	
Emotion*Age*Gender	*		*	***	***	***		**

Significance: [. p-value < .1] [* p-value <.05] [** p-value < .01] [*** p-value < .001]