

### Type and structure of the model

I trained and tested a random forest, SVM, and neural network model. The SVM produced the highest accuracies and F1 score so this is the final model presented in this pdf. However, all three models are presented in the corresponding notebook file.

### Normalization

To save time, memory, and minimize computation I normalized each feature by speaker, instead of all values of pcm\_RMSenergy\_sma\_... arrays per speaker. I normalized pcm\_RMSenergy\_sma\_max and pcm\_RMSenergy\_sma\_kurtosis for each speaker. This was done in a similar fashion to the first part of this homework. I selected out all the rows for each speaker, normalized the data of each feature (each column) following the formula

$$(x - \mu_X) / \sigma_X$$

and completed this process for all seven speakers until I have a final data frame normalized by speaker.

#### 1. Leaving out speaker cc

SVM accuracy: 0.1575091575091575  
SVM F1 (weighted): 0.15328913702824945

	precision	recall	f1-score	support
anxiety	0.13	0.26	0.18	19
boredom	0.25	0.21	0.23	14
cold-anger	0.14	0.14	0.14	22
contempt	0.22	0.22	0.22	23
despair	0.12	0.14	0.13	21
disgust	0.17	0.17	0.17	23
elation	0.20	0.15	0.17	20
happy	0.10	0.10	0.10	20
hot-anger	0.18	0.17	0.17	18
interest	0.06	0.05	0.06	19
neutral	0.00	0.00	0.00	8
panic	0.14	0.07	0.10	14
pride	0.20	0.28	0.23	18
sadness	0.31	0.26	0.29	19
shame	0.00	0.00	0.00	15
accuracy			0.16	273
macro avg	0.15	0.15	0.15	273
weighted avg	0.16	0.16	0.15	273

## 2. Leaving out speaker jg

SVM accuracy: 0.15471698113207547

SVM F1 (weighted): 0.16540772674550938

	precision	recall	f1-score	support
anxiety	0.00	0.00	0.00	10
boredom	0.04	0.07	0.05	15
cold-anger	0.05	0.07	0.06	15
contempt	0.22	0.36	0.28	22
despair	0.00	0.00	0.00	9
disgust	0.31	0.16	0.21	31
elation	0.19	0.25	0.22	16
happy	0.06	0.04	0.05	23
hot-anger	0.15	0.21	0.18	14
interest	0.19	0.18	0.18	17
neutral	0.40	0.11	0.17	18
panic	0.56	0.28	0.37	18
pride	0.20	0.09	0.12	23
sadness	0.21	0.23	0.22	13
shame	0.27	0.14	0.19	21
accuracy			0.15	265
macro avg	0.19	0.15	0.15	265
weighted avg	0.21	0.15	0.17	265

## 3. Leaving out speaker mm

SVM accuracy: 0.26358695652173914

SVM F1 (weighted): 0.25248117409002346

	precision	recall	f1-score	support
anxiety	0.11	0.19	0.14	21
boredom	0.32	0.59	0.41	29
cold-anger	0.48	0.41	0.44	27
contempt	0.13	0.20	0.16	25
despair	0.17	0.17	0.17	29
disgust	0.17	0.14	0.15	22
elation	0.38	0.59	0.46	27
happy	0.39	0.33	0.36	21
hot-anger	0.55	0.42	0.48	26
interest	0.08	0.04	0.05	26
neutral	0.00	0.00	0.00	17
panic	0.40	0.19	0.26	21
pride	0.29	0.21	0.24	24
sadness	0.30	0.22	0.26	27
shame	0.07	0.08	0.07	26
accuracy			0.26	368
macro avg	0.26	0.25	0.24	368
weighted avg	0.26	0.26	0.25	368

#### 4. Leaving out speaker cl

SVM accuracy: 0.2582781456953642  
SVM F1 (weighted): 0.2633832123106876

	precision	recall	f1-score	support
anxiety	0.48	0.31	0.38	39
boredom	0.29	0.32	0.30	19
cold-anger	0.09	0.10	0.10	20
contempt	0.24	0.37	0.29	19
despair	0.12	0.22	0.16	18
disgust	0.38	0.35	0.36	23
elation	0.11	0.11	0.11	19
happy	0.33	0.50	0.40	18
hot-anger	0.25	0.25	0.25	16
interest	0.15	0.19	0.17	21
neutral	0.80	0.44	0.57	9
panic	0.46	0.21	0.29	28
pride	0.29	0.21	0.24	19
sadness	0.00	0.00	0.00	17
shame	0.33	0.35	0.34	17
accuracy			0.26	302
macro avg	0.29	0.26	0.26	302
weighted avg	0.29	0.26	0.26	302

#### 5. Leaving out speaker mk

SVM accuracy: 0.16876574307304787  
SVM F1 (weighted): 0.1728180767748381

	precision	recall	f1-score	support
anxiety	0.09	0.10	0.10	29
boredom	0.07	0.10	0.09	20
cold-anger	0.15	0.39	0.22	23
contempt	0.12	0.19	0.15	21
despair	0.25	0.09	0.14	53
disgust	0.21	0.19	0.20	21
elation	0.00	0.00	0.00	23
happy	0.26	0.21	0.24	42
hot-anger	0.33	0.18	0.24	22
interest	0.31	0.25	0.28	44
neutral	1.00	0.62	0.77	8
panic	0.35	0.33	0.34	21
pride	0.00	0.00	0.00	23
sadness	0.07	0.09	0.08	22
shame	0.11	0.08	0.09	25
accuracy			0.17	397
macro avg	0.22	0.19	0.19	397
weighted avg	0.20	0.17	0.17	397

## 6. Leaving out speaker mf

SVM accuracy: 0.23411371237458195

SVM F1 (weighted): 0.24125729615734962

	precision	recall	f1-score	support
anxiety	0.19	0.32	0.24	22
boredom	0.28	0.19	0.22	27
cold-anger	0.06	0.10	0.08	20
contempt	0.46	0.25	0.32	44
despair	0.11	0.19	0.14	16
disgust	0.00	0.00	0.00	1
elation	0.17	0.15	0.16	26
happy	0.12	0.04	0.06	23
hot-anger	0.55	0.52	0.54	21
interest	0.25	0.26	0.26	19
neutral	0.53	0.80	0.64	10
panic	0.64	0.58	0.61	12
pride	0.08	0.06	0.07	18
sadness	0.00	0.00	0.00	20
shame	0.42	0.25	0.31	20
accuracy			0.23	299
macro avg	0.26	0.25	0.24	299
weighted avg	0.27	0.23	0.24	299

## 7. Leaving out speaker gg

SVM accuracy: 0.28095238095238095

SVM F1 (weighted): 0.2654592056789423

	precision	recall	f1-score	support
anxiety	0.50	0.50	0.50	30
boredom	0.47	0.53	0.50	30
cold-anger	0.16	0.26	0.19	27
contempt	0.21	0.38	0.27	26
despair	0.18	0.29	0.22	28
disgust	0.30	0.06	0.10	51
elation	0.29	0.46	0.36	28
happy	0.16	0.20	0.18	30
hot-anger	0.64	0.41	0.50	22
interest	0.17	0.23	0.20	30
neutral	0.33	0.11	0.17	9
panic	0.48	0.48	0.48	27
pride	0.19	0.16	0.17	25
sadness	0.00	0.00	0.00	33
shame	0.33	0.25	0.29	24
accuracy			0.28	420
macro avg	0.29	0.29	0.28	420
weighted avg	0.29	0.28	0.27	420



### Aggregated Accuracy and F1 Score

Aggregate accuracy and F1 over all experiments and emotions is calculated by

$$\frac{(accuracy1 * numsamples1) + (accuracy2 * numsamples2) + ...}{numsamples1 + numsamples2 + ...}$$

Accuracy

$$0.2201 = \frac{(.16 * 273) + (.15 * 265) + (.26 * 368) + (.26 * 302) + (.17 * 397) + (.23 * 299) + (.28 * 420)}{273 + 265 + 368 + 302 + 397 + 299 + 420}$$

F1 Score

$$0.2191 = \frac{(.15 * 273) + (.17 * 265) + (.25 * 368) + (.26 * 302) + (.17 * 397) + (.24 * 299) + (.27 * 420)}{273 + 265 + 368 + 302 + 397 + 299 + 420}$$