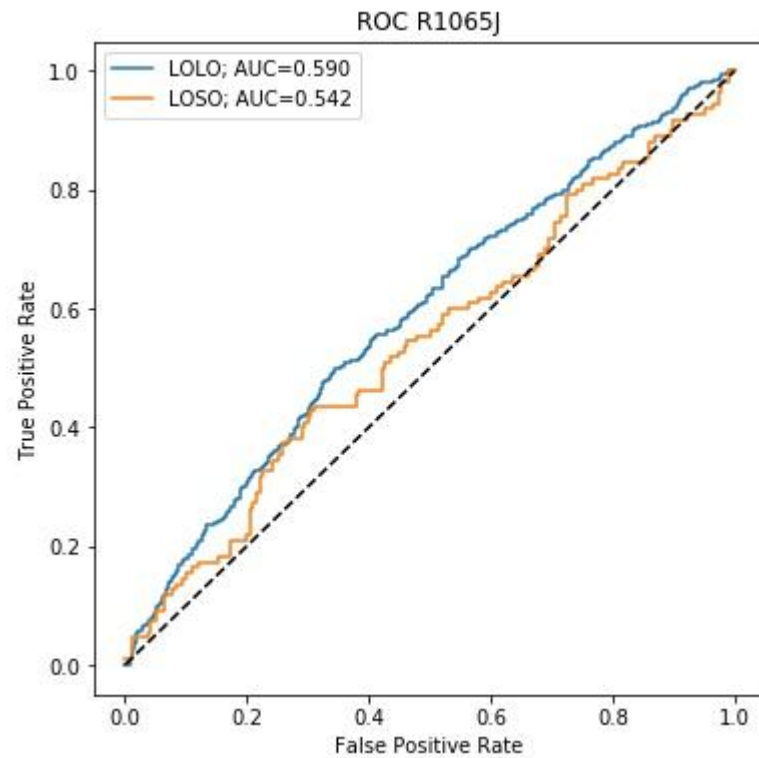


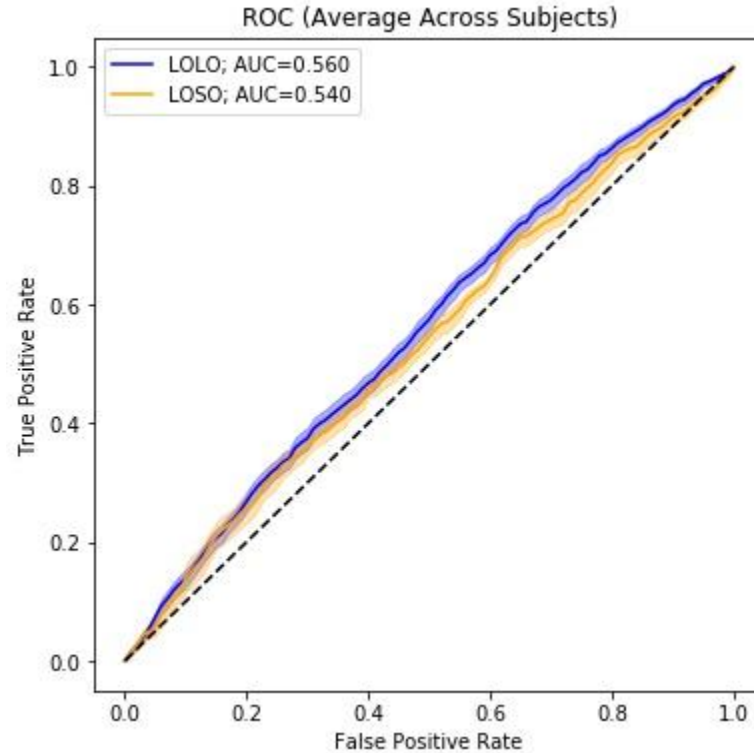
ML Project Results

Jonathan Levine, Parker Stakoff

Part 1A:



Part 1B: iEEG Mean +/- SEM



Part 2

AUC Values for List Level Cross-Validation

'R1051J': '0.559',
'R1060M': '0.542',
'R1065J': '0.590',
'R1137E': '0.610',
'R1154D': '0.604',
'R1161E': '0.514',
'R1189M': '0.542',
'R1195E': '0.556',
'R1236J': '0.528'

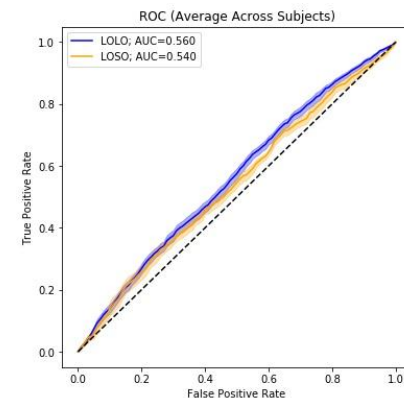
AUC Values for Vault Session Test

'R1051J': '0.531',
'R1060M': '0.586',
'R1065J': '0.542',
'R1137E': '0.496',
'R1154D': '0.511',
'R1161E': '0.507',
'R1189M': '0.547',
'R1195E': '0.511',
'R1236J': '0.594'

AUC Values for Session Level Cross-Validation

'R1051J': '0.526',
'R1060M': '0.492',
'R1065J': '0.574',
'R1137E': '0.527',
'R1154D': '0.571',
'R1161E': '0.519',
'R1189M': '0.508',
'R1195E': '0.583',
'R1236J': '0.515'

iEEG Subjects



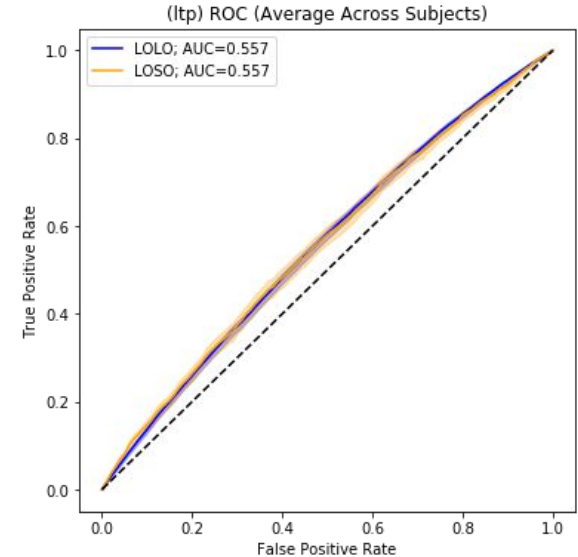
Scalp Subjects

AUC Values for Session Level Cross-Validation

'LTP093': '0.541',
'LTP115': '0.532',
'LTP123': '0.521',
'LTP133': '0.526',
'LTP138': '0.588',
'LTP249': '0.626',
'LTP258': '0.564',
'LTP259': '0.564',
'LTP265': '0.591',
'LTP283': '0.554',
'LTP285': '0.552',
'LTP304': '0.543',
'LTP330': '0.543'

AUC Values for Vault Session Test

'LTP093': '0.579',
'LTP115': '0.520',
'LTP123': '0.498',
'LTP133': '0.596',
'LTP138': '0.565',
'LTP249': '0.628',
'LTP258': '0.550',
'LTP259': '0.466',
'LTP265': '0.587',
'LTP283': '0.598',
'LTP285': '0.580',
'LTP304': '0.592',
'LTP330': '0.484'



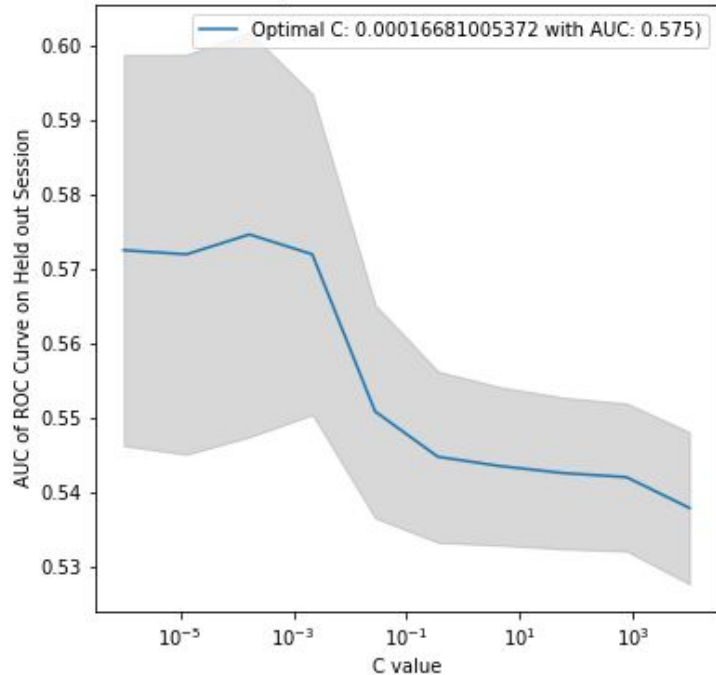
Discussion

- 1) On average, the scalp EEG have higher AUC values, indicating better classification. This is a little bit counter-intuitive, because the iEEG should have been a little less noisy. They are not too different though.. Scalp EEG Median: .0552. iEEG Median: 0.526
- 2) The AUCs for the list level validation are higher, indicating better performance, than the AUCs for the session level validation. We have a median AUC value of 0.5260 for session level, and 0.5560 for list level validation.
- 3) The AUCs for the session level validation yielded a better prediction of the performance on the vault, however it was not a very significant difference

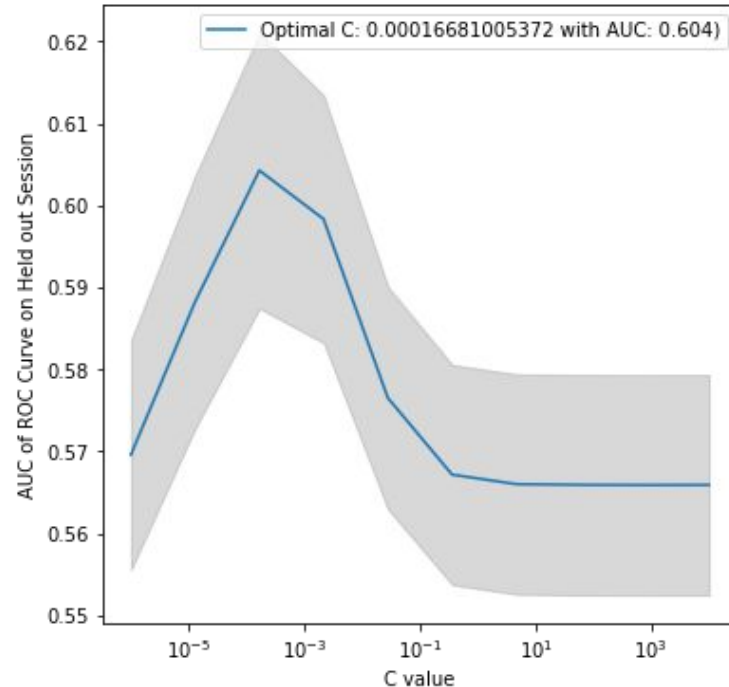
Part 3

The Effect of Changing C Values on Performance

iEEG Subjects: Effect of C Value on AUC

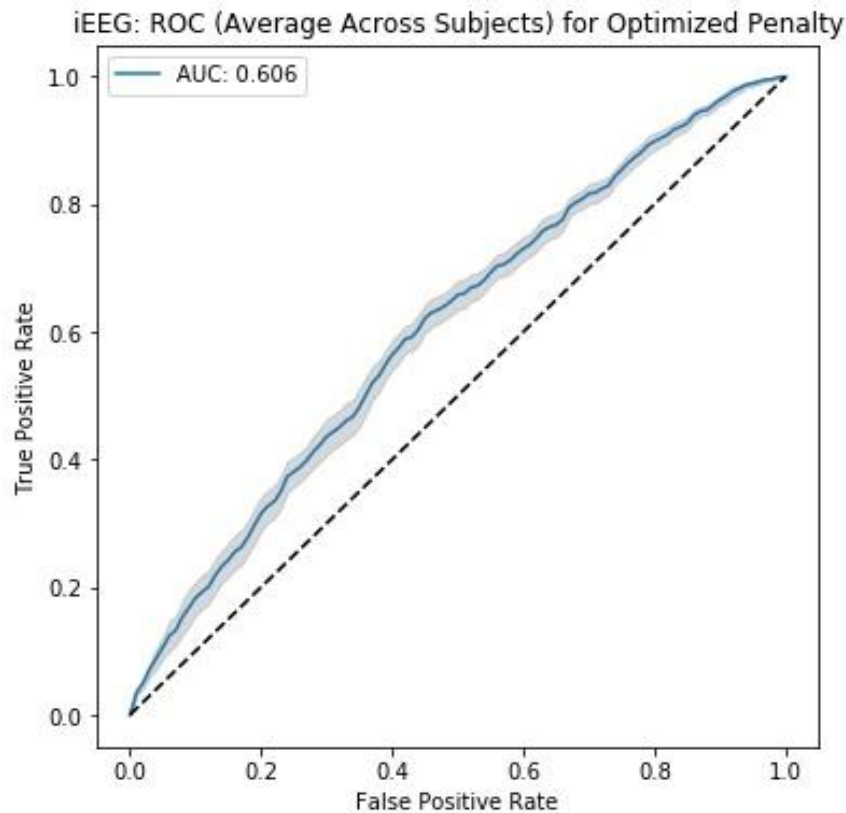


Itp Subjects: Effect of C Value on AUC



The best penalty parameter is somewhere in the middle of the graph. Using a smaller penalty parameter (bigger lambda) prevents overfitting to the training data, but too small of a penalty parameter doesn't allow enough fitting

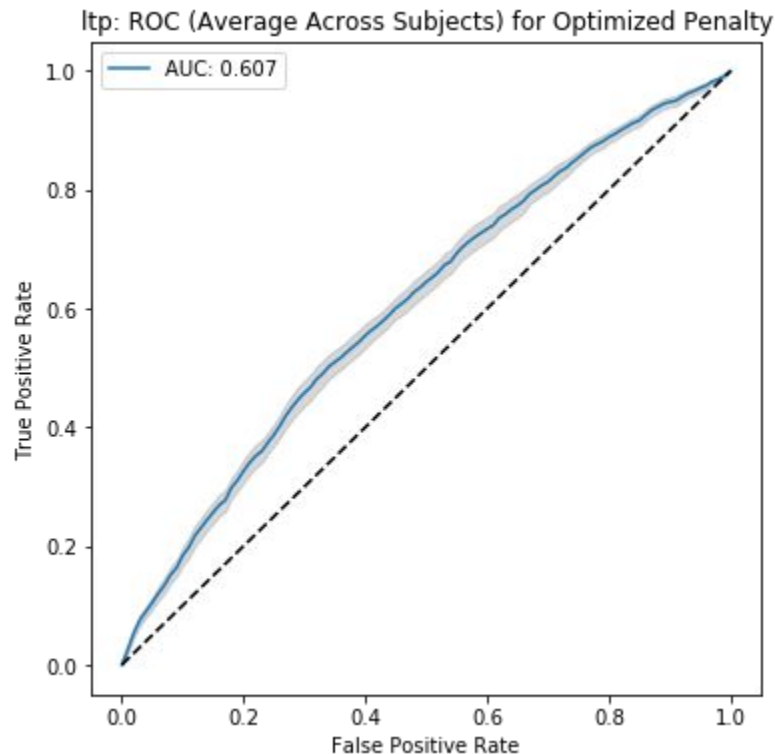
Optimized iEEG ROC; Tested on Vault Session



AUC Values by Subject:

'R1051J': '0.561',
'R1060M': '0.602',
'R1065J': '0.623',
'R1137E': '0.674',
'R1154D': '0.580',
'R1161E': '0.583',
'R1189M': '0.543',
'R1195E': '0.594',
'R1236J': '0.692'

Optimized scalp ROC; Tested on Vault Session



AUC Values by Subject:

'LTP093': '0.620',
'LTP115': '0.554',
'LTP123': '0.509',
'LTP133': '0.599',
'LTP138': '0.600',
'LTP249': '0.661',
'LTP258': '0.532',
'LTP259': '0.612',
'LTP265': '0.665',
'LTP283': '0.643',
'LTP285': '0.626',
'LTP304': '0.682',
'LTP330': '0.580'

Discussion

The ROC Curves and AUC values for the optimized penalty parameters found using nested cross-validation indicate better performance than the ones that were calculated using the default of $C=1.0$. This is because we have optimized the tradeoff between tightness of fitting and penalizing overfitting while training the model. This allows the model to be more flexible and perform better on the new (vault) data set.

Part 4

AUC Values for Channels W/ Weakest SME

iEEG Subjects

'R1051J': '0.561',
'R1060M': '0.578',
'R1065J': '0.539',
'R1137E': '0.618',
'R1154D': '0.551',
'R1161E': '0.575',
'R1189M': '0.544',
'R1195E': '0.556',
'R1236J': '0.666'

Ltp Subjects

'LTP093': '0.596',
'LTP115': '0.551',
'LTP123': '0.501',
'LTP133': '0.611',
'LTP138': '0.569',
'LTP249': '0.640',
'LTP258': '0.518',
'LTP259': '0.616',
'LTP265': '0.659',
'LTP283': '0.641',
'LTP285': '0.625',
'LTP304': '0.677',
'LTP330': '0.595'

Discussion

For both the iEEG subjects and the LTP subjects, the AUCs were lower when using half of the electrodes. This is because the classifier was trained on only half the data, and on the half less associated with the SME. Without these crucial data, the classifier performed worse and led to smaller AUC values accordingly.