In [12]:
```
import numpy as np
from scipy import sparse

import h2o
from h2o.automl import H2OAutoML
h2o.init(nthreads = 4,max_mem_size = "12G")
```

```
Checking whether there is an H2O instance running at http://localhost:54321
..... not found.
Attempting to start a local H2O server...
  Java Version: openjdk version "11.0.6" 2020-01-14; OpenJDK Runtime Environmen
t (build 11.0.6+10-post-Ubuntu-1ubuntu118.04.1); OpenJDK 64-Bit Server VM (buil
d 11.0.6+10-post-Ubuntu-1ubuntu118.04.1, mixed mode, sharing)
  Starting server from /home/alex/miniconda3/envs/h20/lib/python3.7/site-packag
es/h2o/backend/bin/h2o.jar
  Ice root: /tmp/tmpsbl5xi50
  JVM stdout: /tmp/tmpsbl5xi50/h2o_alex_started_from_python.out
  JVM stderr: /tmp/tmpsbl5xi50/h2o_alex_started_from_python.err
  Server is running at http://127.0.0.1:54321
Connecting to H2O server at http://127.0.0.1:54321 ... successful.
```

H2O cluster uptime:	00 secs
H2O cluster timezone:	America/Los_Angeles
H2O data parsing timezone:	UTC
H2O cluster version:	3.28.0.3
H2O cluster version age:	26 days
H2O cluster name:	H2O_from_python_alex_rmjqvr
H2O cluster total nodes:	1
H2O cluster free memory:	12 Gb
H2O cluster total cores:	6
H2O cluster allowed cores:	4
H2O cluster status:	accepting new members, healthy
H2O connection url:	http://127.0.0.1:54321
H2O connection proxy:	{'http': None, 'https': None}
H2O internal security:	False
H2O API Extensions:	Amazon S3, XGBoost, Algos, AutoML, Core V3, TargetEncoder, Core V4
Python version:	3.7.6 final

In [13]:
```
%%time
# lemmatized keywords, sparse, y included, latest text preprocessing with a tot
al of ~13K features, tfidf

X_train = sparse.load_npz("../processed_data/full_lemma_keyword_pipeline_train_
sparse.npz")
X_test = sparse.load_npz("../processed_data/full_lemma_keyword_pipeline_test_sp
arse.npz")

X_train = h2o.H2OFrame(X_train)
X_test = h2o.H2OFrame(X_test)

y = X_train.columns[-1]
x = X_train.columns
x.remove(y)

# Ensure binary target is a factor
X_train[y] = X_train[y].asfactor()

print(X_train.shape)
print(X_test.shape)

aml = H2OAutoML(max_models = 20,
                seed = 1,
                verbosity='debug',
               )
aml.train(x = x, y = y, training_frame = X_train)

# Get model ids for all models in the AutoML Leaderboard
model_ids = list(aml.leaderboard['model_id'].as_data_frame().iloc[:,0])
# Get the "All Models" Stacked Ensemble model
se = h2o.get_model([mid for mid in model_ids if "StackedEnsemble_AllModels" in
mid][0])
# Get the Stacked Ensemble metalearner model
metalearner = h2o.get_model(se.metalearner()['name'])

metalearner.coef_norm()
```

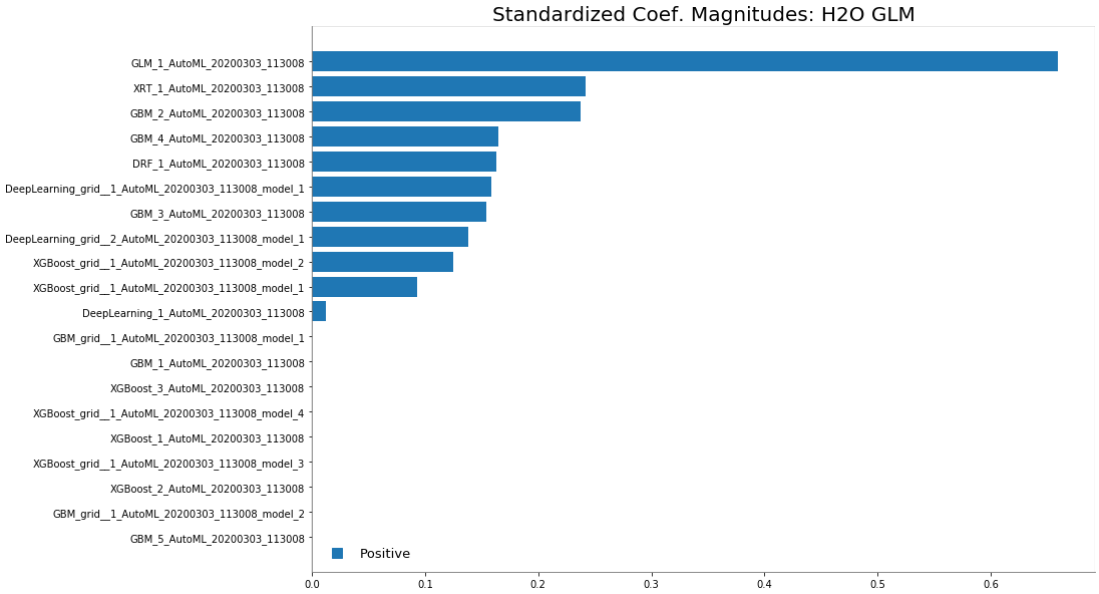
```
Parse progress: |████████████████████████████████████████████████████| 10
0%
Parse progress: |████████████████████████████████████████████████████| 10
0%
(7613, 13583)
(3263, 13582)
AutoML progress: |
11:30:08.663: Project: AutoML_20200303_113008661
11:30:08.670: Setting stopping tolerance adaptively based on the training fram
e: 0.011460988720255175
11:30:08.670: Build control seed: 1
11:30:08.684: training frame: Frame key: automl_training_py_530_sid_9ab8    col
s: 13583    rows: 7613  chunks: 1    size: 2026558  checksum: -4424098674846662
324
11:30:08.684: validation frame: NULL
11:30:08.684: leaderboard frame: NULL
11:30:08.684: blending frame: NULL
11:30:08.684: response column: C13583
11:30:08.684: fold column: null
11:30:08.684: weights column: null
11:30:08.692: Loading execution steps: [{XGBoost : defaults}, {GLM : defaults},
{DRF : [def_1]}, {GBM : defaults}, {DeepLearning : defaults}, {DRF : [XRT]}, {X
GBoost : grids}, {GBM : grids}, {DeepLearning : grids}, {StackedEnsemble : defa
ults}]
11:30:08.697: AutoML job created: 2020.03.03 11:30:08.661
11:30:08.697: AutoML build started: 2020.03.03 11:30:08.697
11:30:08.701: AutoML: starting XGBoost_1_AutoML_20200303_113008 model training
11:30:08.860: XGBoost_1_AutoML_20200303_113008 [XGBoost def_1] started

████████████████████████████████████████████████
11:55:07.996: XGBoost_1_AutoML_20200303_113008 [XGBoost def_1] complete
11:55:08.10: New leader: XGBoost_1_AutoML_20200303_113008, auc: 0.8155178719061
653
11:55:08.10: AutoML: starting XGBoost_2_AutoML_20200303_113008 model training
11:55:08.22: XGBoost_2_AutoML_20200303_113008 [XGBoost def_2] started

█
12:06:22.102: XGBoost_2_AutoML_20200303_113008 [XGBoost def_2] complete
12:06:22.106: AutoML: starting XGBoost_3_AutoML_20200303_113008 model training
12:06:22.122: XGBoost_3_AutoML_20200303_113008 [XGBoost def_3] started

█
12:39:07.303: XGBoost_3_AutoML_20200303_113008 [XGBoost def_3] complete
12:39:07.309: New leader: XGBoost_3_AutoML_20200303_113008, auc: 0.822619030687
3026
12:39:07.314: AutoML: starting GLM_1_AutoML_20200303_113008 model training
12:39:07.329: GLM_1_AutoML_20200303_113008 [GLM def_1] started


12:39:42.332: GLM_1_AutoML_20200303_113008 [GLM def_1] complete
12:39:42.338: New leader: GLM_1_AutoML_20200303_113008, auc: 0.8364690204286769
12:39:42.342: AutoML: starting DRF_1_AutoML_20200303_113008 model training
12:39:42.382: DRF_1_AutoML_20200303_113008 [DRF def_1] started


12:42:55.403: DRF_1_AutoML_20200303_113008 [DRF def_1] complete
12:42:55.409: AutoML: starting GBM_1_AutoML_20200303_113008 model training
12:42:55.426: GBM_1_AutoML_20200303_113008 [GBM def_1] started


12:57:12.715: GBM_1_AutoML_20200303_113008 [GBM def_1] complete
12:57:12.722: AutoML: starting GBM_2_AutoML_20200303_113008 model training
12:57:12.737: GBM_2_AutoML_20200303_113008 [GBM def_2] started
```

Out[13]:

```
{'Intercept': -0.2281763821700542,
 'GBM_4_AutoML_20200303_113008': 0.16446022599130605,
 'XGBoost_grid__1_AutoML_20200303_113008_model_2': 0.12501119043254158,
 'GBM_3_AutoML_20200303_113008': 0.1542993270148204,
 'GBM_2_AutoML_20200303_113008': 0.23771513876202582,
 'GLM_1_AutoML_20200303_113008': 0.65945416603432,
 'GBM_grid__1_AutoML_20200303_113008_model_1': 0.0,
 'GBM_1_AutoML_20200303_113008': 0.0,
 'XGBoost_grid__1_AutoML_20200303_113008_model_1': 0.09258659132891679,
 'XGBoost_3_AutoML_20200303_113008': 0.0,
 'XRT_1_AutoML_20200303_113008': 0.2415403230544263,
 'XGBoost_grid__1_AutoML_20200303_113008_model_4': 0.0,
 'DRF_1_AutoML_20200303_113008': 0.16322373969185242,
 'XGBoost_1_AutoML_20200303_113008': 0.0,
 'DeepLearning_grid__1_AutoML_20200303_113008_model_1': 0.15838513886644118,
 'XGBoost_grid__1_AutoML_20200303_113008_model_3': 0.0,
 'XGBoost_2_AutoML_20200303_113008': 0.0,
 'DeepLearning_grid__2_AutoML_20200303_113008_model_1': 0.13864661816736448,
 'GBM_grid__1_AutoML_20200303_113008_model_2': 0.0,
 'GBM_5_AutoML_20200303_113008': 0.0,
 'DeepLearning_1_AutoML_20200303_113008': 0.01231096282418128}
```

In [14]:
```
# Get model ids for all models in the AutoML Leaderboard
model_ids = list(aml.leaderboard['model_id'].as_data_frame().iloc[:,0])
# Get the "All Models" Stacked Ensemble model
se = h2o.get_model([mid for mid in model_ids if "StackedEnsemble_AllModels" in mid][0])
# Get the Stacked Ensemble metalearner model
metalearner = h2o.get_model(se.metalearner()['name'])

print(metalearner.coef_norm())

%matplotlib inline
metalearner.std_coef_plot()
```

```
{'Intercept': -0.2281763821700542, 'GBM_4_AutoML_20200303_113008': 0.1644602259
9130605, 'XGBoost_grid__1_AutoML_20200303_113008_model_2': 0.12501119043254158,
'GBM_3_AutoML_20200303_113008': 0.1542993270148204, 'GBM_2_AutoML_20200303_1130
08': 0.23771513876202582, 'GLM_1_AutoML_20200303_113008': 0.65945416603432, 'GB
M_grid__1_AutoML_20200303_113008_model_1': 0.0, 'GBM_1_AutoML_20200303_113008':
0.0, 'XGBoost_grid__1_AutoML_20200303_113008_model_1': 0.09258659132891679, 'XG
Boost_3_AutoML_20200303_113008': 0.0, 'XRT_1_AutoML_20200303_113008': 0.2415403
230544263, 'XGBoost_grid__1_AutoML_20200303_113008_model_4': 0.0, 'DRF_1_AutoML
_20200303_113008': 0.16322373969185242, 'XGBoost_1_AutoML_20200303_113008': 0.
0, 'DeepLearning_grid__1_AutoML_20200303_113008_model_1': 0.15838513886644118,
'XGBoost_grid__1_AutoML_20200303_113008_model_3': 0.0, 'XGBoost_2_AutoML_202003
03_113008': 0.0, 'DeepLearning_grid__2_AutoML_20200303_113008_model_1': 0.13864
661816736448, 'GBM_grid__1_AutoML_20200303_113008_model_2': 0.0, 'GBM_5_AutoML_
20200303_113008': 0.0, 'DeepLearning_1_AutoML_20200303_113008': 0.0123109628241
8128}
```



In [15]:
```
lb = aml.leaderboard
lb.head()
```

model_id	auc	logloss	aucpr	mean_per_class_error	
StackedEnsemble_AllModels_AutoML_20200303_113008	0.860714	0.442195	0.847751	0.21372	0
StackedEnsemble_BestOfFamily_AutoML_20200303_113008	0.860149	0.44284	0.852265	0.216648	0
GBM_4_AutoML_20200303_113008	0.840937	0.481935	0.829821	0.238195	0
XGBoost_grid__1_AutoML_20200303_113008_model_2	0.839592	0.477252	0.827178	0.232679	0
GBM_3_AutoML_20200303_113008	0.839382	0.487468	0.829392	0.239423	0
GBM_2_AutoML_20200303_113008	0.838685	0.48796	0.82923	0.23973	0
GLM_1_AutoML_20200303_113008	0.836469	0.488063	0.828124	0.229677	0
GBM_grid__1_AutoML_20200303_113008_model_1	0.833237	0.499721	0.822985	0.231742	0
GBM_1_AutoML_20200303_113008	0.833188	0.497765	0.820909	0.237652	0
XGBoost_grid__1_AutoML_20200303_113008_model_1	0.830208	0.502776	0.818973	0.254431	0

Out[15]:

In [17]:
```
%%time
# Experiment 7 predictions
predictions7 = aml.predict(X_test)
predictions7.shape
```

```
stackedensemble prediction progress: |████████████████████████████████| 10
0%
CPU times: user 274 ms, sys: 31.9 ms, total: 306 ms
Wall time: 47.7 s
```

Out[17]:
```
(3263, 3)
```

In [18]:
```
import pandas as pd
test_df = pd.read_csv("../data/test.csv")
test_id = test_df['id']
test_predictions_df = pd.DataFrame([test_id, pd.Series(predictions7.as_data_fra
me().iloc[:, 0])]).T
test_predictions_df.columns = ['id', 'target']
test_predictions_df['id'] = test_predictions_df['id'].astype('int32')
test_predictions_df['target'] = test_predictions_df['target'].astype('int32')
```

In [19]:
```
test_predictions_df['target'].sum()
```

Out[19]:
```
1382
```

In [20]:
```
test_predictions_df.to_csv('test_preds_automl_007.csv', index=False)
```

In [21]:
```
h2o.save_model(aml.leader, path = "./saved_models/automl_007_bin")
```

Out[21]:
```
'/home/alex/Documents/mlbase/disaster_tweet_kaggle/h2o/saved_models/automl_007_
bin/StackedEnsemble_AllModels_AutoML_20200303_113008'
```

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

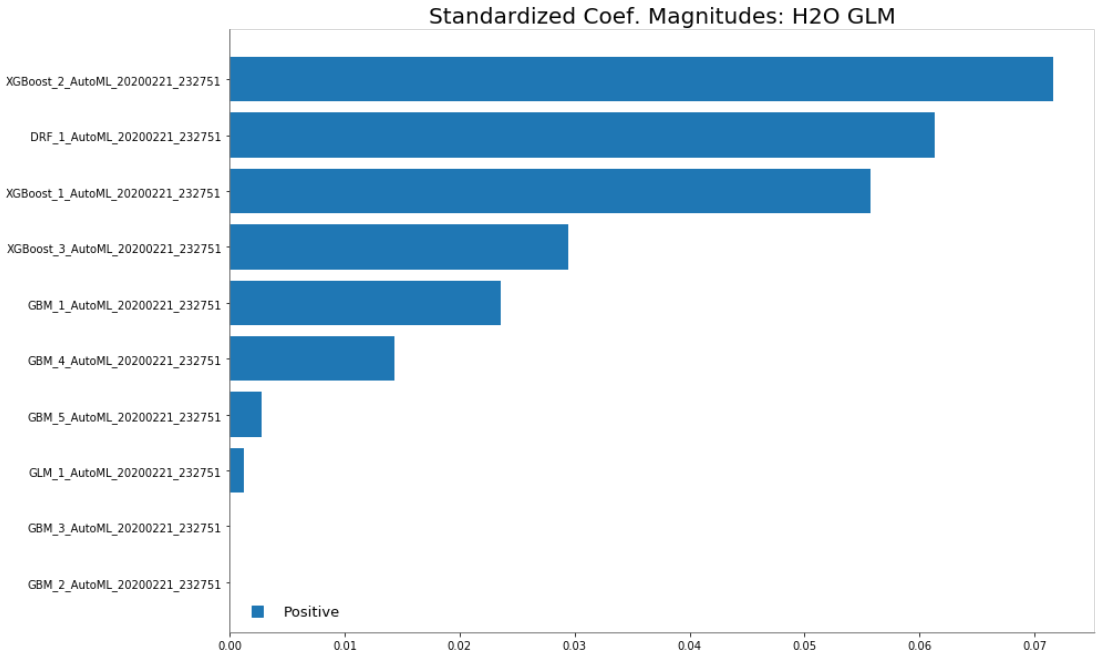
In [ ]:

In [2]:
```
%%time
# Experiment 1
X_train = np.load("../processed_data/full_lemma_keyword_pca_50_pipeline_tf_train_ndarray.npy")
X_test = np.load("../processed_data/full_lemma_keyword_pca_50_pipeline_tf_test_ndarray.npy")

X_train = h2o.H2OFrame(X_train)
X_test = h2o.H2OFrame(X_test)

y = X_train.columns[-1]
x = X_train.columns
x.remove(y)

aml = H2OAutoML(max_models = 10,
                seed = 1,
                verbosity='debug',
               )
aml.train(x = x, y = y, training_frame = X_train)

# Get model ids for all models in the AutoML Leaderboard
model_ids = list(aml.leaderboard['model_id'].as_data_frame().iloc[:,0])
# Get the "All Models" Stacked Ensemble model
se = h2o.get_model([mid for mid in model_ids if "StackedEnsemble_AllModels" in mid][0])
# Get the Stacked Ensemble metalearner model
metalearner = h2o.get_model(se.metalearner()['name'])

metalearner.coef_norm()
```

```
Parse progress: |████████████████████████████████████████████████████| 10
0%
Parse progress: |████████████████████████████████████████████████████| 10
0%
AutoML progress: |
23:27:51.862: Project: AutoML_20200221_232751860
23:27:51.862: Setting stopping tolerance adaptively based on the training fram
e: 0.011460988720255175
23:27:51.862: Build control seed: 1
23:27:51.863: training frame: Frame key: automl_training_Key_Frame__upload_a64c
4a5544f95b80afd19d09cb64459b.hex    cols: 242    rows: 7613  chunks: 4    size:
3150109  checksum: -1202237540327242178
23:27:51.863: validation frame: NULL
23:27:51.863: leaderboard frame: NULL
23:27:51.863: blending frame: NULL
23:27:51.863: response column: C242
23:27:51.863: fold column: null
23:27:51.863: weights column: null
23:27:51.869: Loading execution steps: [{XGBoost : defaults}, {GLM : defaults},
{DRF : [def_1]}, {GBM : defaults}, {DeepLearning : defaults}, {DRF : [XRT]}, {X
GBoost : grids}, {GBM : grids}, {DeepLearning : grids}, {StackedEnsemble : defa
ults}]
23:27:51.874: AutoML job created: 2020.02.21 23:27:51.860
23:27:51.875: AutoML build started: 2020.02.21 23:27:51.875
23:27:51.881: AutoML: starting XGBoost_1_AutoML_20200221_232751 model training
23:27:52.18: XGBoost_1_AutoML_20200221_232751 [XGBoost def_1] started

███
23:28:08.19: XGBoost_1_AutoML_20200221_232751 [XGBoost def_1] complete
23:28:08.27: New leader: XGBoost_1_AutoML_20200221_232751, mean_residual_devian
ce: 0.44106507474520734
23:28:08.28: AutoML: starting XGBoost_2_AutoML_20200221_232751 model training
23:28:08.28: XGBoost_2_AutoML_20200221_232751 [XGBoost def_2] started

█
23:28:21.32: XGBoost_2_AutoML_20200221_232751 [XGBoost def_2] complete
23:28:21.36: AutoML: starting XGBoost_3_AutoML_20200221_232751 model training
23:28:21.37: XGBoost_3_AutoML_20200221_232751 [XGBoost def_3] started

█
23:28:29.38: XGBoost_3_AutoML_20200221_232751 [XGBoost def_3] complete
23:28:29.44: AutoML: starting GLM_1_AutoML_20200221_232751 model training
23:28:29.44: GLM_1_AutoML_20200221_232751 [GLM def_1] started


23:28:30.44: GLM_1_AutoML_20200221_232751 [GLM def_1] complete
23:28:30.46: AutoML: starting DRF_1_AutoML_20200221_232751 model training
23:28:30.46: DRF_1_AutoML_20200221_232751 [DRF def_1] started

███
23:28:43.48: DRF_1_AutoML_20200221_232751 [DRF def_1] complete
23:28:43.52: AutoML: starting GBM_1_AutoML_20200221_232751 model training
23:28:43.53: GBM_1_AutoML_20200221_232751 [GBM def_1] started

█
23:28:48.54: GBM_1_AutoML_20200221_232751 [GBM def_1] complete
23:28:48.58: AutoML: starting GBM_2_AutoML_20200221_232751 model training
23:28:48.59: GBM_2_AutoML_20200221_232751 [GBM def_2] started

█
23:28:53.60: GBM_2_AutoML_20200221_232751 [GBM def_2] complete
23:28:53.64: AutoML: starting GBM_3_AutoML_20200221_232751 model training
23:28:53.65: GBM_3_AutoML_20200221_232751 [GBM def_3] started
```

Out[2]:
```
{'Intercept': 0.34257191645868984,
 'XGBoost_1_AutoML_20200221_232751': 0.05576652257573207,
 'DRF_1_AutoML_20200221_232751': 0.061332121090884886,
 'XGBoost_3_AutoML_20200221_232751': 0.02941413881503072,
 'GBM_4_AutoML_20200221_232751': 0.01428765587910585,
 'XGBoost_2_AutoML_20200221_232751': 0.07165427133901207,
 'GBM_3_AutoML_20200221_232751': 0.0,
 'GBM_1_AutoML_20200221_232751': 0.023564014208765,
 'GBM_2_AutoML_20200221_232751': 0.0,
 'GBM_5_AutoML_20200221_232751': 0.00280615106051427,
 'GLM_1_AutoML_20200221_232751': 0.0012646711768132368}
```

In [3]:
```
%matplotlib inline
metalearner.std_coef_plot()
```



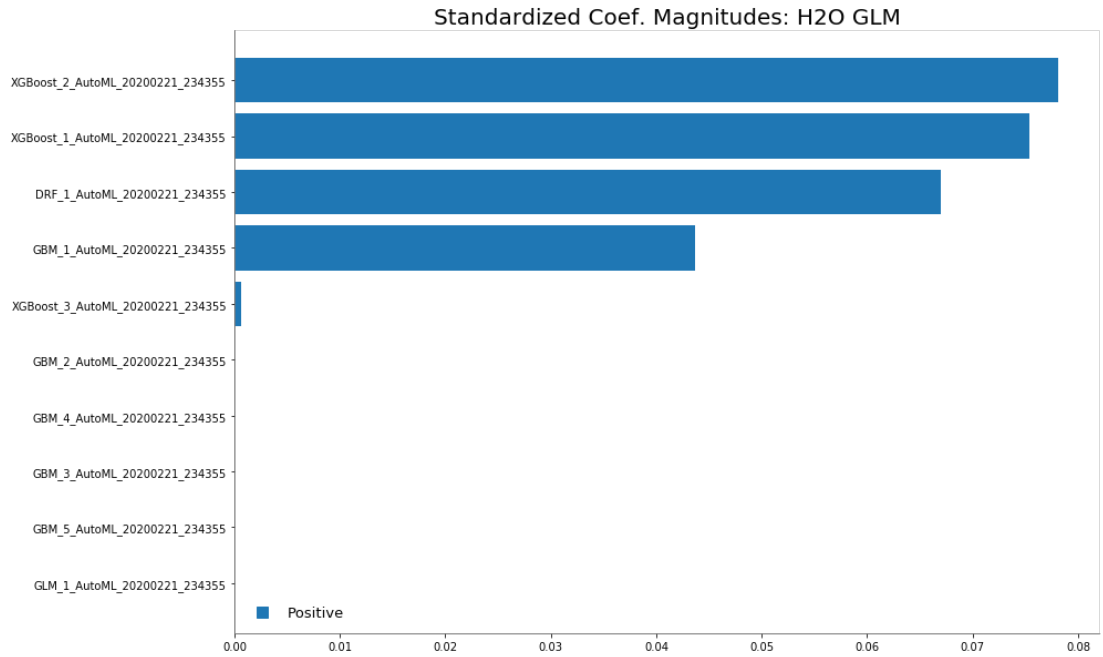
In [5]:
```
# Experiment 1 Prediction Test
predictions1 = aml.predict(X_test)
predictions1.shape
```

```
stackedensemble prediction progress: |████████████████████████████████| 10
0%
```

Out[5]:
```
(3263, 1)
```

In [7]:
```
%%time
# Experiment 2
X_train = sparse.load_npz("../processed_data/full_lemma_keyword_pca_50_pipeline
_tt_train_sparse.npz")
X_test = sparse.load_npz("../processed_data/full_lemma_keyword_pca_50_pipeline_
tt_test_sparse.npz")

X_train = h2o.H2OFrame(X_train)
X_test = h2o.H2OFrame(X_test)

y = X_train.columns[-1]
x = X_train.columns
x.remove(y)

aml = H2OAutoML(max_models = 10,
                seed = 1,
                verbosity='debug',
               )
aml.train(x = x, y = y, training_frame = X_train)

# Get model ids for all models in the AutoML Leaderboard
model_ids = list(aml.leaderboard['model_id'].as_data_frame().iloc[:,0])
# Get the "All Models" Stacked Ensemble model
se = h2o.get_model([mid for mid in model_ids if "StackedEnsemble_AllModels" in
mid][0])
# Get the Stacked Ensemble metalearner model
metalearner = h2o.get_model(se.metalearner()['name'])

print(metalearner.coef_norm())

%matplotlib inline
metalearner.std_coef_plot()
```

```
Parse progress: |████████████████████████████████████████████████████| 10
0%
Parse progress: |████████████████████████████████████████████████████| 10
0%
AutoML progress: |
23:43:55.160: Project: AutoML_20200221_234355159
23:43:55.160: Setting stopping tolerance adaptively based on the training fram
e: 0.011460988720255175
23:43:55.160: Build control seed: 1
23:43:55.160: training frame: Frame key: automl_training_py_117_sid_a762    col
s: 242    rows: 7613  chunks: 3    size: 3131656  checksum: 2064656790548190256
23:43:55.160: validation frame: NULL
23:43:55.160: leaderboard frame: NULL
23:43:55.160: blending frame: NULL
23:43:55.160: response column: C242
23:43:55.160: fold column: null
23:43:55.160: weights column: null
23:43:55.160: Loading execution steps: [{XGBoost : defaults}, {GLM : defaults},
{DRF : [def_1]}, {GBM : defaults}, {DeepLearning : defaults}, {DRF : [XRT]}, {X
GBoost : grids}, {GBM : grids}, {DeepLearning : grids}, {StackedEnsemble : defa
ults}]
23:43:55.160: AutoML job created: 2020.02.21 23:43:55.159
23:43:55.160: AutoML build started: 2020.02.21 23:43:55.160
23:43:55.160: AutoML: starting XGBoost_1_AutoML_20200221_234355 model training
23:43:55.161: XGBoost_1_AutoML_20200221_234355 [XGBoost def_1] started

██
23:44:11.162: XGBoost_1_AutoML_20200221_234355 [XGBoost def_1] complete
23:44:11.164: New leader: XGBoost_1_AutoML_20200221_234355, mean_residual_devia
nce: 0.438377362639235
23:44:11.164: AutoML: starting XGBoost_2_AutoML_20200221_234355 model training
23:44:11.165: XGBoost_2_AutoML_20200221_234355 [XGBoost def_2] started

██
23:44:25.166: XGBoost_2_AutoML_20200221_234355 [XGBoost def_2] complete
23:44:25.167: AutoML: starting XGBoost_3_AutoML_20200221_234355 model training
23:44:25.167: XGBoost_3_AutoML_20200221_234355 [XGBoost def_3] started

█
23:44:35.168: XGBoost_3_AutoML_20200221_234355 [XGBoost def_3] complete
23:44:35.170: AutoML: starting GLM_1_AutoML_20200221_234355 model training
23:44:35.171: GLM_1_AutoML_20200221_234355 [GLM def_1] started
23:44:36.171: GLM_1_AutoML_20200221_234355 [GLM def_1] complete
23:44:36.174: AutoML: starting DRF_1_AutoML_20200221_234355 model training
23:44:36.175: DRF_1_AutoML_20200221_234355 [DRF def_1] started

███
23:44:50.178: DRF_1_AutoML_20200221_234355 [DRF def_1] complete
23:44:50.180: AutoML: starting GBM_1_AutoML_20200221_234355 model training
23:44:50.181: GBM_1_AutoML_20200221_234355 [GBM def_1] started

█
23:44:55.182: GBM_1_AutoML_20200221_234355 [GBM def_1] complete
23:44:55.184: AutoML: starting GBM_2_AutoML_20200221_234355 model training
23:44:55.186: GBM_2_AutoML_20200221_234355 [GBM def_2] started

█
23:45:00.186: GBM_2_AutoML_20200221_234355 [GBM def_2] complete
23:45:00.187: AutoML: starting GBM_3_AutoML_20200221_234355 model training
23:45:00.187: GBM_3_AutoML_20200221_234355 [GBM def_3] started

██
23:45:07.188: GBM_3_AutoML_20200221_234355 [GBM def_3] complete
```




```
CPU times: user 6.95 s, sys: 156 ms, total: 7.11 s
Wall time: 1min 31s
```

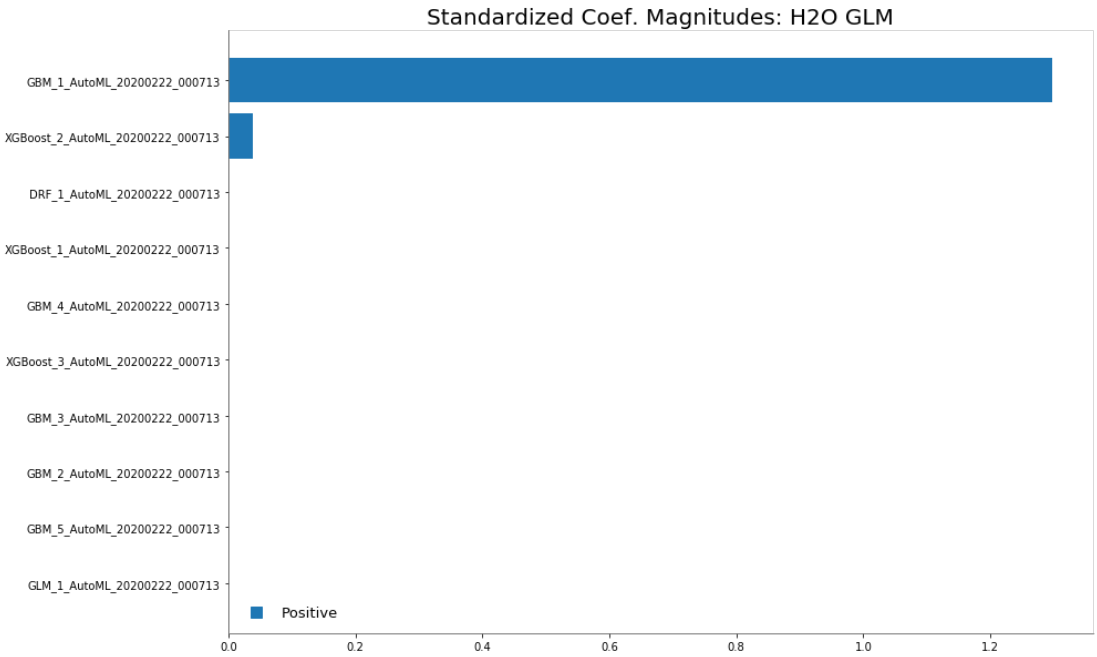
In [9]:
```
# Experiment 2 Prediction Test
predictions2 = aml.predict(X_test)
predictions2.shape
```

```
stackedensemble prediction progress: |████████████████████████████████| 10
0%
```

Out[9]:
```
(3263, 1)
```

In [2]:
```
%%time
# Experiment 3 - bow pca 50
X_train = sparse.load_npz("../processed_data/full_raw_keyword_bow_pca_50_pipeli
ne_tt_train_sparse.npz")
X_test = sparse.load_npz("../processed_data/full_raw_keyword_bow_pca_50_pipelin
e_tt_test_sparse.npz")

X_train = h2o.H2OFrame(X_train)
X_test = h2o.H2OFrame(X_test)

y = X_train.columns[-1]
x = X_train.columns
x.remove(y)

aml = H2OAutoML(max_models = 10,
                seed = 1,
                verbosity='info',
               )
aml.train(x = x, y = y, training_frame = X_train)

# Get model ids for all models in the AutoML Leaderboard
model_ids = list(aml.leaderboard['model_id'].as_data_frame().iloc[:,0])
# Get the "All Models" Stacked Ensemble model
se = h2o.get_model([mid for mid in model_ids if "StackedEnsemble_AllModels" in
mid][0])
# Get the Stacked Ensemble metalearner model
metalearner = h2o.get_model(se.metalearner()['name'])

print(metalearner.coef_norm())

%matplotlib inline
metalearner.std_coef_plot()
```

```
Parse progress: |████████████████████████████████████████████████████| 10
0%
Parse progress: |████████████████████████████████████████████████████| 10
0%
AutoML progress: |
00:07:13.501: Project: AutoML_20200222_00713499
00:07:13.502: Setting stopping tolerance adaptively based on the training fram
e: 0.011460988720255175
00:07:13.502: Build control seed: 1
00:07:13.502: training frame: Frame key: automl_training_py_1_sid_a749    cols:
275    rows: 7613  chunks: 3    size: 3139444  checksum: 5360252508036772992
00:07:13.502: validation frame: NULL
00:07:13.502: leaderboard frame: NULL
00:07:13.502: blending frame: NULL
00:07:13.502: response column: C275
00:07:13.502: fold column: null
00:07:13.502: weights column: null
00:07:13.510: Loading execution steps: [{XGBoost : defaults}, {GLM : defaults},
{DRF : [def_1]}, {GBM : defaults}, {DeepLearning : defaults}, {DRF : [XRT]}, {X
GBoost : grids}, {GBM : grids}, {DeepLearning : grids}, {StackedEnsemble : defa
ults}]
00:07:13.515: AutoML job created: 2020.02.22 00:07:13.499
00:07:13.515: AutoML build started: 2020.02.22 00:07:13.515
00:07:13.519: AutoML: starting XGBoost_1_AutoML_20200222_000713 model training

██
00:07:25.673: New leader: XGBoost_1_AutoML_20200222_000713, mean_residual_devia
nce: 7.412241391589661
00:07:25.673: AutoML: starting XGBoost_2_AutoML_20200222_000713 model training

██
00:07:37.681: New leader: XGBoost_2_AutoML_20200222_000713, mean_residual_devia
nce: 7.29133356164068
00:07:37.681: AutoML: starting XGBoost_3_AutoML_20200222_000713 model training

█
00:07:50.690: AutoML: starting GLM_1_AutoML_20200222_000713 model training


00:07:51.692: AutoML: starting DRF_1_AutoML_20200222_000713 model training

███
00:08:04.697: AutoML: starting GBM_1_AutoML_20200222_000713 model training

██
00:08:14.702: New leader: GBM_1_AutoML_20200222_000713, mean_residual_deviance:
6.571425276123931
00:08:14.703: AutoML: starting GBM_2_AutoML_20200222_000713 model training

█
00:08:19.706: AutoML: starting GBM_3_AutoML_20200222_000713 model training

█
00:08:25.708: AutoML: starting GBM_4_AutoML_20200222_000713 model training

██
00:08:31.714: AutoML: starting GBM_5_AutoML_20200222_000713 model training

██
00:08:40.722: AutoML: starting StackedEnsemble_BestOfFamily_AutoML_20200222_000
713 model training
00:08:41.729: AutoML: starting StackedEnsemble_AllModels_AutoML_20200222_000713
model training
```




```
CPU times: user 5.94 s, sys: 166 ms, total: 6.1 s
Wall time: 1min 33s
```

In [3]:
```
# Experiment 3 Prediction Test
predictions3 = aml.predict(X_test)
predictions3.shape
```

```
gbm prediction progress: |████████████████████████████████████████████████| 10
0%
```

Out[3]:
```
(3263, 1)
```

In [ ]:
```

```

In [37]:
```
# X_train = sparse.load_npz("../processed_data/full_raw_keyword_bow_pipeline_tt
_train_sparse.npz")
X_train = np.load("../full_raw_keyword_bow_pipeline_tt_train_ndarray.npy")
# y_train = np.load("processed_data/raw_keyword_categorical_y_train.npy")
# y_train = h2o.H2OFrame(y_train)
# X_test = sparse.load_npz("../processed_data/full_raw_keyword_bow_pipeline_tt_
test_sparse.npz")
X_test = np.load("../full_raw_keyword_bow_pipeline_tt_test_ndarray.npy")

X_train = h2o.H2OFrame(X_train)
X_test = h2o.H2OFrame(X_test)

# combined_train = X_train.cbind(y_train)
```

```
Parse progress: |████████████████████████████████████████████████████████| 10
0%
Parse progress: |████████████████████████████████████████████████████████| 10
0%
```

In [41]:
```
X_train.shape
```

Out[41]:
```
(7613, 20338)
```

In [42]:
```
X_test.shape
```

Out[42]:
```
(3263, 20337)
```

In [43]:
```
y = X_train.columns[-1]
x = X_train.columns
x.remove(y)

# Ensure binary target is a factor
X_train[y] = X_train[y].asfactor()
```

In [29]:
```
# y = "C110000"
# x = combined_train.columns
# x.remove(y)
```

Run AutoML

In [45]:
```
aml = H2OAutoML(max_models = 20,
                seed = 1,
                verbosity='info',
#                 max_runtime_secs = 30, # For debugging
               )
aml.train(x = x, y = y, training_frame = X_train)
```

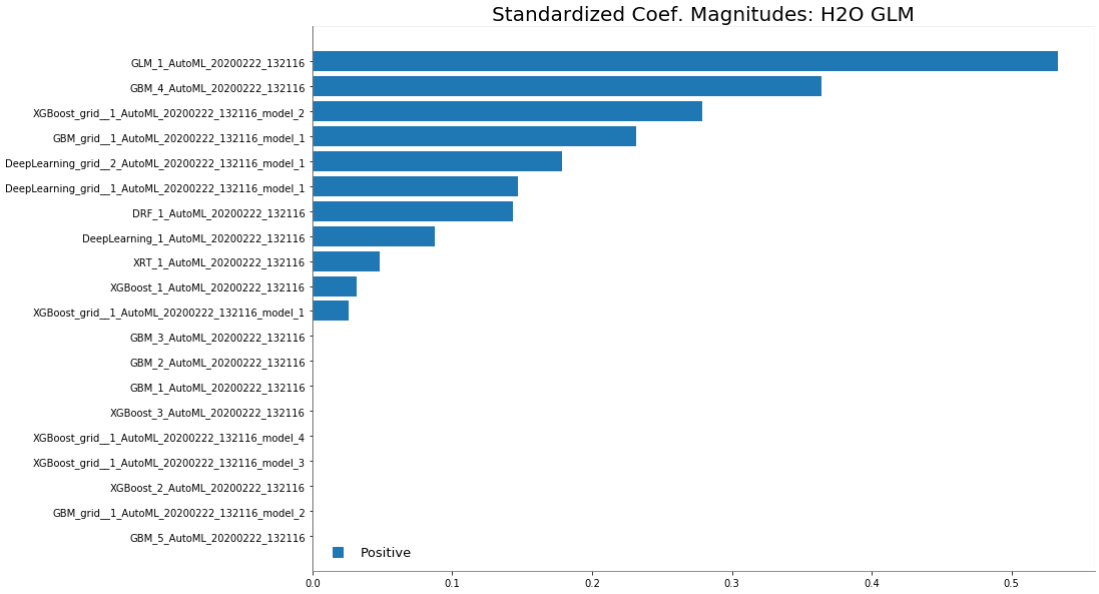
```
AutoML progress: |
13:21:16.253: Project: AutoML_20200222_132116250
13:21:16.265: Setting stopping tolerance adaptively based on the training fram
e: 0.011460988720255175
13:21:16.265: Build control seed: 1
13:21:16.289: training frame: Frame key: automl_training_py_851_sid_a6a5    col
s: 20338    rows: 7613  chunks: 148    size: 240807846  checksum: -858660181832
4432240
13:21:16.289: validation frame: NULL
13:21:16.289: leaderboard frame: NULL
13:21:16.289: blending frame: NULL
13:21:16.289: response column: C20338
13:21:16.289: fold column: null
13:21:16.289: weights column: null
13:21:16.398: Loading execution steps: [{XGBoost : defaults}, {GLM : defaults},
{DRF : [def_1]}, {GBM : defaults}, {DeepLearning : defaults}, {DRF : [XRT]}, {X
GBoost : grids}, {GBM : grids}, {DeepLearning : grids}, {StackedEnsemble : defa
ults}]
13:21:16.403: AutoML job created: 2020.02.22 13:21:16.250
13:21:16.404: AutoML build started: 2020.02.22 13:21:16.403
13:21:16.493: AutoML: starting XGBoost_1_AutoML_20200222_132116 model training

13:45:06.455: New leader: XGBoost_1_AutoML_20200222_132116, auc: 0.799670688958
6066
13:45:06.455: AutoML: starting XGBoost_2_AutoML_20200222_132116 model training

13:56:47.651: AutoML: starting XGBoost_3_AutoML_20200222_132116 model training

14:31:02.519: New leader: XGBoost_3_AutoML_20200222_132116, auc: 0.818601937296
0684
14:31:02.638: AutoML: starting GLM_1_AutoML_20200222_132116 model training


14:38:59.49: New leader: GLM_1_AutoML_20200222_132116, auc: 0.8350472115055452
14:38:59.86: AutoML: starting DRF_1_AutoML_20200222_132116 model training


15:02:37.189: AutoML: starting GBM_1_AutoML_20200222_132116 model training


17:58:57.743: New leader: GBM_1_AutoML_20200222_132116, auc: 0.836954210479401
17:58:57.743: AutoML: starting GBM_2_AutoML_20200222_132116 model training


21:34:55.124: New leader: GBM_2_AutoML_20200222_132116, auc: 0.8401902542069167
21:34:55.124: AutoML: starting GBM_3_AutoML_20200222_132116 model training


01:18:37.896: New leader: GBM_3_AutoML_20200222_132116, auc: 0.8408943113702047
01:18:37.896: AutoML: starting GBM_4_AutoML_20200222_132116 model training


05:50:18.751: New leader: GBM_4_AutoML_20200222_132116, auc: 0.845331677495842
05:50:18.751: AutoML: starting GBM_5_AutoML_20200222_132116 model training


06:43:32.76: AutoML: starting DeepLearning_1_AutoML_20200222_132116 model train
ing
```

In [46]:
```
aml.modeling_steps
```

Out[46]:
```
[{'name': 'XGBoost',
  'steps': [{'id': 'def_1', 'weight': 10},
   {'id': 'def_2', 'weight': 10},
   {'id': 'def_3', 'weight': 10}]},
 {'name': 'GLM', 'steps': [{'id': 'def_1', 'weight': 10}]},
 {'name': 'DRF', 'steps': [{'id': 'def_1', 'weight': 10}]},
 {'name': 'GBM',
  'steps': [{'id': 'def_1', 'weight': 10},
   {'id': 'def_2', 'weight': 10},
   {'id': 'def_3', 'weight': 10},
   {'id': 'def_4', 'weight': 10},
   {'id': 'def_5', 'weight': 10}]},
 {'name': 'DeepLearning', 'steps': [{'id': 'def_1', 'weight': 10}]},
 {'name': 'DRF', 'steps': [{'id': 'XRT', 'weight': 10}]},
 {'name': 'XGBoost', 'steps': [{'id': 'grid_1', 'weight': 100}]},
 {'name': 'GBM', 'steps': [{'id': 'grid_1', 'weight': 60}]},
 {'name': 'DeepLearning',
  'steps': [{'id': 'grid_1', 'weight': 20}, {'id': 'grid_2', 'weight': 20}]},
 {'name': 'StackedEnsemble',
  'steps': [{'id': 'best', 'weight': 10}, {'id': 'all', 'weight': 10}]}]
```

In [47]:
```
# Get model ids for all models in the AutoML Leaderboard
model_ids = list(aml.leaderboard['model_id'].as_data_frame().iloc[:,0])
# Get the "All Models" Stacked Ensemble model
se = h2o.get_model([mid for mid in model_ids if "StackedEnsemble_AllModels" in
mid][0])
# Get the Stacked Ensemble metalearner model
metalearner = h2o.get_model(se.metalearner()['name'])

print(metalearner.coef_norm())

%matplotlib inline
metalearner.std_coef_plot()
```

```
{'Intercept': -0.22084968506644476, 'XGBoost_grid__1_AutoML_20200222_132116_mod
el_2': 0.27850699616898056, 'GBM_4_AutoML_20200222_132116': 0.3638424184269829
5, 'GBM_grid__1_AutoML_20200222_132116_model_1': 0.23165007332467588, 'GBM_3_Au
toML_20200222_132116': 0.0, 'GBM_2_AutoML_20200222_132116': 0.0, 'GBM_1_AutoML_
20200222_132116': 0.0, 'GLM_1_AutoML_20200222_132116': 0.5329696274679702, 'Dee
pLearning_grid__2_AutoML_20200222_132116_model_1': 0.1785443247147275, 'XGBoost
_grid__1_AutoML_20200222_132116_model_1': 0.026158606025897122, 'XGBoost_3_Auto
ML_20200222_132116': 0.0, 'XGBoost_grid__1_AutoML_20200222_132116_model_4': 0.
0, 'DRF_1_AutoML_20200222_132116': 0.14370500884265608, 'XGBoost_1_AutoML_20200
222_132116': 0.031497896763378226, 'DeepLearning_1_AutoML_20200222_132116': 0.0
878257223706418, 'DeepLearning_grid__1_AutoML_20200222_132116_model_1': 0.14719
232235066243, 'XGBoost_grid__1_AutoML_20200222_132116_model_3': 0.0, 'XGBoost_2
_AutoML_20200222_132116': 0.0, 'XRT_1_AutoML_20200222_132116': 0.04791984693762
383, 'GBM_grid__1_AutoML_20200222_132116_model_2': 0.0, 'GBM_5_AutoML_20200222_
132116': 0.0}
```



In [48]:
```
# Save the model
h2o.save_model(aml.leader, path = "./saved_models/automl_005_bin")
```

Out[48]:
```
'/home/alex/Documents/mlbase/disaster_tweet_kaggle/h2o/saved_models/automl_005_
bin/StackedEnsemble_BestOfFamily_AutoML_20200222_132116'
```

In [49]:
```
%%time
# Experiment 5 Prediction Test
predictions5 = aml.predict(X_test)
predictions5.shape
```

```
stackedensemble prediction progress: |████████████████████████████████| 10
0%
CPU times: user 183 ms, sys: 31.1 ms, total: 214 ms
Wall time: 14.4 s
```

Out[49]: (3263, 3)

In [53]:
```
predictions5
```

predict	p0	p1
1	0.299266	0.700734
1	0.130853	0.869147
1	0.0740614	0.925939
1	0.403016	0.596984
1	0.048906	0.951094
1	0.229236	0.770764
0	0.742732	0.257268
0	0.806888	0.193112
0	0.819966	0.180034
0	0.797184	0.202816

Out[53]:

In [50]:
```
import pandas as pd
test_df = pd.read_csv("../data/test.csv")
test_id = test_df['id']
test_predictions_df = pd.DataFrame([test_id, pd.Series(predictions5.as_data_fra
me().iloc[:, 0])]).T
test_predictions_df.columns = ['id', 'target']
```

In [51]:
```
test_predictions_df.to_csv('test_preds_automl_005.csv', index=False)
```

In [52]:
```
lb = aml.leaderboard
lb.head()
```

model_id	auc	logloss	aucpr	mean_per_class_error	
StackedEnsemble_BestOfFamily_AutoML_20200222_132116	0.858575	0.446024	0.852109	0.212056	0
StackedEnsemble_AllModels_AutoML_20200222_132116	0.858222	0.446052	0.851982	0.214646	0
XGBoost_grid__1_AutoML_20200222_132116_model_2	0.847469	0.470319	0.835908	0.221965	0
GBM_4_AutoML_20200222_132116	0.845332	0.483274	0.835073	0.226435	0
GBM_grid__1_AutoML_20200222_132116_model_1	0.841468	0.500601	0.832605	0.228817	0
GBM_3_AutoML_20200222_132116	0.840894	0.494642	0.830746	0.23427	0
GBM_2_AutoML_20200222_132116	0.84019	0.496928	0.830837	0.2335	
GBM_1_AutoML_20200222_132116	0.836954	0.503705	0.826798	0.229047	0
GLM_1_AutoML_20200222_132116	0.835047	0.491352	0.826733	0.232259	0
DeepLearning_grid__2_AutoML_20200222_132116_model_1	0.829	0.652747	0.587207	0.236082	0

Out[52]:

In [21]:
```
h2o.save_model(aml.leader, path = "./saved_models/automl_004_bin")
```

Out[21]:
```
'/home/alex/Documents/mlbase/disaster_tweet_kaggle/h2o/saved_models/automl_004_
bin/DeepLearning_grid__1_AutoML_20200222_032428_model_1'
```

In [23]:
```
aml2 = h2o.load_model("./saved_models/automl_004_bin/DeepLearning_grid__1_AutoM
L_20200222_032428_model_1")
```

In [24]:
```
dir(aml2)
```

Out[24]:
```
['F0point5',
 'F1',
 'F2',
 '_ModelBase__generate_partial_plots',
 '_ModelBase__generate_user_splits',
 '_ModelBase__grabValues',
 '_ModelBase__plot_1dpdp',
 '_ModelBase__plot_2dpdp',
 '_ModelBase__predFor3D',
 '_ModelBase__setAxs1D',
 '__class__',
 '__delattr__',
 '__dict__',
 '__dir__',
 '__doc__',
 '__eq__',
 '__format__',
 '__ge__',
 '__getattr__',
 '__getattribute__',
 '__gt__',
 '__hash__',
 '__init__',
 '__init_subclass__',
 '__le__',
 '__lt__',
 '__module__',
 '__ne__',
 '__new__',
 '__reduce__',
 '__reduce_ex__',
 '__repr__',
 '__setattr__',
 '__sizeof__',
 '__str__',
 '__subclasshook__',
 '__weakref__',
 '_additional_used_columns',
 '_bc',
 '_bci',
 '_check_and_save_parm',
 '_check_targets',
 '_compute_algo',
 '_delegate_to_metrics',
 '_end_time',
 '_estimator_type',
 '_fillMultinomialDict',
 '_future',
 '_get_metrics',
 '_have_mojo',
 '_have_pojo',
 '_id',
 '_is_xvalidated',
 '_job',
 '_keyify_if_h2oframe',
 '_metrics_class',
 '_model_json',
 '_parms',
 '_plot',
 '_print_model_scoring_history',
 '_requires_training_frame',
 '_resolve_model',
 '_run_time',
```

In [25]:
```
aml2.F1
```

```
Model Details
=============
H2ODeepLearningEstimator :  Deep Learning
Model Key:  DeepLearning_grid__1_AutoML_20200222_032428_model_1


Status of Neuron Layers: predicting C20337, 2-class classification, bernoulli d
istribution, CrossEntropy loss, 4,067,802 weights/biases, 48.8 MB, 27,144 train
ing samples, mini-batch size 1
```

	layer	units	type	dropout	l1	l2	mean_rate	rate_rms	momentum	mean_weight	weight_
0	1	20336	Input	20							
1	2	200	RectifierDropout	40	0	0	0.977042	0.00153036	0	0.00727941	0.0481
2	3	2	Softmax		0	0	0.902415	0.244836	0	0.00986327	0.38

```
ModelMetricsBinomial: deeplearning
** Reported on train data. **

MSE: 1.7266850582090668e-09
RMSE: 4.155340008000629e-05
LogLoss: 9.267748319421941e-07
Mean Per-Class Error: 0.0
AUC: 1.0
AUCPR: 0.0
Gini: 1.0

Confusion Matrix (Act/Pred) for max f1 @ threshold = 0.9996075471647122:
```

		0	1	Error	Rate
0	0	7612.0	0.0	0.0	(0.0/7612.0)
1	1	0.0	1.0	0.0	(0.0/1.0)
2	Total	7612.0	1.0	0.0	(0.0/7613.0)

```
Maximum Metrics: Maximum metrics at their respective thresholds
```

	metric	threshold	value	idx
0	max f1	9.996075e-01	1.0	0.0
1	max f2	9.996075e-01	1.0	0.0
2	max f0point5	9.996075e-01	1.0	0.0
3	max accuracy	9.996075e-01	1.0	0.0
4	max precision	9.996075e-01	1.0	0.0
5	max recall	9.996075e-01	1.0	0.0
6	max specificity	9.996075e-01	1.0	0.0
7	max absolute_mcc	9.996075e-01	1.0	0.0
8	max min_per_class_accuracy	9.996075e-01	1.0	0.0
9	max mean_per_class_accuracy	9.996075e-01	1.0	0.0
10	max tns	9.996075e-01	7612.0	0.0
11	max fns	9.996075e-01	0.0	0.0
12	max fps	6.193928e-18	7612.0	399.0
13	max tps	9.996075e-01	1.0	0.0
14	max tnr	9.996075e-01	1.0	0.0
15	max fnr	9.996075e-01	0.0	0.0
16	max fpr	6.193928e-18	1.0	399.0
17	max tpr	9.996075e-01	1.0	0.0

```
Gains/Lift Table: Avg response rate:  0.01 %, avg score:  0.01 %
```

	group	cumulative_data_fraction	lower_threshold	lift	cumulative_lift	response_rate	score
0	1	0.010114	1.802922e-10	98.87013	98.870130	0.012987	1.306836e-02
1	2	0.020229	2.293305e-11	0.00000	49.435065	0.000000	6.132870e-11
2	3	0.030080	5.540042e-12	0.00000	33.244541	0.000000	1.280717e-11
3	4	0.040063	1.642750e-12	0.00000	24.960656	0.000000	2.900338e-12
4	5	0.050046	5.903790e-13	0.00000	19.981627	0.000000	1.013965e-12
5	6	0.100092	1.023800e-14	0.00000	9.990814	0.000000	1.296480e-13
6	7	0.150007	3.534926e-16	0.00000	6.666375	0.000000	2.963425e-15
7	8	0.200053	1.129864e-17	0.00000	4.998687	0.000000	1.001845e-16
8	9	0.300013	3.732061e-21	0.00000	3.333187	0.000000	1.588717e-18
9	10	0.399974	2.624096e-25	0.00000	2.500164	0.000000	4.595708e-22
10	11	0.500066	2.920532e-31	0.00000	1.999737	0.000000	1.992354e-26
11	12	0.600026	2.611918e-39	0.00000	1.666594	0.000000	1.884698e-32
12	13	0.699987	1.446788e-50	0.00000	1.428598	0.000000	1.350577e-40
13	14	0.799947	2.332991e-65	0.00000	1.250082	0.000000	4.724662e-52
14	15	0.899908	2.487951e-91	0.00000	1.111225	0.000000	3.352021e-67
15	16	1.000000	9.211654e-140	0.00000	1.000000	0.000000	3.588582e-93

```
ModelMetricsBinomial: deeplearning
** Reported on cross-validation data. **

MSE: 0.00013135426277789726
RMSE: 0.011460988734742621
LogLoss: 0.0030228245701911715
Mean Per-Class Error: 0.008867577509195979
AUC: 0.9822648449816079
AUCPR: 0.003676470588235294
Gini: 0.9645296899632159

Confusion Matrix (Act/Pred) for max f1 @ threshold = 1.0132437368732008e-10:
```

		0	1	Error	Rate
0	0	7477.0	135.0	0.0177	(135.0/7612.0)
1	1	0.0	1.0	0.0	(0.0/1.0)
2	Total	7477.0	136.0	0.0177	(135.0/7613.0)

```
Maximum Metrics: Maximum metrics at their respective thresholds
```

	metric	threshold	value	idx
0	max f1	1.013244e-10	0.014599	135.0
1	max f2	1.013244e-10	0.035714	135.0
2	max f0point5	1.013244e-10	0.009174	135.0
3	max accuracy	5.100234e-05	0.999737	0.0
4	max precision	1.013244e-10	0.007353	135.0
5	max recall	1.013244e-10	1.000000	135.0
6	max specificity	5.100234e-05	0.999869	0.0
7	max absolute_mcc	1.013244e-10	0.084986	135.0
8	max min_per_class_accuracy	1.013244e-10	0.982265	135.0
9	max mean_per_class_accuracy	1.013244e-10	0.991132	135.0
10	max tns	5.100234e-05	7611.000000	0.0
11	max fns	5.100234e-05	1.000000	0.0
12	max fps	1.421735e-18	7612.000000	399.0
13	max tps	1.013244e-10	1.000000	135.0
14	max tnr	5.100234e-05	0.999869	0.0
15	max fnr	5.100234e-05	1.000000	0.0
16	max fpr	1.421735e-18	1.000000	399.0
17	max tpr	1.013244e-10	1.000000	135.0

```
Gains/Lift Table: Avg response rate:  0.01 %, avg score:  0.00 %
```

	group	cumulative_data_fraction	lower_threshold	lift	cumulative_lift	response_rate	sc
0	1	0.010114	8.512282e-10	0.000000	0.000000	0.000000	9.025751e
1	2	0.020097	6.870312e-11	100.171053	49.758170	0.013158	2.661291e
2	3	0.030080	6.435641e-12	0.000000	33.244541	0.000000	2.513683e
3	4	0.040063	1.272123e-12	0.000000	24.960656	0.000000	2.979778e
4	5	0.050046	2.141560e-13	0.000000	19.981627	0.000000	6.290080e
5	6	0.100092	1.556618e-16	0.000000	9.990814	0.000000	3.269805e
6	7	0.150007	1.083049e-20	0.000000	6.666375	0.000000	2.217211e
7	8	0.200053	4.798200e-26	0.000000	4.998687	0.000000	9.142823e
8	9	0.300013	3.443183e-39	0.000000	3.333187	0.000000	1.627817e
9	10	0.399974	4.852426e-52	0.000000	2.500164	0.000000	1.091184e
10	11	0.500066	3.679154e-64	0.000000	1.999737	0.000000	2.044856e
11	12	0.600026	1.424191e-76	0.000000	1.666594	0.000000	1.359427e
12	13	0.699987	1.016643e-87	0.000000	1.428598	0.000000	5.826658e
13	14	0.799947	4.678720e-101	0.000000	1.250082	0.000000	3.315469e
14	15	0.899908	1.590261e-117	0.000000	1.111225	0.000000	1.859891e-
15	16	1.000000	8.635758e-164	0.000000	1.000000	0.000000	3.277727e-

Cross-Validation Metrics Summary:

		mean	sd	cv_1_valid	cv_2_valid	cv_3_valid	cv_4_va
0	auc	0.19027595	0.42546996	0.0	0.9513798	0.0	(
1	aucpr	0.006666667	0.0	NaN	0.006666667	NaN	N
2	lift_top_group	0.0	0.0	NaN	0.0	NaN	N
3	logloss	0.0030220307	0.006757462	2.727688E-10	0.015110146	1.723711E-11	2.6087467E-
4	mean_per_class_error	0.024310118	0.0	NaN	0.024310118	NaN	N
5	mse	1.3131976E-4	2.9363993E-4	1.0240409E-16	6.5659883E-4	5.977388E-20	3.4193868E-
6	pr_auc	0.006666667	0.0	NaN	0.006666667	NaN	N
7	r2	-Infinity	NaN	-Infinity	-6.5703265E-4	-Infinity	-Infir
8	rmse	0.0051248944	0.011459451	1.0119491E-8	0.025624184	2.4448696E-10	5.8475524E-

Scoring History:

	timestamp	duration	training_speed	epochs	iterations	samples	training_rmse	training_logloss	traini
0	2020-02-22 11:17:38	0.000 sec	None	0.000000	0	0.0	NaN	NaN	
1	2020-02-22 11:17:44	39 min 9.779 sec	223 obs/sec	0.170235	1	1296.0	0.011461	4.536821e-03	-0.0
2	2020-02-22 11:19:54	41 min 19.682 sec	220 obs/sec	3.565480	21	27144.0	0.000042	9.267748e-07	0.9

Variable Importances:

	variable	relative_importance	scaled_importance	percentage
0	C2744	1.000000	1.000000	0.000114
1	C19770	0.987238	0.987238	0.000112
2	C13074	0.965126	0.965126	0.000110
3	C3981	0.961258	0.961258	0.000109
4	C19799	0.955598	0.955598	0.000109
5	C18052	0.947276	0.947276	0.000108
6	C13202	0.934454	0.934454	0.000106
7	C12733	0.914398	0.914398	0.000104
8	C164	0.911760	0.911760	0.000104
9	C17455	0.909137	0.909137	0.000103
10	C16127	0.907963	0.907963	0.000103
11	C18531	0.903513	0.903513	0.000103
12	C2610	0.899375	0.899375	0.000102
13	C18590	0.898254	0.898254	0.000102
14	C12670	0.896280	0.896280	0.000102
15	C5900	0.895458	0.895458	0.000102
16	C16629	0.891352	0.891352	0.000101
17	C2562	0.886023	0.886023	0.000101
18	C4525	0.883681	0.883681	0.000101
19	C2594	0.882354	0.882354	0.000100

See the whole table with table.as_data_frame()

Out[25]: <bound method H2OBinomialModel.F1 of >

In [29]:
```
di
```

```
---------------------------------------------------------------------------
AttributeError                            Traceback (most recent call last)
<ipython-input-29-b3b7bb88a570> in <module>
----> 1 aml2.training_info

~/miniconda3/envs/h20/lib/python3.7/site-packages/h2o/utils/metaclass.py in __g
etattr__(self, name)
    191             if name in self._bci:
    192                 return self._bci[name]
--> 193             return getattr(new_clz, name)
    194
    195         new_clz = extend_and_replace(clz, __init__=__init__, __getattr_
_=__getattr__)

~/miniconda3/envs/h20/lib/python3.7/site-packages/h2o/utils/metaclass.py in __g
etattribute__(cls, name)
    233             if attr is not MetaFeature.NOT_FOUND:
    234                 return attr
--> 235         return type.__getattribute__(cls, name)
    236
    237     def __setattr__(cls, name, value):

AttributeError: type object 'ModelBase' has no attribute 'training_info'
```

In [ ]:
```
```

In [6]:
```
lb = aml.leaderboard
```

In [6]:
```
lb.head()
```

Out[6]:

model_id	mean_residual_deviance	rmse	mse	mae
StackedEnsemble_BestOfFamily_AutoML_20200221_092127	0.148802	0.385749	0.148802	0.310458
StackedEnsemble_AllModels_AutoML_20200221_092127	0.148818	0.38577	0.148818	0.310552
XGBoost_2_AutoML_20200221_092127	0.157919	0.39739	0.157919	0.337343
GBM_4_AutoML_20200221_092127	0.16077	0.400961	0.16077	0.348566
GBM_3_AutoML_20200221_092127	0.163293	0.404095	0.163293	0.35532
XGBoost_1_AutoML_20200221_092127	0.164017	0.40499	0.164017	0.359857
GLM_1_AutoML_20200221_092127	0.164835	0.405998	0.164835	0.352993
GBM_2_AutoML_20200221_092127	0.165197	0.406444	0.165197	0.361149
GBM_1_AutoML_20200221_092127	0.16637	0.407885	0.16637	0.36481
XGBoost_3_AutoML_20200221_092127	0.171875	0.414578	0.171875	0.379498

In [7]:
```
lb.head()
```

model_id	mean_residual_deviance	rmse	mse	
StackedEnsemble_AllModels_AutoML_20200221_201104	0.000131376	0.0114619	0.000131376	0.000
StackedEnsemble_BestOfFamily_AutoML_20200221_201104	0.000131376	0.0114619	0.000131376	0.000
GBM_5_AutoML_20200221_201104	0.000132225	0.0114989	0.000132225	0.000
GBM_4_AutoML_20200221_201104	0.00013967	0.0118182	0.00013967	0.000
XGBoost_2_AutoML_20200221_201104	0.000140173	0.0118395	0.000140173	0.000
GBM_3_AutoML_20200221_201104	0.000140341	0.0118465	0.000140341	0.000
GBM_2_AutoML_20200221_201104	0.000141645	0.0119015	0.000141645	0.00
XGBoost_1_AutoML_20200221_201104	0.000148843	0.0122001	0.000148843	0.000
GLM_1_AutoML_20200221_201104	0.00016624	0.0128934	0.00016624	0.000
XGBoost_3_AutoML_20200221_201104	0.000174279	0.0132015	0.000174279	0.000

Out[7]:

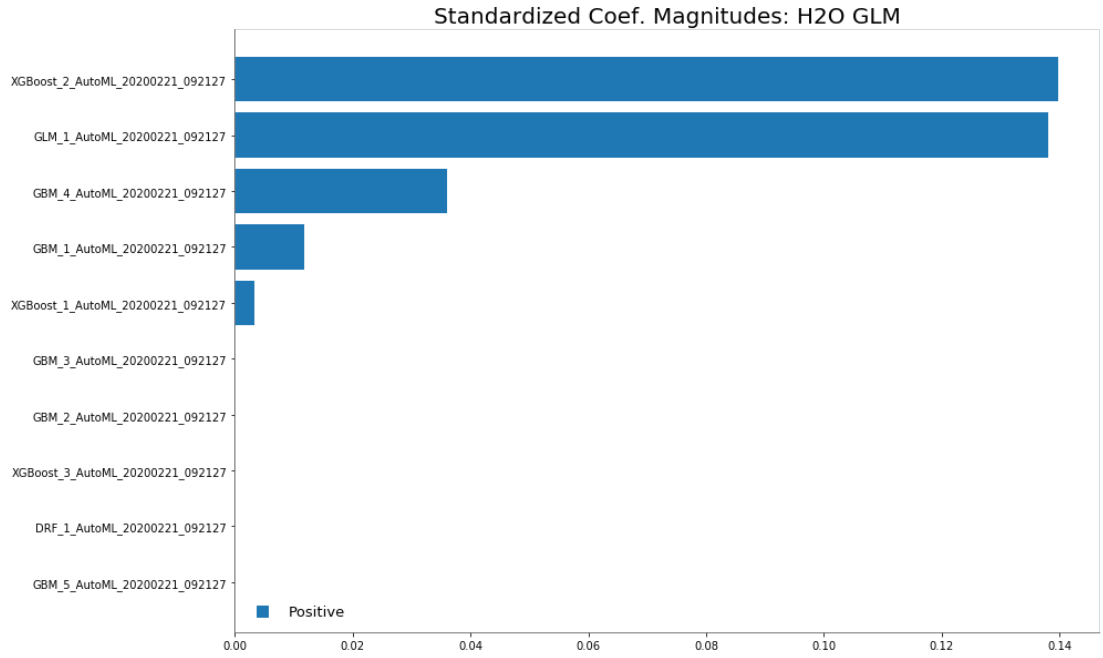
In [ ]:

In [7]:
```
# Get model ids for all models in the AutoML Leaderboard
model_ids = list(aml.leaderboard['model_id'].as_data_frame().iloc[:,0])
# Get the "All Models" Stacked Ensemble model
se = h2o.get_model([mid for mid in model_ids if "StackedEnsemble_AllModels" in
mid][0])
# Get the Stacked Ensemble metalearner model
metalearner = h2o.get_model(se.metalearner()['name'])
```

In [8]:
```
metalearner.coef_norm()
```

Out[8]:
```
{'Intercept': 0.42965979246026575,
 'XGBoost_2_AutoML_20200221_092127': 0.13980509143405623,
 'GBM_4_AutoML_20200221_092127': 0.036119599854358475,
 'GBM_3_AutoML_20200221_092127': 0.0,
 'XGBoost_1_AutoML_20200221_092127': 0.0034155997464314753,
 'GLM_1_AutoML_20200221_092127': 0.1381498848377734,
 'GBM_2_AutoML_20200221_092127': 0.0,
 'GBM_1_AutoML_20200221_092127': 0.011880218602186476,
 'XGBoost_3_AutoML_20200221_092127': 0.0,
 'DRF_1_AutoML_20200221_092127': 0.0,
 'GBM_5_AutoML_20200221_092127': 0.0}
```

In [9]:
```
%matplotlib inline
metalearner.std_coef_plot()
```

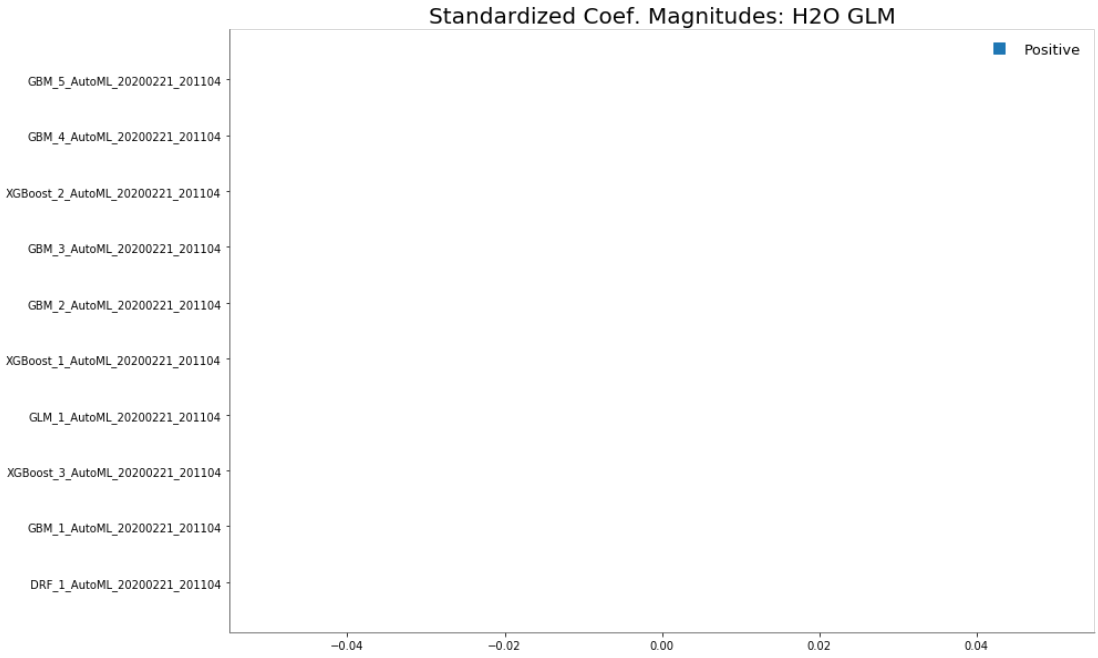


In [12]:
```
# Get model ids for all models in the AutoML Leaderboard
model_ids = list(aml.leaderboard['model_id'].as_data_frame().iloc[:,0])
# Get the "All Models" Stacked Ensemble model
se = h2o.get_model([mid for mid in model_ids if "StackedEnsemble_AllModels" in
mid][0])
# Get the Stacked Ensemble metalearner model
metalearner = h2o.get_model(se.metalearner()['name'])
```

In [13]:
```
metalearner.coef_norm()
```

Out[13]:
```
{'Intercept': 0.00013135426244581638,
 'GBM_5_AutoML_20200221_201104': 0.0,
 'GBM_4_AutoML_20200221_201104': 0.0,
 'XGBoost_2_AutoML_20200221_201104': 0.0,
 'GBM_3_AutoML_20200221_201104': 0.0,
 'GBM_2_AutoML_20200221_201104': 0.0,
 'XGBoost_1_AutoML_20200221_201104': 0.0,
 'GLM_1_AutoML_20200221_201104': 0.0,
 'XGBoost_3_AutoML_20200221_201104': 0.0,
 'GBM_1_AutoML_20200221_201104': 0.0,
 'DRF_1_AutoML_20200221_201104': 0.0}
```

In [14]:
```
%matplotlib inline
metalearner.std_coef_plot()
```



In [8]:
```
h2o.save_model(aml.leader, path = "./saved_models/automl_002_bin")
```

Out[8]:
```
'/home/alex/Documents/mlbase/disaster_tweet_kaggle/h2o/saved_models/automl_002_
bin/StackedEnsemble_AllModels_AutoML_20200221_201104'
```

In [9]:
```
?h2o.save_model
```

```
Signature: h2o.save_model(model, path='', force=False)
Docstring:
Save an H2O Model object to disk. (Note that ensemble binary models can now be
saved using this method.)

:param model: The model object to save.
:param path: a path to save the model at (hdfs, s3, local)
:param force: if True overwrite destination directory in case it exists, or thr
ow exception if set to False.

:returns: the path of the saved model

:examples:

>>> from h2o.estimators.glm import H2OGeneralizedLinearEstimator
>>> h2o_df = h2o.import_file("http://s3.amazonaws.com/h2o-public-test-data/smal
ldata/prostate/prostate.csv.zip")
>>> my_model = H2OGeneralizedLinearEstimator(family = "binomial")
>>> my_model.train(y = "CAPSULE",
...                x = ["AGE", "RACE", "PSA", "GLEASON"],
...                training_frame = h2o_df)
>>> h2o.save_model(my_model, path='', force=True)
File:      ~/miniconda3/envs/h20/lib/python3.7/site-packages/h2o/h2o.py
Type:      function
```

In [ ]:

In [ ]:

In [10]:
```
X_test = sparse.load_npz("../processed_data/full_raw_keyword_bow_test_sparse.npz")
X_test = h2o.H2OFrame(X_test)
```

```
Parse progress: |████████████████████████████████████████████████████████| 100%
```

In [19]:
```
predictions = aml.predict(X_test)
```

```
stackedensemble prediction progress: |████████ (failed)

---------------------------------------------------------------------------
OSError                                   Traceback (most recent call last)
<ipython-input-19-abdfdb4e54e0> in <module>
----> 1 predictions = aml.predict(X_test)

~/miniconda3/envs/h20/lib/python3.7/site-packages/h2o/automl/autoh2o.py in pred
ict(self, test_data)
    516             leader = self.leader
    517         if leader is not None:
--> 518             return leader.predict(test_data)
    519         print("No model built yet...")
    520

~/miniconda3/envs/h20/lib/python3.7/site-packages/h2o/model/model_base.py in pr
edict(self, test_data, custom_metric, custom_metric_func)
    232         j = H2OJob(h2o.api("POST /4/Predictions/models/%s/frames/%s" %
(self.model_id, test_data.frame_id), data = {'custom_metric_func': custom_metri
c_func}),
    233                    self._model_json["algo"] + " prediction")
--> 234         j.poll()
    235         return h2o.get_frame(j.dest_key)
    236

~/miniconda3/envs/h20/lib/python3.7/site-packages/h2o/job.py in poll(self, poll
_updates)
     76             if (isinstance(self.job, dict)) and ("stacktrace" in list(s
elf.job)):
     77                 raise EnvironmentError("Job with key {} failed with an
exception: {}\nstacktrace: "
---> 78                                        "\n{}".format(self.job_key, sel
f.exception, self.job["stacktrace"]))
     79             else:
     80                 raise EnvironmentError("Job with key %s failed with an
exception: %s" % (self.job_key, self.exception))

OSError: Job with key $03017f00000132d4ffffffff$_8196bb3b970f73b7e68fec28eb254b
20 failed with an exception: java.lang.NullPointerException
stacktrace:
java.lang.NullPointerException
        at water.MRTask.dfork(MRTask.java:453)
        at water.MRTask.doAll(MRTask.java:390)
        at water.MRTask.doAll(MRTask.java:397)
        at hex.glm.GLMModel.predictScoreImpl(GLMModel.java:1734)
        at hex.Model.score(Model.java:1470)
        at hex.ensemble.StackedEnsembleModel.predictScoreImpl(StackedEnsembleMo
del.java:146)
        at hex.Model.score(Model.java:1470)
        at water.api.ModelMetricsHandler$1.compute2(ModelMetricsHandler.java:38
1)
        at water.H2O$H2OCountedCompleter.compute(H2O.java:1468)
        at jsr166y.CountedCompleter.exec(CountedCompleter.java:468)
        at jsr166y.ForkJoinTask.doExec(ForkJoinTask.java:263)
        at jsr166y.ForkJoinPool$WorkQueue.runTask(ForkJoinPool.java:974)
        at jsr166y.ForkJoinPool.runWorker(ForkJoinPool.java:1477)
        at jsr166y.ForkJoinWorkerThread.run(ForkJoinWorkerThread.java:104)
```

In [ ]:
```

```

In [ ]:

In [22]:
```
# Shut down and release RAM
h2o.cluster().shutdown()
```

```
H2O session _sid_9ab8 closed.
```

In [ ]: