Demo gen?rica

October 26, 2018

Anteriormente habíamos comprovado cómo es interesante usar PCA después de la extracción de features aleatorios. Ahora vamos a ver cómo se comporta con RandomForest, pero vamos a usar un dataset más adecuado que antes, uno que solo tiene variables numéricas.

En principio esto solo hay que implementarlo en python

```
In [1]: %%javascript
        IPython.OutputArea.prototype._should_scroll = function(lines) {
            return false;
        }
```

```
<IPython.core.display.Javascript object>
```

```
In [2]: path = "../../datasets/falldetection/falldetection.csv"
```

```
In [3]: import pandas as pd
        import numpy as np
        from sklearn.ensemble import RandomForestClassifier
        from sklearn.tree import DecisionTreeClassifier
        from sklearn.svm import LinearSVC
        from sklearn.kernel_approximation import RBFSampler
        from sklearn import datasets
        from sklearn.decomposition import PCA
        from sklearn.pipeline import Pipeline
        import matplotlib.pyplot as plt
        import math
        import ipywidgets as widgets
        from IPython.display import clear_output
        #from markdown import markdown as md
        from IPython.display import Markdown as md
        from sklearn.ensemble import BaggingClassifier
        from sklearn.linear_model import LogisticRegression
        from sklearn.preprocessing import scale
        from sklearn.kernel_approximation import Nystroem
        #df = pd.read_csv(path)
```

```
In [4]: def get_data(d, prop_train = 2/3, perform_normalization = True):
            dsize = size_selector.value
```

```
if d == "fall_detection":
    df = pd.read_csv(path)
    #N = df.shape[0]
    if dsize == -1: dsize = df.shape[0]
    N = min(df.shape[0], dsize)
    df = df.sample(n = N)

    #prop_train = 2 / 3
    N_train = np.ceil(N * prop_train).astype(np.int64)
    N_test = N - N_train

    data = df.drop(["ACTIVITY"], 1)
    target = df.ACTIVITY


    if perform_normalization:
        data = pd.DataFrame(scale(data.astype(np.float64)))

    data_train = data.iloc[:N_train]
    data_test = data.iloc[N_train:]

    target_train = target[:N_train]
    target_test = target[N_train:]

    return data_train, data_test, target_train, target_test
elif d == "digits":
    digits = datasets.load_digits()
    target = digits.target
    data = digits.data

    #data /= 16
    #data -= data.mean(axis=0)
    if perform_normalization:
        data = scale(data.astype(np.float64))

    N = data.shape[0]
    #prop_train = 2 / 3
    N_train = math.ceil(N * prop_train)
    N_test = N - N_train

    data_train = data[:N_train]
    data_test = data[N_train:]

    target_train = target[:N_train]
    target_test = target[N_train:]

    return data_train, data_test, target_train, target_test
elif d == "full_covertype":
```

```
    p = "../../datasets/covertype/full_covertype_cleaned.csv"
    df = pd.read_csv(p)

    if dsize == -1: dsize = df.shape[0]
    N = min(df.shape[0], dsize)
    df = df.sample(n = N)

    #N = data.shape[0]
    #prop_train = 2 / 3
    N_train = np.ceil(N * prop_train).astype(np.int64)
    N_test = N - N_train

    target = df.target
    data = df.drop(labels = "target", axis = 1)

    if perform_normalization:
        data = pd.DataFrame(scale(data.astype(np.float64)))

    data_train = data.iloc[:N_train]
    data_test = data.iloc[N_train:]
    target_train = target.iloc[:N_train]
    target_test = target.iloc[N_train:]
    return data_train, data_test, target_train, target_test
elif d == "subset_covertype":
    p = "/home/hobber/git/TFG/code/datasets/covertype/4900_covertype_cleaned.csv"
    df = pd.read_csv(p)

    if dsize == -1: dsize = df.shape[0]
    N = min(df.shape[0], dsize)
    df = df.sample(n = N)

    #N = data.shape[0]
    #prop_train = 2 / 3
    N_train = np.ceil(N * prop_train).astype(np.int64)
    N_test = N - N_train

    target = df.target
    data = df.drop(labels = "target", axis = 1)

    if perform_normalization:
        data = pd.DataFrame(scale(data.astype(np.float64)))

    data_train = data.iloc[:N_train]
    data_test = data.iloc[N_train:]
    target_train = target.iloc[:N_train]
    target_test = target.iloc[N_train:]
    return data_train, data_test, target_train, target_test
else:
```

```
            print("No such dataset")

    N = df.shape[0]
    prop_train = 2 / 3 N_train = np.ceil(N * prop_train).astype(np.int64) N_test = N - N_train
    data = df.drop(["ACTIVITY"], 1) target = df.ACTIVITY
    data_train = data.iloc[:N_train] data_test = data.iloc[N_train:]
    target_train = target[:N_train] target_test = target[N_train:]

In [5]: def linearSVM_graph():
            SVM_clf = LinearSVC(max_iter=999999)
            data_train, data_test, target_train, target_test = get_data(dataset_selector.value)

            sub_progress_bar.min = 0
            sub_progress_bar.max = 2
            sub_progress_bar.value = 0

            SVM_clf.fit(data_train, target_train)

            sub_progress_bar.value += 1

            SVM_train_score = SVM_clf.score(data_train, target_train)
            SVM_test_score = SVM_clf.score(data_test, target_test)

            sub_progress_bar.value += 1

            train_dic = {
                'absi': [feats[0], feats[-1]],
                'ord': [SVM_train_score, SVM_train_score],
                'label': 'LinearSVM Train score'
            }

            test_dic = {
                'absi': [feats[0], feats[-1]],
                'ord': [SVM_test_score, SVM_test_score],
                'label': 'SVM Test score'
            }
            return train_dic, test_dic
            #return DT_train_score, DT_test_score

In [6]: def logit_graph():
            logit_clf = LogisticRegression(C = 1, multi_class = 'multinomial', solver = 'lbfgs
            data_train, data_test, target_train, target_test = get_data(dataset_selector.value)

            sub_progress_bar.min = 0
            sub_progress_bar.max = 2
            sub_progress_bar.value = 0

            logit_clf.fit(data_train, target_train)
```

```
            sub_progress_bar.value += 1

            logit_train_score = logit_clf.score(data_train, target_train)
            logit_test_score = logit_clf.score(data_test, target_test)

            sub_progress_bar.value += 1

            train_dic = {
                'absi': [feats[0], feats[-1]],
                'ord': [logit_train_score, logit_train_score],
                'label': 'Logit Train score'
            }

            test_dic = {
                'absi': [feats[0], feats[-1]],
                'ord': [logit_test_score, logit_test_score],
                'label': 'Logit Test score'
            }
            return train_dic, test_dic

In [7]: def dt_graph():
            DT_clf = DecisionTreeClassifier()
            data_train, data_test, target_train, target_test = get_data(dataset_selector.value)
            DT_clf.fit(data_train, target_train)
            DT_train_score = DT_clf.score(data_train, target_train)
            DT_test_score = DT_clf.score(data_test, target_test)

            train_dic = {
                'absi': [feats[0], feats[-1]],
                'ord': [DT_train_score, DT_train_score],
                'label': 'DT Train score'
            }

            test_dic = {
                'absi': [feats[0], feats[-1]],
                'ord': [DT_test_score, DT_test_score],
                'label': 'DT Test score'
            }
            return train_dic, test_dic
            #return DT_train_score, DT_test_score

In [8]: def rf_graph():
            RF_clf = RandomForestClassifier(n_estimators = n_estimators_selector.value)
            data_train, data_test, target_train, target_test = get_data(dataset_selector.value)

            sub_progress_bar.min = 0
            sub_progress_bar.max = 2
```

```
        sub_progress_bar.value = 0

        RF_clf.fit(data_train, target_train)

        sub_progress_bar.value += 1

        RF_train_score = RF_clf.score(data_train, target_train)
        RF_test_score = RF_clf.score(data_test, target_test)

        sub_progress_bar.value += 1

        train_dic = {
            'absi': [feats[0], feats[-1]],
            'ord': [RF_train_score, RF_train_score],
            'label': 'RF Train score'
        }

        test_dic = {
            'absi': [feats[0], feats[-1]],
            'ord': [RF_test_score, RF_test_score],
            'label': 'RF Test score'
        }
        return train_dic, test_dic
        #return RF_train_score, RF_test_score

In [9]: def nystroem_pca_rf_blackbox_graph():
        NYS_PCA_RF_clf = Pipeline([
            #("sampler",RBFSampler(gamma = 0.2)),
            ("sampler",Nystroem(gamma=0.2)),
            ("pca", PCA(n_components = 0.9, svd_solver = "full")),
            ("clf", RandomForestClassifier(n_estimators = n_estimators_selector.value))
        ])

        NYS_PCA_RF_train_scores = []
        NYS_PCA_RF_test_scores = []
        data_train, data_test, target_train, target_test = get_data(dataset_selector.value)

        sub_progress_bar.min = 0
        sub_progress_bar.max = len(feats)
        sub_progress_bar.value = 0

        for f in feats:
            NYS_PCA_RF_clf.set_params(sampler__n_components = f)
            NYS_PCA_RF_clf.fit(data_train, target_train)
            train_score = NYS_PCA_RF_clf.score(data_train, target_train)
            test_score = NYS_PCA_RF_clf.score(data_test, target_test)

            NYS_PCA_RF_train_scores.append(train_score)
```

```
        NYS_PCA_RF_test_scores.append(test_score)

        sub_progress_bar.value += 1


    train_dic = {
        'absi': feats,
        'ord': NYS_PCA_RF_train_scores,
        'label': 'NYS_PCA_RF (Black Box)Train scores'
    }

    test_dic = {
        'absi': feats,
        'ord': NYS_PCA_RF_test_scores,
        'label': 'NYS_PCA_RF (Black Box) Test scores'
    }
    return train_dic, test_dic
    #return RBF_PCA_RF_train_scores, RBF_PCA_RF_test_scores


In [10]: def rbf_pca_rf_blackbox_graph():
     RBF_PCA_RF_clf = Pipeline([
         ("sampler",RBFSampler(gamma = 0.2)),
         ("pca", PCA(n_components = 0.9, svd_solver = "full")),
         ("clf", RandomForestClassifier(n_estimators = n_estimators_selector.value))
     ])

     RBF_PCA_RF_train_scores = []
     RBF_PCA_RF_test_scores = []
     data_train, data_test, target_train, target_test = get_data(dataset_selector.valu

     sub_progress_bar.min = 0
     sub_progress_bar.max = len(feats)
     sub_progress_bar.value = 0

     for f in feats:
         RBF_PCA_RF_clf.set_params(sampler__n_components = f)
         RBF_PCA_RF_clf.fit(data_train, target_train)
         train_score = RBF_PCA_RF_clf.score(data_train, target_train)
         test_score = RBF_PCA_RF_clf.score(data_test, target_test)

         RBF_PCA_RF_train_scores.append(train_score)
         RBF_PCA_RF_test_scores.append(test_score)

         sub_progress_bar.value += 1


     train_dic = {
```

```
        'absi': feats,
        'ord': RBF_PCA_RF_train_scores,
        'label': 'RBF_PCA_RF (Black Box)Train scores'
    }

    test_dic = {
        'absi': feats,
        'ord': RBF_PCA_RF_test_scores,
        'label': 'RBF_PCA_RF (Black Box) Test scores'
    }
    return train_dic, test_dic
    #return RBF_PCA_RF_train_scores, RBF_PCA_RF_test_scores


In [11]: def nystroem_pca_dt_graph():
    NYS_PCA_DT_clf = Pipeline([
        ("sampler",Nystroem(gamma = 0.2)),
        ("pca", PCA(n_components = 0.9, svd_solver = "full")),
        ("clf", DecisionTreeClassifier())
    ])

    NYS_PCA_DT_train_scores = []
    NYS_PCA_DT_test_scores = []
    data_train, data_test, target_train, target_test = get_data(dataset_selector.value

    sub_progress_bar.min = 0
    sub_progress_bar.max = len(feats)
    sub_progress_bar.value = 0

    for f in feats:
        NYS_PCA_DT_clf.set_params(sampler__n_components = f)
        NYS_PCA_DT_clf.fit(data_train, target_train)
        train_score = NYS_PCA_DT_clf.score(data_train, target_train)
        test_score = NYS_PCA_DT_clf.score(data_test, target_test)

        NYS_PCA_DT_train_scores.append(train_score)
        NYS_PCA_DT_test_scores.append(test_score)

        sub_progress_bar.value += 1


    train_dic = {
        'absi': feats,
        'ord': NYS_PCA_DT_train_scores,
        'label': 'NYS_PCA_DT Train scores'
    }

    test_dic = {
```

```
            'absi': feats,
            'ord': NYS_PCA_DT_test_scores,
            'label': 'NYS_PCA_DT Test scores'
        }
        return train_dic, test_dic
        #return RBF_PCA_DT_train_scores, RBF_PCA_DT_test_scores
```

In [12]:
```
def rbf_pca_dt_graph():
    RBF_PCA_DT_clf = Pipeline([
        ("sampler",RBFSampler(gamma = 0.2)),
        ("pca", PCA(n_components = 0.9, svd_solver = "full")),
        ("clf", DecisionTreeClassifier())
    ])

    RBF_PCA_DT_train_scores = []
    RBF_PCA_DT_test_scores = []
    data_train, data_test, target_train, target_test = get_data(dataset_selector.value

    sub_progress_bar.min = 0
    sub_progress_bar.max = len(feats)
    sub_progress_bar.value = 0

    for f in feats:
        RBF_PCA_DT_clf.set_params(sampler__n_components = f)
        RBF_PCA_DT_clf.fit(data_train, target_train)
        train_score = RBF_PCA_DT_clf.score(data_train, target_train)
        test_score = RBF_PCA_DT_clf.score(data_test, target_test)

        RBF_PCA_DT_train_scores.append(train_score)
        RBF_PCA_DT_test_scores.append(test_score)

        sub_progress_bar.value += 1


    train_dic = {
        'absi': feats,
        'ord': RBF_PCA_DT_train_scores,
        'label': 'RBF_PCA_DT Train scores'
    }

    test_dic = {
        'absi': feats,
        'ord': RBF_PCA_DT_test_scores,
        'label': 'RBF_PCA_DT Test scores'
    }
    return train_dic, test_dic
    #return RBF_PCA_DT_train_scores, RBF_PCA_DT_test_scores
```

In [13]:
```
def nystroem_pca_linearSVM_greybox_graph():
```

```
            sub_clf = Pipeline([
                ("sampler",Nystroem(gamma = 0.2)),
                ("pca", PCA(n_components = 0.9, svd_solver = "full")),
                ("clf", LinearSVC(C = 1))
            ])

            NYS_PCA_linearSVM_clf = BaggingClassifier(
                base_estimator = sub_clf,
                n_estimators = n_estimators_selector.value,
                bootstrap = True)


            NYS_PCA_linearSVM_train_scores = []
            NYS_PCA_linearSVM_test_scores = []

            sub_progress_bar.min = 0
            sub_progress_bar.max = len(feats)
            sub_progress_bar.value = 0

            data_train, data_test, target_train, target_test = get_data(dataset_selector.value
            for f in feats:
                NYS_PCA_linearSVM_clf.set_params(base_estimator__sampler__n_components = f)
                NYS_PCA_linearSVM_clf.fit(data_train, target_train)
                train_score = NYS_PCA_linearSVM_clf.score(data_train, target_train)
                test_score = NYS_PCA_linearSVM_clf.score(data_test, target_test)

                NYS_PCA_linearSVM_train_scores.append(train_score)
                NYS_PCA_linearSVM_test_scores.append(test_score)

                sub_progress_bar.value += 1


            train_dic = {
                'absi': feats,
                'ord': NYS_PCA_linearSVM_train_scores,
                'label': 'NYS_PCA_LinearSVM (Grey Box)Train scores'
            }

            test_dic = {
                'absi': feats,
                'ord': NYS_PCA_linearSVM_test_scores,
                'label': 'NYS_PCA_LinearSVM (Grey Box) Test scores'
            }
            return train_dic, test_dic

In [14]: def rbf_pca_linearSVM_greybox_graph():
            sub_clf = Pipeline([
                ("sampler",RBFSampler(gamma = 0.2)),
```

```
        ("pca", PCA(n_components = 0.9, svd_solver = "full")),
        ("clf", LinearSVC(C = 1))
    ])

    RBF_PCA_linearSVM_clf = BaggingClassifier(
        base_estimator = sub_clf,
        n_estimators = n_estimators_selector.value,
        bootstrap = True)


    RBF_PCA_linearSVM_train_scores = []
    RBF_PCA_linearSVM_test_scores = []

    sub_progress_bar.min = 0
    sub_progress_bar.max = len(feats)
    sub_progress_bar.value = 0

    data_train, data_test, target_train, target_test = get_data(dataset_selector.value
    for f in feats:
        RBF_PCA_linearSVM_clf.set_params(base_estimator__sampler__n_components = f)
        RBF_PCA_linearSVM_clf.fit(data_train, target_train)
        train_score = RBF_PCA_linearSVM_clf.score(data_train, target_train)
        test_score = RBF_PCA_linearSVM_clf.score(data_test, target_test)

        RBF_PCA_linearSVM_train_scores.append(train_score)
        RBF_PCA_linearSVM_test_scores.append(test_score)

        sub_progress_bar.value += 1


    train_dic = {
        'absi': feats,
        'ord': RBF_PCA_linearSVM_train_scores,
        'label': 'RBF_PCA_LinearSVM (Grey Box)Train scores'
    }

    test_dic = {
        'absi': feats,
        'ord': RBF_PCA_linearSVM_test_scores,
        'label': 'RBF_PCA_LinearSVM (Grey Box) Test scores'
    }
    return train_dic, test_dic
```

In [15]:
```
def nystroem_pca_logit_greybox_graph():
    sub_clf = Pipeline([
        ("sampler",Nystroem(gamma = 0.2)),
        ("pca", PCA(n_components = 0.9, svd_solver = "full")),
        ("clf", LogisticRegression(C = 1, multi_class = 'multinomial', solver = 'lbfg
```

```
    ])

    NYS_PCA_logit_clf = BaggingClassifier(
        base_estimator = sub_clf,
        n_estimators = n_estimators_selector.value,
        bootstrap = True)


    NYS_PCA_logit_train_scores = []
    NYS_PCA_logit_test_scores = []

    sub_progress_bar.min = 0
    sub_progress_bar.max = len(feats)
    sub_progress_bar.value = 0

    data_train, data_test, target_train, target_test = get_data(dataset_selector.value
    for f in feats:
        NYS_PCA_logit_clf.set_params(base_estimator__sampler__n_components = f)
        NYS_PCA_logit_clf.fit(data_train, target_train)
        train_score = NYS_PCA_logit_clf.score(data_train, target_train)
        test_score = NYS_PCA_logit_clf.score(data_test, target_test)

        NYS_PCA_logit_train_scores.append(train_score)
        NYS_PCA_logit_test_scores.append(test_score)

        sub_progress_bar.value += 1


    train_dic = {
        'absi': feats,
        'ord': NYS_PCA_logit_train_scores,
        'label': 'NYS_PCA_Logit (Grey Box)Train scores'
    }

    test_dic = {
        'absi': feats,
        'ord': NYS_PCA_logit_test_scores,
        'label': 'NYS_PCA_Logit (Grey Box) Test scores'
    }
    return train_dic, test_dic

In [16]: def rbf_pca_logit_greybox_graph():
    sub_clf = Pipeline([
        ("sampler",RBFSampler(gamma = 0.2)),
        ("pca", PCA(n_components = 0.9, svd_solver = "full")),
        ("clf", LogisticRegression(C = 1, multi_class = 'multinomial', solver = 'lbfg
    ])
```

```
            RBF_PCA_logit_clf = BaggingClassifier(
                base_estimator = sub_clf,
                n_estimators = n_estimators_selector.value,
                bootstrap = True)


            RBF_PCA_logit_train_scores = []
            RBF_PCA_logit_test_scores = []

            sub_progress_bar.min = 0
            sub_progress_bar.max = len(feats)
            sub_progress_bar.value = 0

            data_train, data_test, target_train, target_test = get_data(dataset_selector.valu
            for f in feats:
                RBF_PCA_logit_clf.set_params(base_estimator__sampler__n_components = f)
                RBF_PCA_logit_clf.fit(data_train, target_train)
                train_score = RBF_PCA_logit_clf.score(data_train, target_train)
                test_score = RBF_PCA_logit_clf.score(data_test, target_test)

                RBF_PCA_logit_train_scores.append(train_score)
                RBF_PCA_logit_test_scores.append(test_score)

                sub_progress_bar.value += 1


            train_dic = {
                'absi': feats,
                'ord': RBF_PCA_logit_train_scores,
                'label': 'RBF_PCA_Logit (Grey Box)Train scores'
            }

            test_dic = {
                'absi': feats,
                'ord': RBF_PCA_logit_test_scores,
                'label': 'RBF_PCA_Logit (Grey Box) Test scores'
            }
            return train_dic, test_dic

In [17]: def nystroem_pca_rf_greybox_graph():
            sub_clf = Pipeline([
                ("sampler",Nystroem(gamma=0.2)),
                ("pca", PCA(n_components = 0.9, svd_solver = "full")),
                ("clf", DecisionTreeClassifier())
            ])

            NYS_PCA_RF_clf = BaggingClassifier(
                base_estimator = sub_clf,
```

```
        n_estimators = n_estimators_selector.value,
        bootstrap = True)


    NYS_PCA_RF_train_scores = []
    NYS_PCA_RF_test_scores = []
    data_train, data_test, target_train, target_test = get_data(dataset_selector.valu

    sub_progress_bar.min = 0
    sub_progress_bar.max = len(feats)
    sub_progress_bar.value = 0

    for f in feats:
        NYS_PCA_RF_clf.set_params(base_estimator__sampler__n_components = f)
        NYS_PCA_RF_clf.fit(data_train, target_train)
        train_score = NYS_PCA_RF_clf.score(data_train, target_train)
        test_score = NYS_PCA_RF_clf.score(data_test, target_test)

        NYS_PCA_RF_train_scores.append(train_score)
        NYS_PCA_RF_test_scores.append(test_score)

        sub_progress_bar.value += 1


    train_dic = {
        'absi': feats,
        'ord': NYS_PCA_RF_train_scores,
        'label': 'NYS_PCA_RF (Grey Box)Train scores'
    }

    test_dic = {
        'absi': feats,
        'ord': NYS_PCA_RF_test_scores,
        'label': 'NYS_PCA_RF (Grey Box) Test scores'
    }
    return train_dic, test_dic
```

In [18]:
```
def rbf_pca_rf_greybox_graph():
    sub_clf = Pipeline([
        ("sampler",RBFSampler(gamma = 0.2)),
        ("pca", PCA(n_components = 0.9, svd_solver = "full")),
        ("clf", DecisionTreeClassifier())
    ])

    RBF_PCA_RF_clf = BaggingClassifier(
        base_estimator = sub_clf,
        n_estimators = n_estimators_selector.value,
        bootstrap = True)
```

```
    RBF_PCA_RF_train_scores = []
    RBF_PCA_RF_test_scores = []
    data_train, data_test, target_train, target_test = get_data(dataset_selector.value

    sub_progress_bar.min = 0
    sub_progress_bar.max = len(feats)
    sub_progress_bar.value = 0

    for f in feats:
        RBF_PCA_RF_clf.set_params(base_estimator__sampler__n_components = f)
        RBF_PCA_RF_clf.fit(data_train, target_train)
        train_score = RBF_PCA_RF_clf.score(data_train, target_train)
        test_score = RBF_PCA_RF_clf.score(data_test, target_test)

        RBF_PCA_RF_train_scores.append(train_score)
        RBF_PCA_RF_test_scores.append(test_score)

        sub_progress_bar.value += 1


    train_dic = {
        'absi': feats,
        'ord': RBF_PCA_RF_train_scores,
        'label': 'RBF_PCA_RF (Grey Box)Train scores'
    }

    test_dic = {
        'absi': feats,
        'ord': RBF_PCA_RF_test_scores,
        'label': 'RBF_PCA_RF (Grey Box) Test scores'
    }
    return train_dic, test_dic
```

In [19]:
```
def show_graphs(e):
    if clear_output_button.value:
        clear_output()
        display(gui)
    display(md("Using dataset **" + str(dataset_selector.value) + "** with **" + str(
    global feats
    feats = list(range(*(features_selector.value), features_selector.step))
    feats2 = np.linspace(*(features_selector.value), dtype = np.int64)
    if len(feats2) <= len(feats):
        feats = feats2
    train_dicts = []
    test_dicts = []
```

```
                progress_bar.min = 0
                progress_bar.max = sum([i.value for i in ch_boxes])
                progress_bar.value = 0

                for i in range(len(ch_boxes)):
                    if ch_boxes[i].value:
                        train_dic, test_dic = models[i]()
                        train_dicts.append(train_dic)
                        test_dicts.append(test_dic)
                        progress_bar.value += 1

                fig = plt.figure(figsize=(20,5))
                test_graph = fig.add_subplot(121)
                train_graph = fig.add_subplot(122, sharey = test_graph)

                for i in test_dicts:
                    test_graph.plot(i['absi'], i['ord'], label = i['label'])
                for i in train_dicts:
                    train_graph.plot(i['absi'], i['ord'], label = i['label'])

                tit = ("Using dataset **" +
                       str(dataset_selector.value) +
                       "** with **" +
                    str(n_estimators_selector.value) +
                    "** estimators")
                plt.title(tit)
                train_graph.grid(True)
                test_graph.grid(True)
                train_graph.legend()
                test_graph.legend()
                plt.xlabel("Number of features")
                plt.ylabel("Accuracy")
```

```
In [20]: def show_graphs_deprecated(e):
                if clear_output_button.value:
                    clear_output()
                    display(gui)
                display(md("Using dataset **" + str(dataset_selector.value) + "** with **" + str(
                global feats
                feats = list(range(*(features_selector.value), features_selector.step))
                feats2 = np.linspace(*(features_selector.value), dtype = np.int64)
                if len(feats2) <= len(feats):
                    feats = feats2
                train_dicts = []
                test_dicts = []
                # Random Forest
                if rf_checkbox.value:
                    RF_train_dic, RF_test_dic = rf_graph()
```

```
    train_dicts.append(RF_train_dic)
    test_dicts.append(RF_test_dic)

# Random Forest
if rbf_pca_rf_blackbox_checkbox.value:
    RBF_PCA_RF_train_dic, RBF_PCA_RF_test_dic = rbf_pca_rf_blackbox_graph()
    train_dicts.append(RBF_PCA_RF_train_dic)
    test_dicts.append(RBF_PCA_RF_test_dic)

if rbf_pca_rf_greybox_checkbox.value:
    RBF_PCA_RF_train_dic, RBF_PCA_RF_test_dic = rbf_pca_rf_greybox_graph()
    train_dicts.append(RBF_PCA_RF_train_dic)
    test_dicts.append(RBF_PCA_RF_test_dic)

# Decision Tree
if rbf_pca_dt_checkbox.value:
    RBF_PCA_DT_train_dic, RBF_PCA_DT_test_dic = rbf_pca_dt_graph()
    train_dicts.append(RBF_PCA_DT_train_dic)
    test_dicts.append(RBF_PCA_DT_test_dic)

# Decision Tree
if dt_checkbox.value:
    DT_train_dic, DT_test_dic = dt_graph()
    train_dicts.append(DT_train_dic)
    test_dicts.append(DT_test_dic)

if linearSVM_checkbox.value:
    LinearSVM_train_dic, LinearSVM_test_dic = linearSVM_graph()
    train_dicts.append(LinearSVM_train_dic)
    test_dicts.append(LinearSVM_test_dic)
if logit_checkbox.value:
    logit_train_dic, logit_test_dic = logit_graph()
    train_dicts.append(logit_train_dic)
    test_dicts.append(logit_test_dic)
if rbf_pca_logit_greybox_checkbox.value:
    rbf_pca_logit_greybox_train_dic, rbf_pca_logit_greybox_test_dic = rbf_pca_log
    train_dicts.append(rbf_pca_logit_greybox_train_dic)
    test_dicts.append(rbf_pca_logit_greybox_test_dic)
if rbf_pca_linearSVM_greybox_checkbox.value:
    rbf_pca_linearSVM_greybox_train_dic, rbf_pca_linearSVM_greybox_test_dic = rbf
    train_dicts.append(rbf_pca_linearSVM_greybox_train_dic)
    test_dicts.append(rbf_pca_linearSVM_greybox_test_dic)
if nystroem_pca_rf_blackbox_checkbox.value:
    nys_pca_rf_blackbox_train_dic, nys_pca_rf_blackbox_test_dic = nystroem_pca_rf
    train_dicts.append(nys_pca_rf_blackbox_train_dic)
    test_dicts.append(nys_pca_rf_blackbox_test_dic)
```

```
        fig = plt.figure(figsize=(20,5))
        test_graph = fig.add_subplot(121)
        train_graph = fig.add_subplot(122, sharey = test_graph)

        for i in test_dicts:
            test_graph.plot(i['absi'], i['ord'], label = i['label'])


        for i in train_dicts:
            train_graph.plot(i['absi'], i['ord'], label = i['label'])


        train_graph.grid(True)
        test_graph.grid(True)
        train_graph.legend()
        test_graph.legend()
        plt.xlabel("Number of features")
        plt.ylabel("Accuracy")
```

In [21]:
```
bt = widgets.Button(
    description='Show graphs',
    disabled=False,
    button_style='success', # 'success', 'info', 'warning', 'danger' or ''
    tooltip='Run the specified methods and show results',
    #icon='check'
)
bt.on_click(show_graphs)

dataset_selector = widgets.Dropdown(
    options=['digits', 'fall_detection','full_covertype','subset_covertype'],
    description='Dataset:'
)
```

In [22]:
```
size_selector = widgets.RadioButtons(
    options={'Small (2000)':2000, 'Medium (4900)':4900, 'Large (10000)':10000, 'Full
    value=2000,
    #description='Pizza topping:',
    disabled=False,
    orientation = 'horizontal'
)

cool_size_selector = widgets.VBox([widgets.Label("Size of the dataset"), size_selecto
```

In [ ]:

```
In [23]: dt_checkbox = widgets.Checkbox(
             value=True,
             description='DecisionTree',
         )

         linearSVM_checkbox = widgets.Checkbox(
             value = True,
             description = 'Linear SVM'
         )

         rf_checkbox = widgets.Checkbox(
             value=True,
             description='Random Forest',
         )



         rbf_pca_dt_checkbox = widgets.Checkbox(
             value=True,
             description='RBF >> PCA >> DT',
         )

         rbf_pca_rf_blackbox_checkbox = widgets.Checkbox(
             value=True,
             description='RBF >> PCA >> RF (Black Box Model)',
             layout={'width': '500px'}
         )

         rbf_pca_rf_greybox_checkbox = widgets.Checkbox(
             value=True,
             description='RBF >> PCA >> RF (Grey Box Model)',
             layout={'width': '500px'}
         )

         logit_checkbox = widgets.Checkbox(
             value=True,
             description='Logit',
             #layout={'width': '500px'}
         )

         rbf_pca_logit_greybox_checkbox = widgets.Checkbox(
             value=True,
             #description='RBF >> PCA >> Logit (Grey Box Model)',
             description='RBF >> PCA >> Logit (Ensemble)',
             layout={'width': '500px'}
         )
```

```
rbf_pca_linearSVM_greybox_checkbox = widgets.Checkbox(
    value=True,
    #description='RBF >> PCA >> LinearSVM (Grey Box Model)',
    description='RBF >> PCA >> LinearSVM (Ensemble)',
    layout={'width': '500px'}
)

nystroem_pca_rf_blackbox_checkbox = widgets.Checkbox(
    value=True,
    #description='RBF >> PCA >> LinearSVM (Grey Box Model)',
    description='Nystroem >> PCA >> RF (Back Box Model)',
    layout={'width': '500px'}
)

nystroem_pca_rf_greybox_checkbox = widgets.Checkbox(
    value=True,
    #description='RBF >> PCA >> LinearSVM (Grey Box Model)',
    description='Nystroem >> PCA >> RF (Grey Box Model)',
    layout={'width': '500px'}
)


nystroem_pca_linearSVM_greybox_checkbox = widgets.Checkbox(
    value=True,
    #description='RBF >> PCA >> LinearSVM (Grey Box Model)',
    description='Nystroem >> PCA >> LinearSVM (Ensemble)',
    layout={'width': '500px'}
)


nystroem_pca_logit_greybox_checkbox = widgets.Checkbox(
    value=True,
    #description='RBF >> PCA >> Logit (Grey Box Model)',
    description='Nystroem >> PCA >> Logit (Ensemble)',
    layout={'width': '500px'}
)

nystroem_pca_dt_checkbox = widgets.Checkbox(
    value=True,
    description='Nystroem >> PCA >> DT',
)
```

In [24]:
```
models = [
    dt_graph,
    linearSVM_graph,
    rbf_pca_linearSVM_greybox_graph,
    logit_graph,
    rbf_pca_logit_greybox_graph,
```

```
    rf_graph,
    rbf_pca_dt_graph,
    rbf_pca_rf_blackbox_graph,
    rbf_pca_rf_greybox_graph,
    nystroem_pca_rf_blackbox_graph,
    nystroem_pca_rf_greybox_graph,
    nystroem_pca_linearSVM_greybox_graph,
    nystroem_pca_logit_greybox_graph,
    nystroem_pca_dt_graph,
]
'''
        dt_graph
        linearSVM_graph
        rbf_pca_linearSVM_greybox_graph
        logit_graph
        rbf_pca_logit_greybox_graph
        rf_graph
        rbf_pca_dt_graph
        rbf_pca_rf_blackbox_graph
        rbf_pca_rf_greybox_graph
        nystroem_pca_rf_blackbox_graph
'''



ch_boxes = [
    dt_checkbox,
    linearSVM_checkbox,
    rbf_pca_linearSVM_greybox_checkbox,
    logit_checkbox,
    rbf_pca_logit_greybox_checkbox,
    rf_checkbox,
    rbf_pca_dt_checkbox,
    rbf_pca_rf_blackbox_checkbox,
    rbf_pca_rf_greybox_checkbox,
    nystroem_pca_rf_blackbox_checkbox,
    nystroem_pca_rf_greybox_checkbox,
    nystroem_pca_linearSVM_greybox_checkbox,
    nystroem_pca_logit_greybox_checkbox,
    nystroem_pca_dt_checkbox,
]
```

In [25]:
```
'''
models_selector = widgets.VBox([
    dt_checkbox,
    linearSVM_checkbox,
    rbf_pca_linearSVM_greybox_checkbox,
```

```
        logit_checkbox,
        rbf_pca_logit_greybox_checkbox,
        rf_checkbox,
        rbf_pca_dt_checkbox,
        rbf_pca_rf_blackbox_checkbox,
        rbf_pca_rf_greybox_checkbox,
        nystroem_pca_rf_blackbox_checkbox,
        nystroem_pca_rf_greybox_checkbox,
    ])
    '''
    #models_selector = widgets.VBox(ch_boxes)
```

Out[25]: '\nmodels_selector = widgets.VBox([\n   dt_checkbox,\n   linearSVM_checkbox,\n   rb

```
In [26]: rbf_models_selector = widgets.VBox([
             rbf_pca_linearSVM_greybox_checkbox,
             rbf_pca_logit_greybox_checkbox,
             rbf_pca_dt_checkbox,
             rbf_pca_rf_greybox_checkbox,
             rbf_pca_rf_blackbox_checkbox,
         ])

         nystroem_models_selector = widgets.VBox([
             nystroem_pca_linearSVM_greybox_checkbox,
             nystroem_pca_logit_greybox_checkbox,
             nystroem_pca_dt_checkbox,
             nystroem_pca_rf_greybox_checkbox,
             nystroem_pca_rf_blackbox_checkbox,
         ])

         normal_models_selector = widgets.VBox([
             linearSVM_checkbox,
             logit_checkbox,
             dt_checkbox,
             rf_checkbox,
         ])

         models_selector = widgets.HBox([
             rbf_models_selector,
             nystroem_models_selector,
             normal_models_selector,
         ])

In [27]: n_estimators_selector = widgets.IntSlider(
             value=10,
             min=10,
             max=200,
             step=5,
```

```
        #description='Number of estimators:',
        orientation='horizontal',
        #readout=True,
        #readout_format='d'
    )

    cool_nest_selector = widgets.HBox([widgets.Label("Number of estimators: "), n_estimat
```

In [28]:
```
clear_output_button = widgets.ToggleButton(
    value=True,
    description='Clear Previous',
    button_style='', # 'success', 'info', 'warning', 'danger' or ''
    tooltip='Clear Previous Output',
    icon='check'
)
```

In [29]:
```
features_selector = widgets.IntRangeSlider(
    value=[30, 150],
    min=30,
    max=500,
    step=10,
    #description='Number of features:',
    #continuous_update=False,
    orientation='horizontal',
    readout=True,
    readout_format='d',
)

cool_features_selector = widgets.HBox([widgets.Label("Range of features: "), features_
```

In [30]:
```
def deselect_all(b):
    for i in ch_boxes:
        i.value = False
    #for i in models_selector.children:
     #   i.value = False

def select_all(b):
    for i in ch_boxes:
        i.value = True
    #for i in models_selector.children:
     #   i.value = True
```

In [31]:
```
select_all_button = widgets.Button(
    description='Select All',
    disabled=False,
    button_style='info', # 'success', 'info', 'warning', 'danger' or ''
    tooltip='Select all models',
    #icon='check'
```

```
        )
        select_all_button.on_click(select_all)
```

```
In [32]: deselect_all_button = widgets.Button(
             description='Deselect All',
             disabled=False,
             button_style='info', # 'success', 'info', 'warning', 'danger' or ''
             tooltip='Select all models',
             #icon='check'
         )
         deselect_all_button.on_click(deselect_all)
```

```
In [33]: progress_bar = widgets.IntProgress(
             value=0,
             min=0,
             max=10,
             step=1,
             description='Calculating:',
             bar_style='info', # 'success', 'info', 'warning', 'danger' or ''
             orientation='horizontal'
         )
```

```
In [34]: sub_progress_bar = widgets.IntProgress(
             value=0,
             min=0,
             max=10,
             step=1,
             #description='',
             bar_style='info', # 'success', 'info', 'warning', 'danger' or ''
             orientation='horizontal'
         )
```

```
In [35]: gui = widgets.VBox([
             cool_size_selector,
             dataset_selector,
             models_selector,
             select_all_button,
             deselect_all_button,
             cool_nest_selector,
             cool_features_selector,
             bt,
             clear_output_button,
             progress_bar,
             sub_progress_bar,
         ])
```

```
In [36]: n_estimators_selector.value = 100
```

```
In [37]: display(gui)
```

```
VBox(children=(VBox(children=(Label(value='Size of the dataset'), RadioButtons(options={'Small
```

Vienen ahora una demos para comprobar cosas específicas

```
In [38]: # Acciones:
         # Usar los modelos simples para cada uno de los datasets
         # Observaciones:
         #
         def demo1(e):
             size_selector.value = 2000

             deselect_all(None)

             linearSVM_checkbox.value = True
             logit_checkbox.value = True
             dt_checkbox.value = True
             rf_checkbox.value = True

             n_estimators_selector.value = 100

             clear_output_button.value = False

             #datasets = ['digits', 'fall_detection','subset_covertype', "full_covertype"]
             datasets = ['digits', 'fall_detection','subset_covertype']
             for d in datasets:
                 dataset_selector.value = d
                 show_graphs(None)
```

```
In [39]: # Acciones:
         # Todos los modelos que usan RBF con cada uno de los datasets
         #
         #
         def demo2(e):
             size_selector.value = 2000

             deselect_all(None)

             rbf_pca_dt_checkbox.value = True
             rbf_pca_rf_blackbox_checkbox.value = True
             rbf_pca_rf_greybox_checkbox.value = True
             rbf_pca_logit_greybox_checkbox.value = True
             rbf_pca_linearSVM_greybox_checkbox.value = True


             n_estimators_selector.value = 30

             features_selector.min = 50
```

```
        features_selector.max = 200
        features_selector.step = 10

        clear_output_button.value = False

        #datasets = ['digits', 'fall_detection','subset_covertype', "full_covertype"]
        datasets = ['digits', 'fall_detection','subset_covertype']
        for d in datasets:
            dataset_selector.value = d
            show_graphs(None)
```

In [40]:
```
# Acciones:
# Todos los modelos que usan Nystroem con cada uno de los datasets
#
#
def demo3(e):
    size_selector.value = 2000

    deselect_all(None)


    nystroem_pca_rf_blackbox_checkbox.value = True
    nystroem_pca_rf_greybox_checkbox.value = True
    nystroem_pca_linearSVM_greybox_checkbox.value = True
    nystroem_pca_logit_greybox_checkbox.value = True
    nystroem_pca_dt_checkbox.value = True


    n_estimators_selector.value = 30

    features_selector.min = 50
    features_selector.max = 200
    features_selector.step = 10

    clear_output_button.value = False

    #datasets = ['digits', 'fall_detection','subset_covertype', "full_covertype"]
    datasets = ['digits', 'fall_detection','subset_covertype']
    for d in datasets:
        dataset_selector.value = d
        show_graphs(None)
```

In [41]:
```
# currentwork
# Acciones:
# Todos los modelos de DT, que son 4, con cada uno de los datasets
#
#
def demo4(e):
```

```
        size_selector.value = 2000

        deselect_all(None)


        dt_checkbox.value = True
        rbf_pca_dt_checkbox.value = True
        nystroem_pca_dt_checkbox.value = True


        n_estimators_selector.value = 30

        features_selector.min = 50
        features_selector.max = 200
        features_selector.step = 10

        clear_output_button.value = False

        #datasets = ['digits', 'fall_detection','subset_covertype', "full_covertype"]
        datasets = ['digits', 'fall_detection','subset_covertype']
        for d in datasets:
            dataset_selector.value = d
            show_graphs(None)
```

In [42]:
```
def run_all_demos(e):
    for i in range(1,5):
        exec('demo{0}(None)'.format(i))
```

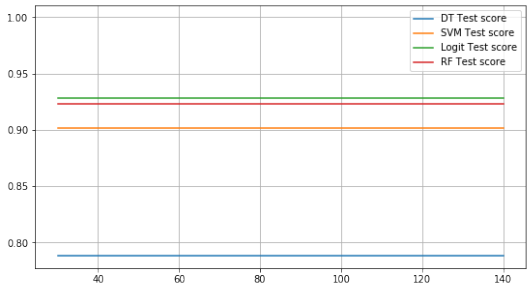
In [43]:
```
demos_str = '''bt_demo{0} = widgets.Button(
    description='Demo {0}',
    #disabled=False,
    button_style='warning', # 'success', 'info', 'warning', 'danger' or ''
    tooltip='Run Demo{0}',
    #icon='check'
)
bt_demo{0}.on_click(demo{0})
'''
all_demos_bt = widgets.Button(
    description = 'Run all demos',
    button_style = 'success',
    tooltip='Run all demos',
)

all_demos_bt.on_click(run_all_demos)
```

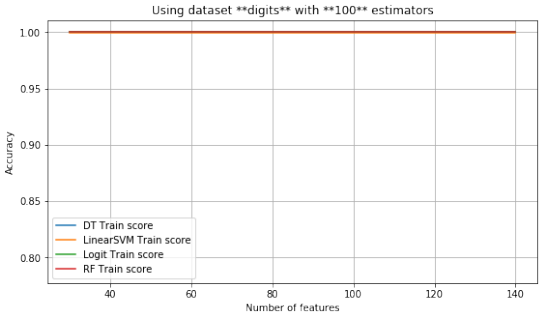
In [45]:
```
display(bt_demo1)
```

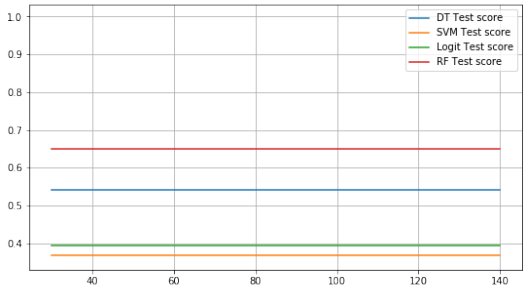
```
Button(button_style='warning', description='Demo 1', style=ButtonStyle(), tooltip='Run Demo1')
```

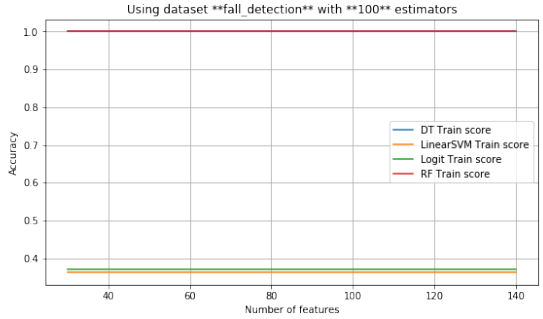
Using dataset **digits** with **100** estimators
Using dataset **fall_detection** with **100** estimators
Using dataset **subset_covertype** with **100** estimators

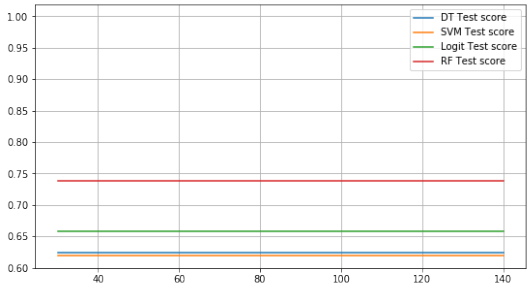
```
/home/hobber/.local/lib/python3.6/site-packages/sklearn/linear_model/logistic.py:757: Converge
  "of iterations.", ConvergenceWarning)
```

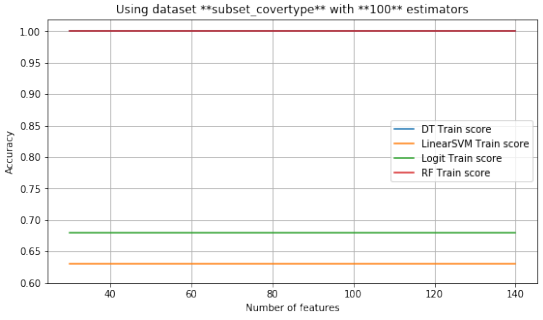








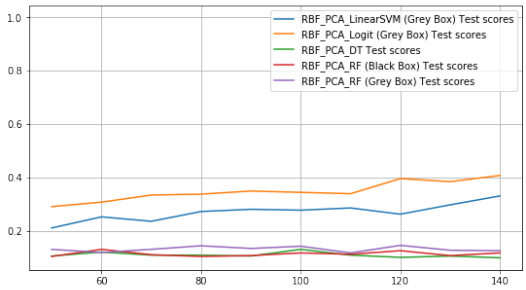


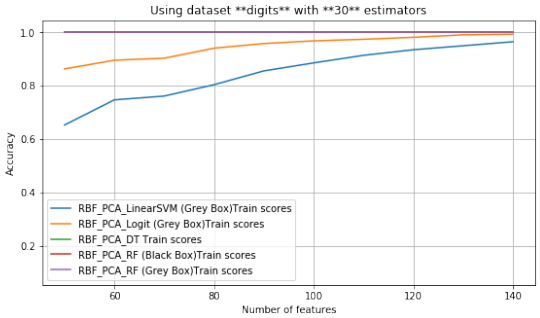


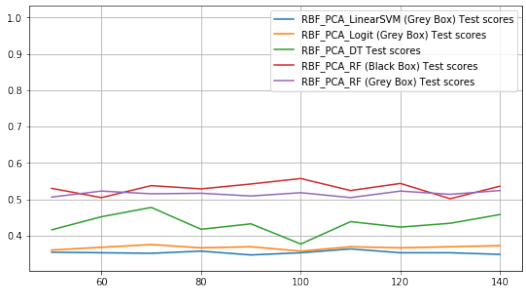
In [46]: `display(bt_demo2)`

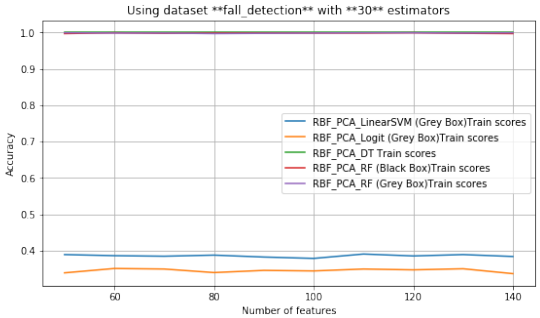
```
Button(button_style='warning', description='Demo 2', style=ButtonStyle(), tooltip='Run Demo2')
```

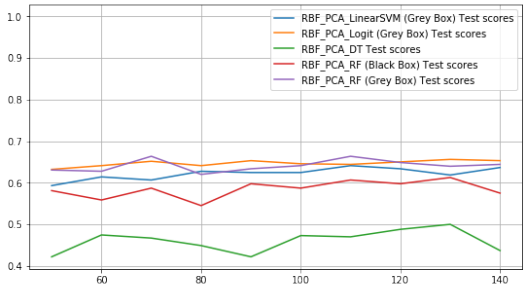
Using dataset **digits** with **30** estimators
Using dataset **fall_detection** with **30** estimators
Using dataset **subset_covertype** with **30** estimators

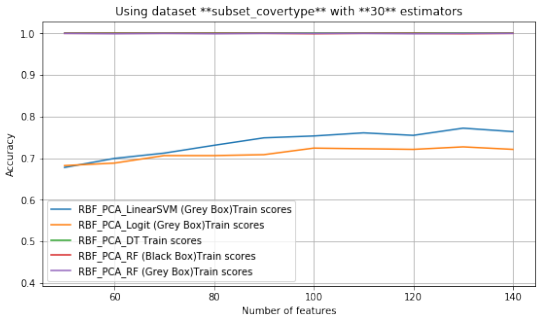








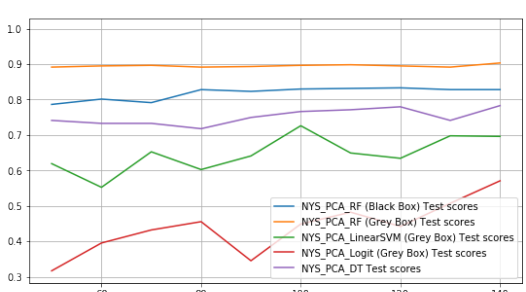


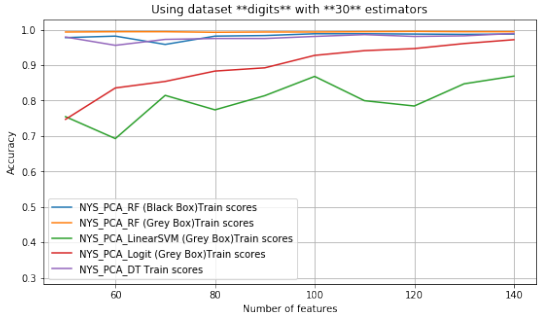


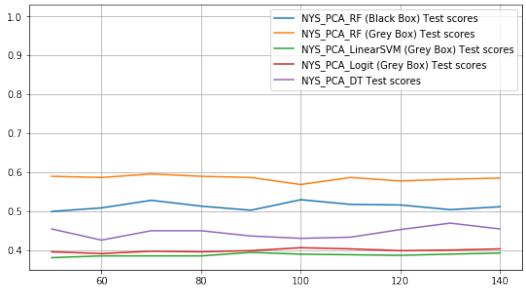
In [47]: `display(bt_demo3)`

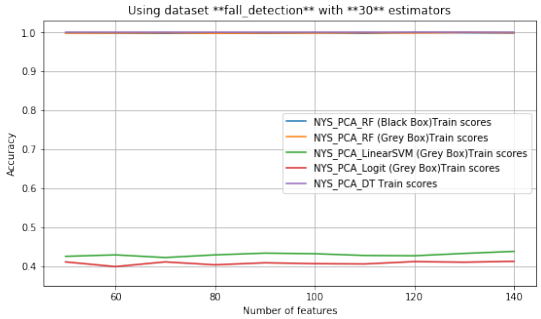
```
Button(button_style='warning', description='Demo 3', style=ButtonStyle(), tooltip='Run Demo3')
```

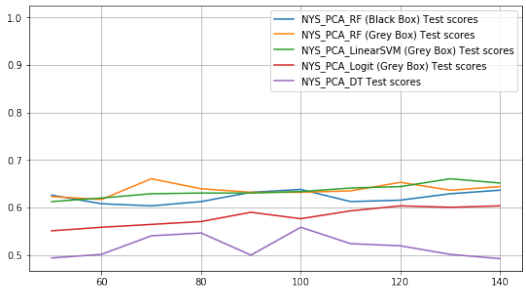
Using dataset **digits** with **30** estimators
Using dataset **fall_detection** with **30** estimators
Using dataset **subset_covertype** with **30** estimators

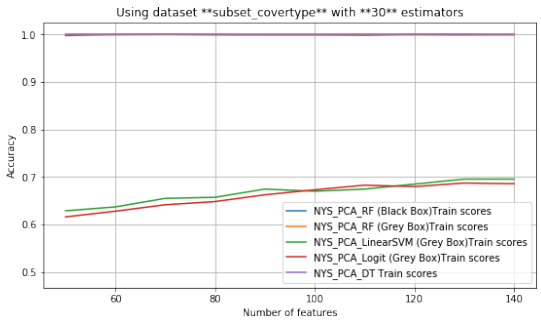








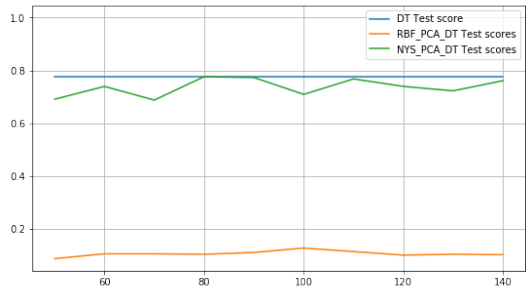


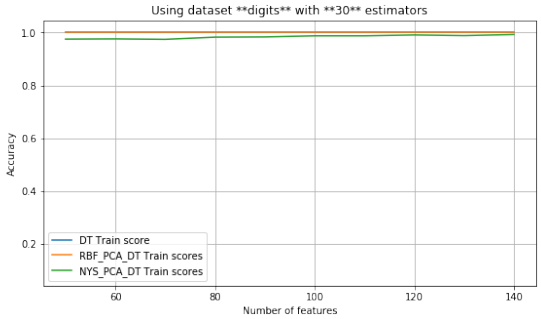


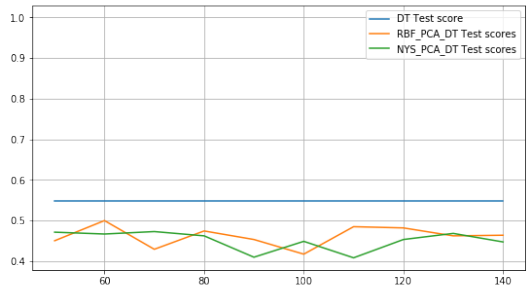
In [48]: `display(bt_demo4)`

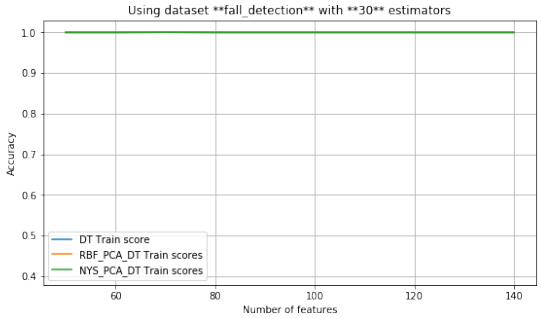
```
Button(button_style='warning', description='Demo 4', style=ButtonStyle(), tooltip='Run Demo4')
```

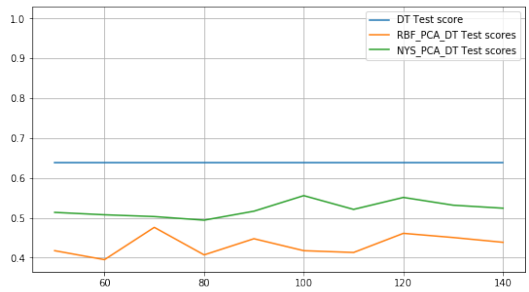
Using dataset **digits** with **30** estimators
Using dataset **fall_detection** with **30** estimators
Using dataset **subset_covertype** with **30** estimators

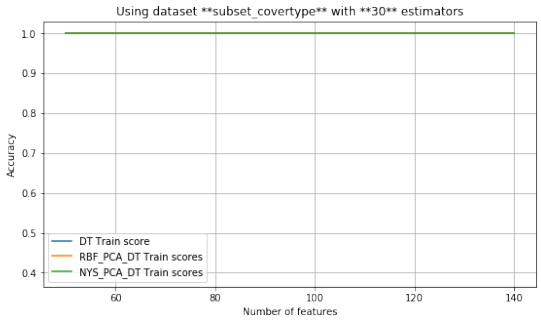













```
In [44]: for i in range(1,5):
             exec(demos_str.format(i))

         for i in range(1,5):
             exec('display(bt_demo{0})'.format(i))
         display(all_demos_bt)
         display(progress_bar)
         display(sub_progress_bar)
```

```
Button(button_style='warning', description='Demo 1', style=ButtonStyle(), tooltip='Run Demo1')

Button(button_style='warning', description='Demo 2', style=ButtonStyle(), tooltip='Run Demo2')

Button(button_style='warning', description='Demo 3', style=ButtonStyle(), tooltip='Run Demo3')

Button(button_style='warning', description='Demo 4', style=ButtonStyle(), tooltip='Run Demo4')

Button(button_style='success', description='Run all demos', style=ButtonStyle(), tooltip='Run a

IntProgress(value=0, bar_style='info', description='Calculating:', max=10)

IntProgress(value=0, bar_style='info', max=10)
```