```python
# imports
import pandas as pd
import numpy as np
from sklearn.linear_model import LogisticRegression
from sklearn.model_selection import GridSearchCV
from sklearn.metrics import accuracy_score, f1_score, roc_auc_score, precision_score, recall_score
from bootstrap import bootstrap

# runs 5 trials of logistic regression on given dataset
def run_logistic_regression(X, y, n_trials=5):
    """
    Runs logistic regression for a dataset
    5 trials of LogReg with 5-fold cross validation and a gridsearch over hyperparameter: C
    and computes mean accuracy over metrics
        accuracy, f1, roc, precision, recall

    parameters
    ----------
    X: feature vector
    y: target vector
    n_trials: number of trials to run

    returns
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    train_metrics: average of each metric on training set across 5 trials
    test_metrics: average of each metric on test set across 5 trials
    hyperp: dataframe of hyperparameters tried during hyperparameter search,
            of metrics (acc, f1, roc) and their mean performance during cross-validation
    """

    # hyperparameters
    C_list = [1e-8,1e-7,1e-6,1e-5,1e-4,1e-3,1e-2,1e-1,1e0,1e1,1e2,1e3,1e4]
    params = {'C': C_list}

    # metric evaluation scores
    scores = ['accuracy', 'f1', 'roc_auc', 'precision', 'recall']

    # to hold calculated metric performances
    train_metrics = []
    test_metrics = []

    for trial in range(n_trials):

        # initialize model for cross validation grid search
        LogReg = LogisticRegression(max_iter=200)
        GS = GridSearchCV(LogReg, params, scoring=scores, refit=False)
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        # bootstrap training and testing sets
        X_train, X_test, y_train, y_test = bootstrap(X,y)
        GS.fit(X_train, y_train)

        # collect results and get dataframe to visualize hyperparameter
search
        res = GS.cv_results_
        hyperp = pd.DataFrame(res['params'])
        hyperp['acc'] = res['mean_test_accuracy']
        hyperp['f1'] = res['mean_test_f1']
        hyperp['roc'] = res['mean_test_roc_auc']
        hyperp.set_index('C', inplace=True)

        test_per = [] # test set performances
        train_per = [] # train set performances

        # get best hyperparameters for each metric and use on test set
        for s in scores:

            # train logreg with best hyperparameters for metric
            best_C = res['params'][np.argmax(res['mean_test_{}'.format(s)])]
            LR = LogisticRegression(C=best_C['C'])
            LR.fit(X_train, y_train)

            # predictions for train and test sets
            y_pred = LR.predict(X_test)
            y_pred_train = LR.predict(X_train)

            # evaluate metric on test set
            if s == 'accuracy':
                test_per.append(accuracy_score(y_test, y_pred))
                train_per.append(accuracy_score(y_train, y_pred_train))
            elif s == 'f1':
                test_per.append(f1_score(y_test, y_pred))
                train_per.append(f1_score(y_train, y_pred_train))
            elif s == 'roc_auc':
                test_per.append(roc_auc_score(y_test, y_pred))
                train_per.append(roc_auc_score(y_train, y_pred_train))
            elif s == 'precision':
                test_per.append(precision_score(y_test, y_pred))
                train_per.append(precision_score(y_train, y_pred_train))
            elif s == 'recall':
                test_per.append(recall_score(y_test, y_pred))
                train_per.append(recall_score(y_train, y_pred_train))

        train_metrics.append(train_per)
        test_metrics.append(test_per)

        print('Trial {} done'.format(trial+1))
```

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97      # take mean of each metric across 5 trials
98      train_metrics = np.mean(np.array(train_metrics), axis=0)
99      test_metrics = np.mean(np.array(test_metrics), axis=0)
100
101     return train_metrics, test_metrics, hyperp
```