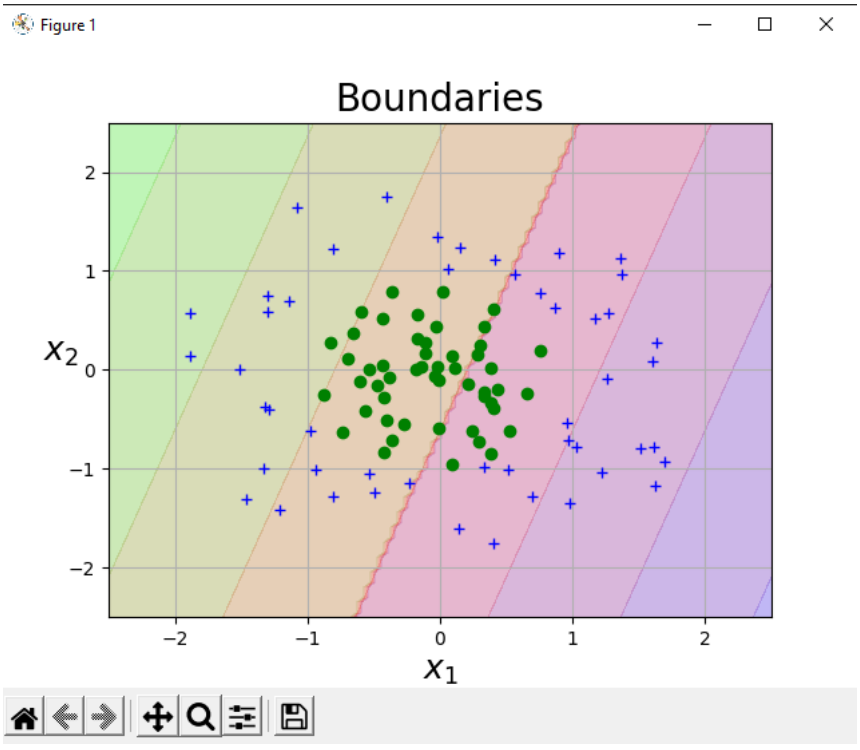
Implementing classifiers - Understanding Decision Boundaries

For this assignments, please use scikit-learn implementations of all the mentioned classifiers. More specifi- cally, use the following functions and parameter settings:

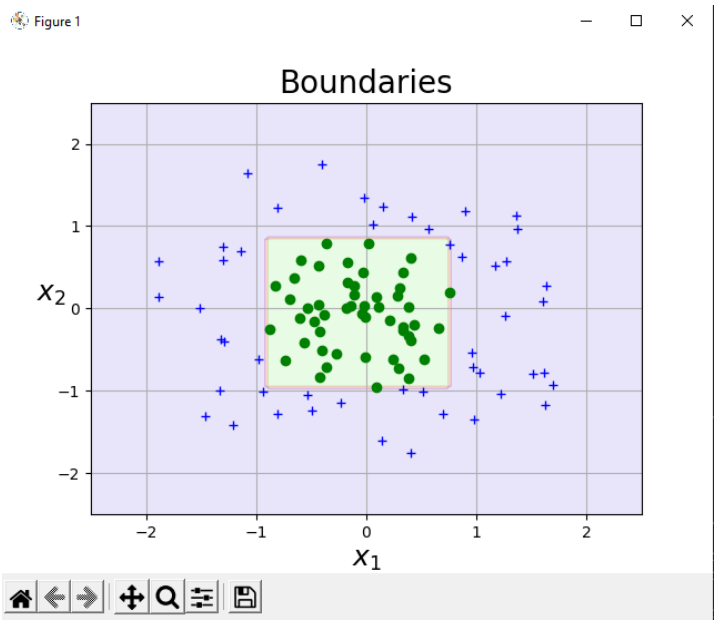
- Logistic Regression: sklearn.linear model.LogisticRegression()
- Decision Trees: sklearn.tree.DecisionTreeClassifier()
- SVMs: sklearn.svm.SVC(kernel='rbf')
- SVMs: sklearn.svm.SVC(kernel='linear')
- Neural Networks: sklearn.neural network.MLPClassifier(hidden layer sizes=(10, 10, 10, 10), max iter=1000)

i) Train each of the aforementioned classifiers using the dataset boundaries.csv. Plot the decision bound- aries for each of the aforementioned classifiers i.e., make a 2-d plot of the data, assign a color to each class label and highlight each data point using the color corresponding to its ground truth class label, and finally mark the decision boundaries of the classifiers.

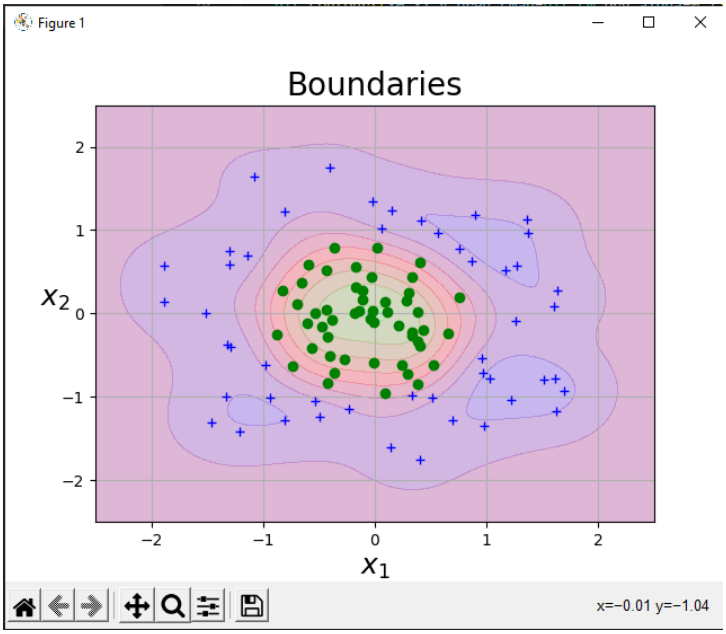
Logistic Regression



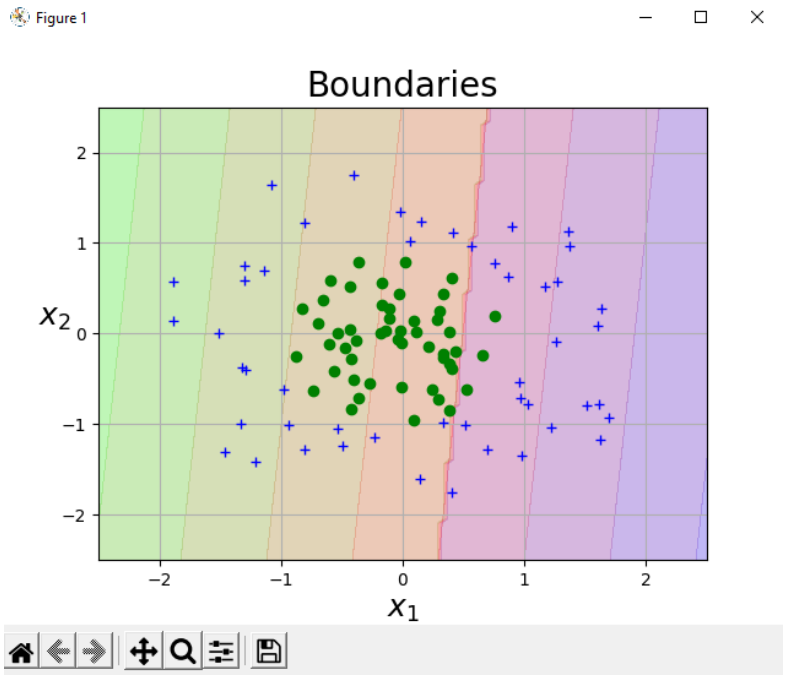
Decision Trees



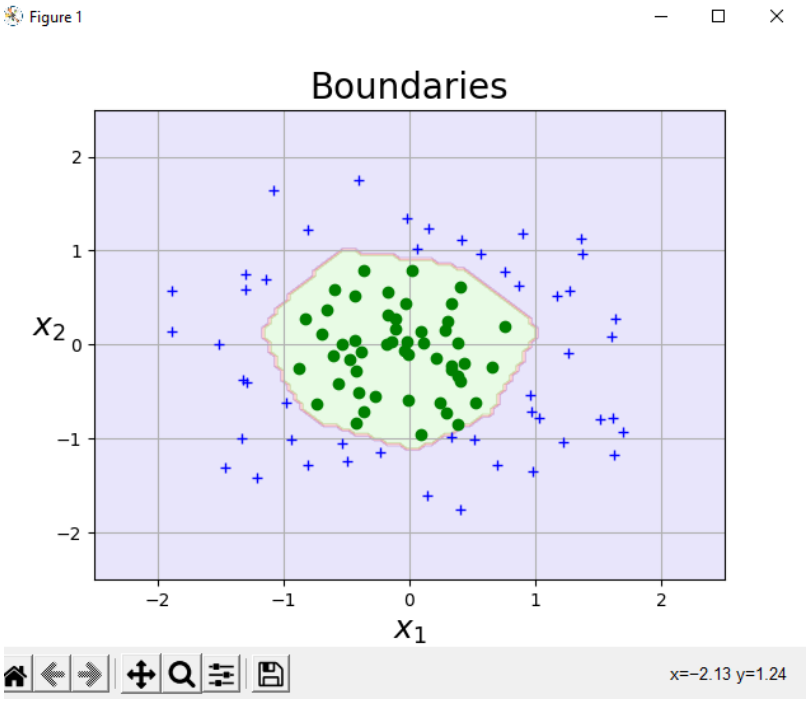
SVM_rbf



SVM_linear



Neural Networks



ii) What are the shapes of the decision boundaries of different classifiers?

The shape of the logistic regression and svm linear boundaries are diagonal lines; which were not useful given the type of data that we have.

While the decision tree boundaries have a shape of a square and the boundaries of the svm rbf boundaries have a shape of a kind of circles; having a more accurate approach to the classification we are looking for.

The best result was given by the Neural network classifier where the classification was exact, and their boundaries has an island shape.

Do all of them have the same shape? No.

If not, why are the shapes of the decision boundaries different?

The forms of the decision boundaries are different; because the classifiers operate in different ways.

While some, such as logical regression or linear kernel svm, have a linear regression.

The MLP obtains a nonlinear figure given that it solves the classification to reach a convergence.