



Universidad Politécnica de Madrid

ESCUELA TÉCNICA SUPERIOR DE INGENIEROS INDUSTRIALES

MÁSTER EN AUTOMÁTICA Y ROBÓTICA

APPLIED ARTIFICIAL INTELLIGENCE

Assignment 1.2: Plotting 2D Input Data

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Plotting 2D Input Data

Given synthetic data, load the `data_D2_C3_01.mat` which consist in a *struct* called `p`. We are going to study this data, plotting it. There are three fields within the struct: `values`, `class` and `outputs`, with the next dimensions 2×1000 , 1×1000 and 1×1000 respectively. That is, the `p.value` is a matrix where the `x` value for each of the 1000 points is in the first row, and the `y` value is in the second row.

1.1 Methodology

The basis idea is to check which class corresponds each point and then assign a different color for plotting this value.

1.2 Results

The final plot can be seen in the next figure:

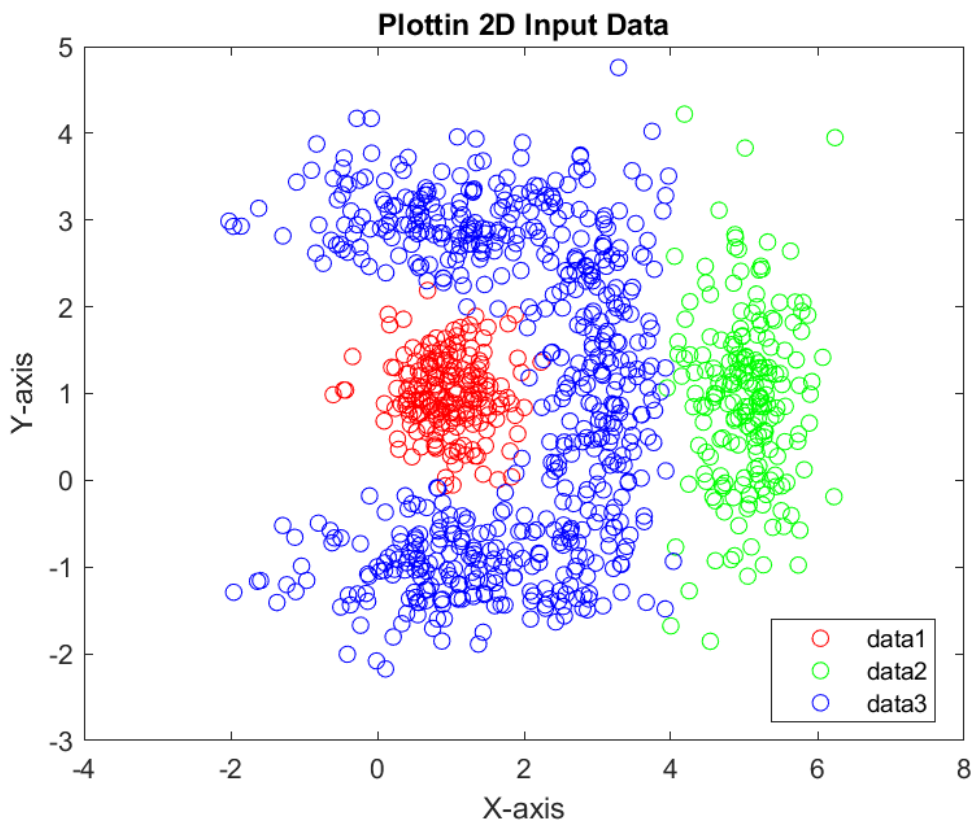


Figure 1: Synthetic data plotted with different color according to the class to which they belong. In this case there are only three types of labels. Done with Matlab.

1.3 Discussions and Results

Matlab presents a great capability for managing data, specially if it consist in arrays of matrices. And also the plotting methods are very flexible.

The results are adequate given the requirements of the task. Three distinct sets of data can be observed. By being labelled, it has been possible to color these groupings. It seems feasible to separate by a straight line the green set from the rest. On the other hand, the red set from the blue set cannot be separated (classified) in this way.

1.4 Relevant Code

```
1 load data_D2_C3_01.mat
2 % Plot data with a color depending on the class
3 x = p.value(1,:);
4 y = p.value(2, :);
5 red = true;
6 blue = true;
7 green = true;
8
9 figure;
10 legendHandles = cell(1, 3);
11 for i = 1:length(x)
12     if p.class(i) == 1
13         h = plot(x(i),y(i),'ro');
14         if red
15             legendHandles{1} = h;
16             red = false;
17         end
18     elseif p.class(i) == 2
19         h = plot(x(i),y(i),'go');
20         if green
21             legendHandles{2} = h;
22             green = false;
23         end
24     elseif p.class(i) == 3
25         h = plot(x(i),y(i),'bo');
26         if blue
27             legendHandles{3} = h;
28             blue = false;
29         end
30     else
31         disp("There are more than 3 labels!");
32     end
33     hold on;
34 end
35
```

```

36 title('Plottin 2D Input Data');
37 xlabel('X-axis');
38 ylabel('Y-axis');
39 legend([legendHandles{:}], 'Location', 'Best');
40 saveas(gcf, 'my_plot.png');

```

Which can be condensed to this new code:

```

1 load data_D2_C3_01.mat
2
3 x = p.value(1,:);
4 y = p.value(2, :);
5
6 colors = {'ro', 'go', 'bo'};
7 labels = {'Class 1', 'Class 2', 'Class 3'};
8
9 figure;
10
11 for i = 1:length(x)
12     if p.class(i) > 0 && p.class(i) <= 3
13         plot(x(i), y(i), colors{p.class(i)});
14         hold on;
15     else
16         disp("Invalid class label detected!");
17     end
18 end
19
20 title('2D Input Data Plot');
21 xlabel('X-axis');
22 ylabel('Y-axis');
23 legend(labels, 'Location', 'Best');
24 saveas(gcf, 'my_plot.png');

```