SRIP Project 5 Documentation
Feature Representation

Task allotted

1. In the virtual-labs repository, pattern-recognition-iiith lab, the task was to resolve Issue No: 238
2. Issue No: 238 was to Convert the following experiment to JavaScript. Link to the experiment:- http://cse20-iiith.vlabs.ac.in/exp1/Objective.html?domain=Computer%20Science&lab=Pattern%20Recognition%20Lab

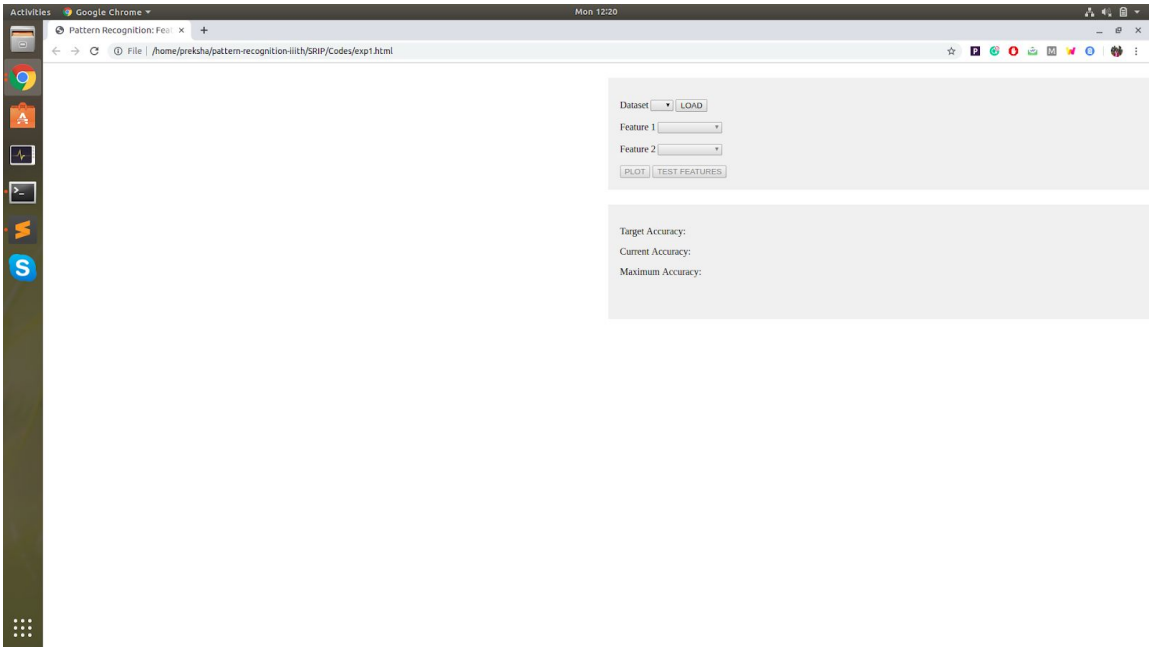
Experiment Explanation

- The main objective of this experiment is to understand the effect of various types of features on the distribution of points in feature space.
- The Euclidean distance between two points in the feature space can be thought of as a measure of dissimilarity between the samples. This fact is used for decision making in the popular Nearest Neighbor Classifier.
- A set of labelled samples that are obtained during training is stored in the feature space as reference points. When a new sample whose class is unknown is obtained, we compare it with each of the reference points in the feature space.
- The closest reference point is the most similar, and hence its class label is assigned to the unknown sample. The performance nearest neighbour classifier is often used to compare different feature representations.
- In this experiment, the accuracy of the nearest neighbour classifier is used to compare the performances of different feature representations.

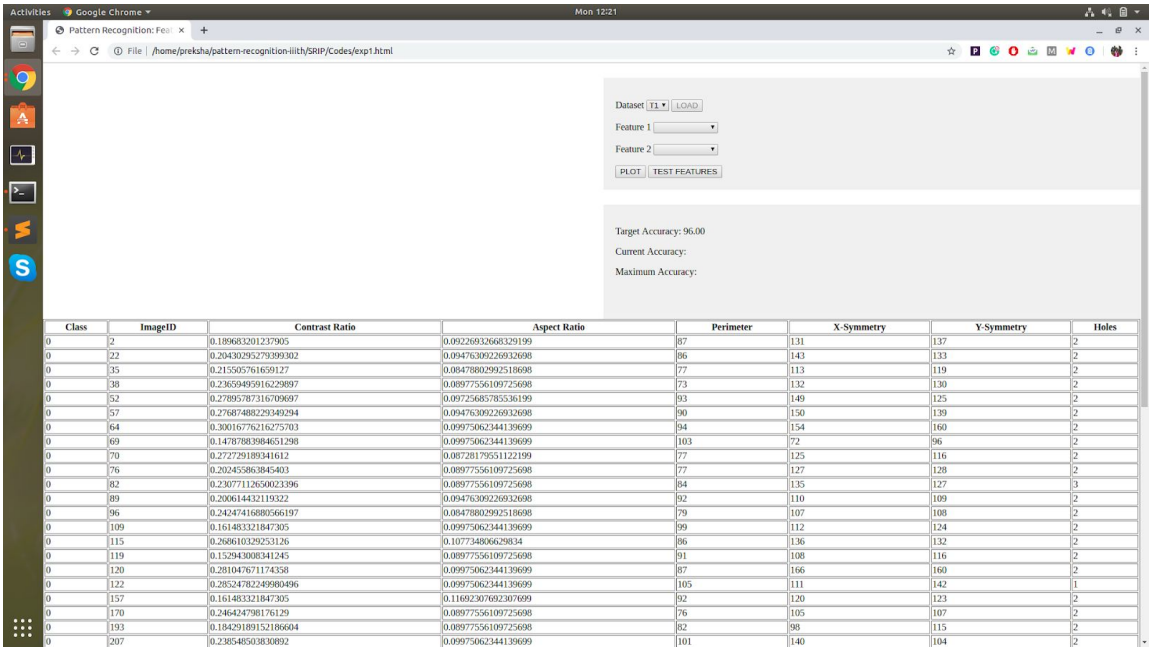
How to Run the Experiment

1. My forked repository(https://github.com/prekshap24/pattern-recognition-iiith) contains a folder named “SRIP”.

2. SRIP folder contains a folder named as Codes and Libraries. Codes contain all the files containing code for the experiment written in JavaScript, HTML, CSS. Libraries contain the datasets used in the experiment.
3. The Codes folder contains 3 files. To run the experiment, simply run the exp1.html file by clicking on it.
4. The experiment will open in the browser.

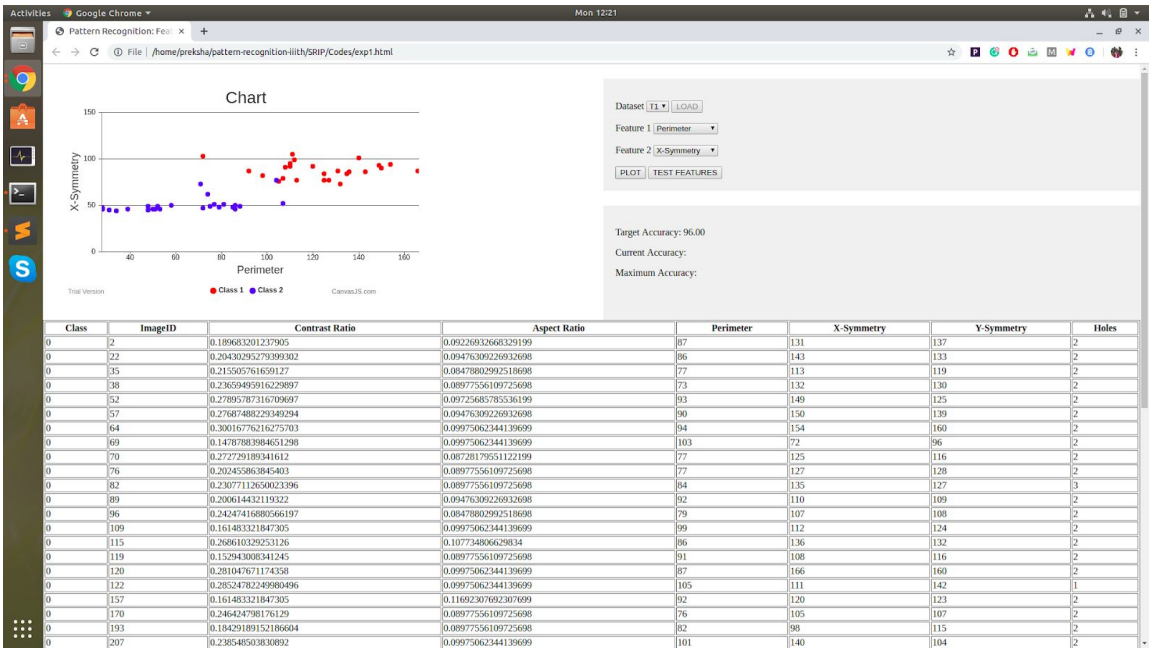


5. Initially select any one of the 3 datasets provided in the drop-down menu and click on the ‘Load’ button.



Class	ImageID	Contrast Ratio	Aspect Ratio	Perimeter	X-Symmetry	Y-Symmetry	Holes
0	2	0.189683201237905	0.09226932668329199	87	131	137	2
0	22	0.29430295279399302	0.09476309226932698	86	143	133	2
0	35	0.215505761659127	0.08478802992518698	77	113	119	2
0	38	0.23659495916229897	0.08977556109725698	73	132	130	2
0	52	0.27895787316709697	0.09725685785536199	93	149	125	2
0	57	0.27687488229349294	0.09476309226932698	90	150	139	2
0	64	0.30016776216275703	0.09975062344139699	94	154	160	2
0	69	0.14787883984651298	0.09975062344139699	103	72	96	2
0	70	0.272729189341612	0.08728179551122199	77	125	116	2
0	76	0.2024558638454O3	0.08977556109725698	77	127	128	2
0	82	0.23077112650023396	0.08977556109725698	84	135	127	3
0	89	0.200614432119322	0.09476309226932698	92	110	109	2
0	96	0.24247416880566197	0.08478802992518698	79	107	108	2
0	109	0.161483321847305	0.09975062344139699	99	112	124	2
0	115	0.268610329253126	0.107734806629834	86	136	132	2
0	119	0.152943008341245	0.08977556109725698	91	108	116	2
0	120	0.2810476711743S8	0.09975062344139699	87	166	160	2
0	122	0.28524782249980496	0.09975062344139699	105	111	142	1
0	157	0.161483321847305	0.11692307692307699	92	120	123	2
0	170	0.2464247981761291	0.08977556109725698	76	105	107	2
0	193	0.18429189152186604	0.08977556109725698	82	98	115	2
0	207	0.238548503830892	0.09975062344139699	101	140	104	2

6. Choose Feature 1 and Feature 2 from the respective drop-down menus. Click on the ‘Plot’ button to plot the 2 features, where Feature 1 represents the x-axis and Feature 2 represents the y-axis.



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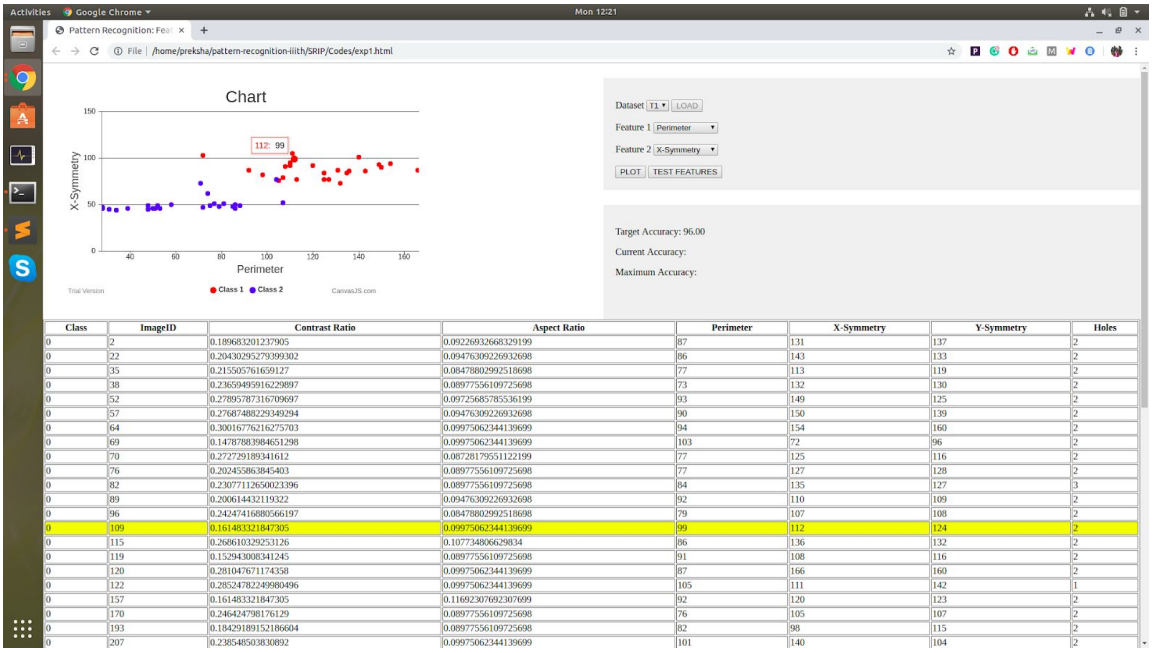
0	57	0.27687488229349294	0.09476309226932698	90	150	139	2
0	64	0.30016776216275703	0.09975062344139699	94	154	160	2
0	69	0.14787883984651298	0.09975062344139699	103	72	96	2
0	70	0.2727291893416 12	0.08728179551122199	77	125	116	2
0	76	0.2024558638454 03	0.08977556109725698	77	127	128	2
0	82	0.23077112650023396	0.08977556109725698	84	135	127	3
0	89	0.2006144321193 22	0.09476309226932698	92	110	109	2
0	96	0.24247416880566197	0.08478802992518698	79	107	108	2
0	109	0.16148332184730 5	0.09975062344139699	99	112	124	2
0	115	0.26861032925312 6	0.10773480662983 4	86	136	132	2
0	119	0.15294300834124 5	0.08977556109725698	91	108	116	2
0	120	0.28104767117435 8	0.09975062344139699	87	166	160	2
0	122	0.28524782249980496	0.09975062344139699	105	111	142	1
0	157	0.16148332184730 5	0.11692307692307699	92	120	123	2
0	170	0.24642479817612 9	0.08977556109725698	76	105	107	2
0	193	0.18429189152186604	0.08977556109725698	82	98	115	2
0	207	0.23854850383089 2	0.09975062344139699	101	140	104	2

7. If you click on any point on the graph, the particular row in the table would be highlighted yellow.



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0	120	0.28104767117435 8	0.09975062344139699	87	166	160	2
0	122	0.28524782249980496	0.09975062344139699	105	111	142	1
0	157	0.16148332184730 5	0.11692307692307699	92	120	123	2
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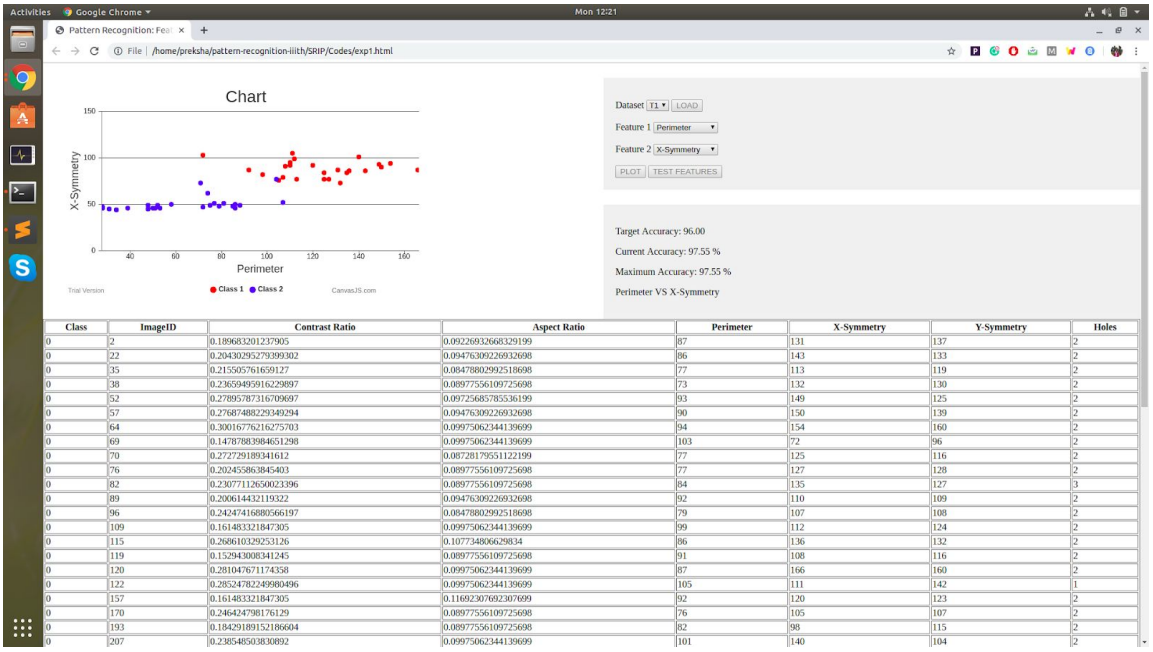
8. Click on the ‘Test Features’ button to calculate the accuracy of the model and display it.



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0	64	0.30016776216275703	0.09975062344139699	94	154	160	2
0	69	0.14787883984651298	0.09975062344139699	103	72	96	2
0	70	0.2727291893416 12	0.08728179551122199	77	125	116	2
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9. To run the experiment again, refresh the page.

Formulas used in the Experiment

- The Euclidean distance formula used to find nearest neighbours is

$$d(p,q) = d(q,p)$$
$$= \sqrt{(q_1 - p_1)^2 + (q_3 - p_3)^2 + \cdots + (q_n - p_n)^2}$$
$$= \sqrt{\sum_{i=1}^{n} (q_i - p_i)^2}$$

- The 3 nearest neighbour classifier algorithm is used to calculate the accuracy of the testing data points for a particular dataset.