

## Project for CS421 – University of Illinois at Chicago

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### REPORT:

1. We have applied a Linear Classifier using Gradient Descent and loss as hinge loss to find the optimal weights.
2. The code has been uploaded in the **src** folder under **gradient\_descent** folder. To run, execute *python formula.py*
3. An input matrix 'X' was defined using the sub scores and a vector 'Y' was defined using the labels. High as 1 and Low as -1.
4. We tried various parameters but the classifier gave the best result when it was run for 1000 iterations and the following weight vector was obtained:

[2.17, -1.8, -0.9, 0.17]

Therefore, the equation becomes:

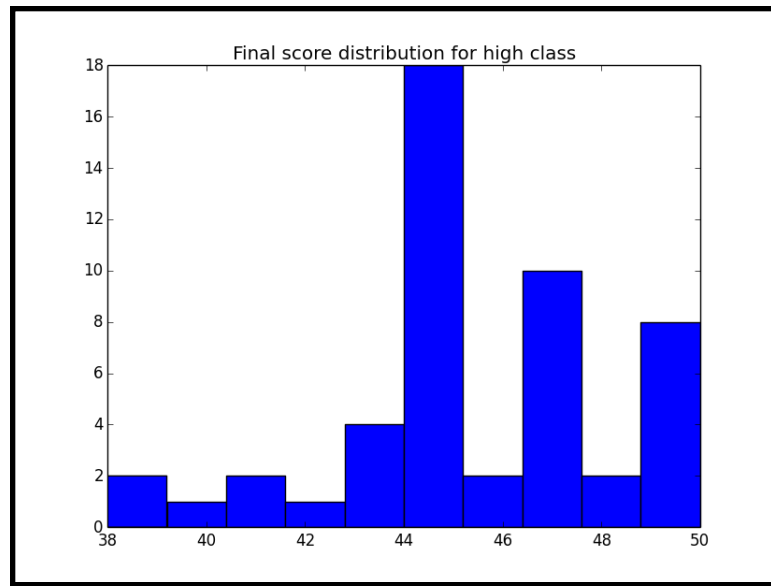
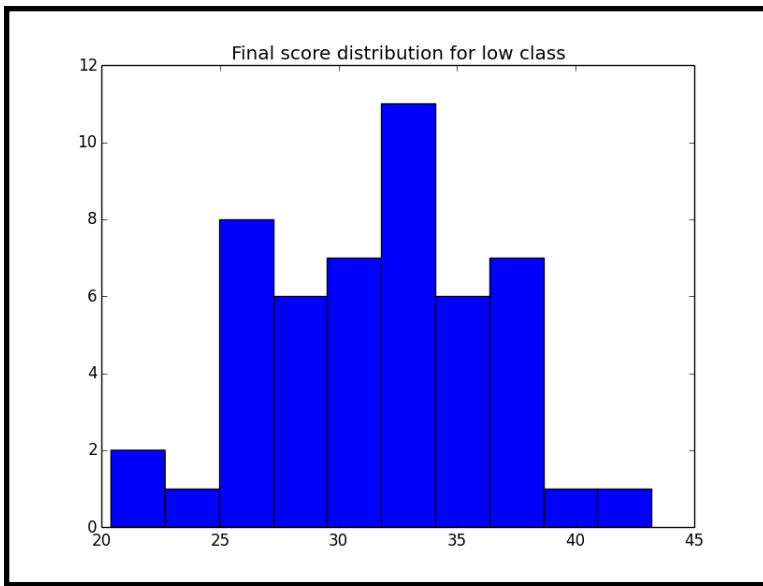
$$2.17a - 1.8b - 0.9c-i + 0.17c-ii + c-iii + d-i + d-ii$$

5. Also, we got the following weight vector for some different set of parameters:

[2.3, -1.8, 0.21, 0.8, 2.01, 2.4, 2.93]

Therefore, the equation becomes:

$$2a - 2b - 0.2c-i + 0.8c-ii + 2c-iii + 2.4d-i + 3d-ii$$



### Histogram Distribution For The Final Score of The Essays Using The Above Equation (5)

- The X-axis of the above histograms represents the final score of the essays and the Y-axis represents the number of essays.
- From the above distribution of the low and high essay types, we have set a threshold for final score as 40 for classification, i.e. **if final score  $\geq 40$  then essay is classified as High else Low.**