Assignment 6: Logistic Regression Methods

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In this assignment we had to implement different regression methods and classify them as face and background images.The data set contains both the face and background images which are used for testing and training.

The diverse types of Regression methods are as follows:

1. Logistic Regression
2. Bayesian Logistic Regression
3. Dual Logistic Regression
4. Dual Bayesian Logistic Regression
5. Kernel Logistic Regression
6. Relevance Vector Logistic Regression

Algorithm Explaination:

All the above regression methods are based on discriminative model of classification.

The distribution used by them is Bernoulli distribution.

For all the algorithms same steps are used only the way the fit function and Laplace approximation of each method is the change where the difference lies.

Firstly we generate a huge matrix of all the face and background images.Next we initialize the phi values(for Logistic,Bayesian,dual linear)/psi value(for the rest) and use the fit function to infer predicted and phi/psi values respectively.

Next from the fminunc function we obtain the phi/psi value that minimizes the cost function,then using the cost function values we compute gradient vector and Hessian Matrix.

Next if the predicted values the values greater than 0.50 are taken as face values and the rest are considered as background .

Finally, the miss detection and False Alarm are calculated using,

$$\text{Miss detection: } \frac{1}{N_{face}} \sum_{n=1}^{N_{face}} |\hat{y}_n - y_n^{GT}|$$

where $\hat{y}_n$ is the inferred label on test image n and y_n^{GT} is the ground truth. N_{face} is the total number of face images in the testing dataset.

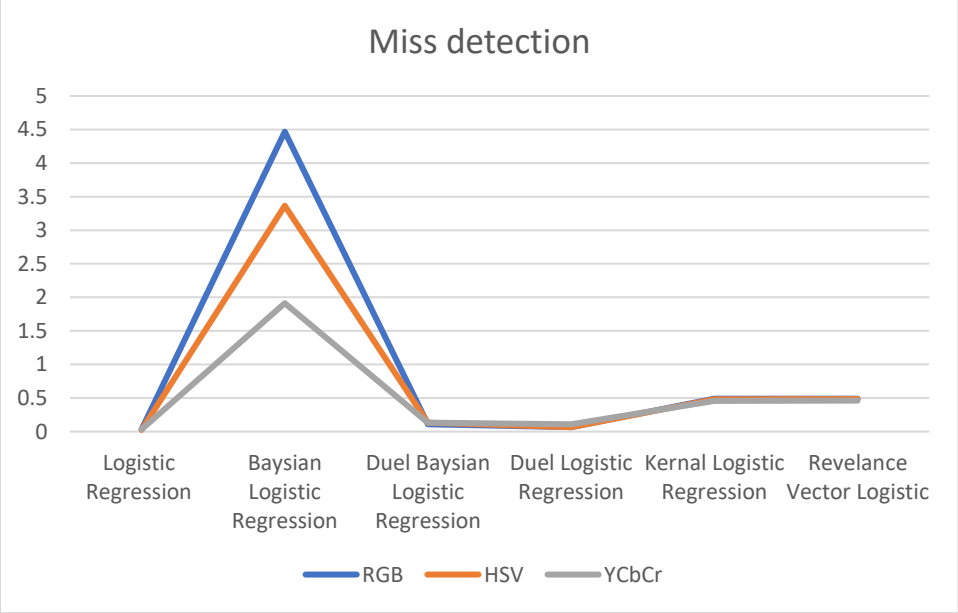
False alarm: $\frac{1}{N_{bg}}\sum_{n=1}^{N_{bg}}|\hat{y}_n - y_n^{GT}|$

where $\hat{y}_n$ is the inferred label on test image n and y_n^{GT} is the ground truth. N_{bg} is the total number of background images in the testing dataset.

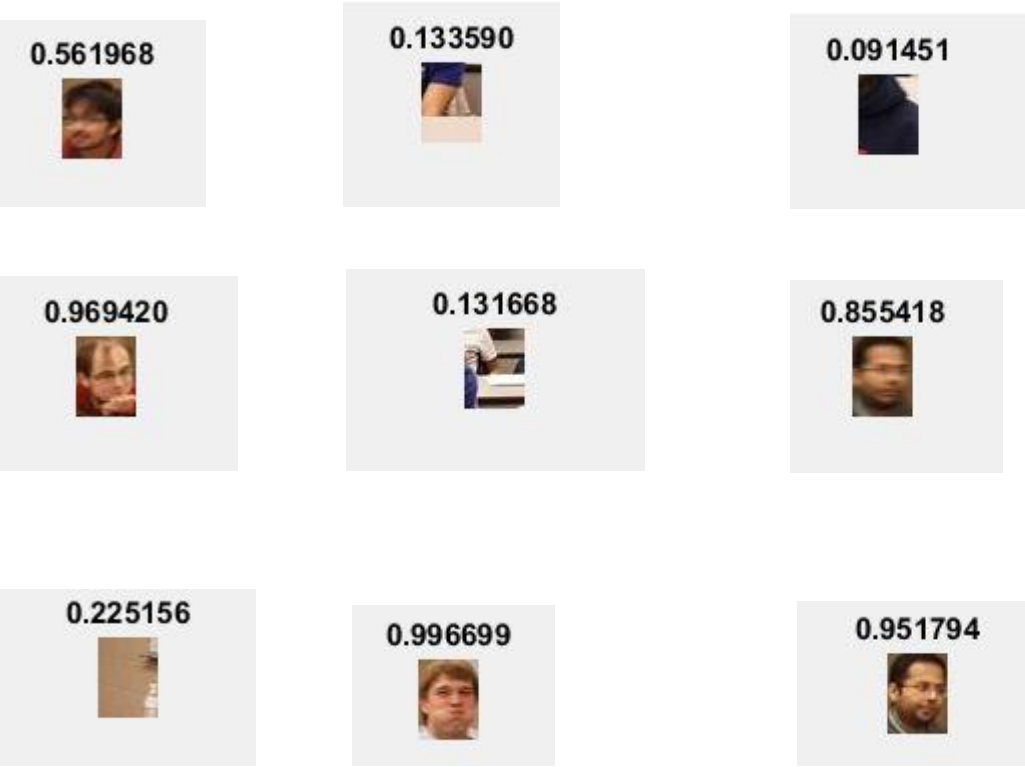
RESULTS :

	Logistic Regression		Baysian Logistic Regression		Duel Baysian Logistic Regression	
	Miss detection	False Alarm	Miss detection	False Alarm	Miss detection	False Alarm
RGB	0.0328	1.7576	4.4674	6.4156	0.1092	0.3685
HSV	0.0249	1.7576	3.364	13.6585	0.133	0.4313
YCbCr	0.0325	1.7576	1.9129	3.6759	0.1327	0.4343

	Duel Logistic Regression		Kernal Logistic Regression		Revelance Vector Logistic	
	Miss detection	False Alarm	Miss detection	False Alarm	Miss detection	False Alarm
RGB	0.0659	0.2776	0.489	0.878	0.4922	0.8789
HSV	0.067	0.2842	0.4821	0.8787	0.4859	0.8808
YCbCr	0.1091	0.3888	0.4557	0.8395	0.4627	0.8337



Resultant images with values



NOTE:

After each regression, there is a commented code for viewing images please comment out to view the images.