Pattern Recognition and Machine Learning

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The objective of this project is to evaluate the effectiveness of detection of skin pixels using color histograms as a detector for human faces. Evaluation will be performed using ROC curves that plot True Positive Rate vs False Positive Rate. You should compare the ROC curves for face pixels using both 3D RGB histograms and 2D normalized chrominance histograms computed from different subsets (folds) of the test data.

Each programming team should
1) Train a set of skin pixel detectors using both 2D and 3D histograms from sets of folds from the test data.
2) Plot ROC curves for the detectors using folds that were not used in training
3) Interpret the results, describing the effectiveness of the detectors and explaining the sources of errors.

Lab work will be reported with a written report in either French or English. Work will be evaluated based on the effectiveness of the experimental evaluations, and the clarity and depth of the explanation of experimental results.

The following is an indicative Barometer for Grading. Actual grades will depend on a subjecting appreciation for the amount of effort deployed and the depth of understanding displayed in the results.

Grade	Example of Criteria
10	ROC plot showing results of skin pixel detection with 3D RGB histograms and 2D Chrominance histograms. Tests with only a single training strategy. Clear description of experiments. Discussion of which technique worked better and why.
12	ROC plots for results of skin pixel detection with 3D RGB histograms and 2D Chrominance histograms trained under different training strategies. Clear description of experiments. Insightful discussion explaining if/why certain training strategies and color spaces work better.
14	ROC plots for results of skin pixel detection with 3D RGB histograms and 2D Chrominance histograms with different size histograms trained under different training strategies. Clear description of experiments. Analysis and explanation of common sources of errors. Explanation if/why certain training strategies and color spaces work and histogram quantizations work better.
16	ROC plots for results of both skin pixel detection and face detection with color histograms using different color spaces and variations in histogram size trained under different training strategies. Face detection can be done using bounding box ground truth data to define a ROI and average skin probability to determine face/no-face. Insightful explanation of results.
18	ROC plots for results of both skin pixel detection and face detection with color histograms using different color spaces and variations in histogram size trained under different training strategies. Face detection can be done using bounding box ground truth data to define a ROI and average skin probability to determine face/no-face. Insightful explanation of results. Analysis of failures in face detection.
20	All of the above plus additional unexpected insights or results.