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Face Images



Non-Face Images

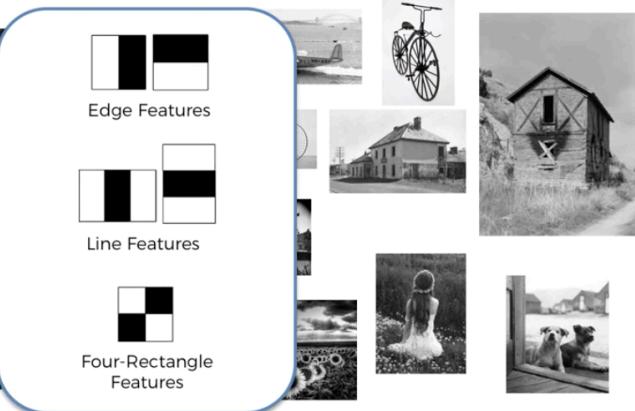
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Face Images

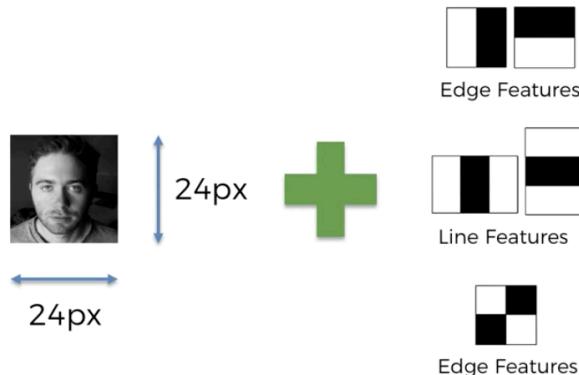


Non-Face Images

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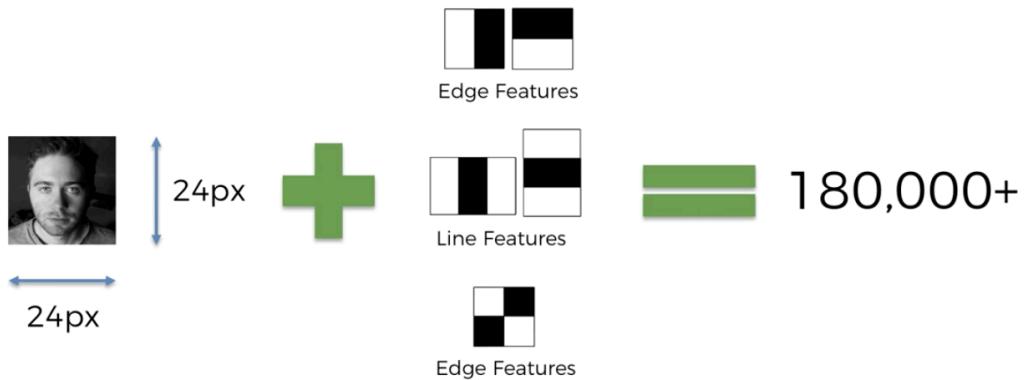
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In here we are detecting a huge number of features which is not so optimal because there is a lot of images in our dataset.

Note: when we are applying the feature detectors like edge feature what it does for example at the first round it looks at the total number of 4 pixels in square and in the next round it expands itself by adding another row which it detects 6 pixels in overall and it keep expanding the size of the square until the end. When it ended it goes to the next feature detectors. In here we have 5 feature detectors.

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$$F(x) = \alpha_1 f_1(x) + \alpha_2 f_2(x) + \alpha_3 f_3(x) + \dots$$

For solving this problem that we detect so many features. We are going to put the features into a classifier.

$F(x)$ is our classifier. $f_i(x)$ is out features. Alpha is the weight of that feature.

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$$F(x) = \alpha_1 f_1(x) + \alpha_2 f_2(x) + \alpha_3 f_3(x) + \dots$$

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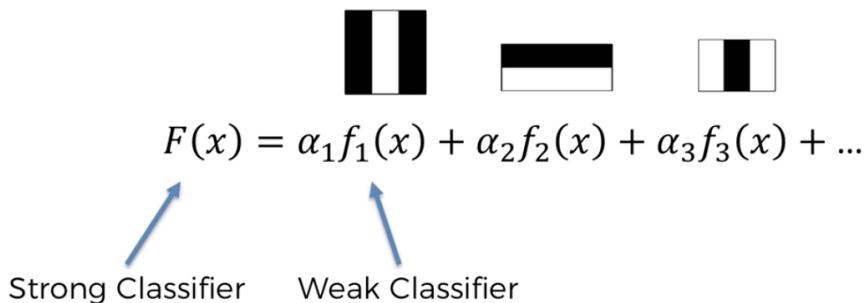
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$$F(x) = \alpha_1 f_1(x) + \alpha_2 f_2(x) + \alpha_3 f_3(x) + \dots$$

Weak Classifier

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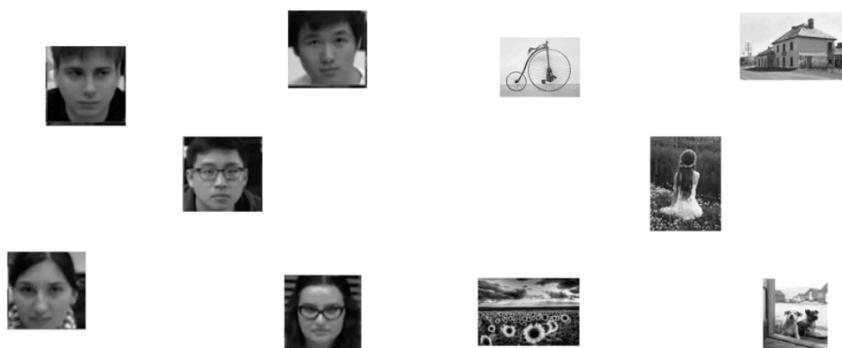


In here we don't actually need to put all of the 180'000 weak classifier in here. Couple of thousand is enough to get a good result. This is called ensemble method.

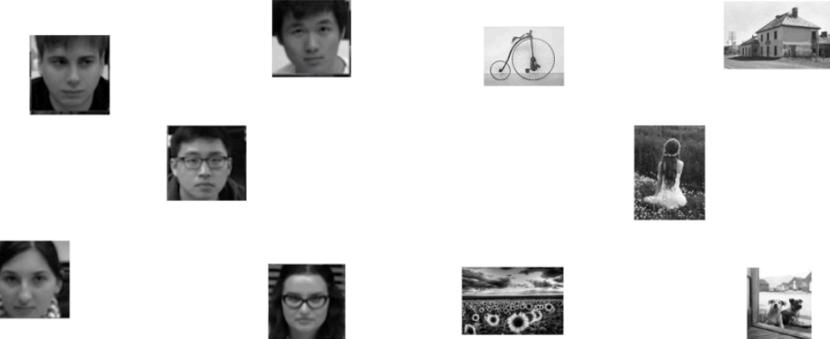
The more weak classifier we have the better our result are going to be. For example in here, the first two weak classifier will give a 80% accuracy and the more we add the better our accuracy rates are going to be.

How we add the most important weak classifiers? This is where the Adaboost will come.

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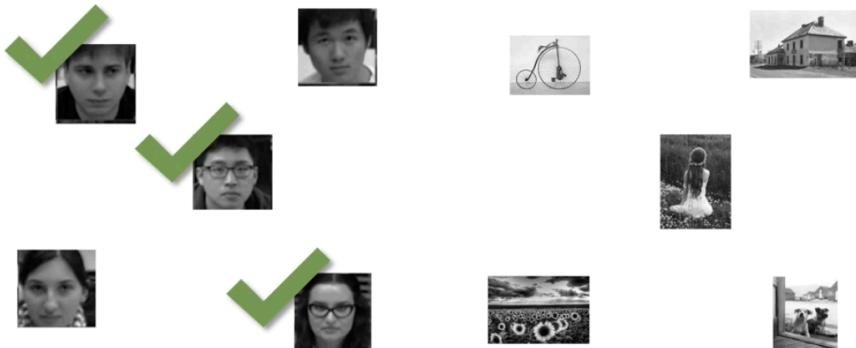


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This is the first important weak classifier

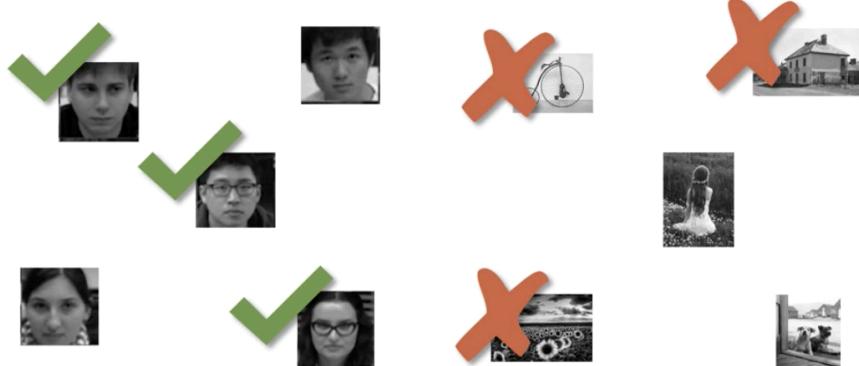
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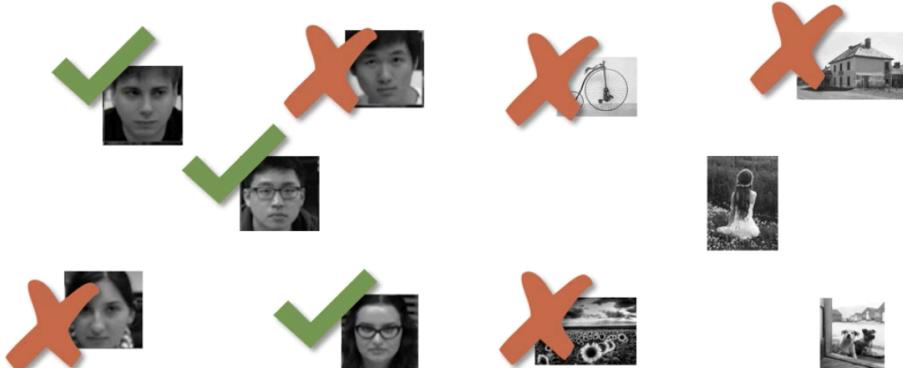
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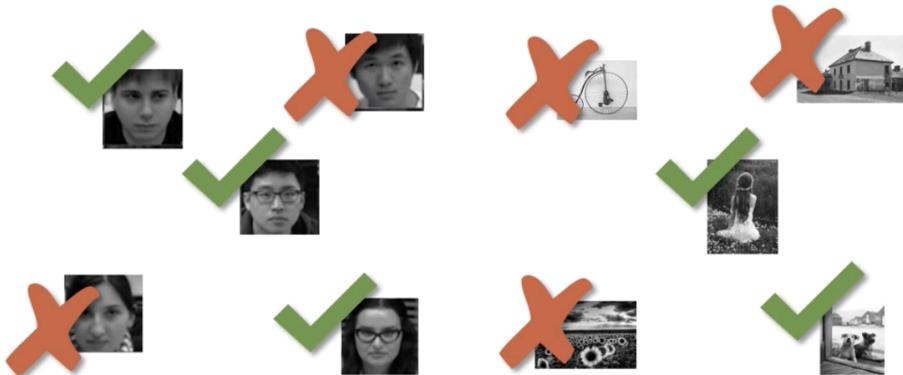
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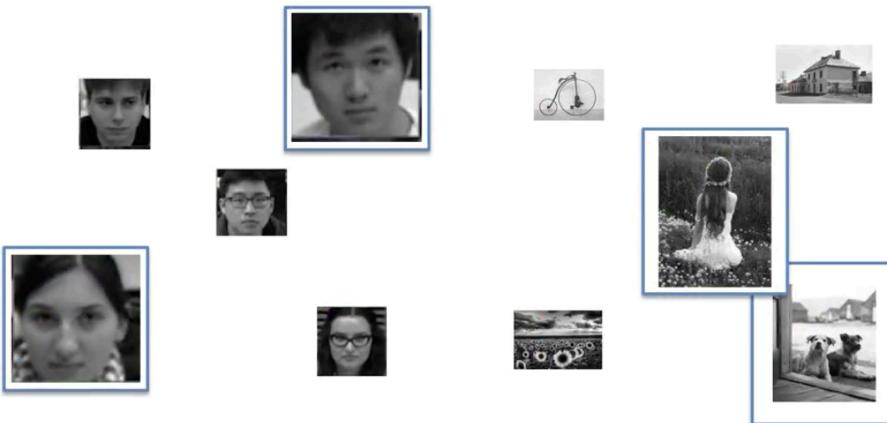


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Now there is some error that for correcting them we use other weak classifiers to complement this one and improving the accuracy rate.

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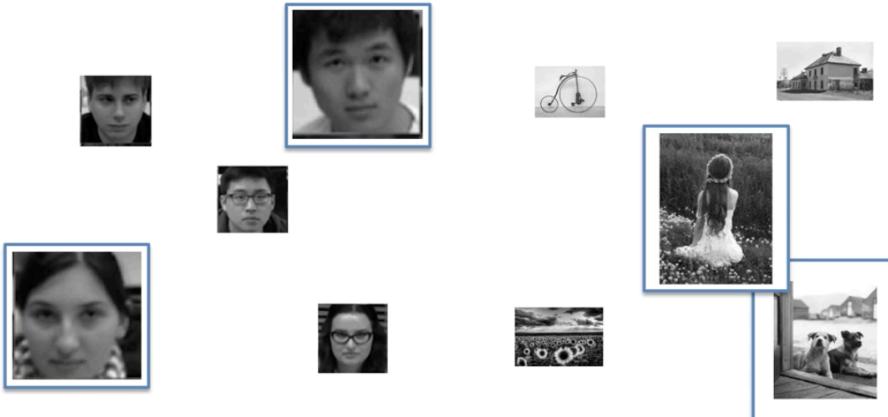


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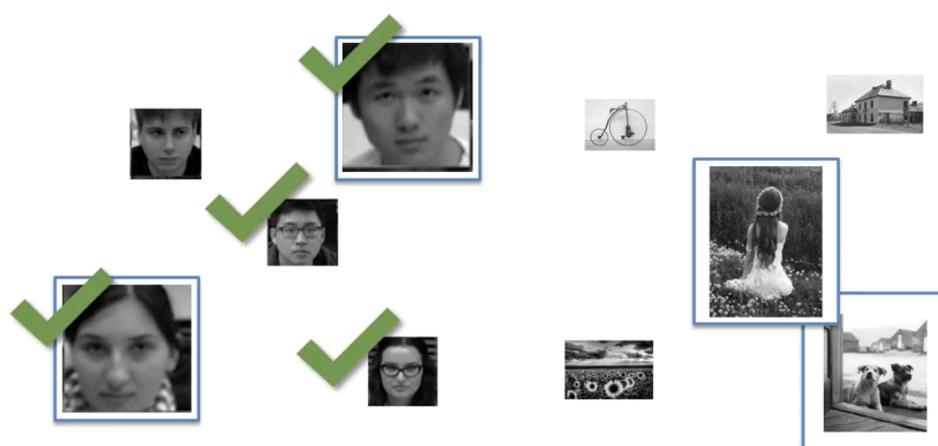
Afterward it increases the weights for the next features which in here we showed them by scaling them up but in reality the image's scale are unchanged.

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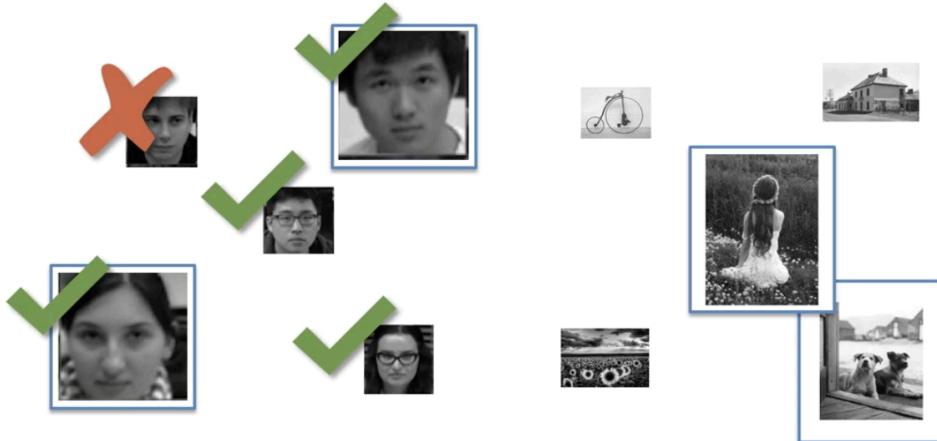


For the next feature, the algorithm will choose a feature that have the ability to classify these images properly which in other word the next feature can complement the previous feature's weakness.

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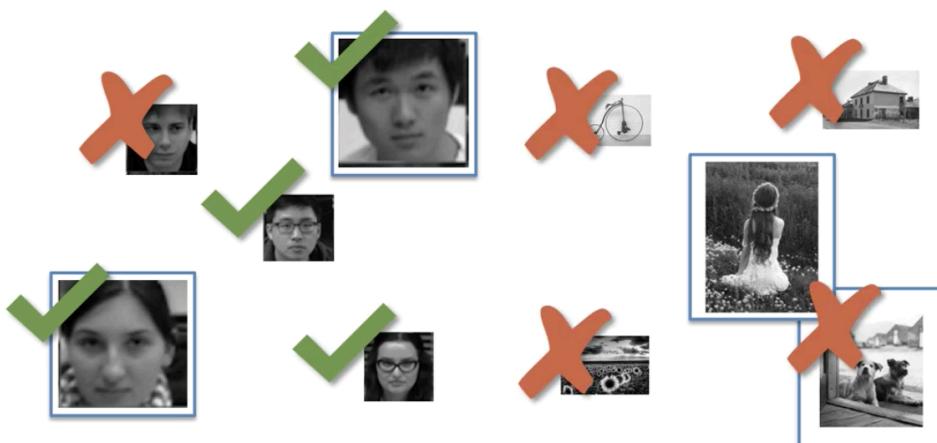
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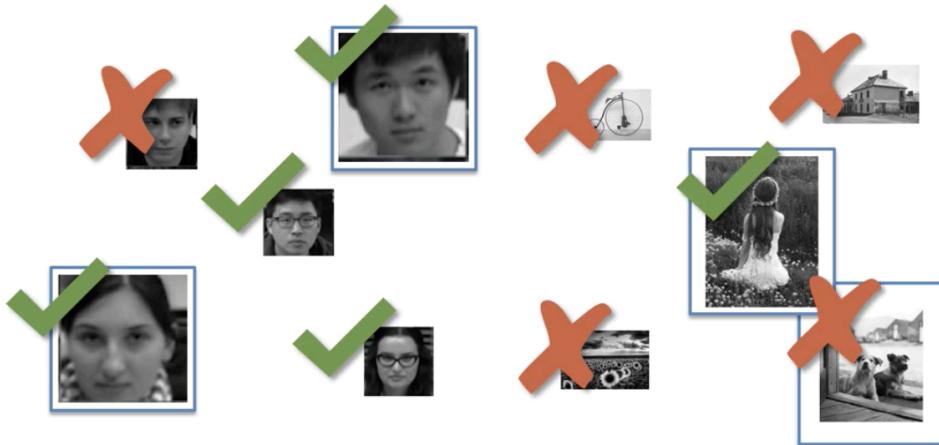
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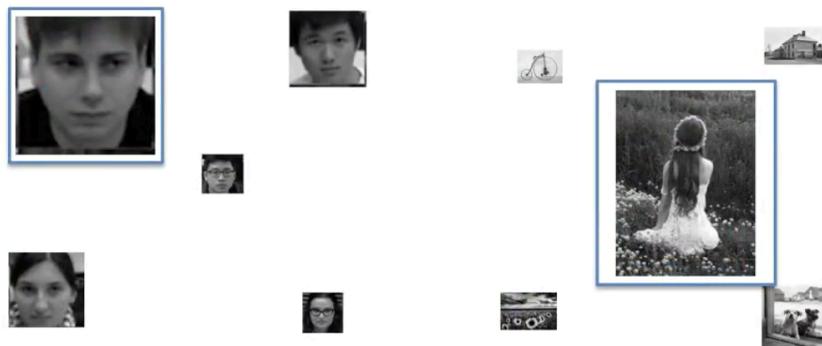
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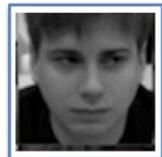


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Next we focus on these two to fix this.

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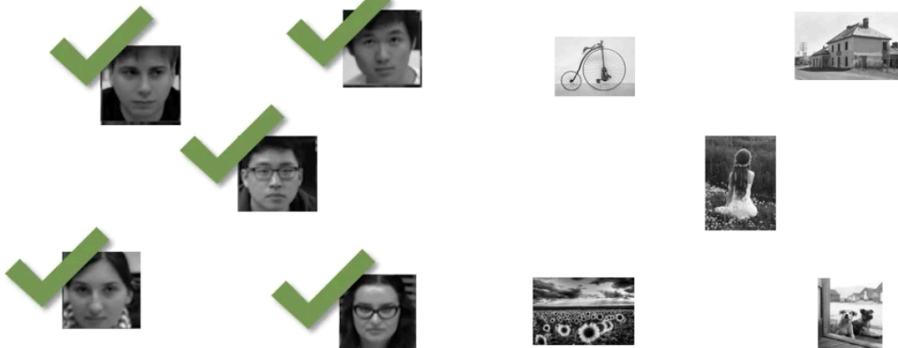
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$$F(x) = \alpha_1 f_1(x) + \alpha_2 f_2(x) + \alpha_3 f_3(x) + \dots$$



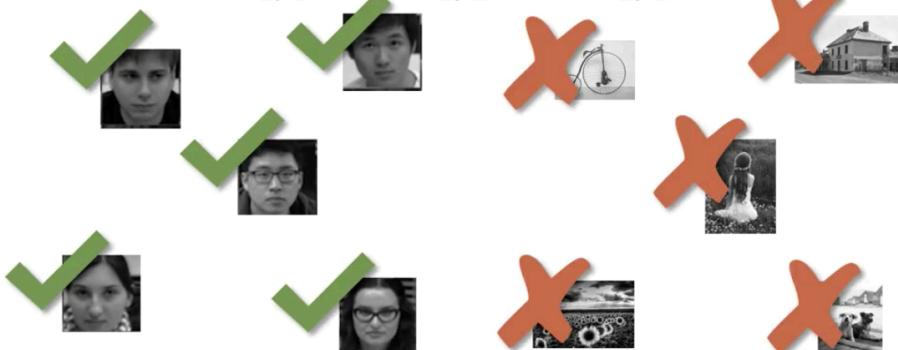
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We keep building the strong classifier based on the weak classifiers until we detect all of these pictures correctly.

Additional Reading

Additional Reading:

Boosting Image Retrieval

Kinh Tieu & Paul Viola (2000)

Link:

[http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.136.2419
&rep=rep1&type=pdf](http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.136.2419&rep=rep1&type=pdf)

