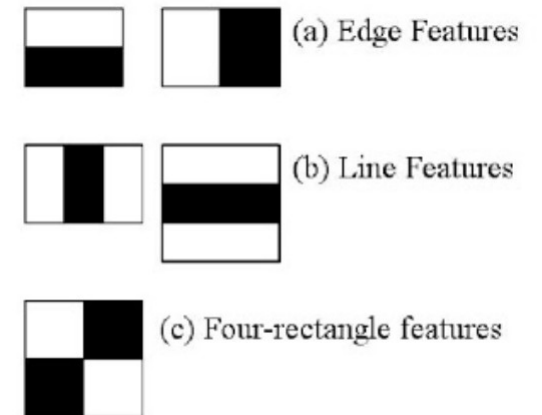




Final Project Presentation (Lukas Lechner, Claudio Nardin, Dominic Egger)

Background

- » **Goal:** Evaluate a machine learning model for smile detection in pictures using Viola & Jones features
- » **Dataset:**
 - 13165 samples (3690 positives, 9475 negatives)
 - 64x64 images of cropped faces
 - many false annotations
- » **Viola & Jones** feature extraction:
 - Compute Haar-like features using integral images
 - Use AdaBoost to find efficient classifiers
 - Create Cascade filters



Method

- » OpenCV's implementation of Viola & Jones feature extractor and detection were used
- » Jupyter notebook
- » Initially, OpenCV's default smile cascade was used
- » After evaluation, a custom cascade was trained
- » Performance was then compared against LeNet



Demo

Results

- » Given image dataset has a high number of controversial or even false annotations
- » Impact on evaluation and performance



Results

Trial 1: default classifier
scaleFactor: 1.1
minNeighbors: 3

		True	
		Positive	Negative
Pred.	Positive	3486	5833
	Negative	120	3697

Precision: 0.374
Recall: 0.967
Accuracy: 0.547

Trial 2: default classifier
scaleFactor: 1.3
minNeighbors: 10

		True	
		Positive	Negative
Pred.	Positive	2134	677
	Negative	1472	8853

Precision: 0.76
Recall: 0.59
Accuracy: 0.84

Trial 3: custom classifier

training specs:

sample width/height: 20/10
pos/neg sample size: 1000/500
stages: 20

detection specs:
scaleFactor: 1.1
minNeighbors: 3

		True	
		Positive	Negative
Pred.	Positive	3606	1215
	Negative	0	8315

Precision: 0.75
Recall: 1.00
Accuracy: 0.91

Trial 4: custom classifier

training specs:

sample width/height: 20/10
pos/neg sample size: 1000/500
stages: 20

detection specs:
scaleFactor: 1.1
minNeighbors: 4

		True	
		Positive	Negative
Pred.	Positive	3606	689
	Negative	0	8841

Precision: 0.84
Recall: 1.00
Accuracy: 0.95

Results

» A number of trials were conducted, 4 of which will be used to illustrate the progression of the project



Results

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scaleFactor: 1.1
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		True	
		Positive	Negative
Pred.	Positive	3606	689
	Negative	0	8841

Precision: 0.84
Recall: 1.00
Accuracy: 0.95

Results

LeNet performance:

	precision	recall	F1 score	support
not smiling	0.95	0.93	0.94	1895
smiling	0.83	0.88	0.85	738
avg/total	0.92	0.91	0.92	2633

Trial 4 custom cascade performance:

	precision	recall	F1 score	support
not smiling	1.0	0.93	0.96	9475
smiling	0.84	1.00	0.91	3690
avg/total	0.96	0.95	0.95	13165

Conclusion

- » Cascade classifier trained on the dataset outperforms LeNet for smile detection
- » Further surveys considering portability would be necessary to determine performance more accurately