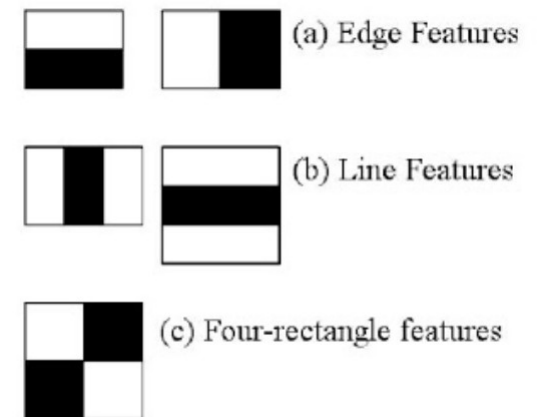




Final Project Presentation (Lukas Lechner, Claudio Nardin, Dominic Egger)

# 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

Trial 1: default classifier  
scaleFactor: 1.1  
minNeighbors: 3

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Pred.	Positive	3486	5833
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pos/neg sample size: 1000/500  
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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

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

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