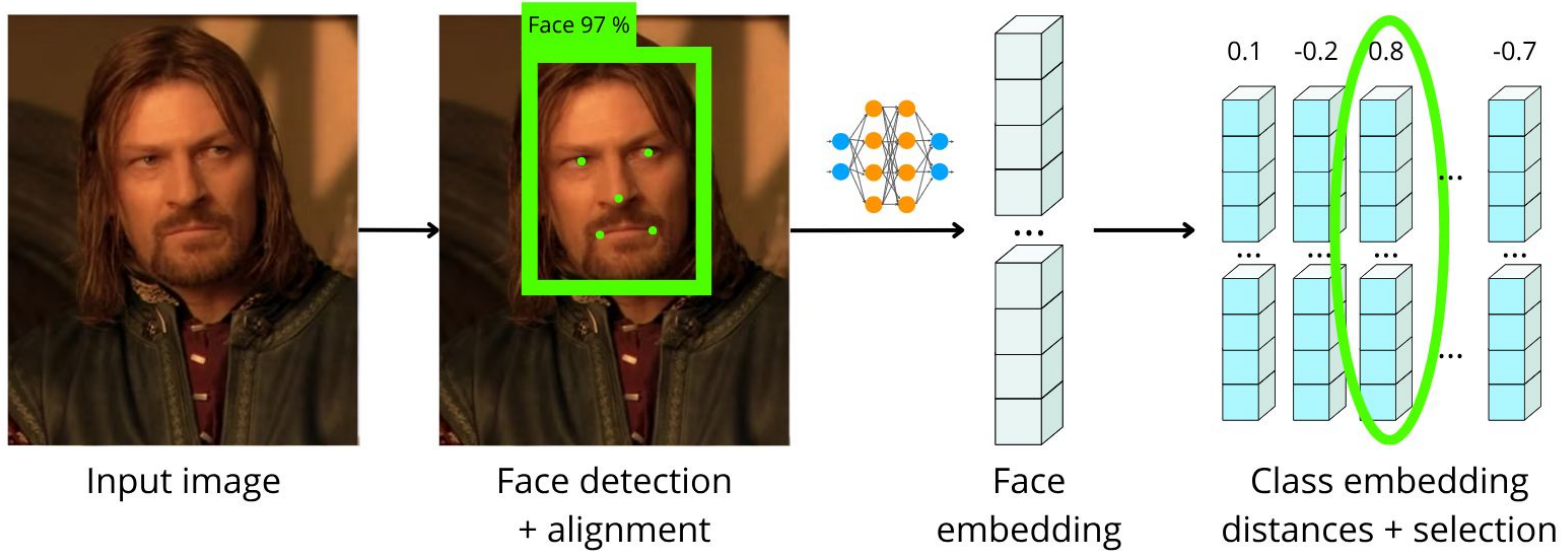


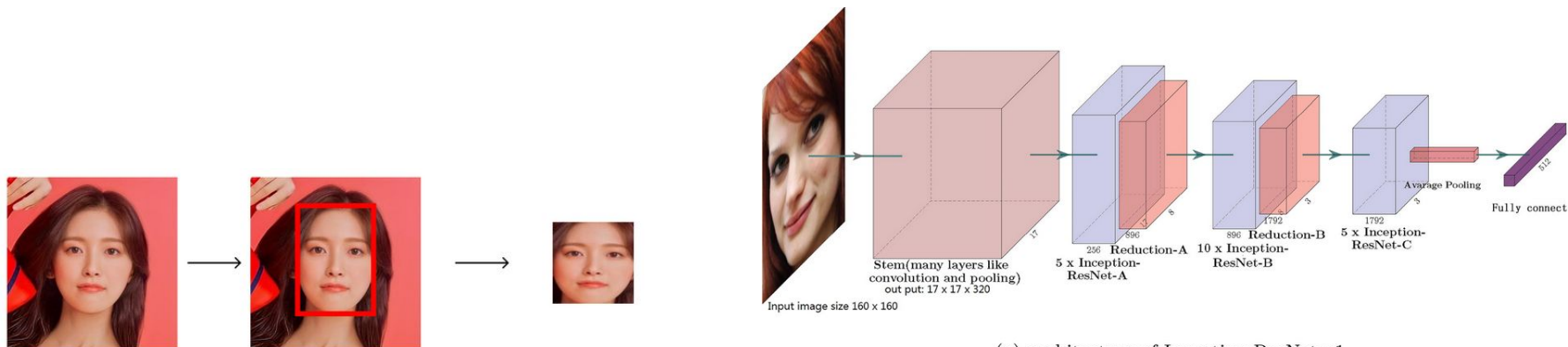
Facial recognition from images (identification)

Vojtěch Vlach (xvlach22)
Martin Kneslík (xknesl02)
Zuzana Hrkľová (xhrklo00)

- What is face identification
- What we did
- How it went



- Face detection – MTCNN via facenet_pytorch
- Face identification:
 - Embedding extraction – facenet_pytorch's InceptionResNetV1
 - Cosine similarity
 - Models: VGGFace2, ResNet50



(a) architecture of Inception-ResNet v1

- CelebA dataset
(Large-scale CelebFaces Attributes)
- 10177 number of identities
- 202599 number of face images
- 40 binary attributes annotations per image

Eyeglasses



Wearing Hat



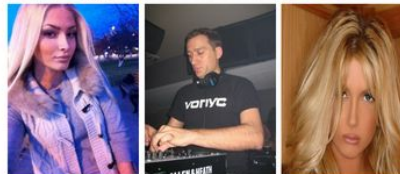
Bangs



Wavy Hair



Pointy Nose



Mustache



Oval Face



Smiling



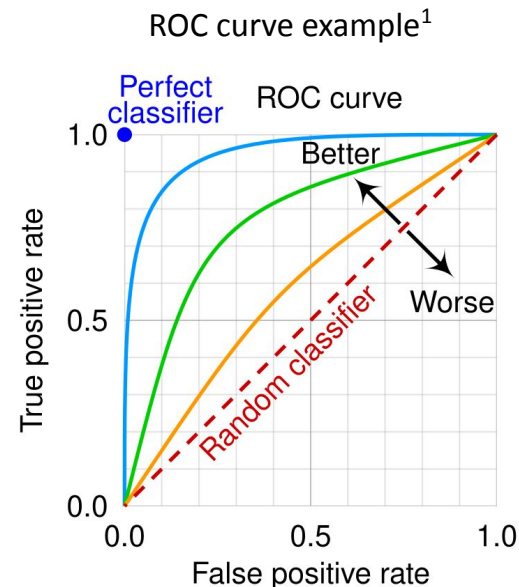


Attribute	Accuracy (0.6)*	Accuracy (0.7)*	Accuracy (0.8)*	Number of pairs
eyeglasses/sunglasses	0.47	0.21	0.04	14512
blurry photo	0.50	0.26	0.07	16870
wearing lipstick	0.58	0.31	0.09	34745
wearing hat	0.56	0.33	0.11	14279
heavy makeup	0.63	0.37	0.11	44659
blond hair	0.63	0.37	0.12	26260

* Threshold accuracy = similarity of two images > threshold

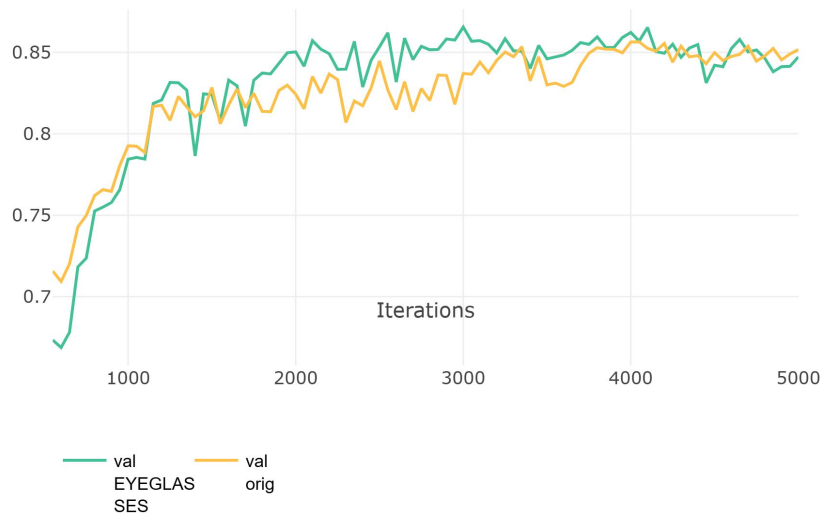
Goal: fine-tune subtask while not decreasing overall accuracy

- Validation:
 - filtered dataset for specific task (attribute) + original dataset
 - Threshold accuracy of all image pairs
 - AUC - Area Under (ROC) curve
- Training:
 - filtered dataset for the task
 - Arc Face Loss (triplet loss but with Cosine similarity)
 - GPU: GeForce GTX Titan 16GB
 - Batch 16 of 160 x 160 normalized images
- **VGGFace2** from *facenet_pytorch* (27M params)
 - Inception-resnet-V1 pretrained on VGGFace dataset
- **Resnet50** from *pytorch* (24M params)
 - pretrained on ImageNet

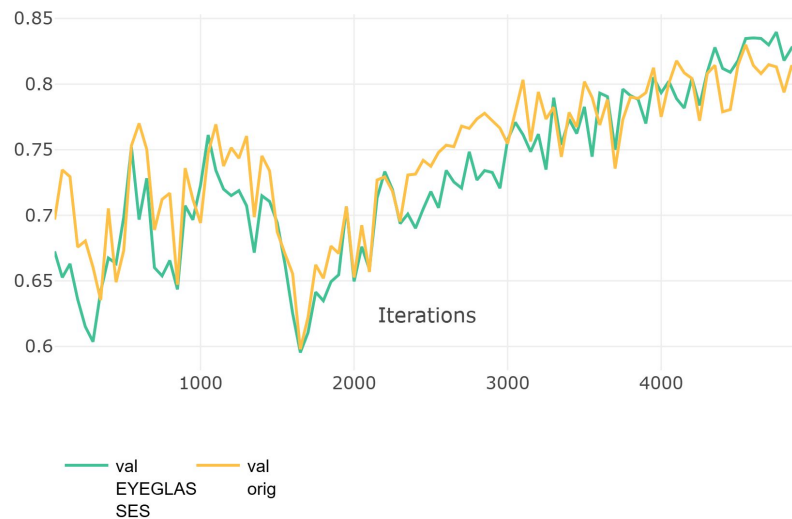


[1] https://en.wikipedia.org/wiki/Receiver_operating_characteristic

AUC on Resnet



AUC on VGGface2

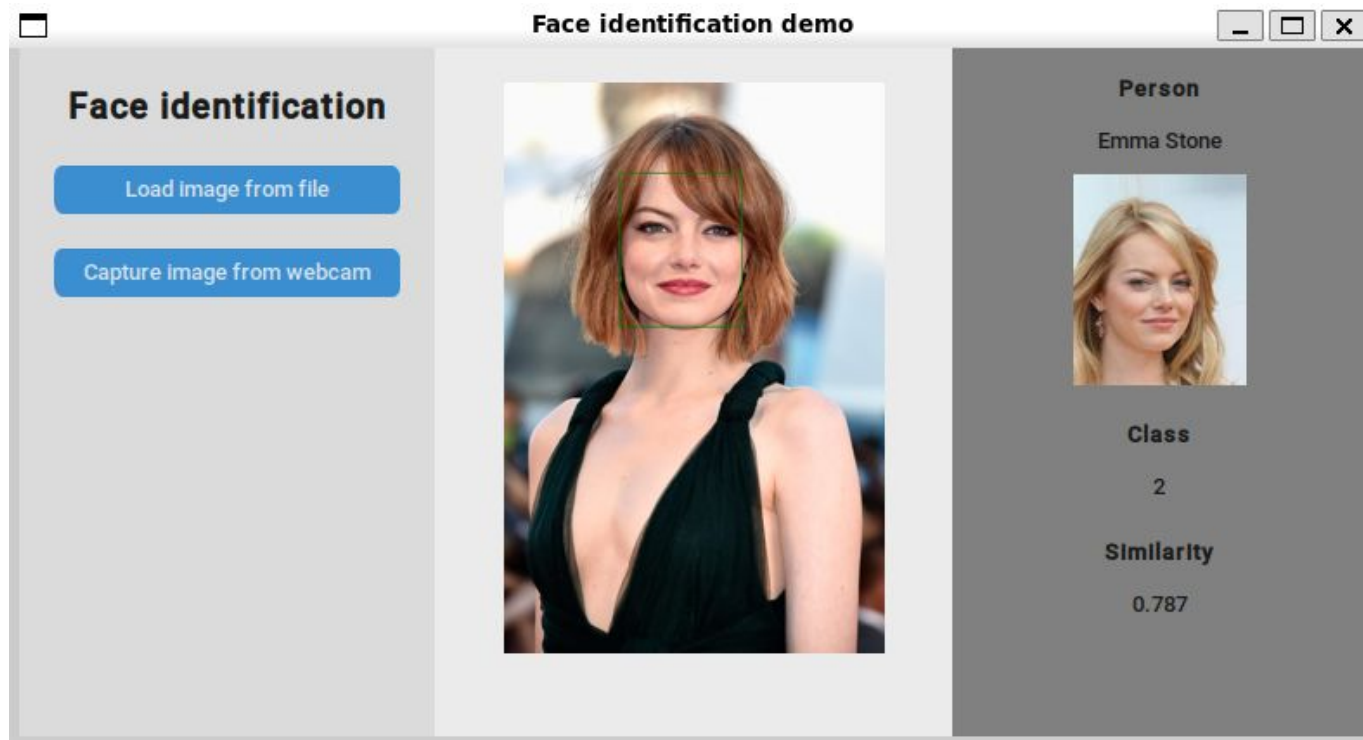


task	trn images	ResNet50 AUC		VGGFace2 AUC	
		filtered val data	orig val data	filtered val data	orig val data
orig	162770		0.71		0.72
eyeglasses	13306	0.87	0.86	0.85	0.84
blurry photo	16456	0.81	0.82	0.63	0.66
wearing lipstick	28654	0.72	0.77	0.65	0.73

1000 images in 220 classes

Model	Top-1*	Top-2*	Top-3*
Resnet (pretrained)	.68	.76	.80
VGGFace2 (pretrained)	.98	.99	.99
VGGFace2 eyeglasses	.64	.73	.78
Resnet eyeglasses	.94	.97	.98

* Top-n = Correct image class/identity was in top N most similar classes

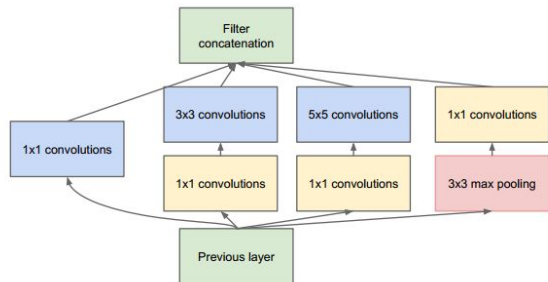




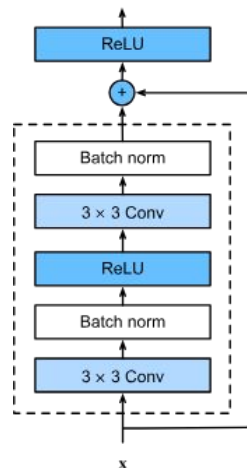
- Task
- Our solution
 - Dataset
 - Face detection
 - Face identification (face_net + pytorch resnet)
- Evaluation
 - Classification + Area under ROC curve
- Experiments + results
 - Dataset subsets
- Conclusion + demo app(s)

- **VGGFace2** from *facenet_pytorch* (27M params)
 - Inception-resnet-V1 pretrained on VGGFace dataset
- **Resnet50** from *pytorch* (24M params)
 - pretrained on ImageNet

Inception block²



Residual block¹



[1] https://d2l.ai/chapter_convolutional-modern/resnet.html

[2] <https://medium.com/swlh/understanding-inception-simplifying-the-network-architecture-54cd31d38949>