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Organization: SpringBoard - Data Science Career Track

Capstone Two Project Ideas

1. Visual aid

Context: According to the WHO, approximately 253 million people live with vision impairment. Whilst many have adapted systems to help them with day to day living, there are times that when they could do with a little help for simple things like distinguishing colours or checking expiry dates. <https://www.bemyeyes.com/>

Goal: Help to be the eyes of someone who need's visual assistance

Approach: Use machine learning to identify objects in the person's surroundings based on an image or video

Models: Deep learning networks

Source:

- **Caltech 256:** Pictures of objects belonging to 256 categories.
- **Labelme:** A large dataset of annotated images.
- **ImageNet:** The de-facto image dataset for new algorithms. Many image API companies have labels from their REST interfaces that are suspiciously close to the 1000 category; WordNet; hierarchy from ImageNet.
- **Google's Open Images:** A collection of 9 million URLs to images "that have been annotated with labels spanning over 6,000 categories" under Creative Commons.

2. Name this expression

Context: Children on the autism spectrum have difficulties recognising facial expressions, body language and tonality of voice. However, by practicing social skills such as identifying facial expressions in a context with less pressure allows children build confidence in these skills for use in daily life. <http://luxai.com/2017/11/29/improve-emotion-recognition-understanding-children-autism/>

Goal: Build a tool that correctly identifies facial expressions from photographs, this tool can then be included in a game or app for the child.

Approach: Use machine learning to identify facial expressions

Models: Deep learning networks

Source:

- **JACFEE:** Japanese and Caucasian Facial Expressions of Emotion
- **mmifacedb:** MMI Facial Expression Database
- **3D facial expression** - Binghamton University 3D Static and Dynamic Facial Expression Databases (Lijun Yin, Jeff Cohn, and teammates)
- **Binghamton Univ 3D static and dynamic facial expression database** (Lijun Yin, Peter Gerhardstein and teammates)
- **Binghamton-Pittsburgh 4D Spontaneous Facial Expression Database** - consist of 2D spontaneous facial expression videos and FACS codes. (Lijun Yin et al.)
- **BioVid Heat Pain Database** - This video (and biomedical signal) dataset contains facial and physiopsychological reactions of 87 study participants who were subjected to experimentally induced heat pain.(University of Magdeburg (Neuro-Information Technology group) and University of Ulm (Emotion Lab))

- Bosphorus 3D/2D Database of FACS annotated facial expressions, of head poses and of face occlusions (Bogazici University)
- CMU Facial Expression Database (CMU/MIT)
- CMU Pose, Illumination, and Expression (PIE) Database (Simon Baker)
- The CMU Multi-PIE Face Database - more than 750,000 images of 337 people recorded in up to four sessions over the span of five months. (Jeff Cohn et al.)
- Cohn-Kanade AU-Coded Expression Database - 500+ expression sequences of 100+ subjects, coded by activated Action Units (Affect Analysis Group, Univ. of Pittsburgh)
- PARSE Dataset Additional Data - facial expression, gaze direction, and gender (Antol, Zitnick, Parikh)
- Facial Expression Dataset - This dataset consists of 242 facial videos (168,359 frames) recorded in real world conditions. (Daniel McDuff et al.)
- <http://grail.cs.washington.edu/projects/deepexpr/ferg-db.html> - database of stylized characters with annotated facial expressions

3. Image matting

Context: Cropping out backgrounds in photographs is always a pain. Photoshop's wand tool doesn't always do the trick. Can machine learning help to do a better job?

Goal: Build an automatic portrait segmentation model

Approach: Use machine learning to identify where faces are

Models: Deep learning networks

Source:

- **FERET:** The Facial Recognition Technology Database
- IndianFaceDatabase
- The Yale Face Database and The Yale Face Database B).

- [300 Videos in the Wild \(300-VW\)](#) - 68 Facial Landmark Tracking (Chrysos, Antonakos, Zafeiriou, Snape, Shen, Kossaifi, Tzimiropoulos, Pantic)
- [BioID face database](#) (BioID group)
- [Caricature/Photomates dataset](#) - a dataset with frontal faces and corresponding Caricature line drawings (Tayfun Akgul)
- [CMU/MIT Frontal Faces](#) (CMU/MIT)
- [CMU/MIT Frontal Faces](#) (CMU/MIT)
- [CSSE Frontal intensity and range images of faces](#) (Ajmal Mian)
- [CelebA](#) - Large-scale CelebFaces Attributes Dataset(Ziwei Liu, Ping Luo, Xiaogang Wang, Xiaoou Tang)
- [MS-Celeb-1M](#) 1 million images of celebrities from around the world. Requires some filtering for best results on deep networks.
- [Columbia Gaze Data Set](#) - 5,880 images of 56 people over 5 head poses and 21 gaze directions (Brian A. Smith, Qi Yin, Steven K. Feiner, Shree K. Nayar)
- [FaceScrub](#) - A Dataset With Over 100,000 Face Images of 530 People (50:50 male and female) (H.-W. Ng, S. Winkler)
- [FaceTracer Database - 15,000 faces](#) (Neeraj Kumar, P. N. Belhumeur, and S. K. Nayar)
- [Face-in-Action](#)
- [Yale Face Database - 11 expressions of 10 people](#) (A. Georghaides)
- [Labelled Faces in the Wild](#): 13,000 cropped facial regions (using; [Viola-Jones](#) that have been labeled with a name identifier. A subset of the people present have two images in the dataset—it's quite common for people to train facial matching systems here.
- [UMD Faces](#) Annotated dataset of 367,920 faces of 8,501 subjects.
- [CASIA WebFace](#) Facial dataset of 453,453 images over 10,575 identities after face detection. Requires some filtering for quality.
- [Olivetti](#): A few images of several different people.

4. 100 years of beauty

Context: In 2015, a couple who were about to get married decided to do a photoshoot of themselves when they got old. The video went viral and received close to 19 million views on YouTube by 2018. The couple used makeup to simulate the aging process but what if we could use machine learning to 'age' an individual?

Goal: To build a virtual time machine

Approach: Use machine learning and style transfer

Source:

- [IMDB-WIKI](#) - 500k+ face images with age and gender labels (Rasmus Rothe, Radu Timofte, Luc Van Gool)

5. #IDidNotWakeUpLikeThis

Context: A clip starts off showing a lady slinking out of bed in the dead of night, she goes into the bathroom, stealthily applies her makeup, and with the aptitude of a ninja slides back into bed before the sun rises. Fast forward 6 months, the same individual lies in bed disheveled and snoring.

This caricature of the 'dating game' is about how relationships start off pretty as picture, propped up by unsustainable vigour but inevitably backslides to reality.

Goal: To build a without makeup filter

Approach: Use machine learning and style transfer to simulate / remove makeup from an image

Source:

- [EURECOM Facial Cosmetics Database](#) - 389 images, 50 persons with/without make-up, annotations about the amount and location of applied makeup.(Jean-Luc DUGELAY et al)

6. **#Batman filter**

Context: Everyone wants to be like batman

Goal: Create a batman filter

Approach: Use machine learning to crop out the person's face and replace it with Batman's