

CS 725: Foundations of Machine Learning

Project Proposal Report

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Title: Face detection using machine learning techniques

Project description

Through this project, we intend to implement machine learning algorithms in detecting and recognizing faces. Face detection is a problem that has many tangible applications in everyday life. It also acts as a precursor to the important problem of face recognition.

We will get to learn different ML based approaches to this problem through this course project and apply them to real-world applications such as detecting and recognizing students' faces in video feed for marking attendance, detecting criminals' faces in CCTV footage etc. Our work will be directly applicable to such areas, where a continuous video stream is used to make predictions and analysis.

Approaches

We have performed a comprehensive literature survey of the various approaches involved in solving this problem. The most recent technique being adopted in this field is based on convolutional neural networks. Following are the two papers on which we intend to work:

- Li, Haoxiang, et al. "**A convolutional neural network cascade for face detection.**" *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*. 2015.
- Farfade, Sachin Sudhakar, Mohammad J. Saberian, and Li-Jia Li. "**Multi-view face detection using deep convolutional neural networks.**" *Proceedings of the 5th ACM on International Conference on Multimedia Retrieval*. ACM, 2015.

Data sets

The above two papers make use of the following two datasets:

- **Fddb: Face Detection Data Set and Benchmark** (<http://vis-www.cs.umass.edu/fddb/>). [Jain, Vidit, and Erik G. Learned-Miller. "Fddb: A benchmark for face detection in unconstrained settings." *UMass Amherst Technical Report* (2010).]. This dataset includes:
 - 2845 images with a total of 5171 faces;
 - a wide range of difficulties including occlusions, difficult poses, and low resolution and out-of-focus faces;
 - the specification of face regions as elliptical regions; and
 - both grayscale and color images.

- **Annotated Facial Landmarks in the Wild** (<https://lrs.icg.tugraz.at/research/aflw/>) [Köstinger, Martin, et al. "Annotated facial landmarks in the wild: A large-scale, real-world database for facial landmark localization." *Computer Vision Workshops (ICCV Workshops)*, 2011 *IEEE International Conference on*. IEEE, 2011.]: Annotated Facial Landmarks in the Wild (AFLW) provides a large-scale collection of annotated face images gathered from Flickr, exhibiting a large variety in appearance (e.g., pose, expression, ethnicity, age, gender) as well as general imaging and environmental conditions. In total about 25k faces are annotated with up to 21 landmarks per image.