

Facial Expression Recognition

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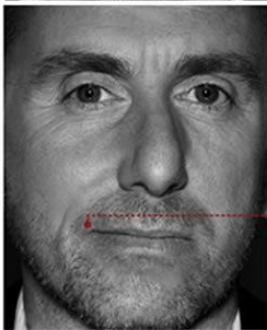
sadness

- ① drooping upper eyelids
- ② losing focus in eyes
- ③ slight pulling down of lip corners



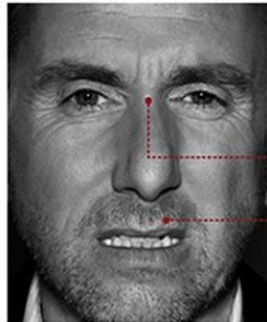
anger

- ① eyebrows down and together
- ② eyes glare
- ③ narrowing of the lips



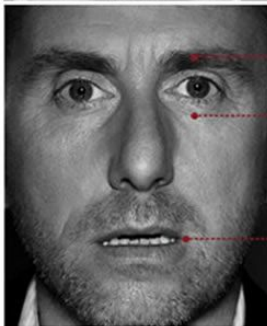
contempt

- ① lip corner tightened and raised on only one side of face



disgust

- ① nose wrinkling
- ② upper lip raised



surprise

- Lasts for only one second:
- ① eyebrows raised
 - ② eyes widened
 - ③ mouth open

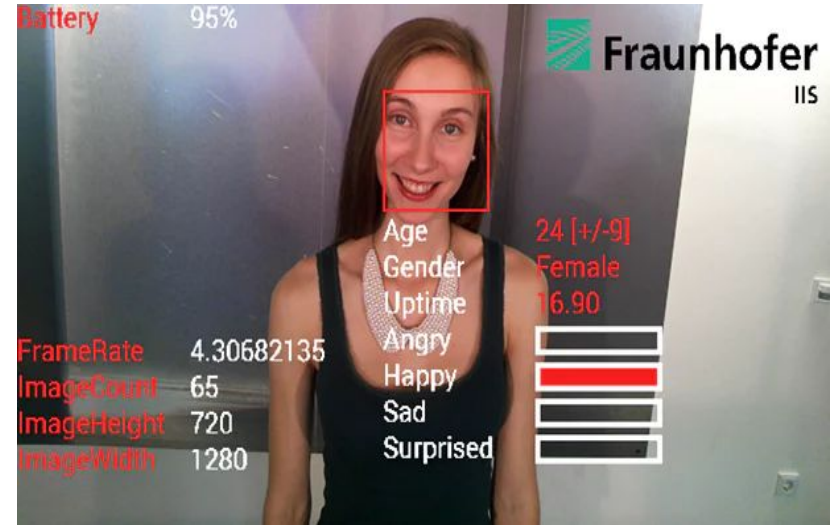


fear

- ① eyebrows raised and pulled together
- ② raised upper eyelids
- ③ tensed lower eyelids
- ④ lips slightly stretched horizontally back to ears

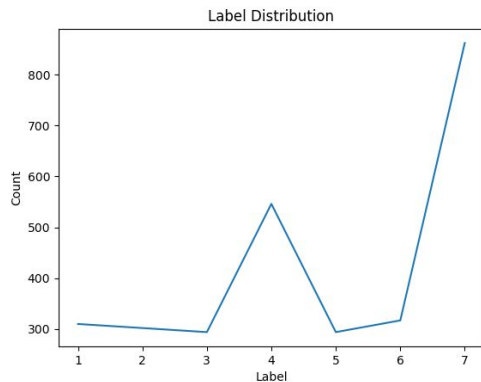
Problem Statement

- Predict people's emotion based on their facial expression



Dataset

- Toronto Faces Dataset
- 32 by 32 greyscale
- 2925 labeled images, 98058 unlabeled images
- label: identity and emotion



(a) Anger



(b) Disgust



(c) Fear



(d) Happy



(e) Sad



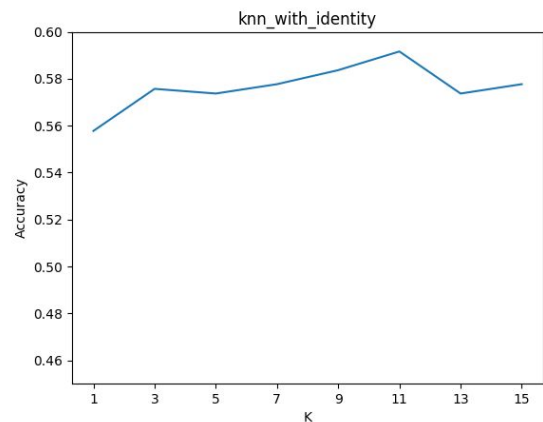
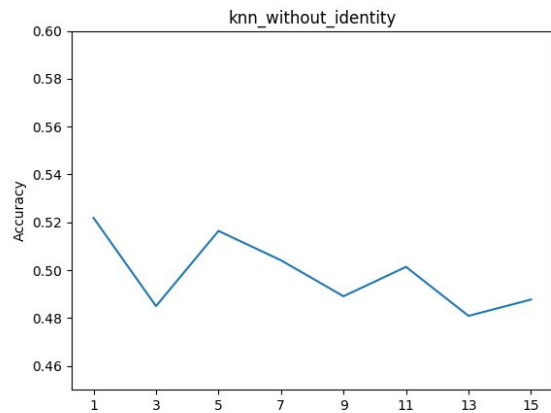
(f) Surprise



(g) Neutral

Supervised Learning

kNN	64%
Logistic Regression	73%
Linear SVM	71%
MLP	75%

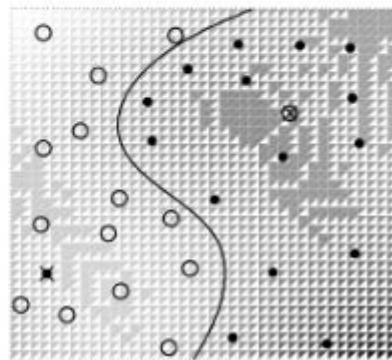
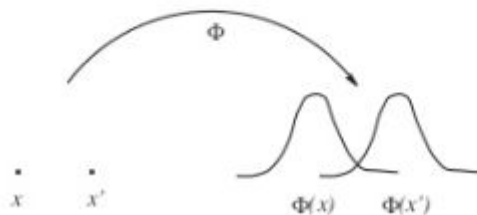


RBF Kernel

- 80% accuracy
- PCA for dimension reduction

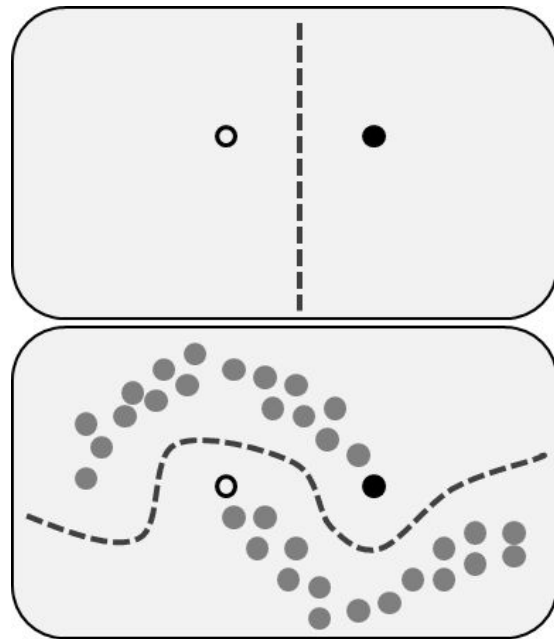
The RBF kernel $K(\mathbf{x}, \mathbf{x}') = \exp(-\gamma \|\mathbf{x} - \mathbf{x}'\|^2)$ is one of the most popular kernel functions. It adds a "bump" around each data point:

$$f(\mathbf{x}) = \sum_{i=1}^m \alpha_i \exp(-\gamma \|\mathbf{x}_i - \mathbf{x}\|^2) + b$$



Semi-Supervised Learning

- Small amount of labeled data with a large amount of unlabeled data
- Label Propagation
- Label Spreading



Ensemble modeling

- MLP, logistic regression, RBF SVM
- 84% accuracy

Next Step

- Further take advantage of the unlabeled images

