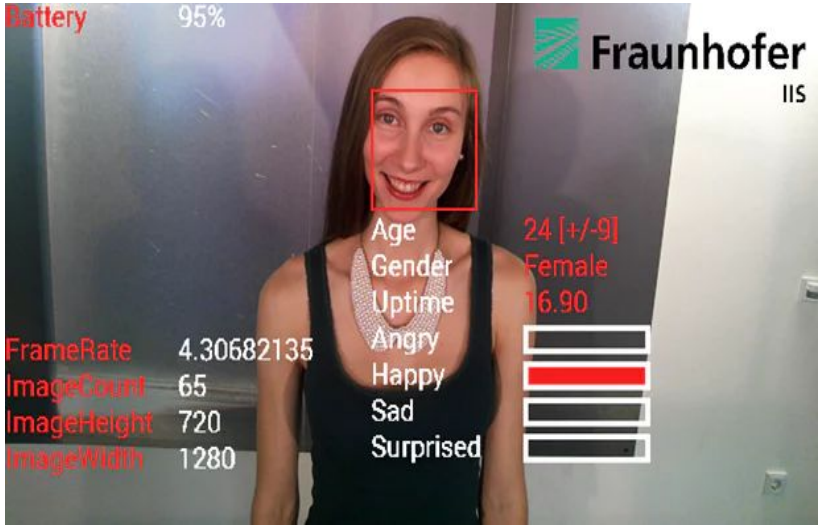
Facial Expression Recognition

Tao Yuan (ty353)
I Huang (ih265)

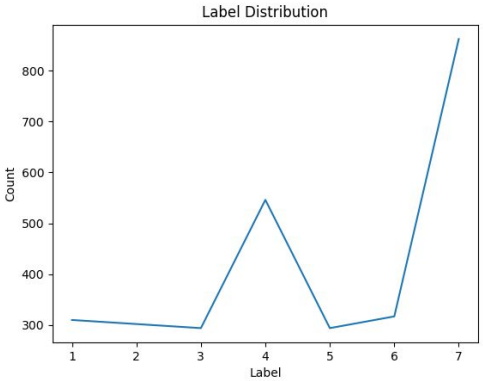
Problem Statement

- **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

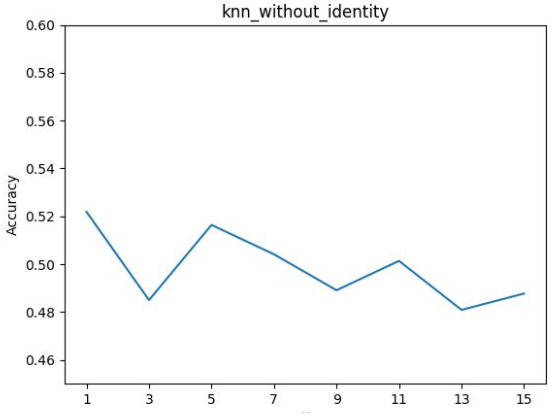

(e) Sad

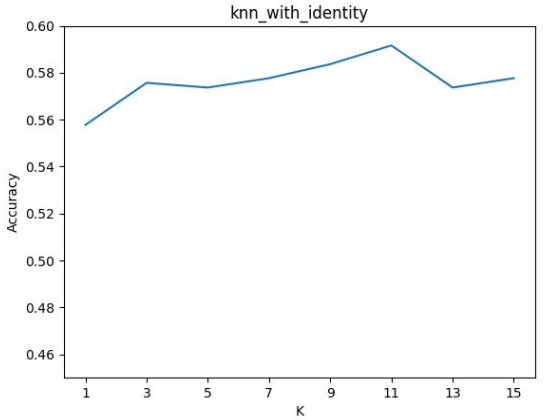

(f) Surprise


(g) Neutral

Supervised Learning

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



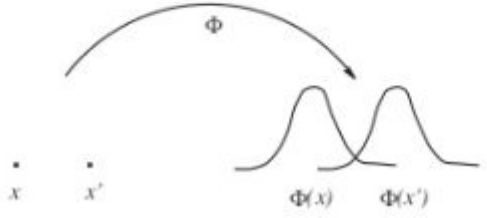


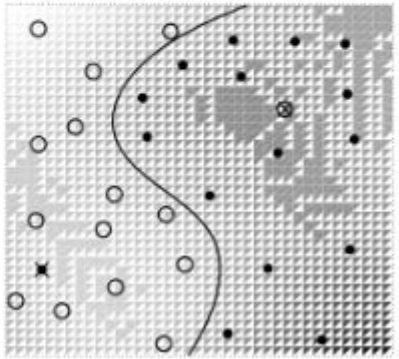
RBF Kernel

- **80% accuracy**
- **PCA for dimension reduction**

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

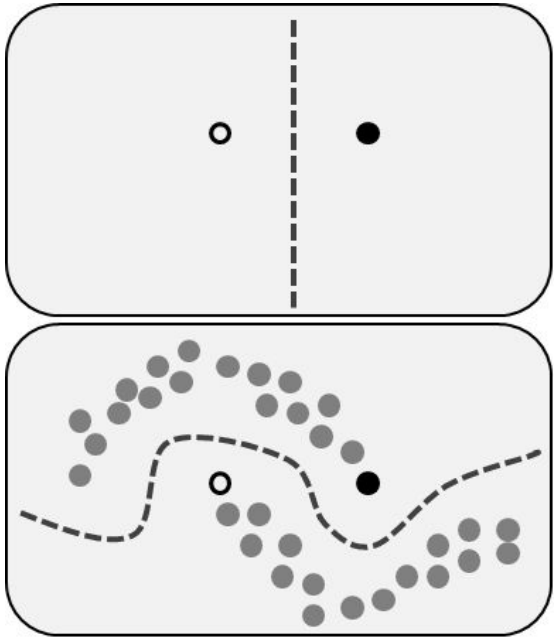
$$f(\boldsymbol{x}) = \sum_{i=1}^{m} \alpha_i \exp(-\gamma||\boldsymbol{x}_i - \boldsymbol{x}||^2) + b$$





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**