HUMAN EMOTION RECOGNITION

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Problem

Input

- A front face photo with full eyes, mouth, nose and forehead
- The face can be captured at various angles
- Capture device and face are in a straight line parallel to the ground
- The photo must be grayscaled

Output

Surprised

Sad

Neutral

Happy

Fear

Disgust

Angry

Example

Input

Method

Output

Importance

Mental health improvement

Education & personalized learning

Health monitoring

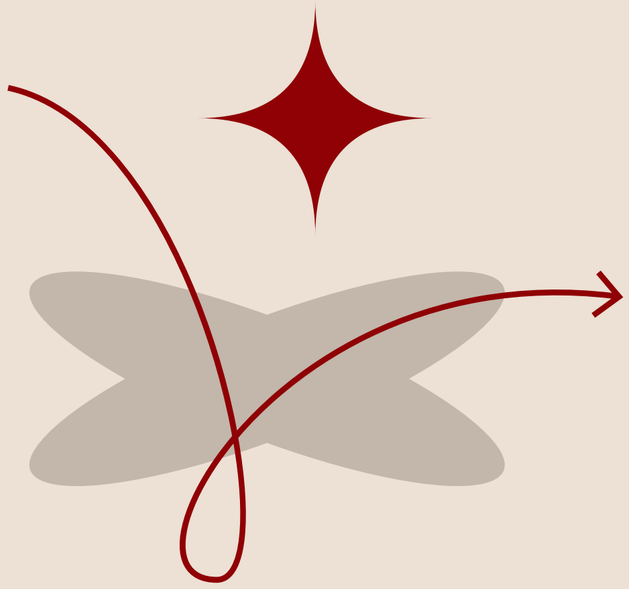
Methods

Feature

Histogram of Oriented Gradients (HOG)

compute_HOG()

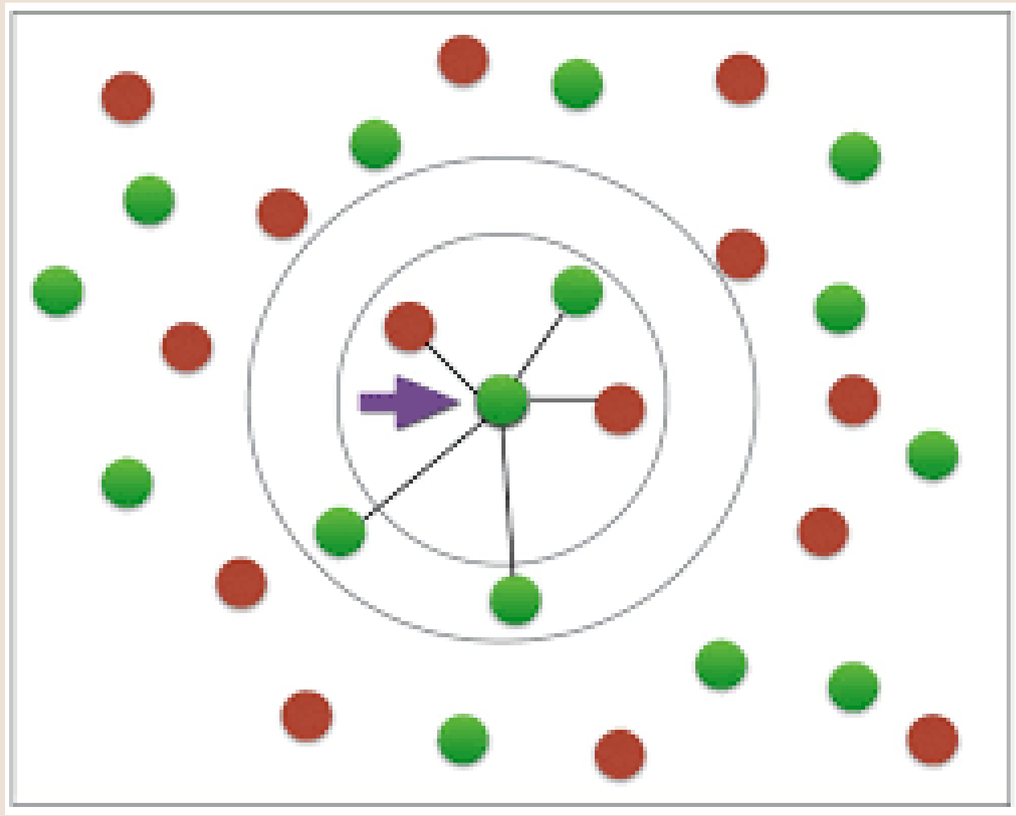
Machine Learning Models



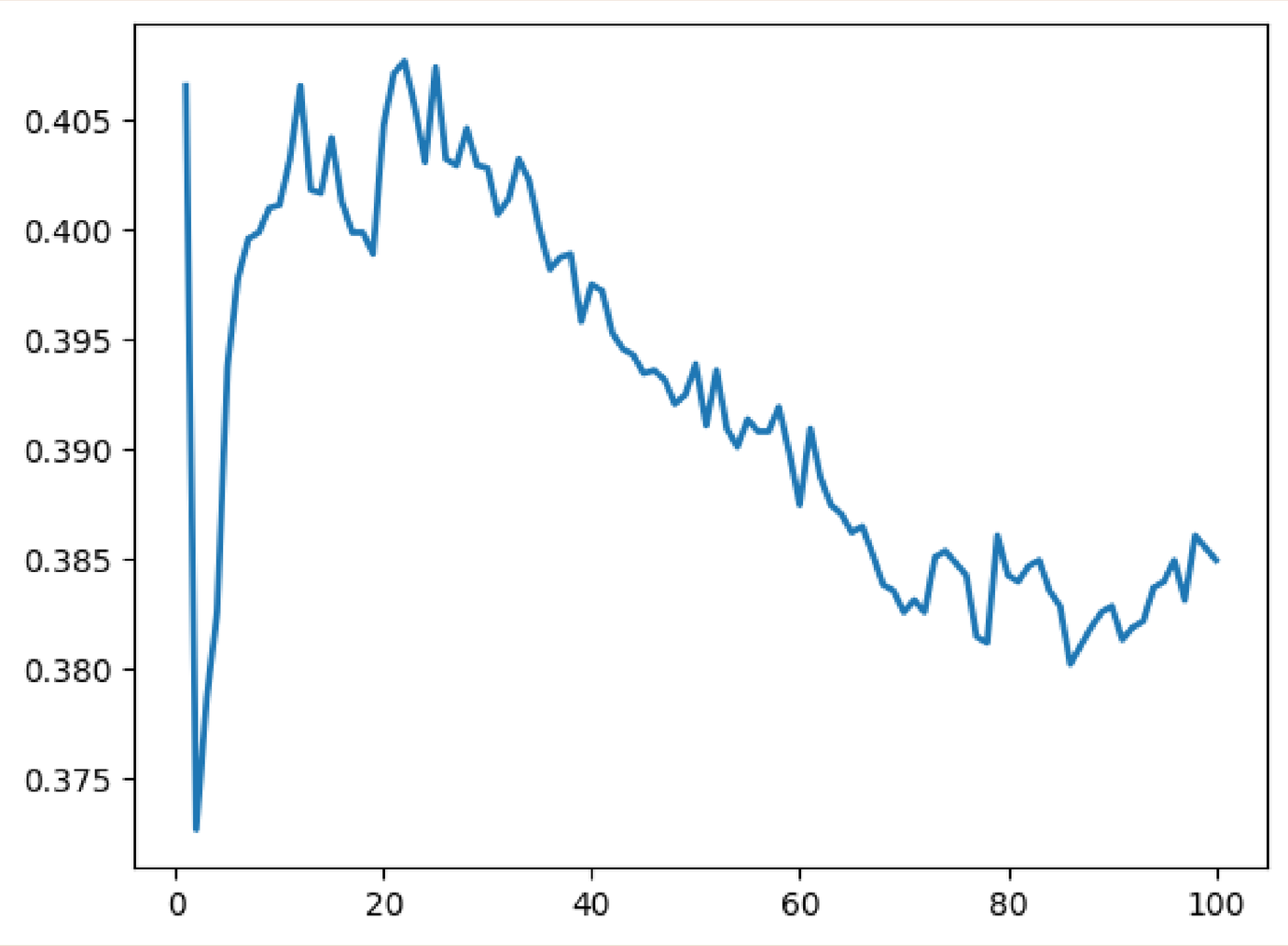
1. k Nearest Neighbors (kNN)
2. Random Forest
3. Softmax Regression
4. Support Vector Machines (RBF)

k Nearest Neighbors

- k from 1 to 100
- Euclidean distance



k Nearest Neighbors



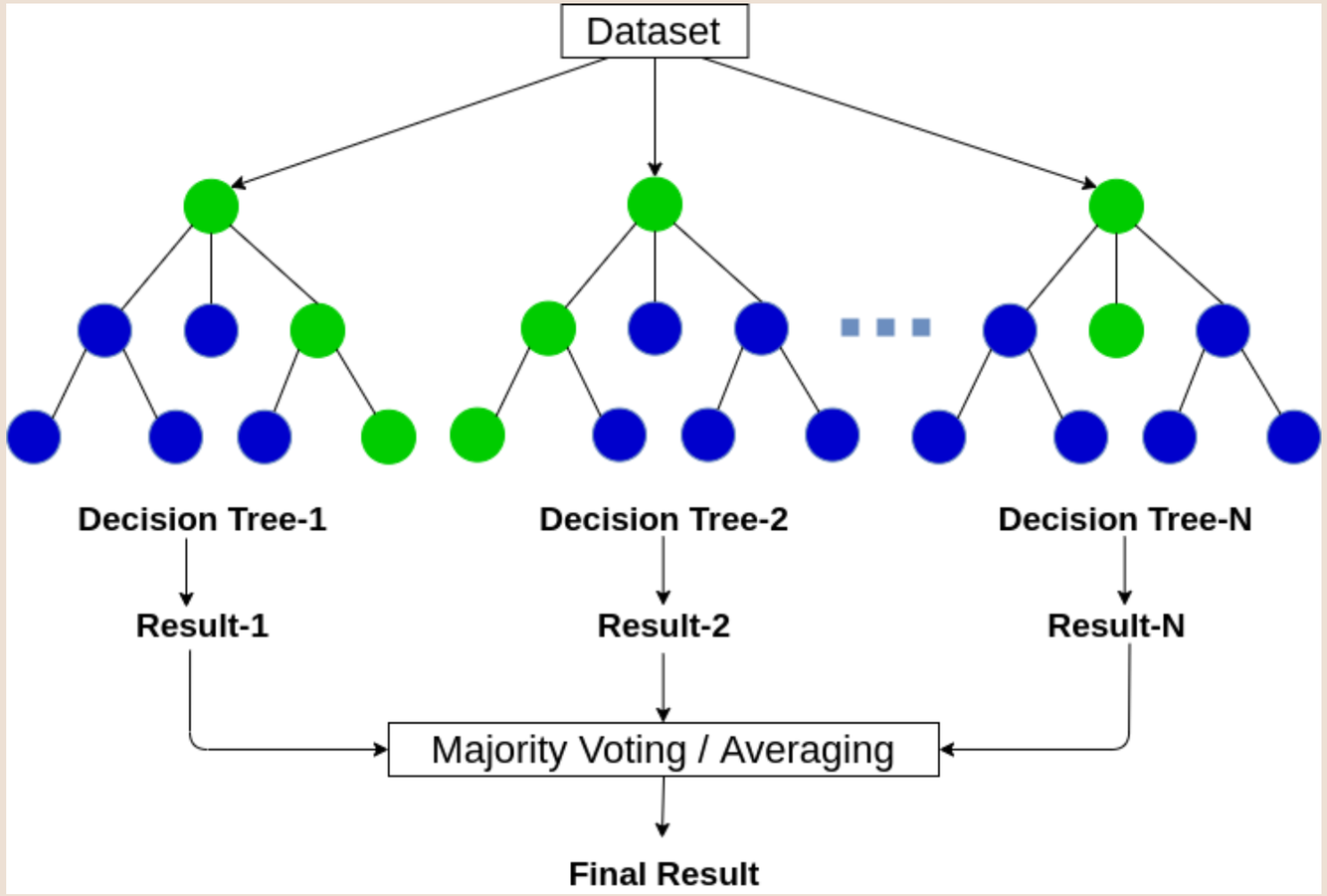
- Highest accuracy is 40.763% at k = 22

Softmax Regression

- Regularization: C=1
- Penalty: l2

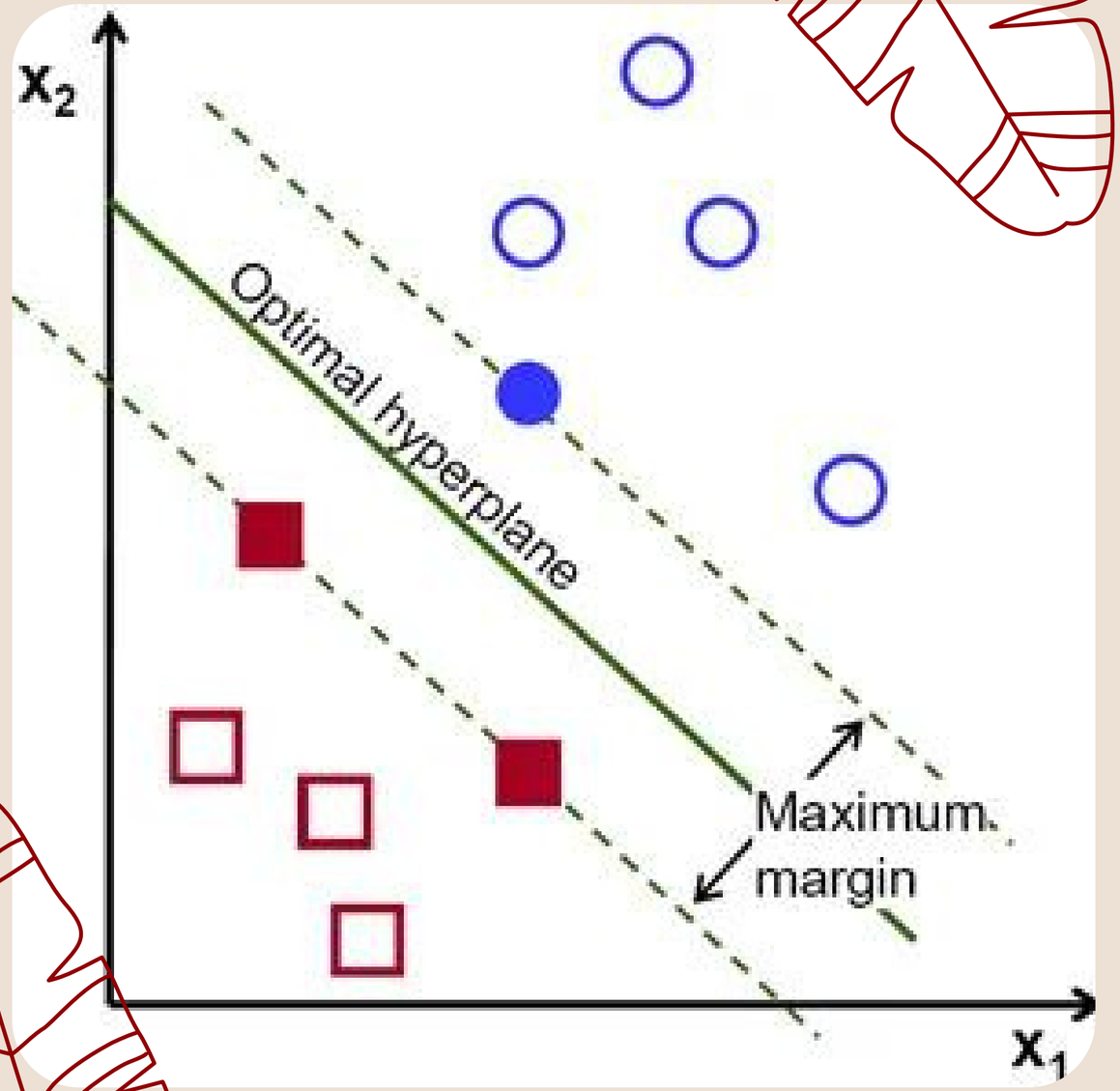
Random Forest

- No. of decision trees: 2000 (n_estimators=2000)



Support Vector Machine

- Regularization: C = 1
- Kernel: RBF



Dataset

FER2013

FER2013

- Authors: Pierre-Luc Carrier and Aaron Courville
- 48x48 grayscale face photos
- 7 classes of emotion: surprise, sad, neutral, happy, fear, disgust, angry
- 28709 images for training and 7178 images for testing

	Training	Testing
happy	7215	1774
neutral	4965	1233
sad	4830	1247
fear	4097	1024
angry	3995	958
surprise	3171	831
disgust	436	111

Metrics & Experiment

Metrics

- Accuracy

Environment

- Google Colab Free
- GPU: Tesla T4
- System RAM: 12GB

Accuracy on testing set

Support Vector Machine (RBF)	50.8%
Random Forest	39.997%
k Nearest Neighbors	40.763%
Softmax Regression	37.81%

Demo

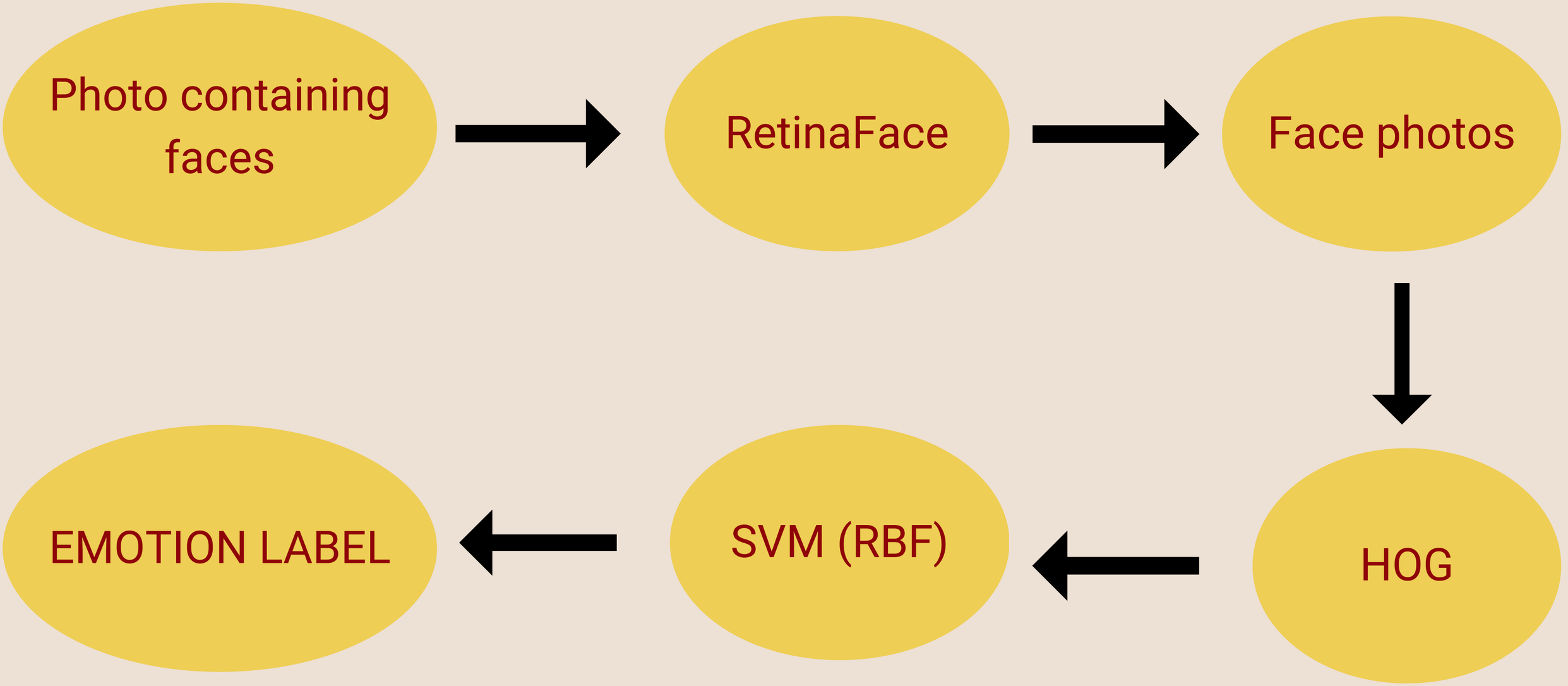


Photo containing faces
RetinaFace
Face photos
HOG
SVM (RBF)
EMOTION LABEL

REFERENCES

- **FER2013 DATASET**
  https://www.kaggle.com/datasets/msambare/fer2013

- **RETINAFACE LIBRARY**

  https://github.com/serengil/retinaface

Thank you