Unsupervised Face Clustering in Raspberry-Pi 2

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Introduction

- Person’s Identification
  - Customized “smart” environment
    - Face Detection → Clustering
  - Supervised learning
    - Safer approach but many practical constraints
    - Not too “smart” to be deployed in smart environment
      - Unsupervised learning

- Embedded platform
  - Low processing capability
  - Memory constraint

→ Unsupervised Face Clustering in Raspberry PI 2
HW & SW Components

- **Hardware component:**
  - Raspberry PI 2
  - Raspberry PI 5MP Camera Board Module
    - Camera interfacing with Raspberry PI 2

- **Software component:**
  - Real-time Face Detection
    - Haar Cascade Classifier (OpenCV)
  - Feature Extraction
    - Autoencoder (Theano Deep Learning Framework)
    - Principal Component Analysis
  - Time-series Data Clustering
    - K-means Clustering
    - D-Stream II Clustering
Process flow

Raspberry PI camera module → Image frames → Raspberry PI 2 → Haar Cascade classifier → Face detection → Autoencoder

Result → Clustering → Feature reduction
Experimental Setup

- Interfaced Raspberry PI Camera module with Raspberry PI 2
- Auto-encoder training and testing
  - 1000 face image frames of 3 persons
    - 900*3 image frames for training the encoder
    - 100*3 image frames for testing
  - Feature reduction from 900 dimension to 100 dimension
Results

✓ Real time Face Detection
✓ Feature reduction (900->100 dimension)
✓ Clustering
  ✓ Accuracy of clustering
    ✓ 93.56% for training
    ✓ 90.67% for testing