# Introduction

* Kind of Biometrics
* Kinds of Performance Measurements

# Pattern Recognition

* Gabor Filters, Gabor Wavelet Transform
* Edge Histogram Descriptor
* Local Descriptors
  + Algorithm
* SIFT, SURF
  + Algorithm
* PCA
  + Idea
  + Algorithm
* Kinds of Classification
  + Bayesian
  + Gaussian
  + Gaussian Mixture Models
    - Expectation Maximization
* Taxonomy of Classification
* Instance based Learning

# Finger Print Recognition

* Ridge Patterns, components
* Minutiae
  + Kinds of minutiae
  + Poincare Index
  + Core Detection
  + Minutiae Extraction Approach
* Matching
  + Correlation-based
  + Minutiae-based
    - Idea
    - RANSAC
  + Ridge feature-based
  + CNN based
  + Pre-Alignment

# Iris Recognition

* Anatomy?
* Iris Recognition
  + Iris Segmentation (Algorithm!)
  + Rubber Sheet Model
  + Measuring Performance
    - FHD
    - Degrees of Freedom
    - Decision
    - FAR
  + Recent Challenges
    - Non-cooperative IRIS matching
    - Local Binary Pattern Histogramm
  + Pros & Cons of IRIS Biometrics

# Face Recognition 1

* Advantages, Challenges
* Closed Set vs Open Set Identification
  + Performance metrics
    - FR, FA
    - ROC
* Preprocessing
* Holistic approaches
  + Eigenfaces
    - PCA Algorithm
    - Eigenfaces Training/Testing
    - Faceness, Face space
  + View-based Eigenspaces
  + Bayesian Face Recognition
  + LDA/Fisherfaces
* Local/fiducial approach
  + Local/Modular PCA
  + Gabor Wavelet Transformtion
  + (Elastic Bunch Graphs)
  + Local Binary Pattern Histogram
  + (High dimensional local feature extraction)

# Face Recognition 2

* Recognition across Pose
  + Geometric pose normalization
  + 2D active appearance model
  + 3D face Model fitting
* DNNs for face recognition
  + DeepFace
  + FaceNet
    - Inception Module
    - Triplet Loss/Metric Learning

# Soft Biometrics

* Gait
  + Avg Silhouette Signature
    - Algorithm
* Others
  + Semantic Descriptors
    - Pro/contra
  + Commonly used features
  + Age estimation
    - Basic Approach
    - 2-stage regression
  + Semantic Attribute recogn.

# Multi Biometrics

* Multimodal vs Crossmodal
* Multi-modal
  + Intra-modal / Multi-modal
  + Fusion Levels
  + Face-Ear
  + Face-Fingerprint
* Deep Perceptual Mapping

# Attacks

* Spoofing/Artificial Samples
* Coercive attack
* Impersonation attack
* Replay attacks
* DoS, database changes
* Font-End Attacks
* Back-End Attacks
* Others
* Counter-attacks

# Standards

* Performance Testing
  + FMR, FNMR (identification)
  + FAR, FRR (verification)
  + FTC, FTE, FTA