Facerecognition for social communities and online image databases

Diplomarbeit
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Face Recognition | Agenda

Agenda

1. Face recognition Pipeline
2. Face recognition Pipeline Extension (social context)
3. Outlook
4. Sources
1. Face recognition Pipeline
Facerecognition Pipeline

- Face Detector
- Face Adjustment
- Face Descriptor
- Face Classifier

Image ➔ Faceimage ➔ Adjusted Faceimage ➔ Face Description ➔ (Probability of Person Identity)
Facedetector

- Viola and Jones [1]
  - Simple features
  - Integral Image
  - Ada-Boosting: Combination of weak classifier to a strong classifier
- openCV implementation

fotos: [6]
Face Adjustmend – Pose

- Facial Features Detection
  - AdaBoosting and SVM
  - Pictorial Structures [2]

\[ L^* = \arg \min_L \left( \sum_{i=1}^{n} m_i(l_i) + \sum_{(v_i,v_j) \in E} d_{ij}(l_i, l_j) \right) \]
Pose Adjustment examples

Facial Features Detection examples

all fotos: [6]
Face Descriptor

- Descriptor for every facial feature
  - Scale-invariant feature transform (SIFT) [3]
  - Speed Up Robust Features [4]
  - Pixel based descriptor
Face Recognition | Pipeline

**Classifier**
- k-Nearest Neighbor
  - Euclidean Distance
  - Cosine Distance
  - Linear Kernel
  - To many features for a non linear kernel
Results with different classifiers
Results with different classifiers

![Graph showing performance comparison between kNN and SVM with 1000 noise classes. The graph plots positive rate against the number of photos per person. Different lines represent different k values for kNN and a linear SVM.]
2. Face Recognition Pipeline Extension
Facerecognition Pipeline Extension

- Without social network context:
  - FaceScore(FaceImg)

- With social network context:
  - FaceScore(FaceImg | c)
  - c = { Set of friends, identity of photographer, friends of photographer, ... }
Lessy Manica

- fully automatic facebook user written in python
- random first friend (South Africa)
- 10 friend requests every day

Statistics:
- Friends: 220
- Fotos from friends of friends: 1,008,316
- Tags: 2,705,860
- Users: 30,077
- Albums: 1,373
### Statistics

<table>
<thead>
<tr>
<th></th>
<th>MIN</th>
<th>MAX</th>
<th>MEAN</th>
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<tbody>
<tr>
<td># Friends</td>
<td>46</td>
<td>1035</td>
<td>46</td>
</tr>
<tr>
<td># Real Friends</td>
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<td>338</td>
<td>70</td>
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<tr>
<td># Fotos/Friends</td>
<td>0</td>
<td>1339</td>
<td>145</td>
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![Graph showing distribution of number of photos per person.](image)
Probabilities

- \( P(\text{persons in a foto are friend}) = 0.61 \)
- \( P(\text{persons are friend with fotograf}) = 0.77 \)

Example:

- FaceScore(?) = 0.61 Person X and 0.34 Person Y

- Person X = NOT friend_of_A and NOT friend_of_Fotograf
  \[ P(X | c) = 0.61 \times 0.39 \times 0.23 = 0.03 \]

- Person Y = friend of A and friend_of_Fotograf
  \[ P(Y | c) = 0.34 \times 0.61 \times 0.77 = 0.145 \]
Outlook.
Thank you for your attention. Any questions?


