



FaceFinder

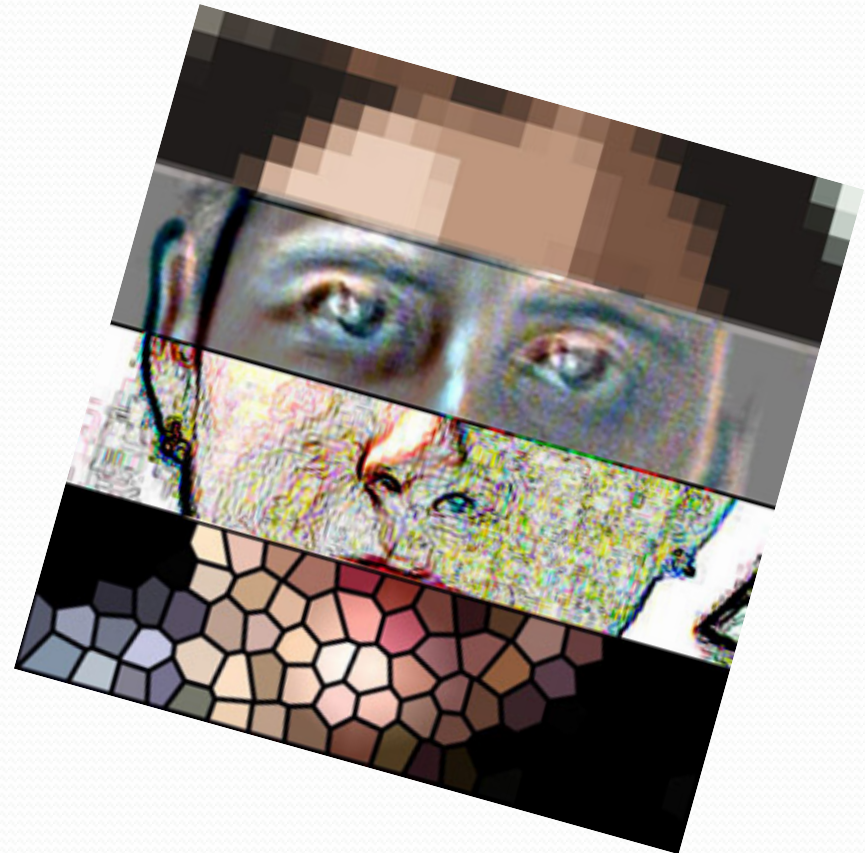
By
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Merve Yurdakul
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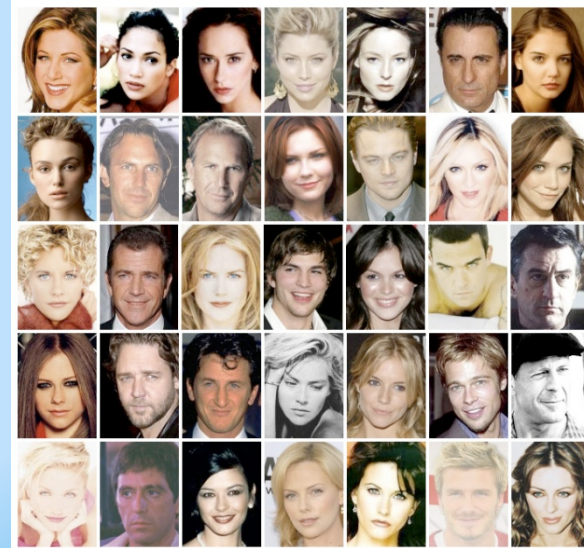
RETINA Vision and Learning Group
Department of Computer Engineering
Bilkent University

Motivation



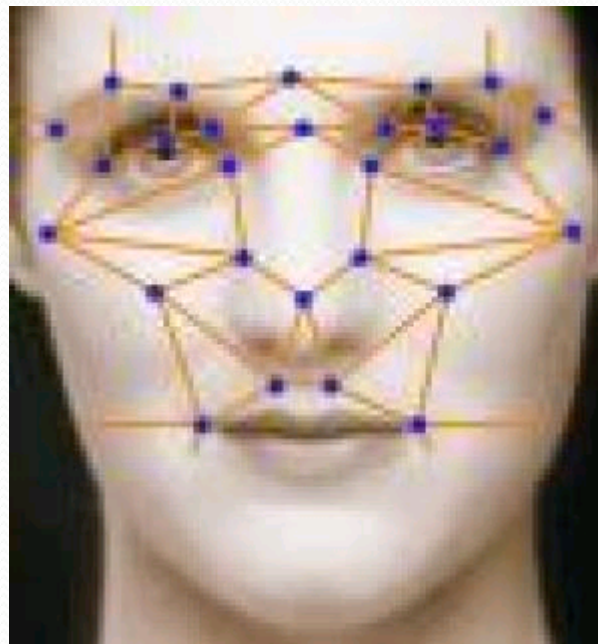
Motivation

Face Recognition → Face Matching



What is Face Recognition?

- Identifying/verifying a person from a digital image or a video frame from a video source



Why Face Recognition?

- Very important task in many applications:
 - Robotics
 - Security access control systems
 - Airport security
 - Criminal recognition
 - Content-based indexing video retrieval systems
 - News archive and video indexing
 - Personal usage
 - Photo and video collection organization
 - Searching a famous, friend.



Problems

- Traditional face recognition algorithms
 - require controlled images in terms of pose, illumination etc.
 - work with small and restricted dataset (Max ~100)
 - require manual work
 - have higher level error prone
- Various amateur images in various applications (Facebook, Picasa, MySpace, YouTube etc).



FaceFinder Library

- A flexible open source library to be used in various applications:
 - find your pictures in Facebook
 - tag the people in your photo album in Picasa
 - person tracer at airports
 - criminal recognition using police sketches
 - find your famous twins



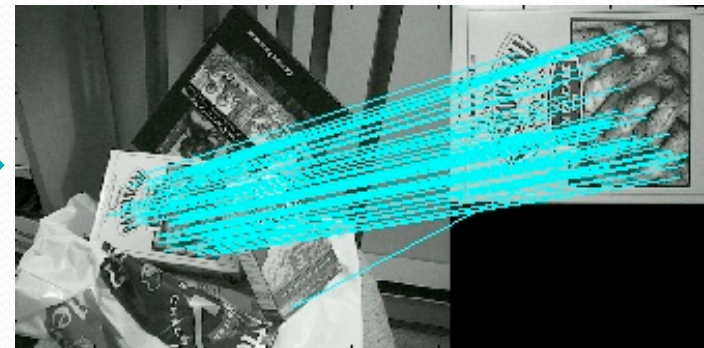
Our Approach

- Based on observation that each person has distinct facial features that do not change.
- The distinct feature concept is commonly used with interest points for object recognition.
- Adapting the distinct feature concept for face recognition.



Our Approach

- Lowe's SIFT Keypoint Detector:[*]
 - Finds the interest points of the objects and matches these points between images.



[*] David G. Lowe, "Distinctive image features from scale-invariant keypoints," International Journal of Computer Vision, 60, 2 (2004), pp. 91-110.



Our Approach

- Deformation of the objects is much less compared to faces.
- Using only object recognition gives poor matches for face images.



Project Steps

1) Face detection

2) Interest point extraction

3) Finding matches between face pairs

4) Elimination of wrong matches with unique match constraint

5) Ranking the output



Project Step 1

1) Face detection

2) Interest point extraction

3) Finding matches between face pairs

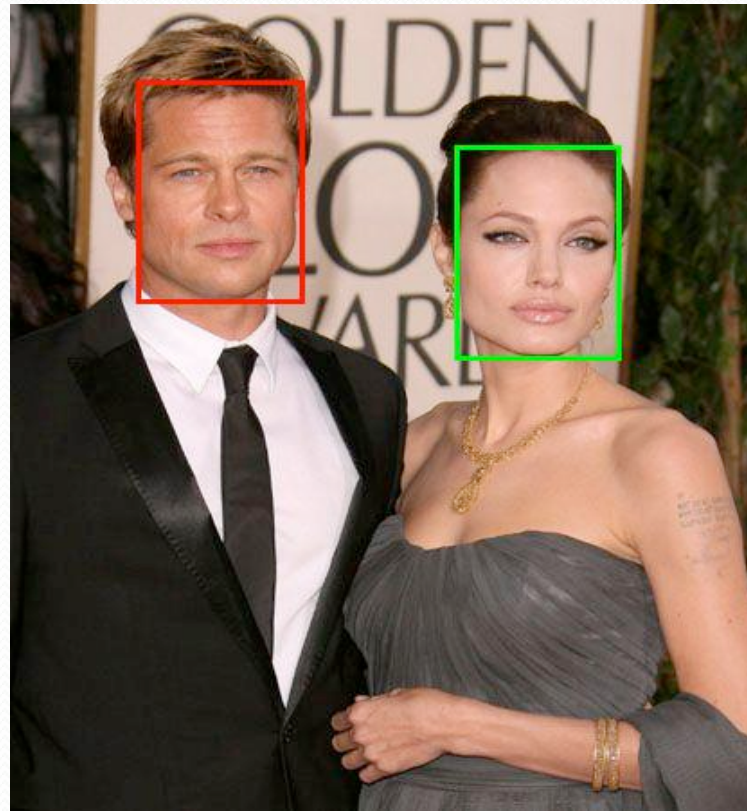
4) Elimination of wrong matches with unique match constraint

5) Ranking the output



1) Face Detection

- Finds the face from the given image



Project Step 2

1) Face detection

2) Interest point extraction

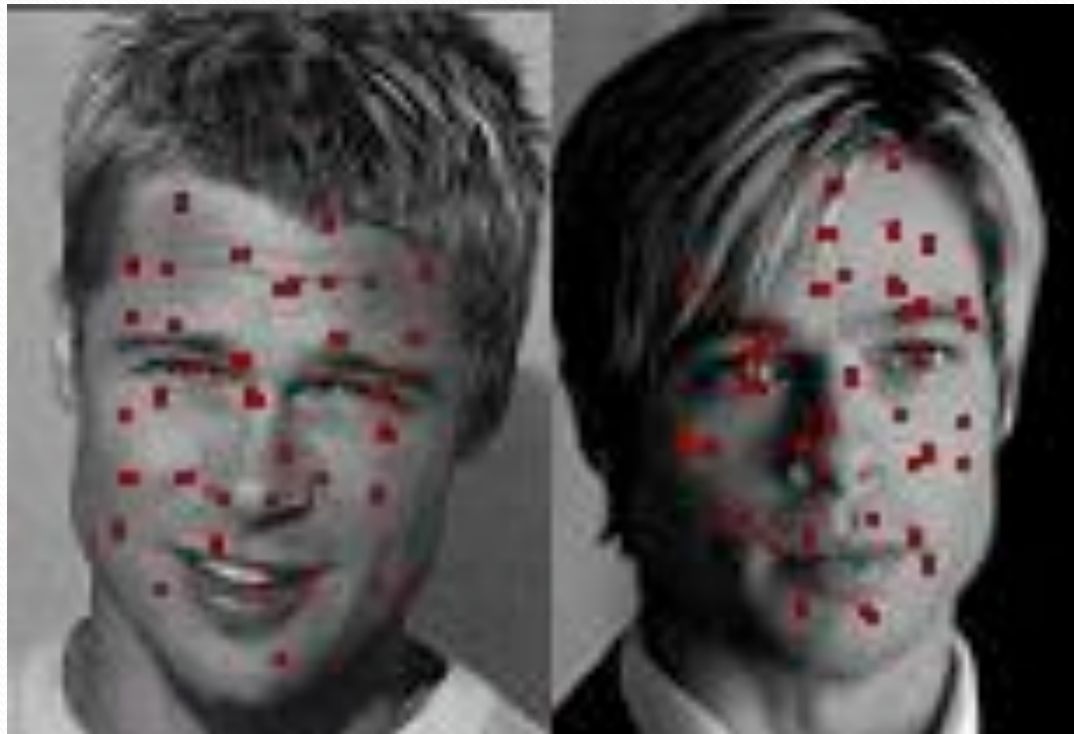
3) Finding matches between face pairs

4) Elimination of wrong matches with unique match constraint

5) Ranking the output



2) Interest Point Extraction



Project Step 3

1) Face detection

2) Interest point extraction

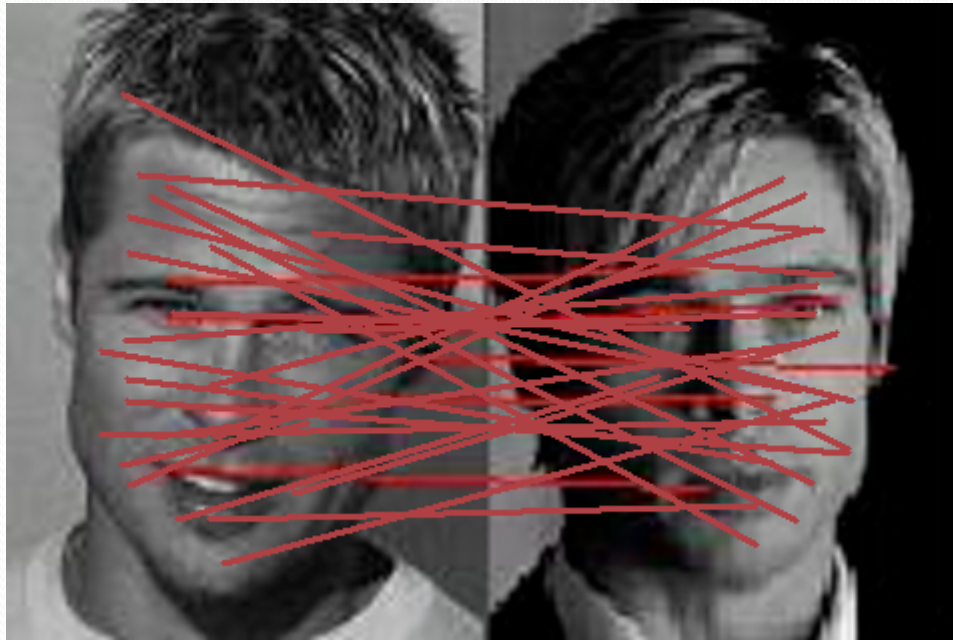
3) Finding matches between face pairs

4) Elimination of wrong matches with unique match constraint

5) Ranking the output



3) Find Matches



Project Step 4

1) Face detection

2) Interest point extraction

3) Finding matches between face pairs

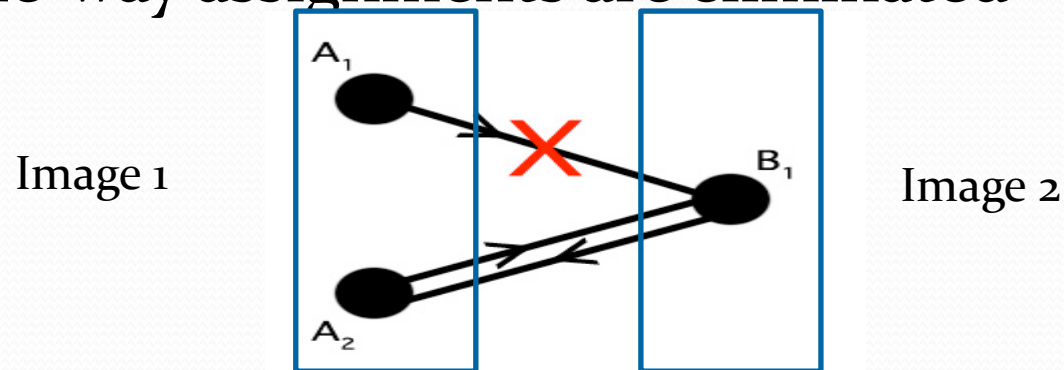
4) Elimination of wrong matches with unique match constraint

5) Ranking the output

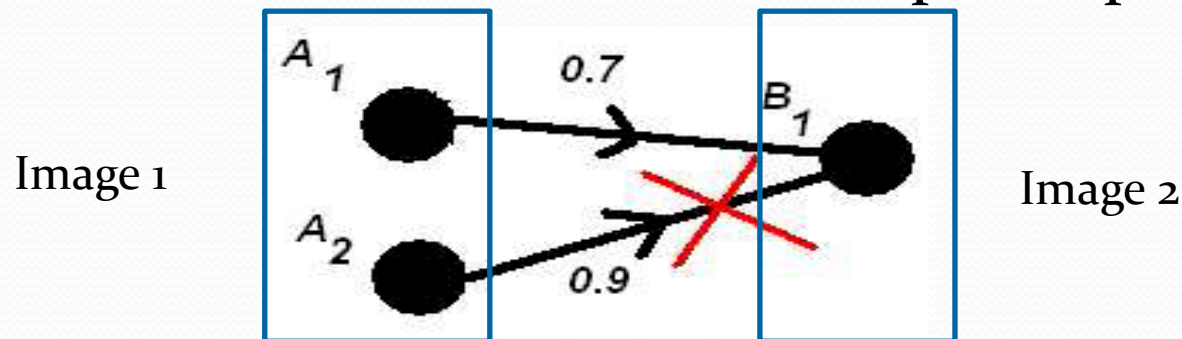


4) Unique Match Constraint [*]

- One-way assignments are eliminated



- Several matches to same interest point prevented



[*] Ozkan, Derya. A Graph Based Approach for Finding People in News. Bilkent University. 2007. 24-28. Nov.-Dec. 2007



4) Unique Match Constraint (cont'd)



Project Step 5

1) Face detection

2) Interest point extraction

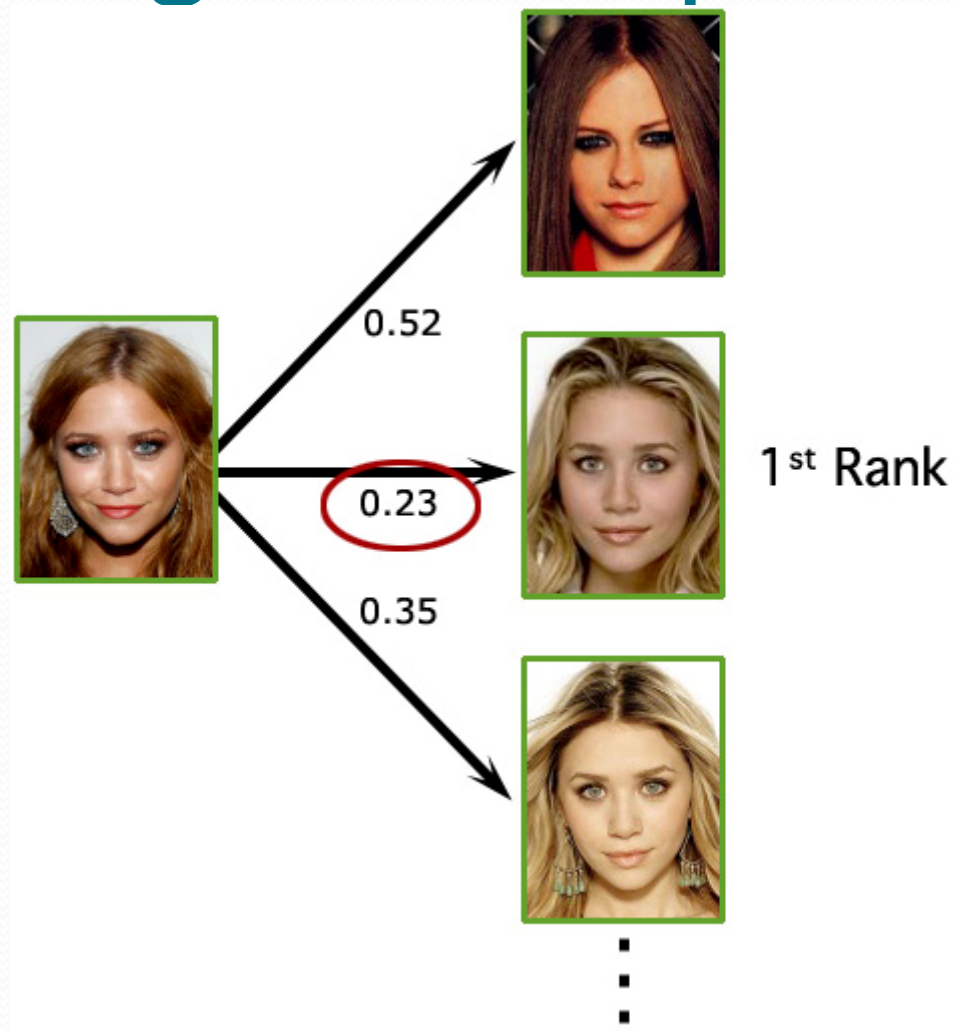
3) Finding matches between face pairs

4) Elimination of wrong matches with unique match constraint

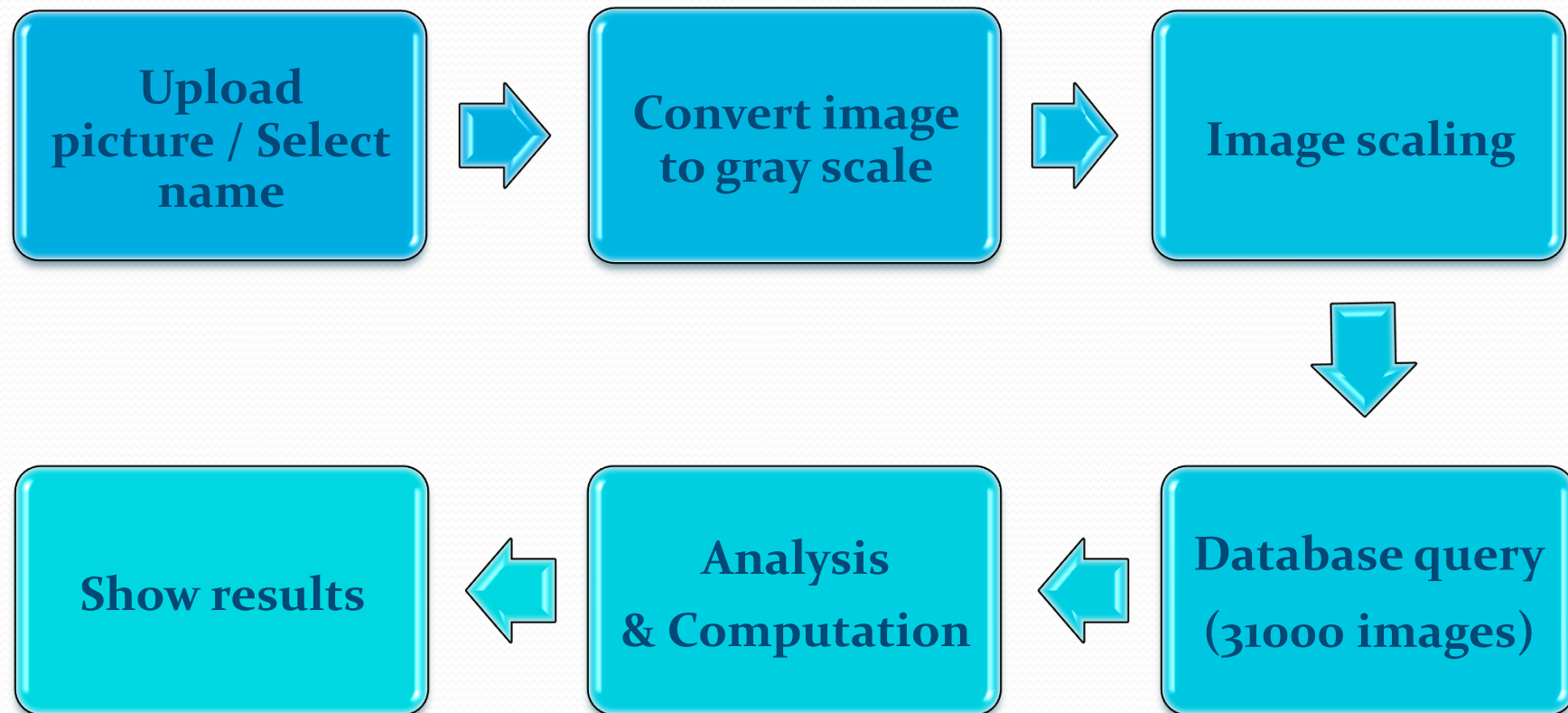
5) Ranking the output



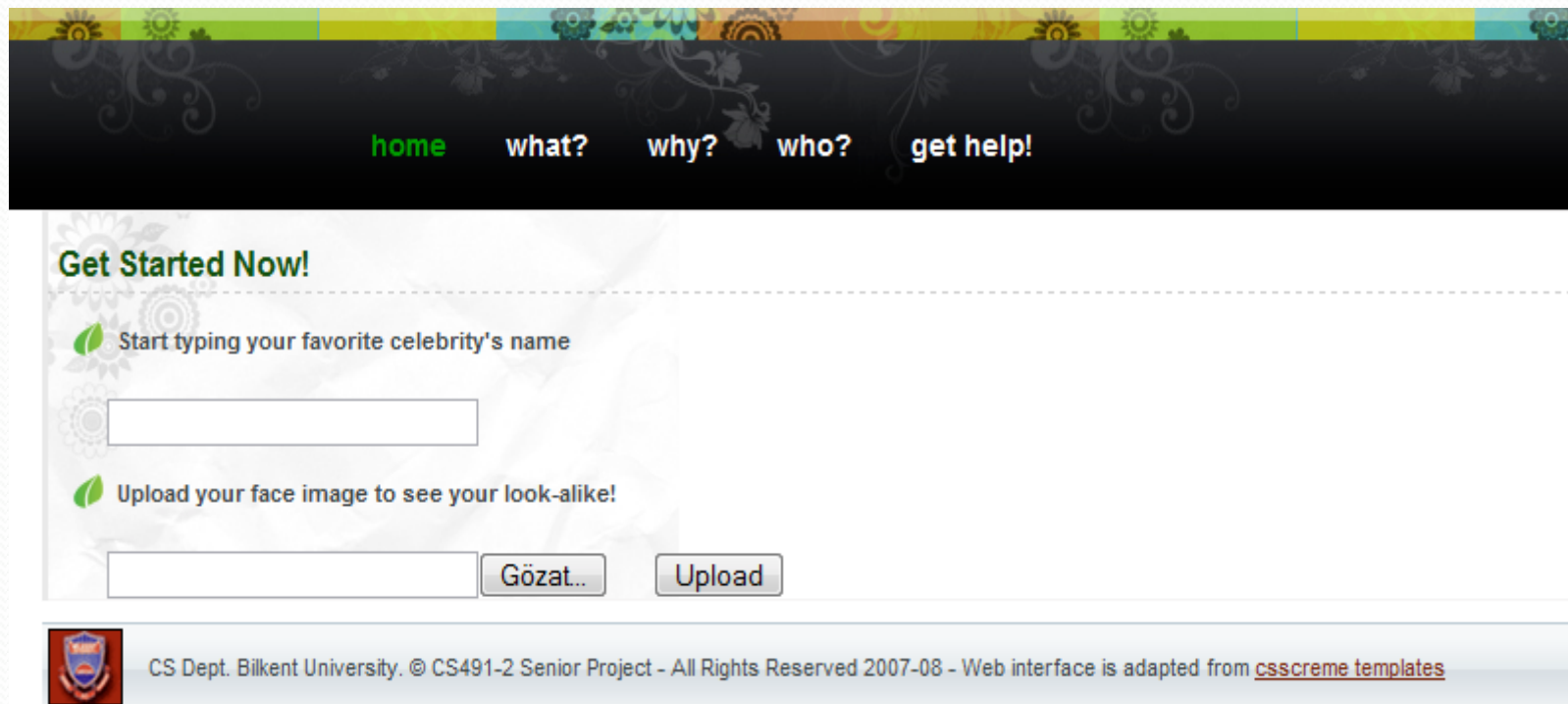
5) Ranking The Output



Application Details



Application Interface



The screenshot shows a web application interface with a blue and white wavy header. Below the header is a navigation bar with links: **home**, **what?**, **why?**, **who?**, and **get help!**. The main content area is titled "Get Started Now!" and contains two sections. The first section, "Start typing your favorite celebrity's name", has a text input field. The second section, "Upload your face image to see your look-alike!", has a text input field, a "Gözet..." button, and an "Upload" button. The footer contains a Bilkent University logo and the text: "CS Dept. Bilkent University. © CS491-2 Senior Project - All Rights Reserved 2007-08 - Web interface is adapted from [csscreme templates](#)".

home **what?** **why?** **who?** **get help!**

Get Started Now!

Start typing your favorite celebrity's name

Upload your face image to see your look-alike!

 Gözet... Upload

 CS Dept. Bilkent University. © CS491-2 Senior Project - All Rights Reserved 2007-08 - Web interface is adapted from [csscreme templates](#)



Application Interface (cont'd)

home what? why? who? get help!

Best Match (101.41908812523 sec)

Query Face vs. Rachel Bilson

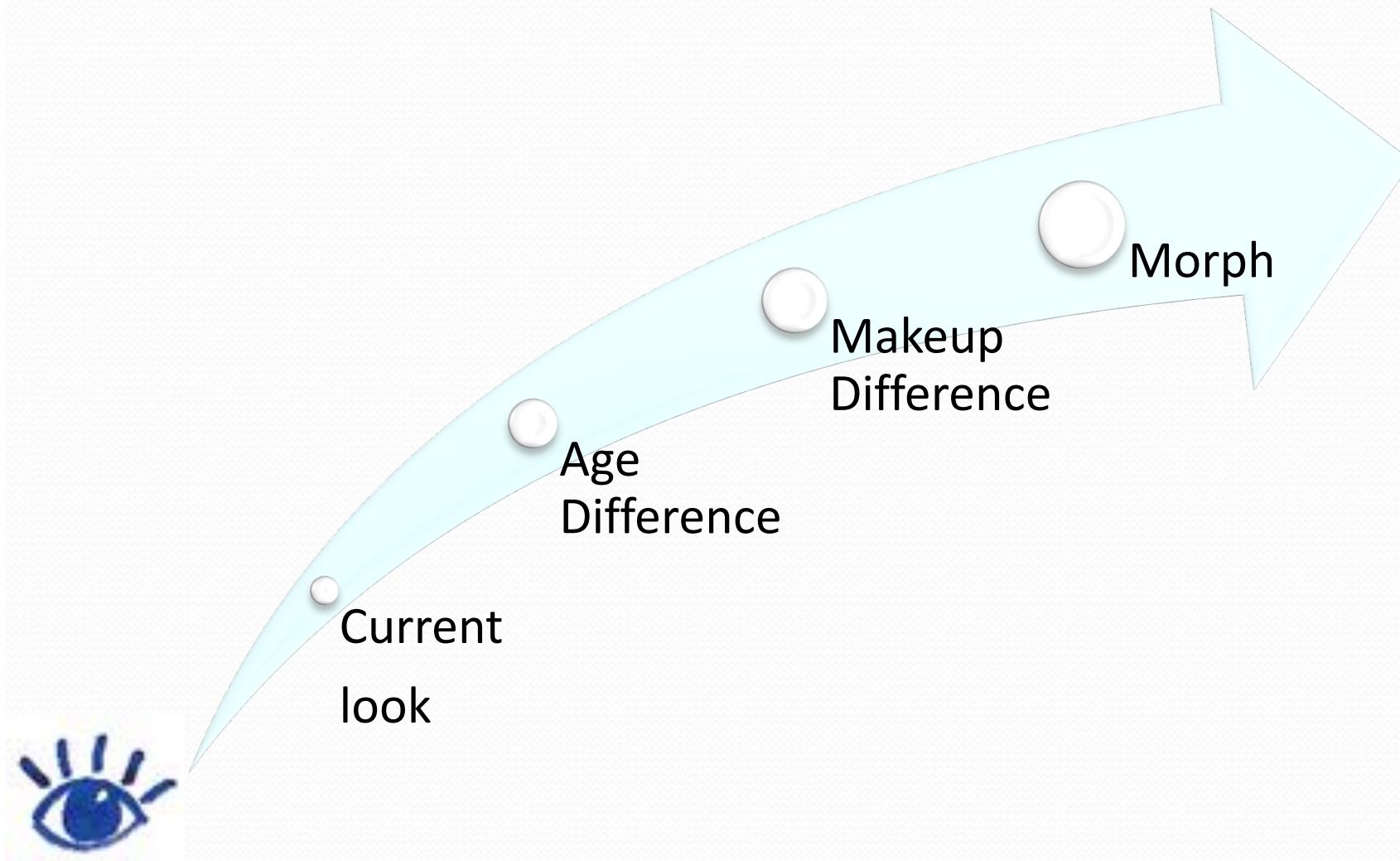
[Try Another Photo!](#)

Top 10 Matches

									
Rachel Bilson	Rachel Bilson	Rachel Bilson	Jessica Alba	Naomi Watts	Rachel Bilson	Kevin Costner	Madonna	Madonna	Shakira



Test Cases



Tests & Results

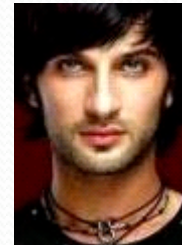
- Current look

-

Given Image

Result

Tarkan



1st Rank

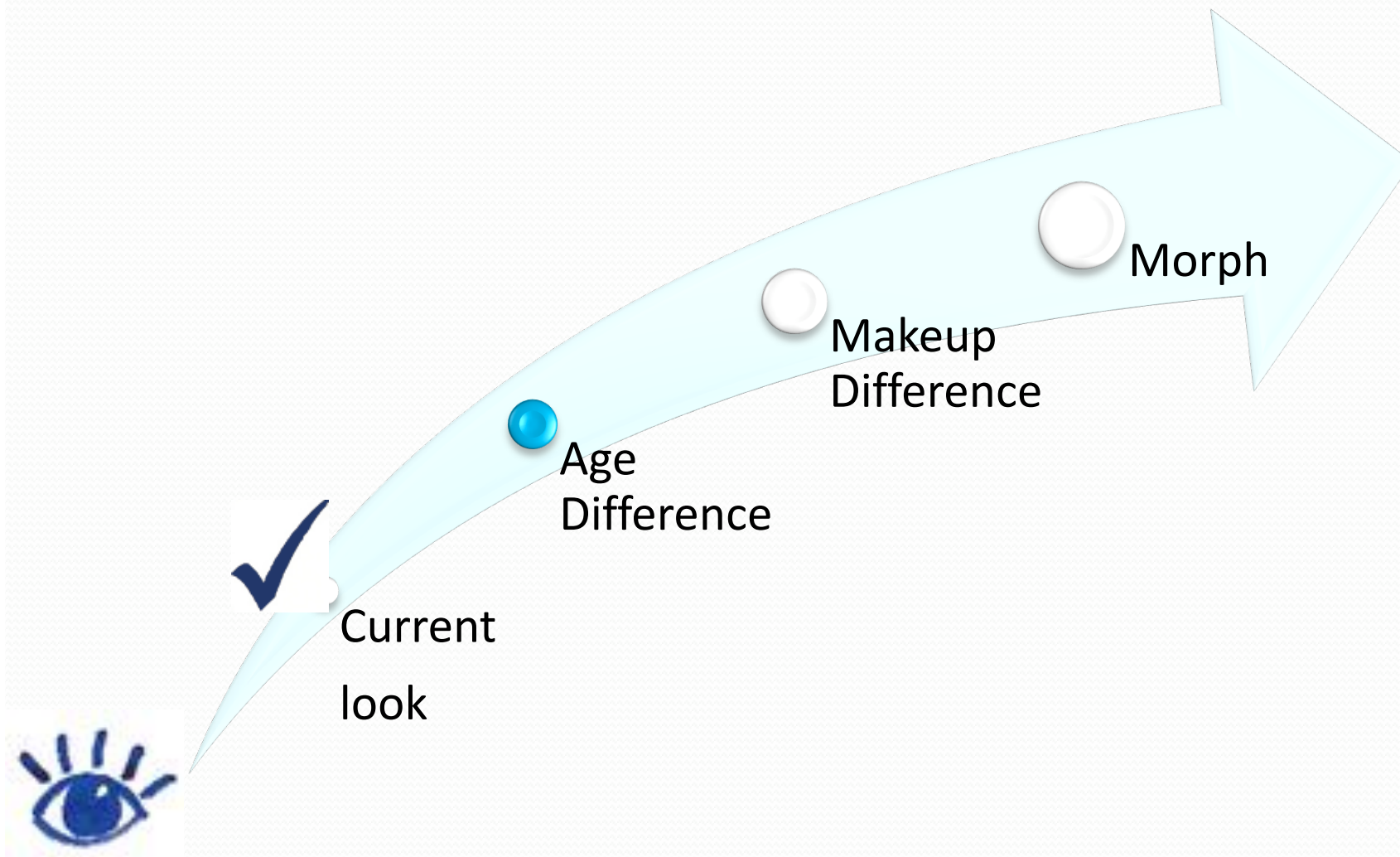
Bruce Wills



1st Rank



Test Criteria



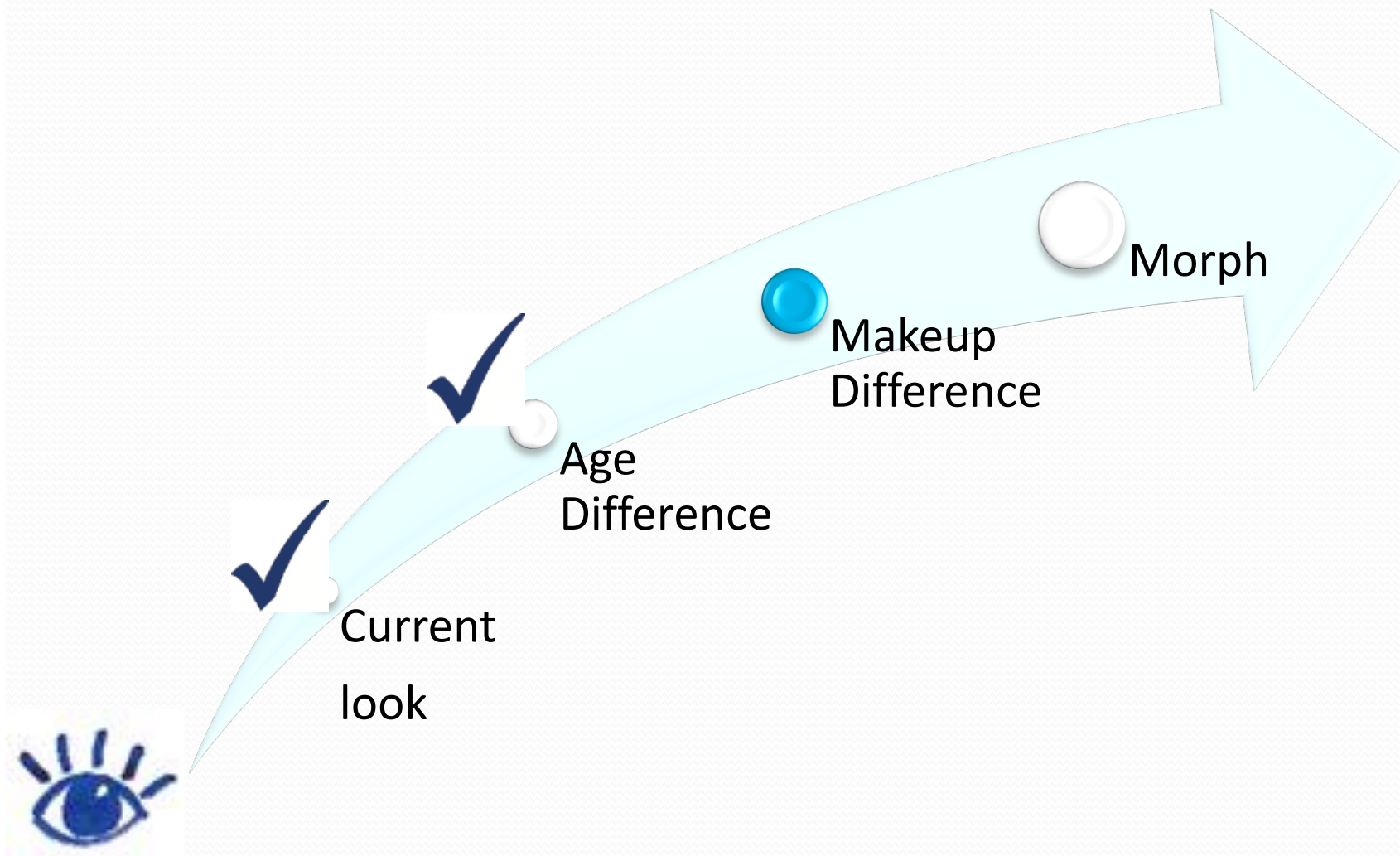
Tests & Results

- Age Difference

	Given Image		Result	
	Elizabeth Hurley	➡		1st Rank
	George Clooney	➡		1st Rank
	Nicole Kidman	➡		2nd Rank



Test Criteria



Tests & Results (cont'd)

- Makeup difference

-

Given Image

Result

Jennifer Lopez



1st Rank

Halle Berry



3rd Rank

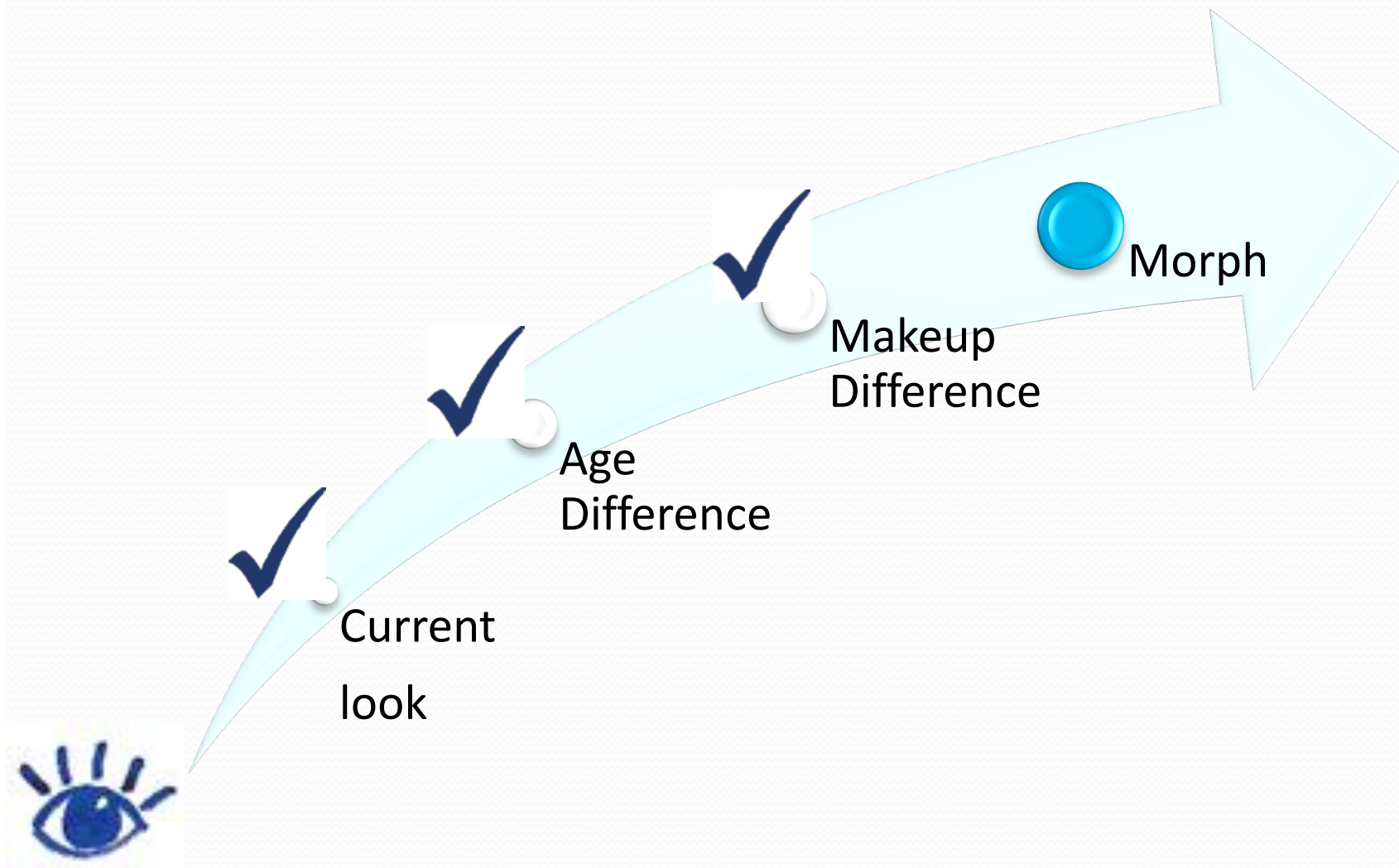
Courtney Cox



3rd Rank

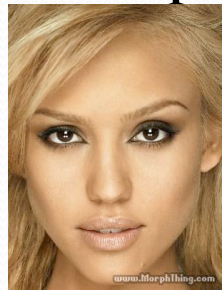


Test Criteria

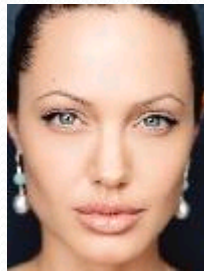


Tests & Results (cont'd)

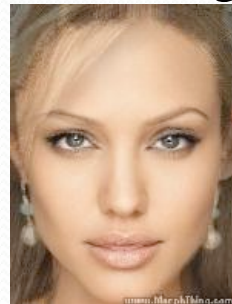
- Morph:



Jessica Alba



Angelina Jolie



Morph



1st Rank



7th Rank



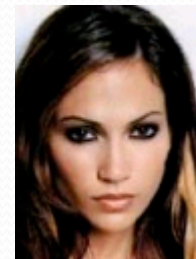
Jennifer Lopez



Jennifer Aniston



Morph



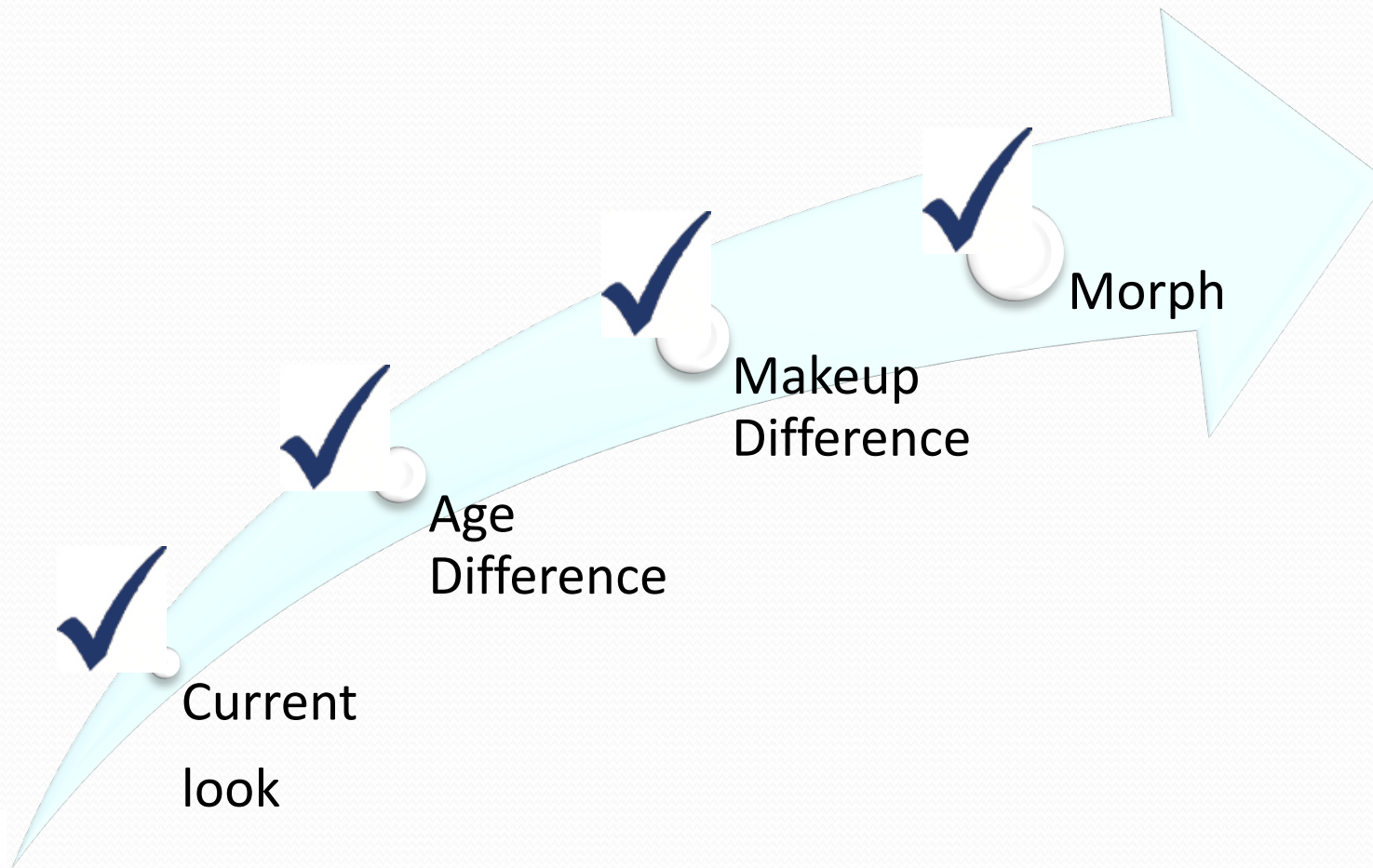
2nd Rank



10th Rank



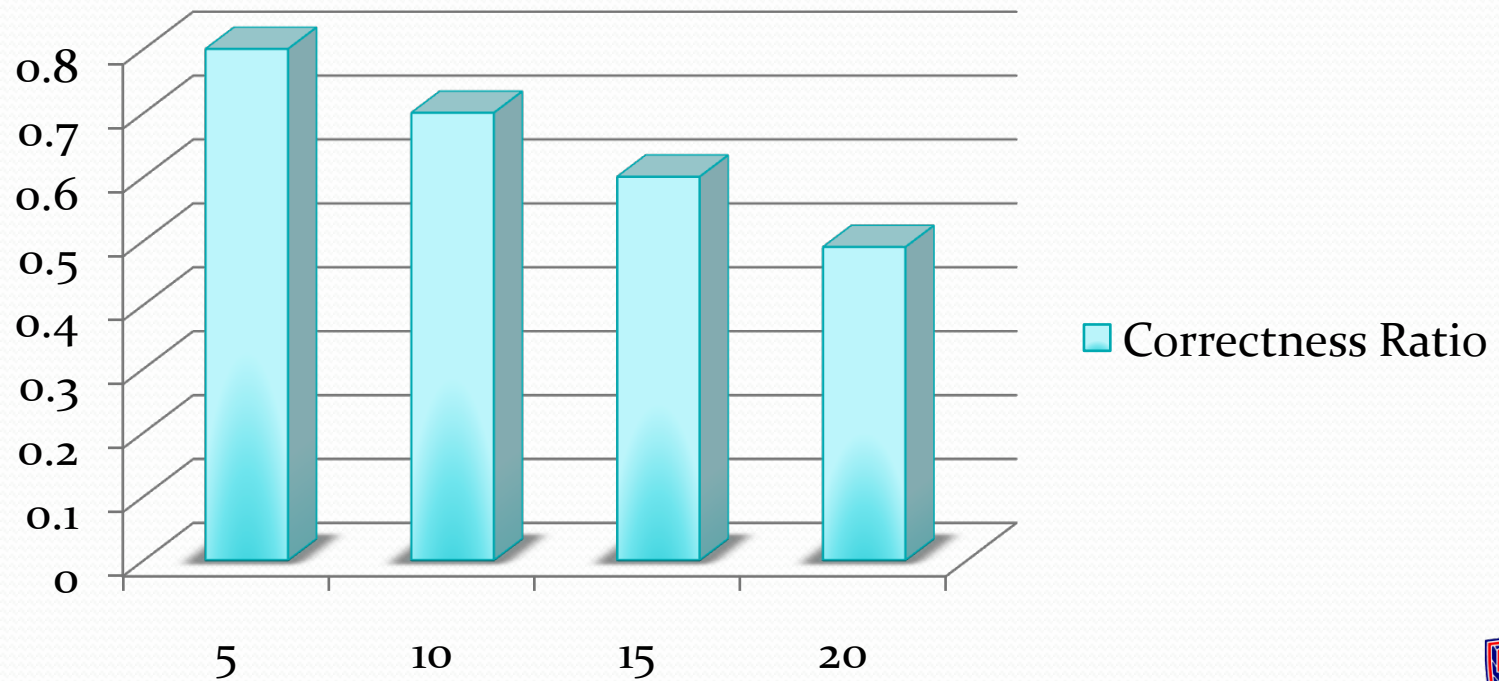
Test Criteria



Implemented Library

- Performance: Recall – Precision Graph

Correctness Ratio



Demonstration

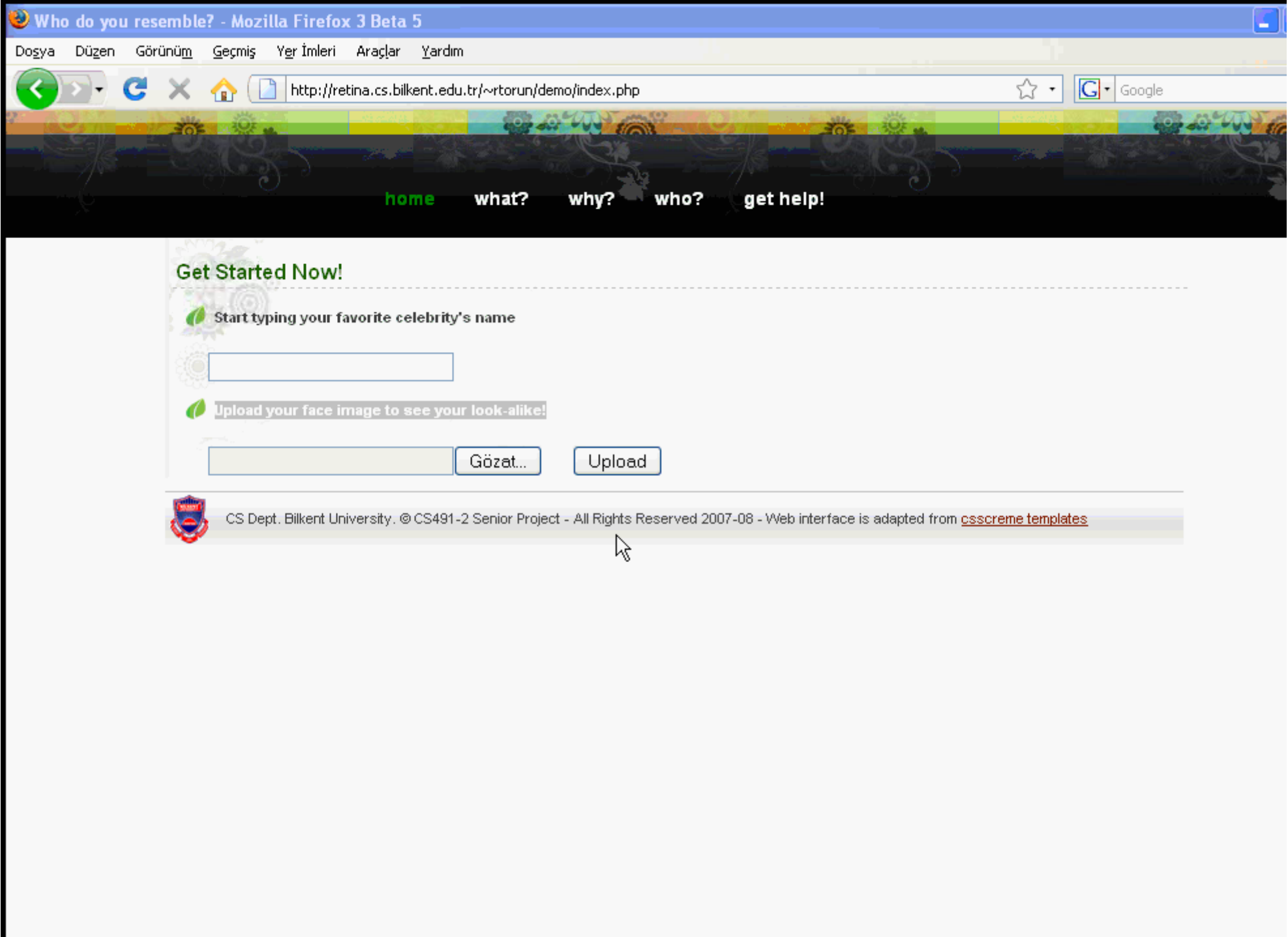
- Select a name from the database



Demonstration

- Upload a picture





Conclusion

- Importance of face recognition is increasing day by day with millions of face images
- A different approach to the face recognition problem by using interest point matching
- Many applications can be developed based on FaceFinder library in the near future



Thanks & Questions

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