

CS 395T: Class Specific  
**FaceTracer: A Search Engine for  
Large Collections of Images with  
Faces**

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October 19 2012

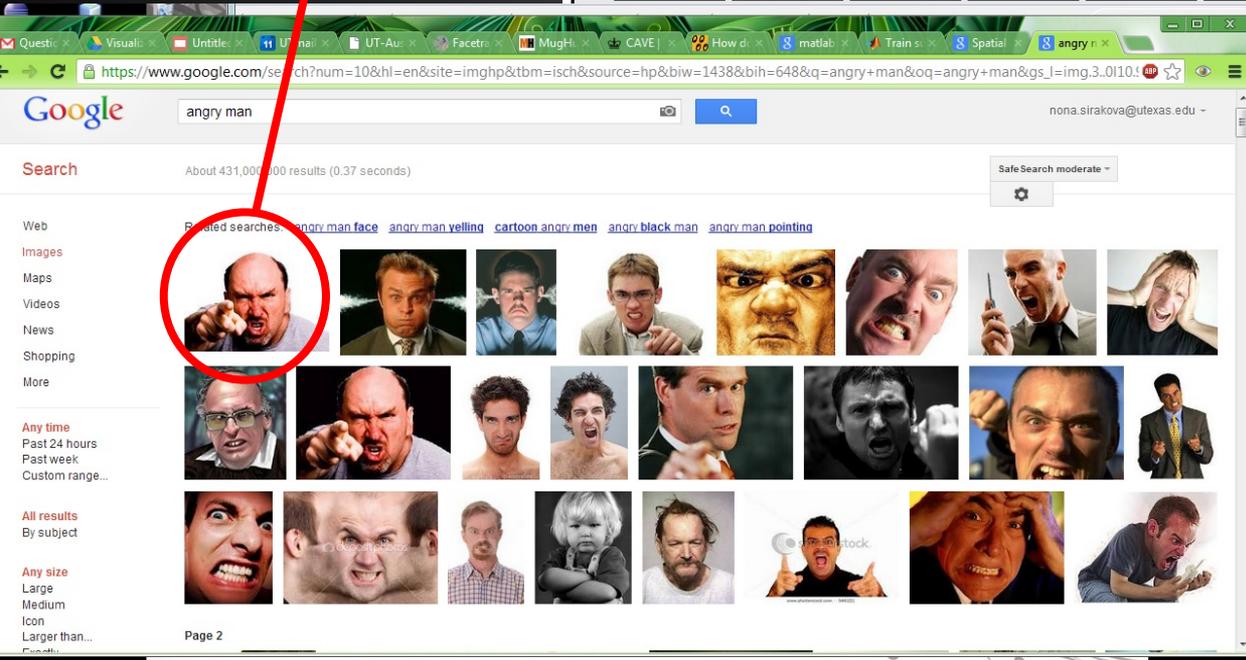
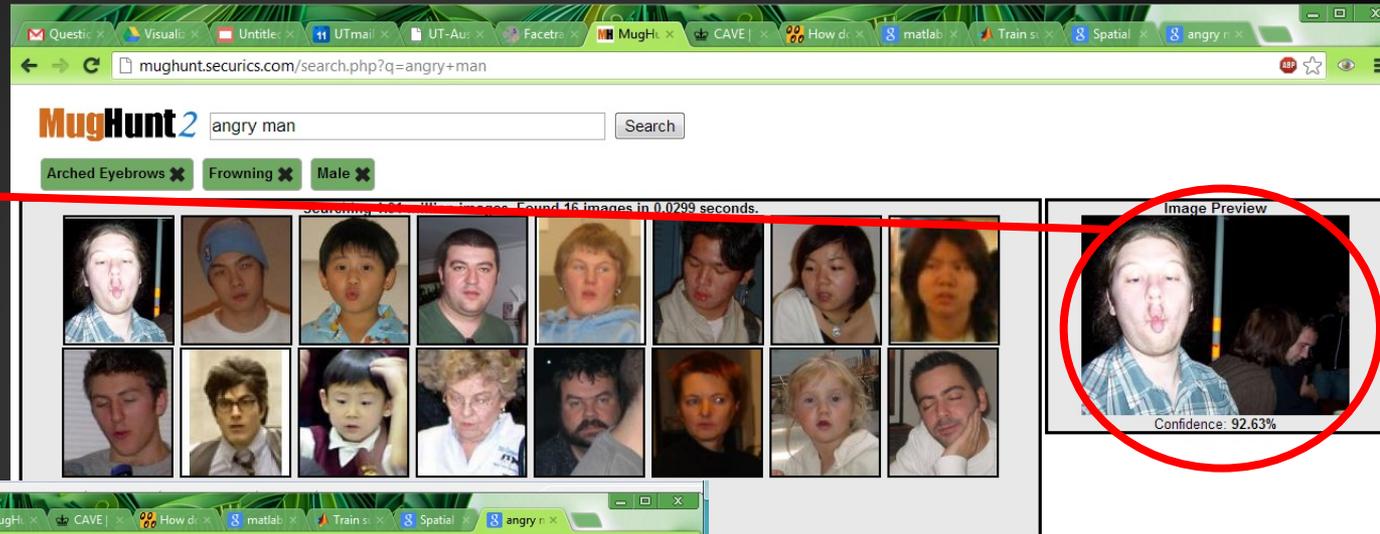
# Database Format:

Eye & mouth corners for a single person per image



# Google VS MugShot

Top picks for angry man



In the database, but not retrieved as angry.



# Does MugHunt work with natural language?

A screenshot of the MugHunt 2 website showing a search for "pretty woman". The search bar contains the text "pretty woman" and a "Search" button. Below the search bar, there is a grid of 50 small image thumbnails. To the right of the grid is a larger "Image Preview" window showing a woman in a white top, with a "Confidence: 99.97%" label below it. The browser's address bar shows the URL "mughunt.securics.com/search.php?q=pretty+woman". The Windows taskbar at the bottom shows the time as 11:54 AM on 10/11/2012.

Two screenshots of the MugHunt 2 website showing search failures. The first screenshot shows a search for "handsome man" with a red error message: "Unknown word: 'handsome'". The second screenshot shows a search for "woman with red lips" with a red error message: "Unknown words: 'red', 'lips'". Both screenshots show the search bar with the respective text and a "Search" button. The browser's address bar shows the URL "mughunt.securics.com/search.php?q=handsome+man" for the first and "mughunt.securics.com/search.php?q=woman+with+red+lips" for the second. The Windows taskbar at the bottom shows the time as 11:54 AM on 10/11/2012.

**Demo:**

**Mug Hunt:** <http://mughunt.securics.com/>

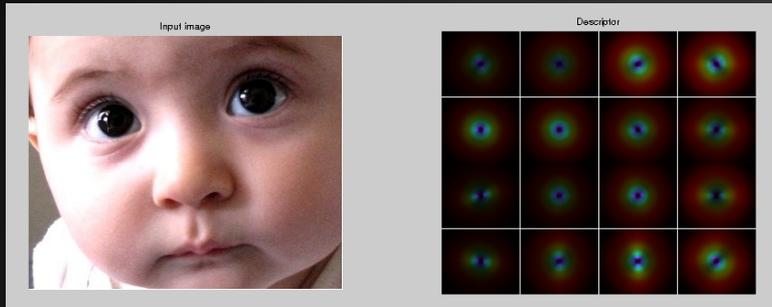
# Features and their values:

Attribute/ Options	Number Labeled	Attribute/ Options	Number Labeled	Attribute/ Options	Number Labeled
<b>Gender</b>	<b>1,954</b>	<b>Smiling</b>	<b>1,571</b>	<b>Race</b>	<b>1,309</b>
Male	867	True	832	White	433
Female	1,087	False	739	Black	399
<b>Age</b>	<b>3,301</b>	<b>Mustache</b>	<b>1,947</b>	Asian	477
Baby	577	True	618	<b>Eye Wear</b>	<b>2,360</b>
Child	636	False	1,329	None	1,256
Youth	784	<b>Blurry</b>	<b>1,763</b>	Eyeglasses	665
Middle Aged	815	True	763	Sunglasses	439
Senior	489	False	1,000	<b>Environment</b>	<b>1,583</b>
<b>Hair Color</b>	<b>1,033</b>	<b>Lighting</b>	<b>633</b>	Outdoor	780
Black	717	Flash	421	Indoor	803
Blond	316	Harsh	212	<b>Total</b>	<b>17,454</b>

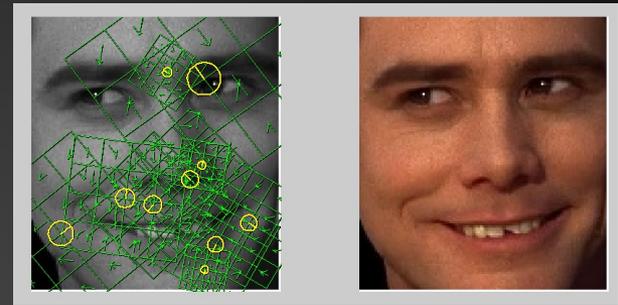
# Features to use in Experiment 1:

Attribute/ Options	Number Labeled	Attribute/ Options	Number Labeled	Attribute/ Options	Number Labeled
<b>Gender</b>	<b>1,954</b>	<b>Smiling</b>	<b>1,571</b>	<b>Race</b>	<b>1,309</b>
Male	867	True	832	White	433
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Black	717	Flash	421	Indoor	803
Blond	316	Harsh	212	<b>Total</b>	<b>17,454</b>

# Examples:



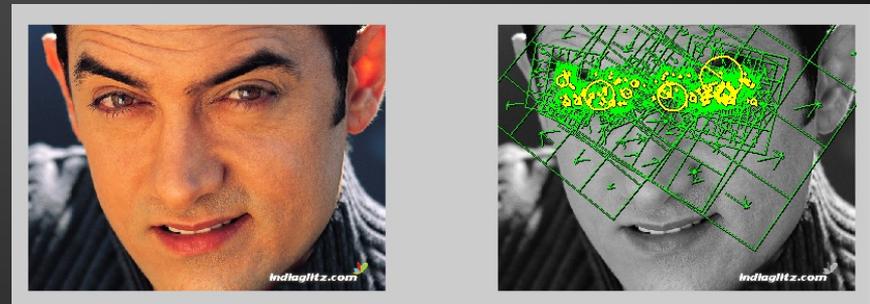
Face GIST



Face SIFT

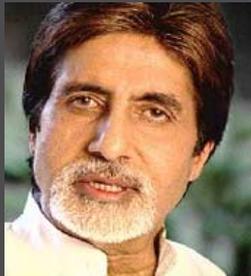


Mouth SIFT

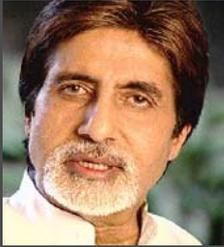


Eyes SIFT

# Experiment 1 set-up:

Attribute	Face Gist Error	Face Sift Error	Eyes Sift Error	Mouth Sift Error
Gender (male, female)	6.0 %	14.8 %	22.2 %	18.0 %
Age (baby, child, youth, middle age, senior)	gender:      male                      female			
Race (Asian, Black, White)				
Hair Color (Blonde, not Blonde)				
Eye Wear (none, eyeglasses, sunglasses)				
Mustache (true, false)				
Facial expression (smiling, not smiling)				

# Experiment 1 set-up:

Attribute	Face Gist Error	Face Sift Error	Eyes Sift Error	Mouth Sift Error
Gender (male, female)	6.0 %	14.8 %	22.2 %	18.0 %
Age (baby, child, youth, middle age, senior)	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>gender: male</p>  </div> <div style="text-align: center;"> <p>female</p>  </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> </div>			
Race (Asian, Black, White)				
Hair Color (Blonde, not Blonde)				
Eye Wear (none, eyeglasses, sunglasses)				
Mustache (true, false)				
Facial expression (smiling, not smiling)				

# Experiment 1 set-up:

Attribute	Face Gist Error	Face Sift Error	Eyes Sift Error	Mouth Sift Error
Gender (male, female)	6.0 %	14.8 %	22.2 %	18.0 %
Age (baby, child, youth, middle age, senior)	14.3 %	20.0 %	24.0 %	24.4 %
Race (Asian, Black, White)				
Hair Color (Blonde, not Blonde)				
Eye Wear (none, eyeglasses, sunglasses)				
Mustache (true, false)				
Facial expression (smiling, not smiling)				

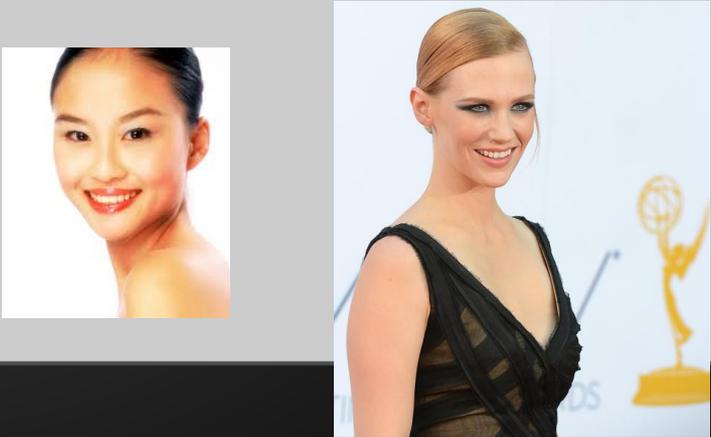


# Experiment 1 set-up:

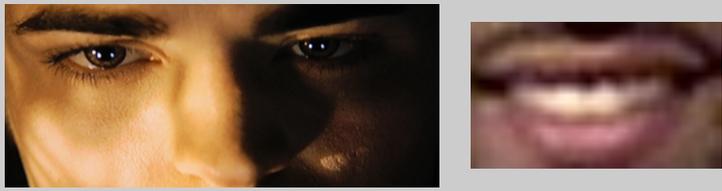
Attribute	Face Gist Error	Face Sift Error	Eyes Sift Error	Mouth Sift Error
Gender (male, female)	6.0 %	14.8 %	22.2 %	18.0 %
Age (baby, child, youth, middle age, senior)	14.3 %	20.0 %	24.0 %	24.4 %
Race (Asian, Black, White)	6.0 %	35.2 %	17.2 %	21.8 %
Hair Color (Blonde, not Blonde)				
Eye Wear (none, eyeglasses, sunglasses)				
Mustache (true, false)				
Facial expression (smiling, not smiling)				

# Experiment 1 set-up:

Attribute	Face Gist Error	Face Sift Error	Eyes Sift Error	Mouth Sift Error
Gender (male, female)	6.0 %	14.8 %	22.2 %	18.0 %
Age (baby, child, youth, middle age, senior)	14.3 %	20.0 %	24.0 %	24.4 %
Race (Asian, Black, White)	6.0 %	35.2 %	17.2 %	21.8 %
Hair Color (Blonde, not Blonde)				
Eye Wear (none, eyeglasses, sunglasses)				
Mustache (true, false)				
Facial expression (smiling, not smiling)				



# Experiment 1 set-up:

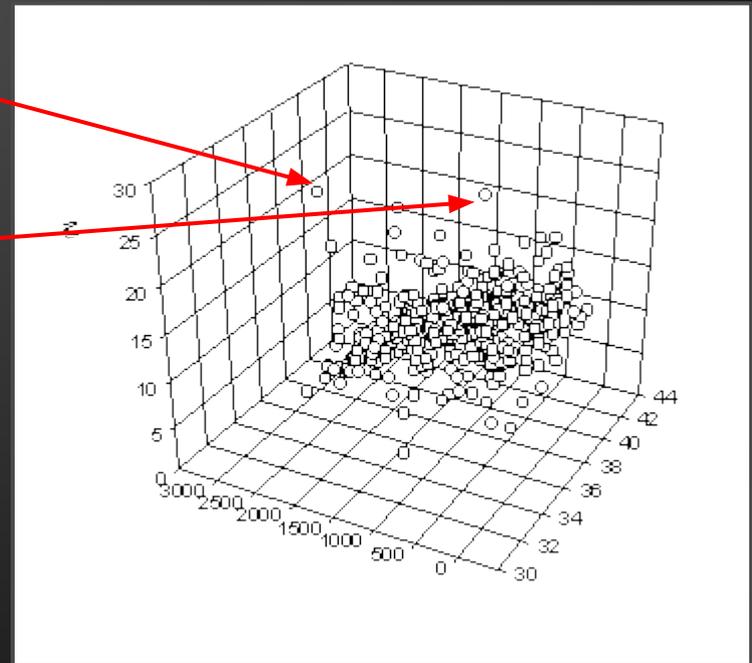
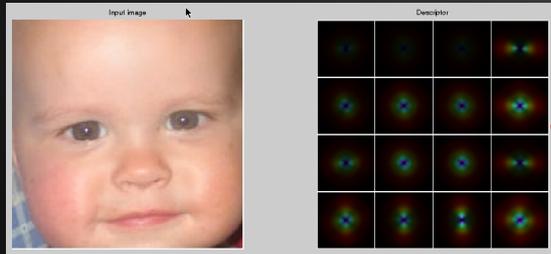
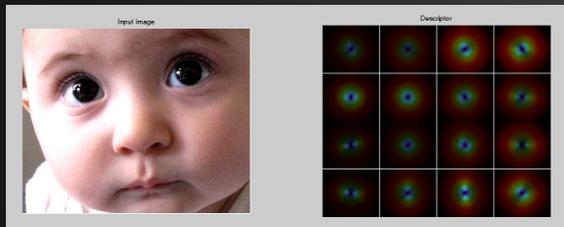
Attribute	Face Gist Error	Face Sift Error	Eyes Sift Error	Mouth Sift Error
Gender (male, female)	6.0 %	14.8 %	22.2 %	18.0 %
Age (baby, child, youth, middle age, senior)	14.3 %	20.0 %	24.0 %	24.4 %
Race (Asian, Black, White)				
Hair Color (Blonde, not Blonde)				
Eye Wear (none, eyeglasses, sunglasses)	4.0 %	9.0 %	4.4 %	43.0 %
Mustache (true, false)	3.7 %	8.2 %	34.8 %	4.0 %
Facial expression (smiling, not smiling)	3.5 %	4.0 %	43.8 %	6.4 %

# Experiment 2 set-up:

- Part 1:
  - Find the GIST descriptor for each face.
  - Plug in GIST space.
  - For a query, plug the query in GIST space.
  - Find query's 5 nearest neighbors.
- Part 2:
  - Find the GIST descriptor for each face.
  - Plug in GIST space & create descriptors.
  - Create an attribute space, and describe every image in terms of its attributes.
  - For a query, find the nearest 5 neighbors in the attribute space.
- Compare part 1 and part 2.

# Experiment 2 set-up Part 1:

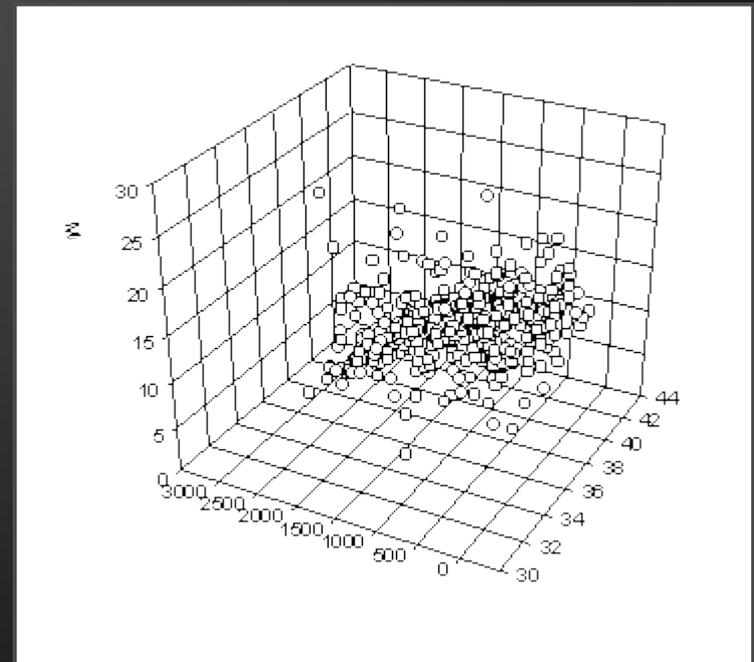
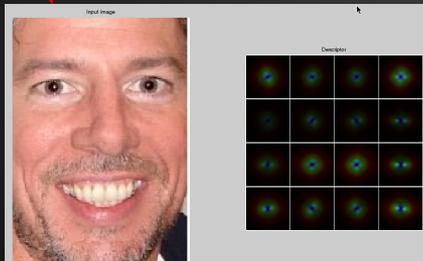
- Find the GIST descriptor for each face.
- Plug in GIST space.



# Experiment 2 set-up Part 1:

- Find the GIST descriptor for query face.

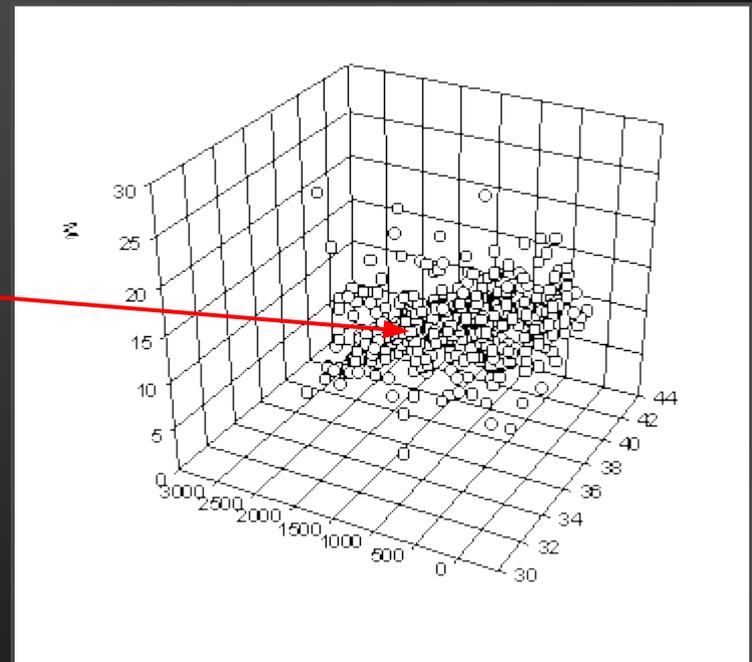
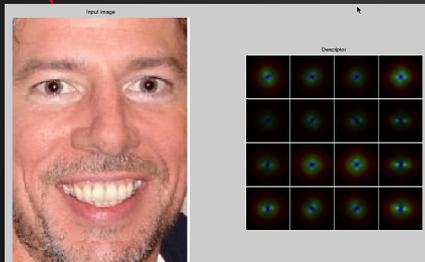
Visual Query



# Experiment 2 set-up Part 1:

- Plug query's GIST descriptor in GIST space.

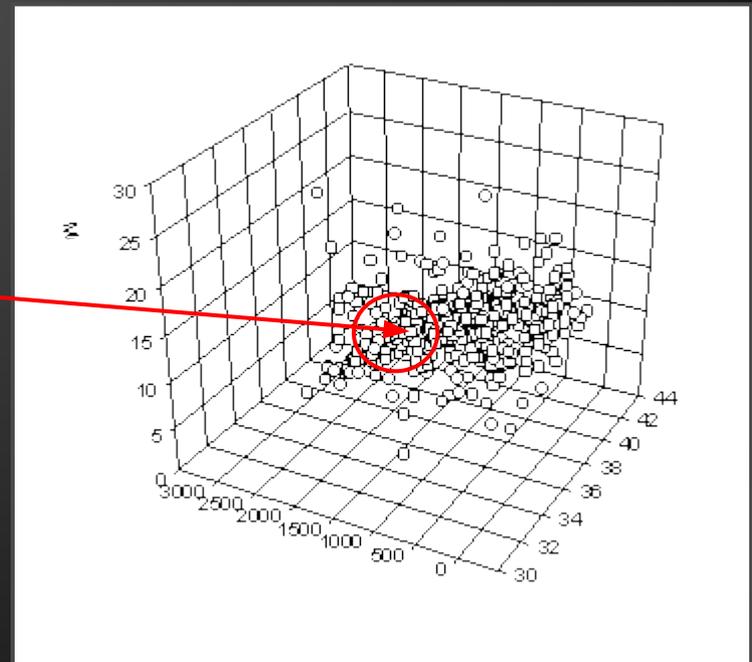
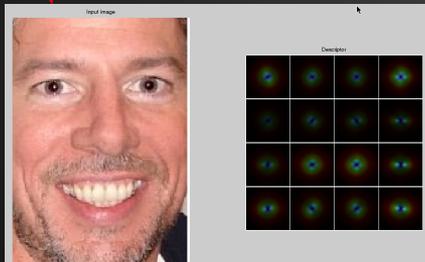
Visual Query



# Experiment 2 set-up Part 1:

- Find query's 5 nearest neighbors.

Visual Query



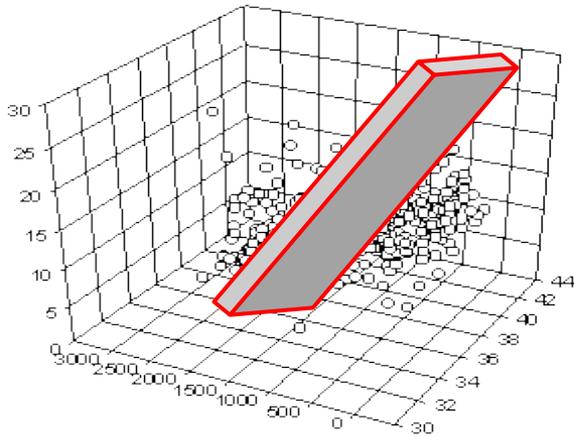
## Experiment 2 set-up Part 2:

- Find the GIST descriptor for each face.
- Plug descriptor in GIST space.
- So far, just like part 1.

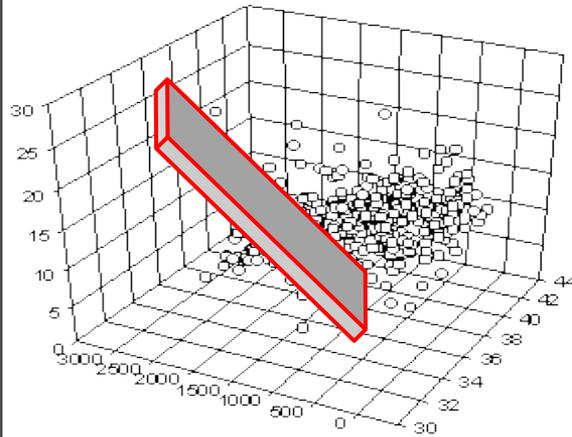
# Experiment 2 set-up Part 2:

- Use SVM on for to train for each attribute.

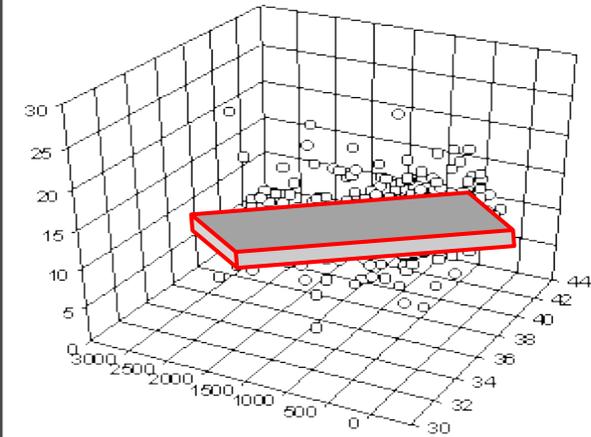
Male VS Female



Smiling VS Not Smiling



Eye Wear VS No  
Eye Wear

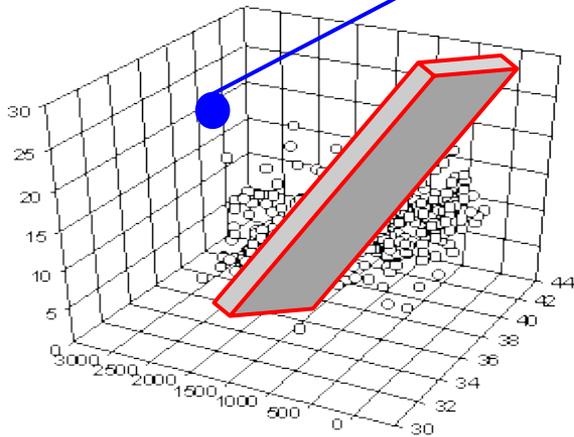


# Experiment 2 set-up Part 2:

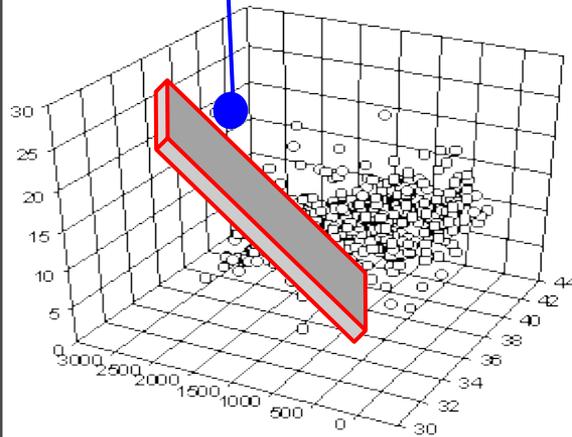
- Each GIST point now has attribute-space coordinates:

$[-3.7, 0.4, 3.5]$

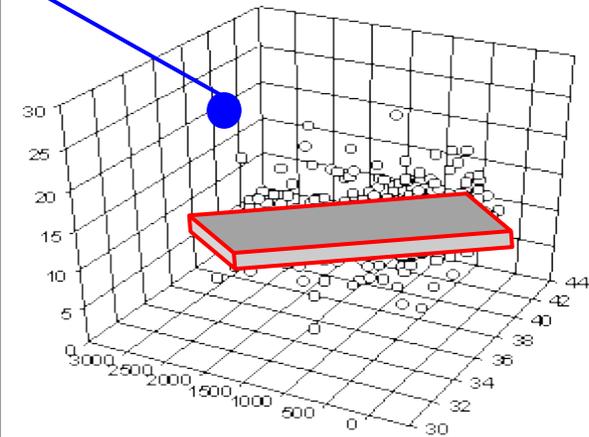
Male VS Female



Smiling VS Not Smiling

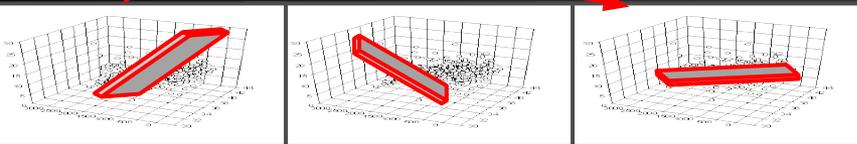


Eye Wear VS No  
Eye Wear



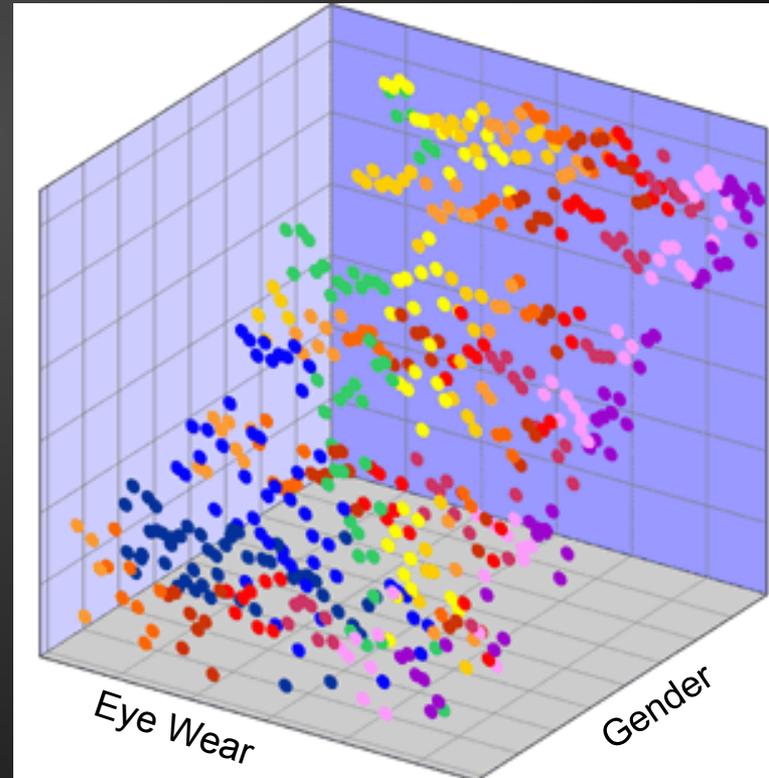
# Experiment 2 set-up Part 2:

- Create an attribute space, and describe every image in terms of its attributes.



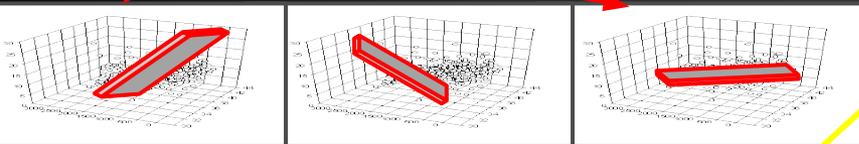
[ 7.2, 11, -3 ]

Facial Expression



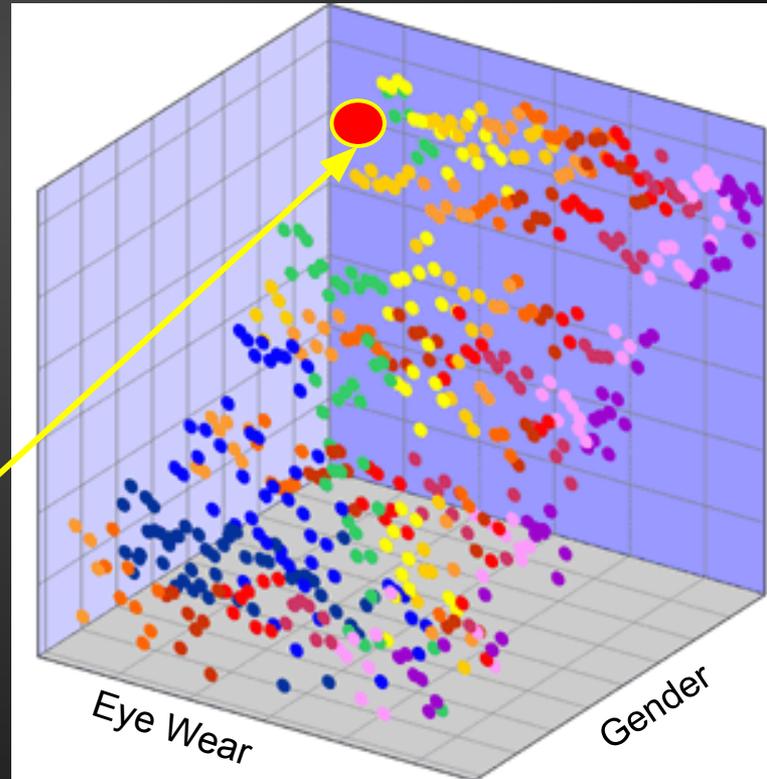
# Experiment 2 set-up Part 2:

- Create an attribute space, and describe every image in terms of its attributes.



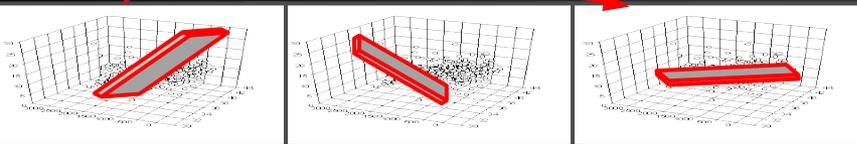
[ 7.2, 11, -3 ]

Facial Expression



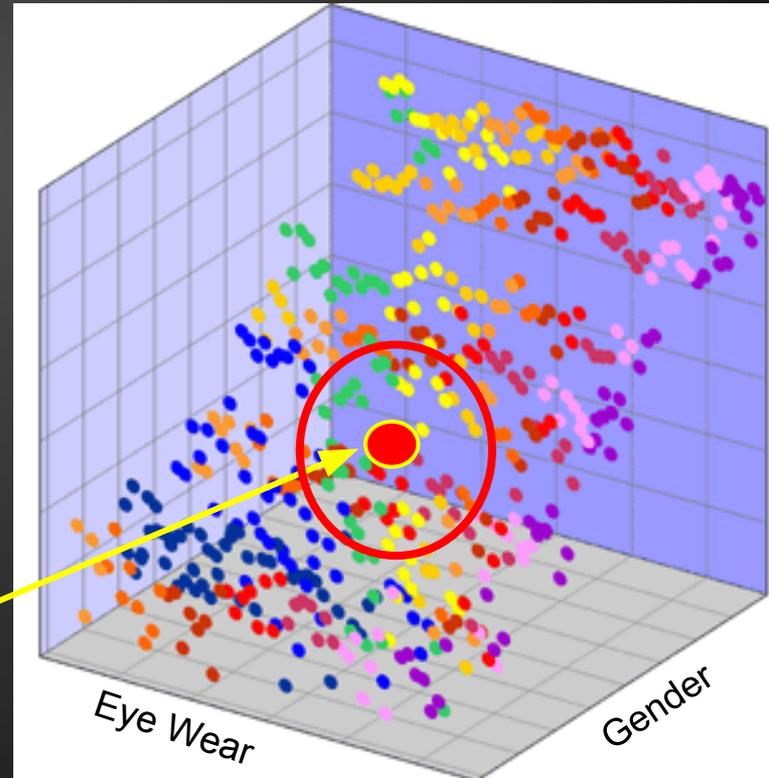
# Experiment 2 set-up Part 2:

- For a query image: plug the attribute vector into the attribute space and take the closest 5 neighbors:



[ 15.2, 6, 22 ]

Facial Expression



# Exp 2 Results Attribute VS Gist Space:



# Exp 2 Results Attribute VS Gist Space:



# Exp 2 Results Attribute VS Gist Space:

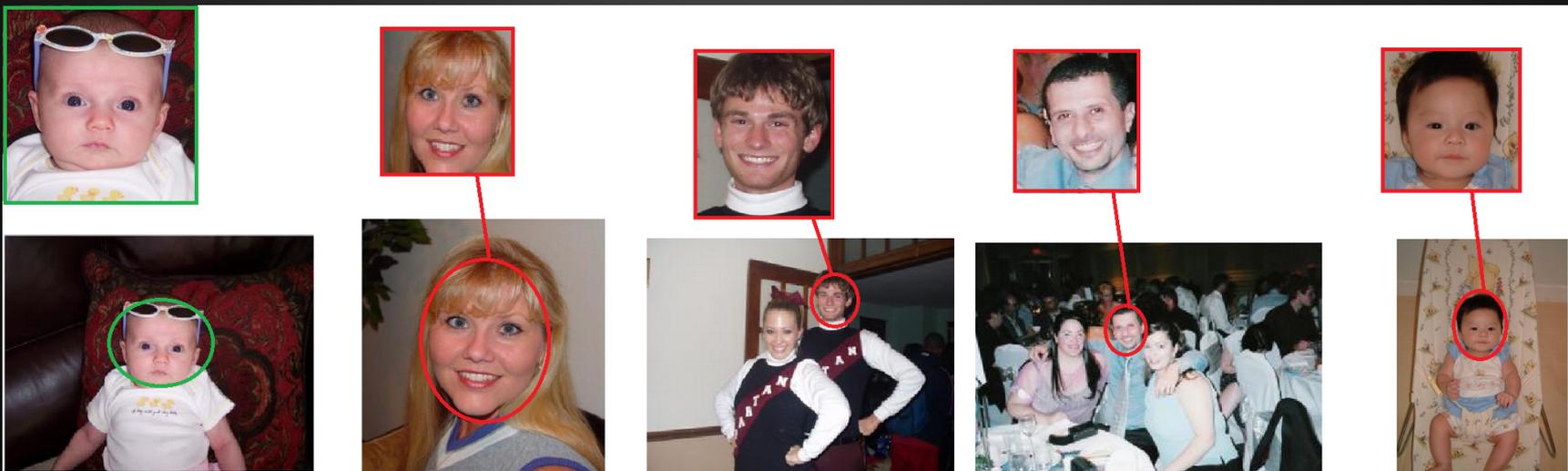
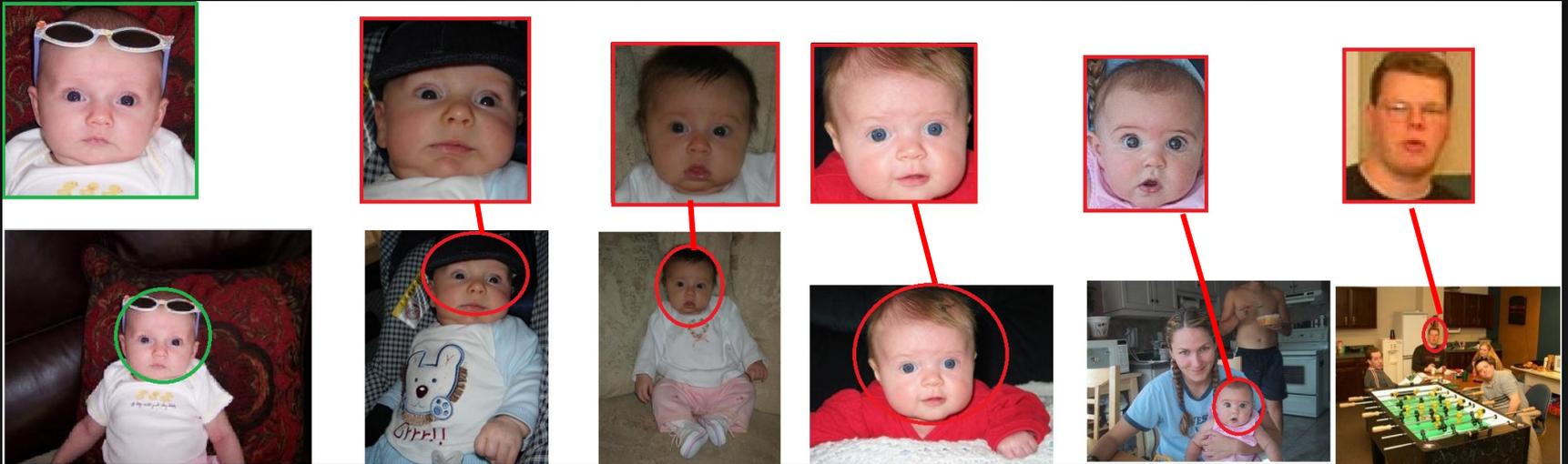


I drew in the beard to illustrate how much the man looks like the one in the closest image.

# Exp 2 Results Attribute VS Gist Space:



# Exp 2 Results Attribute VS Gist Space:



# Questions