Biometric Identification Online

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What is Biometric Identification

"Biometric Identification" is the identification of human individuals on the basis of behavioral and physiological characteristics. Generally, identification techniques can be classified as:

(1) Innate: fingerprint, voice, iris, retina
(2) Acquired: signature

Why Biometric Identification

- Trend
- Convenience
  - Don’t have to remember passwords
  - Fancy features
- Uniqueness

Why Facial Analysis

- Development of both hardware and software
- Advantages over fingerprint and voice recognition
- Facial detection & facial recognition

Online Usage

- Google Street View uses facial detection to blur the faces that appear on the pictures
- Facebook uses facial recognition for its “Tag Suggest” feature
- 163 mailbox used facial recognition as an auxiliary log in mechanism for email accounts

However…

- 163 mailbox discontinued its facial recognition auxiliary mechanism
- Through Google Street View, a wife in Russia discovered her husband kissing another woman
- Researchers at CMU were able to use publicly available information on Facebook to determine (with high probability) the first five digits of people's social security numbers

Furthermore...

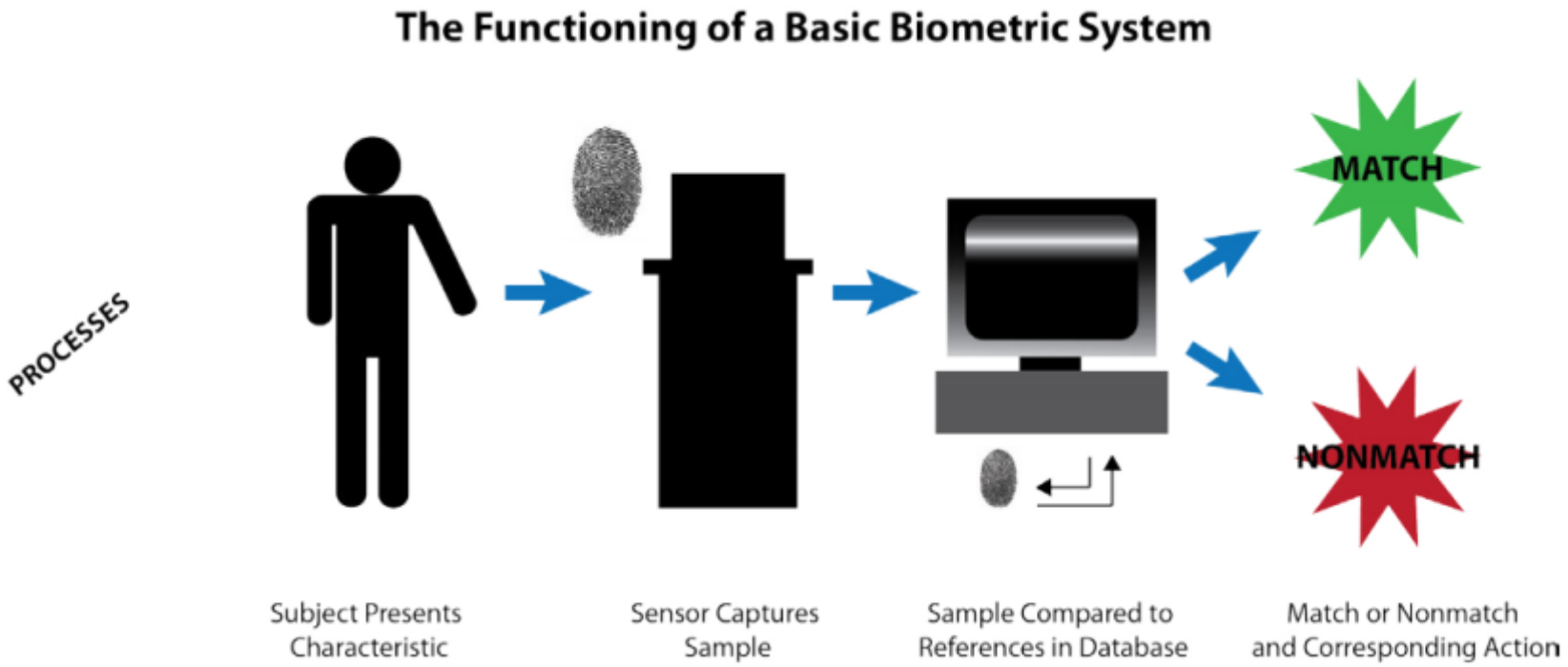
Some more serious problems may be caused in the future: trace daily activities to analyze a person

Advances in facial recognition may end the ability of individuals to remain anonymous in public places!

Security Issue - Moral

- Companies should be transparent with consumers about their policies with respect to biometric data and provide consumers a choice
- Companies should obey their own policies strictly
- Companies should not collect and store biometric data of non-users of its service
- Companies should try their best to protect biometric information and invest in security research

Security Issue - Technology



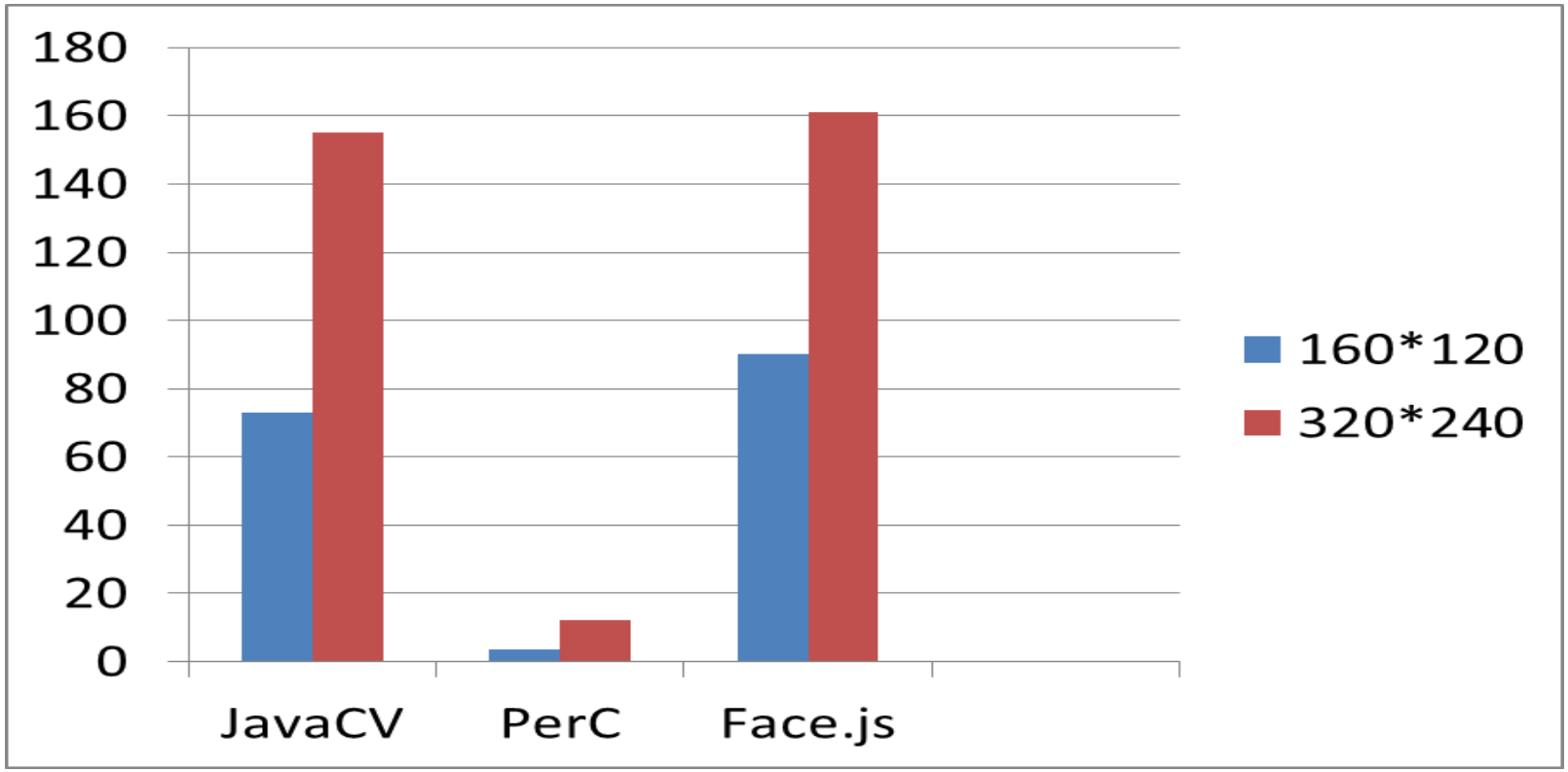
Open Problems

- Problem with the 163 mailbox
- Is it possible to achieve real time facial detection?
- Lack of test data and comparisons of current methods

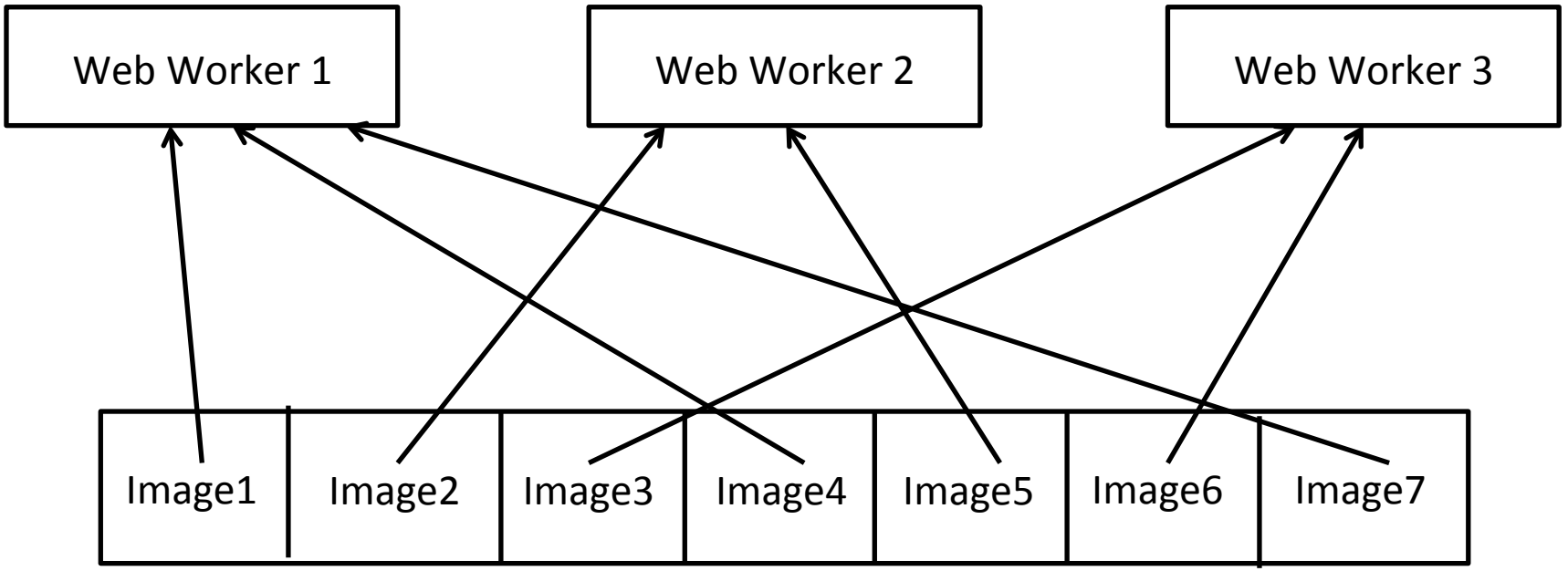
My Experiments

- Tested current facial detection methods
  - JavaCV
  - Perceptual Computing SDK
  - JavaScript
- Migrated native methods to an online environment

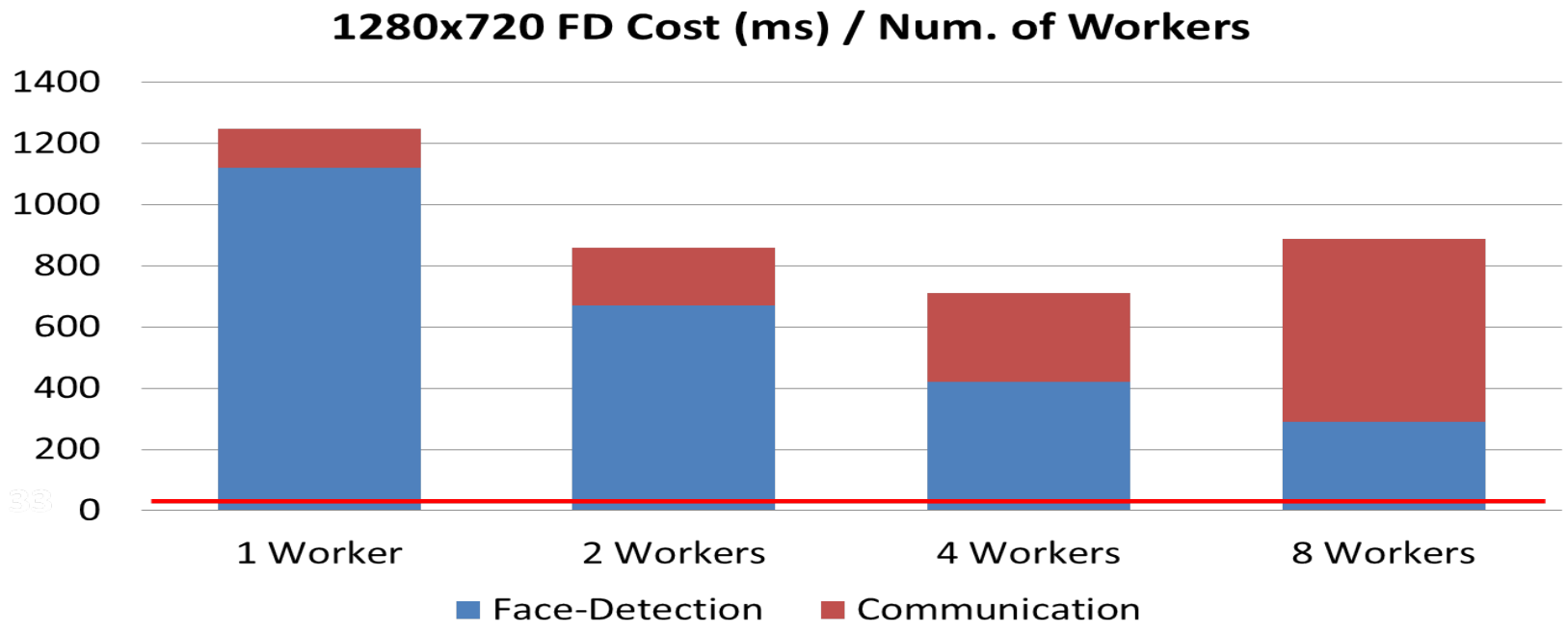
Performance



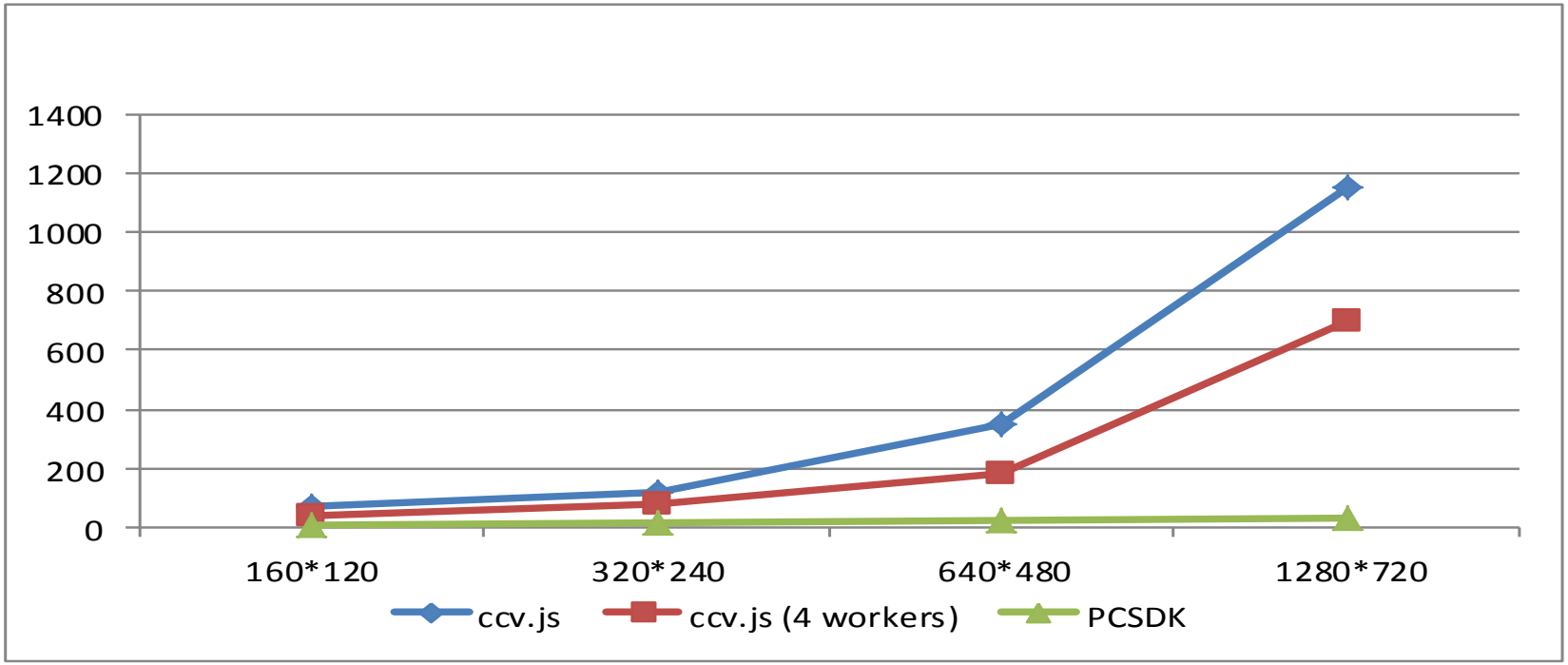
Improvements – Parallel JS



Parallel JS Performance



Overall Performance



Conclusion

- Real time facial analysis can be achieved with current technology
- Problems still exist and improvements should be made: add depth camera, etc

Thank you!

Feedback: yuan.lu@yale.edu

Backup Slides

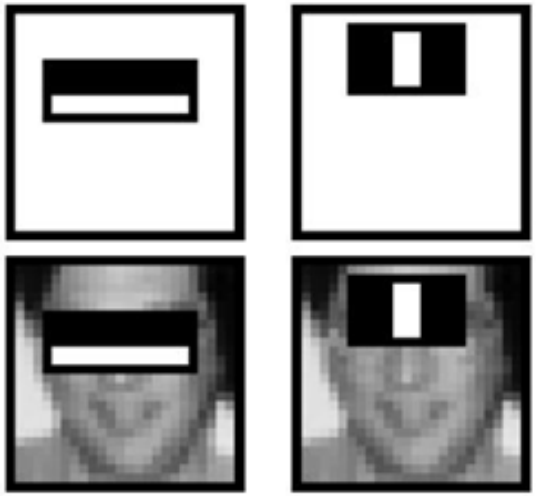
JavaCV

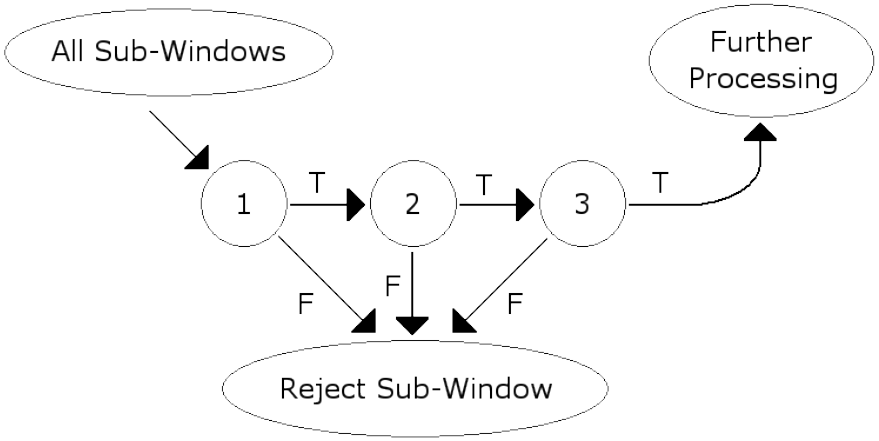
- Based on OpenCV (Open Source Computer Vision Library)
- Uses websocket for transimission
- Uses the Viola–Jones face detection algorithm

Viola–Jones Face Detection

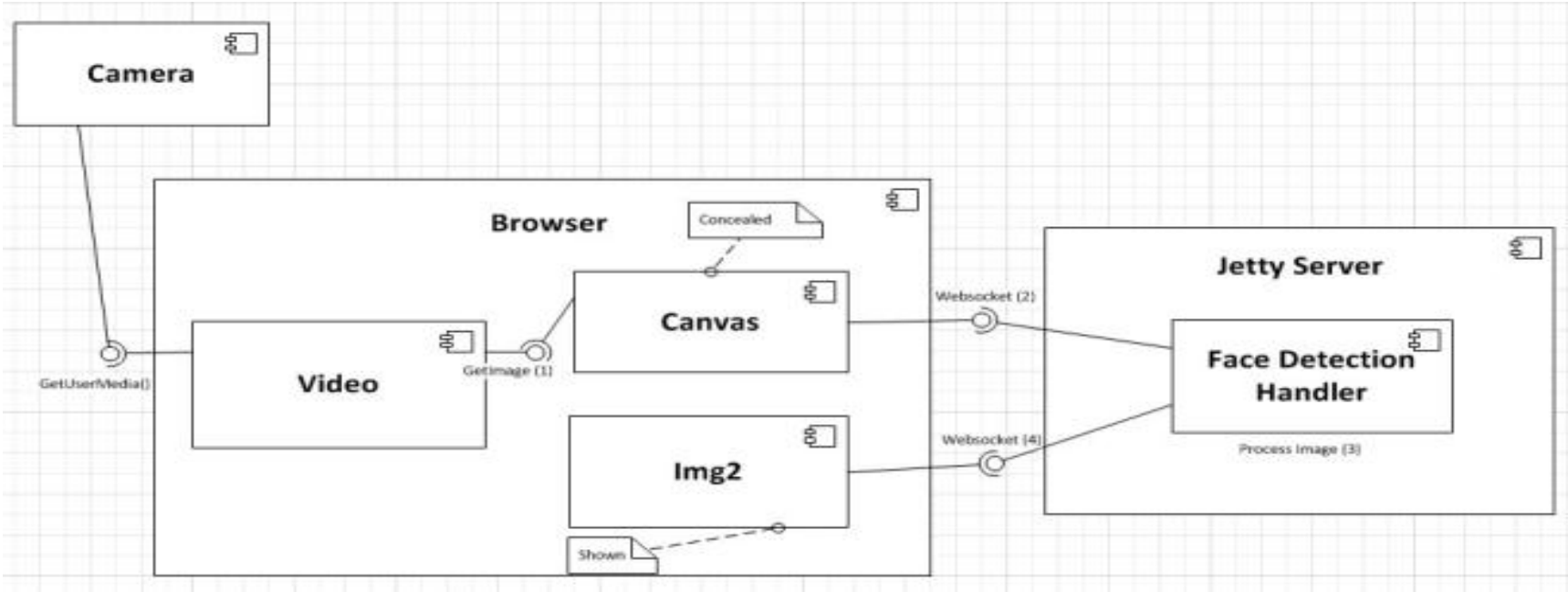
- Uses different feature types to train classifiers
- Uses a cascade architecture to accelerate the algorithm:

low false negative rate & high false positive rate





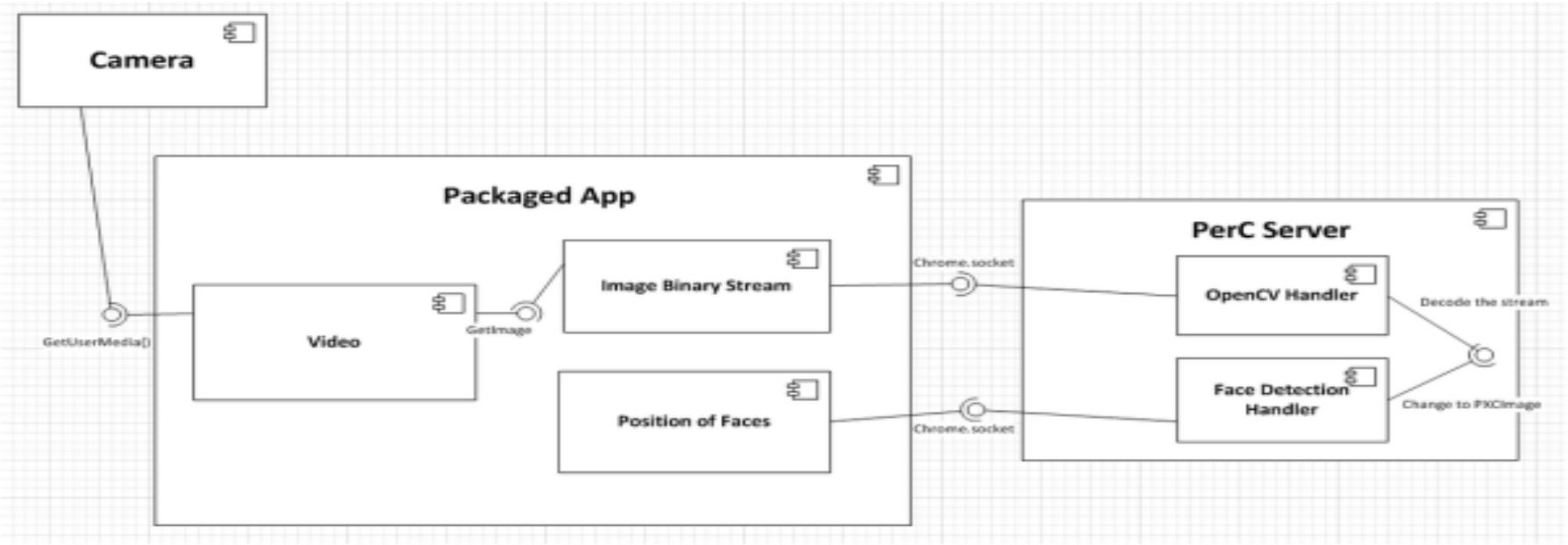
JavaCV


Camera
Browser
Concealed
Canvas
Video
GetUserMedia()
GetImage (1)
Img2
Shown
Websocket (2)
Websocket (4)
Jetty Server
Face Detection Handler
Process Image (3)

Perceputual Computing

- A new SDK supported by Intel released in late 2012
- Developers can create exciting new applications that take advantage of the SDK's core capabilities: speech recognition, close-range hand and finger tracking, face analysis, augmented reality

Perceputual Computing



JavaScript: ccv.js + face.js