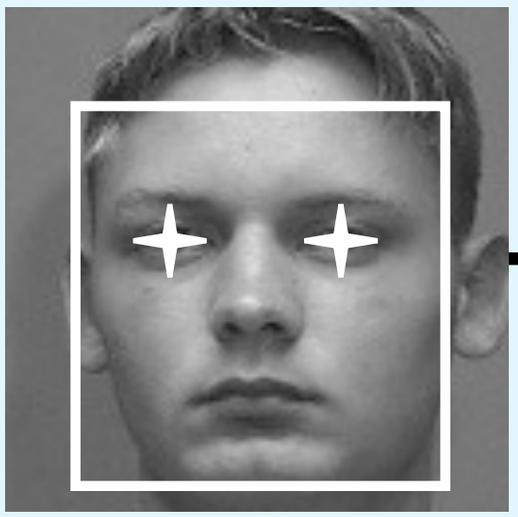
Open Source Biometric Recognition

Josh Klontz
Noblis

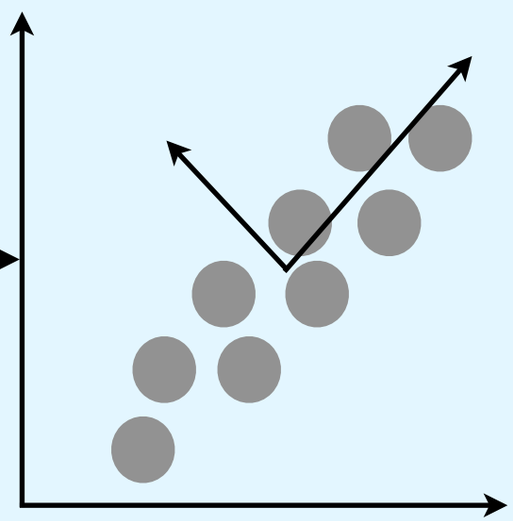
A typical face recognition algorithm



Detection
- Viola & Jones
- Felzenszwalb

Normalization
- Cootes
- Tan & Triggs

Representation
- Lowe
- Ahonen



Extraction
- Turk & Pentland
- Belhumeur & Kriegman

Observations
- Research focuses on isolated steps
- Few implementations of complete systems
- Engineers must piece together components

Issues
- Unclear how new ideas interact
- Barrier to entry to test new ideas

The biometrics community doesn't have a communal open source framework of its' own.

What's in it?

Off-the-shelf algorithms

- Face Recognition
- Gender & Age
- Commercial Wrappers
- Other Algorithms

Systems engineering

- Enroll & Compare
- Serialization
- Parallelization
- Fusion & Clustering

Algorithm evaluation

- Standardized workflow
- Plot generation
- Command line interface

Algorithm development

- C++ plugin API
- Embedded grammar
- Model training

Now back to our experiment!

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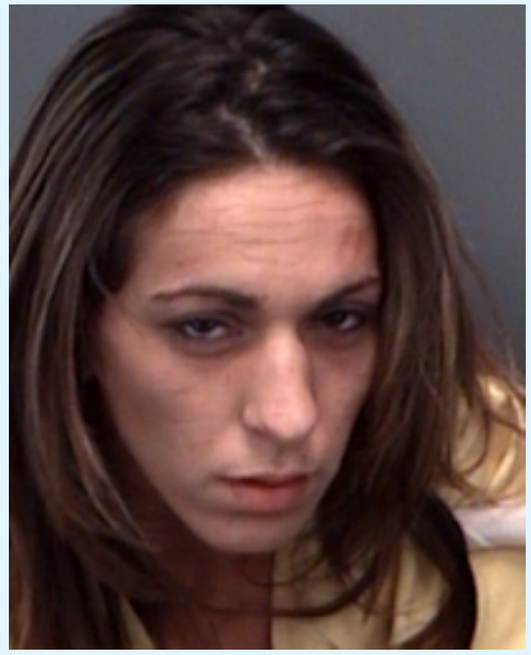
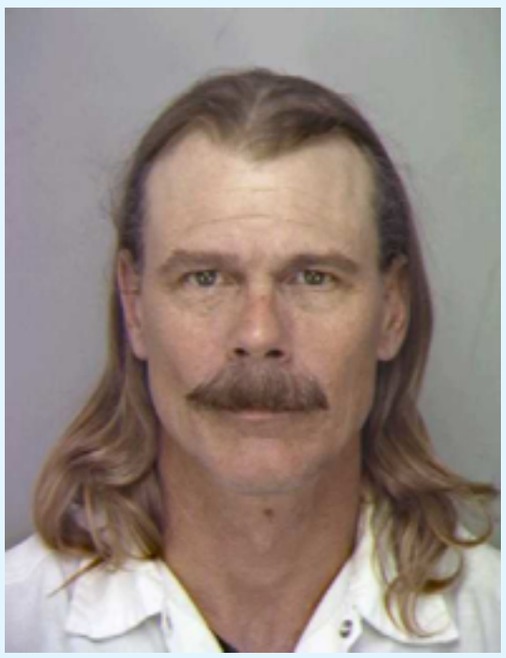
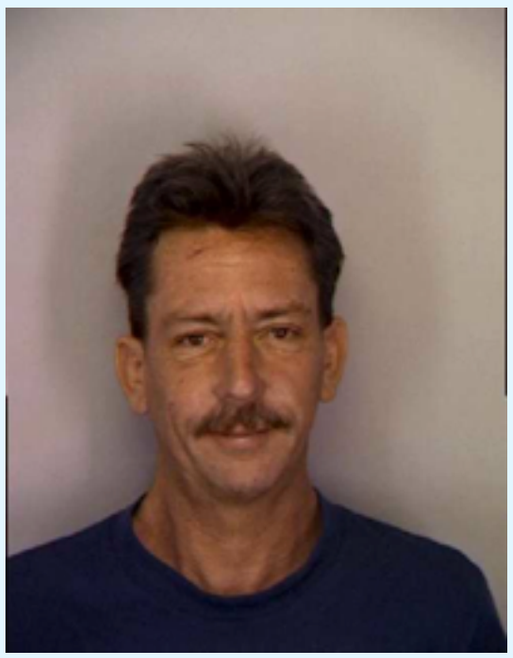
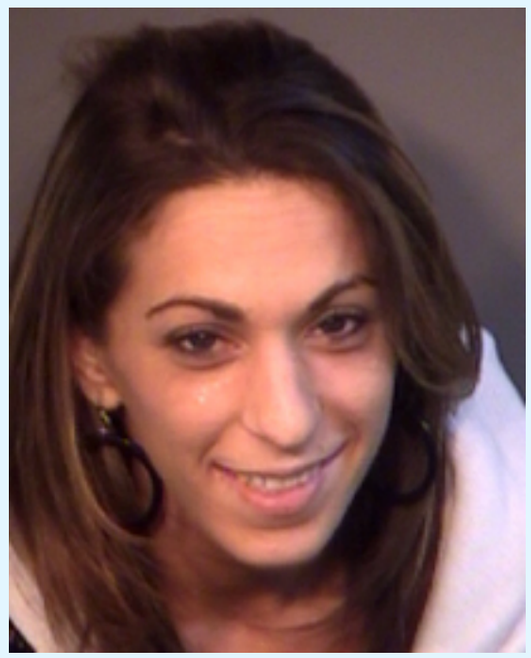
Probe				
Gallery				

Pinellas County Sheriff's Office Mugshots

br -algorithm "Open+Cvt(Gray)
+Cascade(FrontalFace)+ASEFEyes
+Affine(128,128,0.33,0.45)+CvtFloat
+LDA(0.98)+Normalize(L2):Dist(L2)"

-train ../data/PCSO/sigset/PCSO_2x1k_train.xml
Fisherfaces

br **-algorithm Fisherfaces -compare** ../data/PCSO/sigset/PCSO_2x1k_test.xml . **Fisherfaces.mtx**

br -algorithm "Open+Cvt(Gray)
+Cascade(FrontalFace)+ASEFEyes
+Affine(128,128,0.33,0.45)+
(Grid(10,10)+**SIFTDescriptor(12)**+ByRow)/
(Blur(1.1)+**Gamma(0.2)+DoG(1,2)+Contras**
tEq(0.1,10)+LBP(1,2)+RectRegions(8,8,6,6)+
Hist(59))+PCA(0.95)+Normalize(L2)+Cat
+Dup(22)+**RndSubspace(0.05,1)+LDA(0.98**
)+Cat+PCA(0.95)+**Normalize(L1)+**
Quantize:NegativeLogPlusOne(ByteL1)"

-train ../data/PCSO/sigset/PCSO_2x1k_train.xml
Klarefaces

br -algorithm **Klarefaces** -compare ../data/PCSO/sigset/PCSO_2x1k_test.xml .
Klarefaces.mtx

br -algorithm "Open+Cvt(Gray)
+Cascade(FrontalFace)+ASEFEyes
+Affine(128,128,0.33,0.45)+
(Grid(10,10)+SIFTDescriptor(12)+ByRow)/
(Blur(1.1)+Gamma(0.2)+DoG(1,2)+ContrastEq(0.
1,10)+LBP(1,2)+RectRegions(8,8,6,6)+Hist(59))/
(Resize(64,64)+EBIF)
+PCA(0.95)+Normalize(L2)+Cat
+Dup(22)+RndSubspace(0.05,1)+LDA(0.98)+Cat
+PCA(0.95)+Normalize(L1)+
Quantize:NegativeLogPlusOne(ByteL1)"

-train ../data/PCSO/sigset/PCSO_2x1k_train.xml
KlarefacesEBIF

br -algorithm **KlarefacesEBIF** -compare ../data/PCSO/sigset/PCSO_2x1k_test.xml .
KlarefacesEBIF.mtx

br -algorithm **PP5** -compare ../data/PCSO/sigset/PCSO_2x1k_test.xml . **PittPatt.mtx**

br **-makeMask** ../data/PCSO/sigset/
PCSO_2x1k_test.xml . **PCSO.mask**

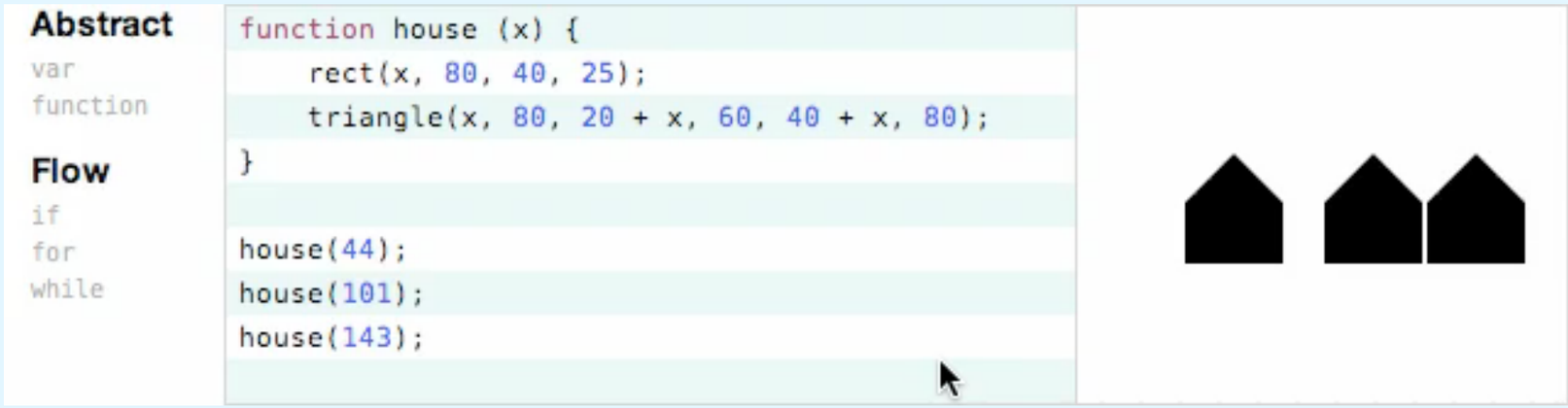
br **-eval Fisherfaces.mtx PCSO.mask**
results/Fisherfaces.csv

br **-plot results/* plots.pdf**

That’s not good enough.

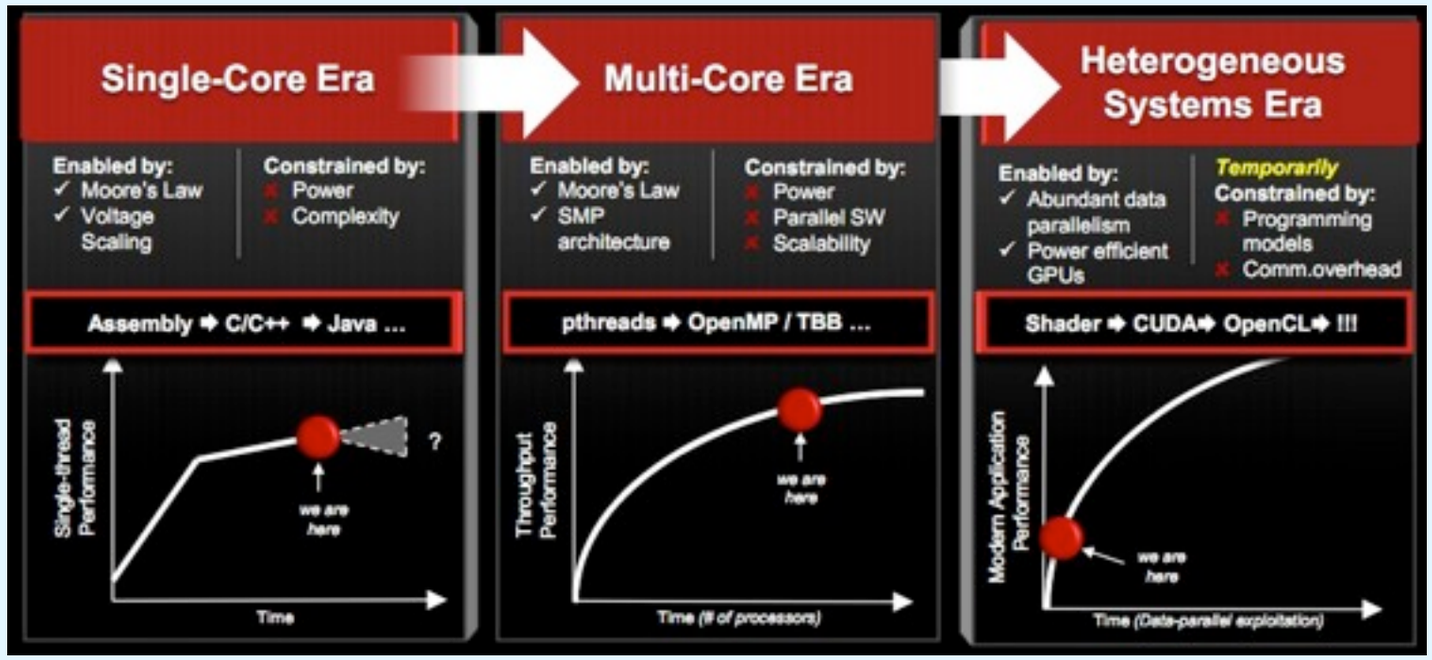
A Domain Specific Language for Visual Recognition

Live Coding (Programmer Productivity)



http://worrydream.com/#!/LearnableProgramming

Heterogeneous Architectures (Hardware Productivity)



http://www.extremetech.com/computing/116561-the-death-of-cpu-scaling-from-one-core-to-many-and-why-were-still-stuck

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