
Face Recognition Grand Challenge

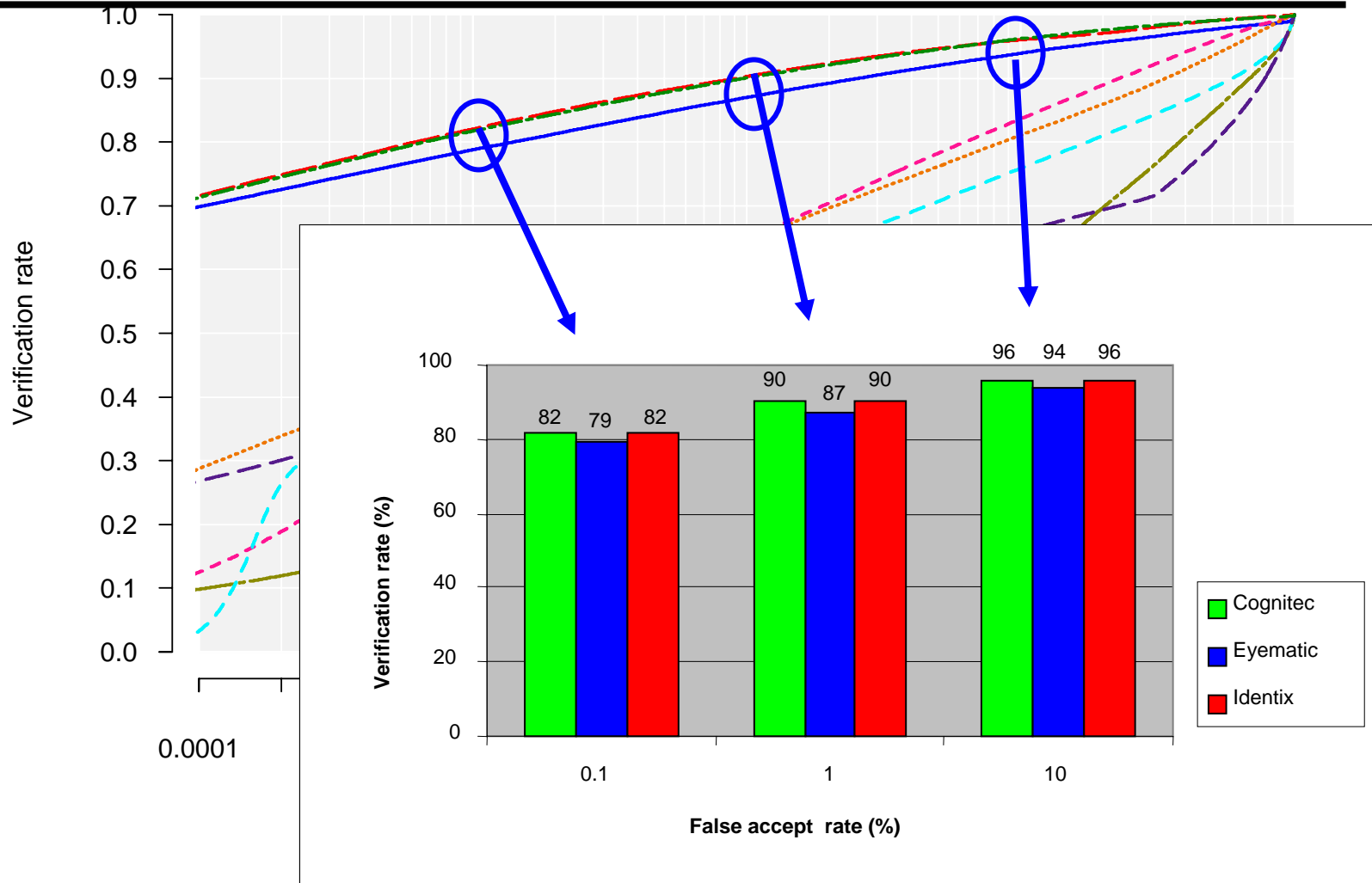
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NIST

March 2004

Face Recognition Grand Challenge

Systematically pursue two methods (2D and 3D) to reduce the error rate in face recognition by an order of magnitude.

Verification - HCInt



Select Point to Measure

- **Verification rate at :**
 - False accept rate = 0.1%
- **Current:**
 - 20% error rate (80% verification rate)
- **Goal:**
 - 2% error rate (98% verification rate)

Measuring Accuracy w/Error Rate of 2%

- **Non-match scores:**
 - Sufficient
- **Match scores:**
 - Need to design collection for sufficient number

1,000 match scores = ~ 20 errors

10,000 match scores = ~ 200 errors

50,000 match scores = ~ 1,000 errors

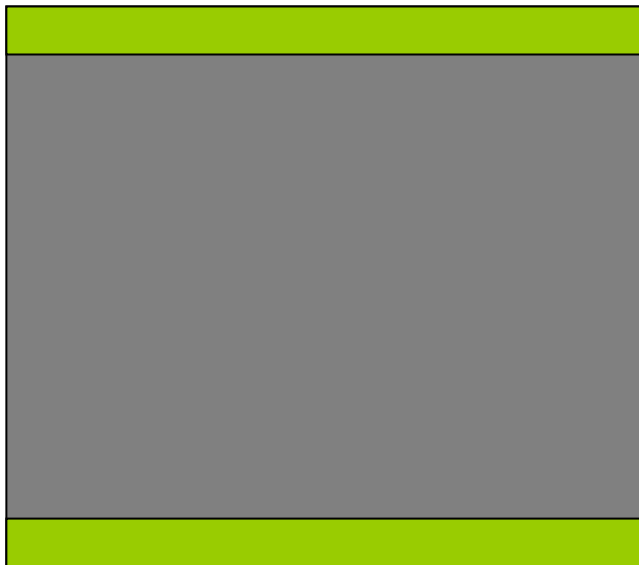
- Allows for error ellipses
- Minimal demographic analysis

Data Collection

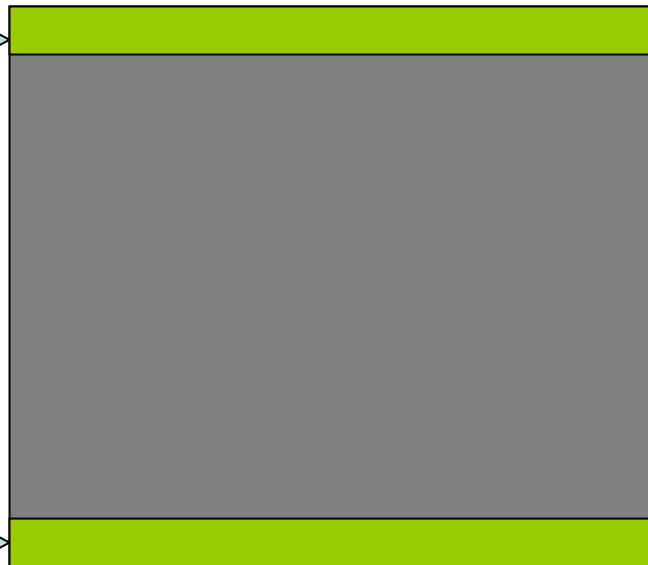
Fall Semester
(Gallery)
15 Weeks

Spring Semester
(Probes)
15 Weeks

200
People

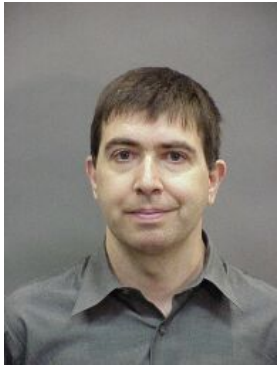


200
People



All match scores ~ 50,000

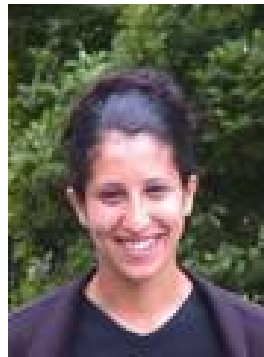
Modes Examined



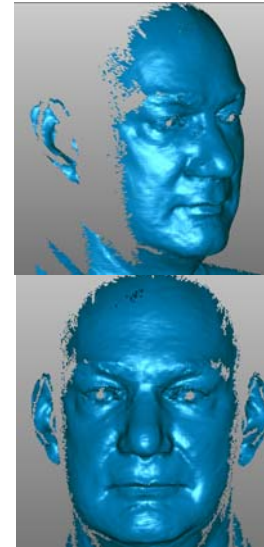
Single Still



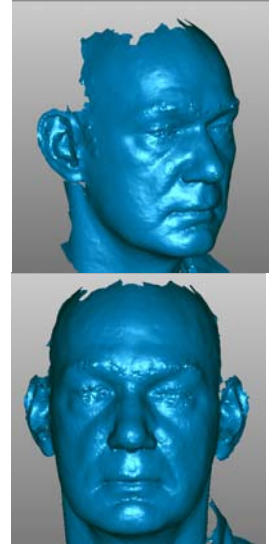
Multiple Stills



Outdoor/
Uncontrolled



3D Single
view



3D Full Face

Measure Progress on:

- Indoor cooperative face recognition
- Outdoor cooperative face recognition
- Comparison of still & 3D face recognition
- Effect of multiple images
- Effect of High Dynamic Range cameras on outdoor face recognition
- Comparison between human and machine performance

Programmatic

- **Series of Challenge Problems**
 - Facilitate development
 - Systematically measure progress
- **FR Challenge Grand Challenge Evaluation**
 - Independent measure

Experiment Design

FRVT 2002 versus Grand Challenge

FRVT 2002

- Flat design
- Process all data
- Blind data
- Black box
- Single mode
- Fixed design
- Central analysis

Grand Challenge

- Combinatorial design
- Process subset of data
- Transparent data
- Transparent box
- Multiple modes
- Adaptive design
- Distributed and central analysis

Grand Challenge Schedule

Date	Activity
Aug-Sep '05	Face Recognition Grand Challenge Evaluation
Sep '04	Release challenge problem v2.0
Aug-Sep '04	Baseline performance determination for v2.0
April '04	Release challenge problem v1.0
April '04	First challenge problem workshop <ul style="list-style-type: none"><li>• Explain challenge problem in detail

Challenge Problem Infrastructure

- **Based on HumanID gait challenge problem**

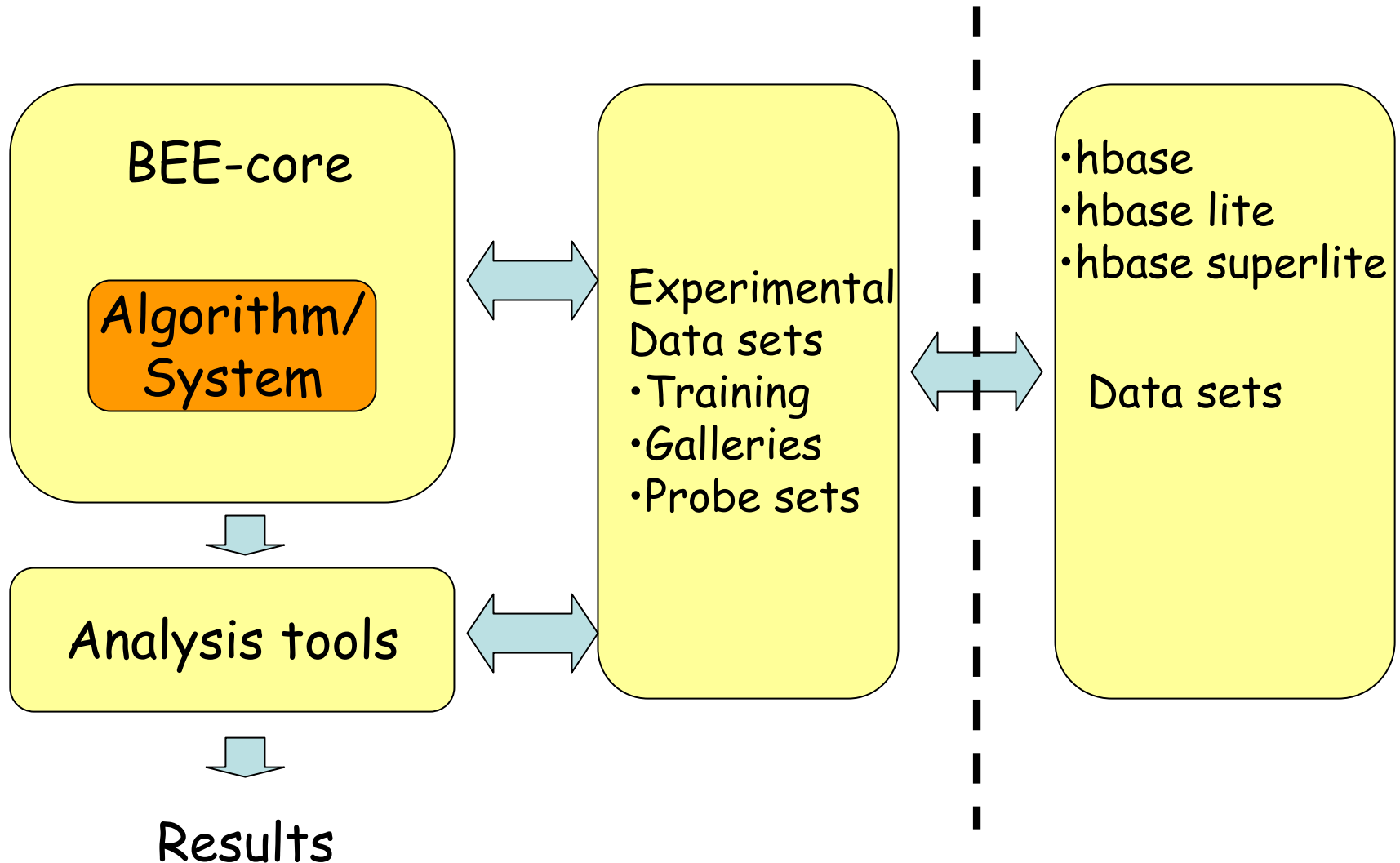
- Design set of experiments
- Baseline algorithms

- Infrastructure for running experiments

- **Documented progress**

- Forced researchers to concentrate on a problem

BEE Architecture

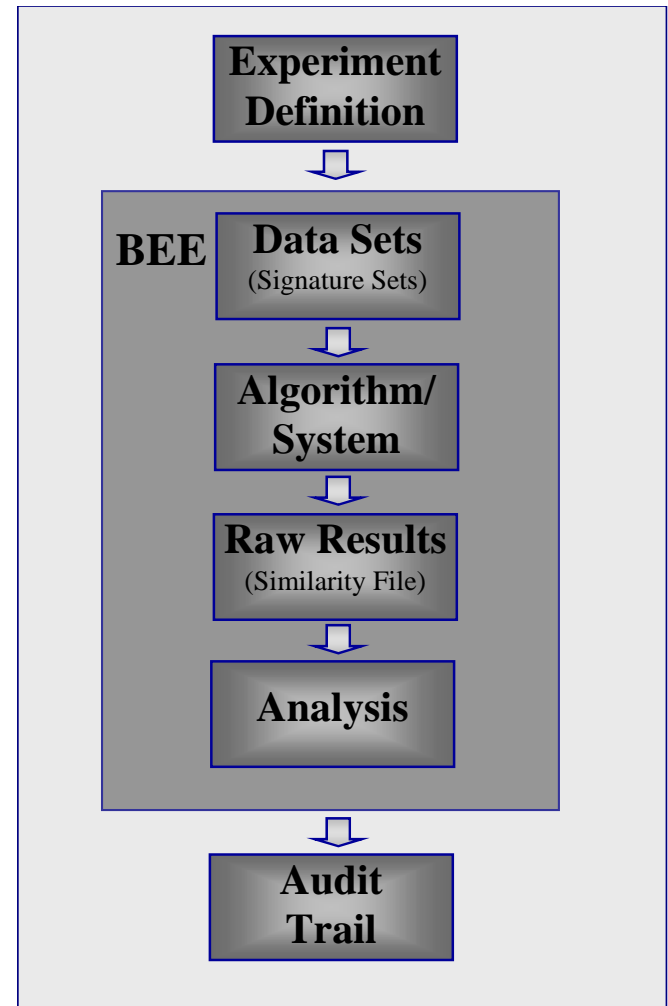


BEE: Biometric Experimentation Environment

- **Flexible Framework for Biometric Algorithms**
 - Plug & play algorithms
 - Mix & match modular components
- **Provides Universal XML-Based Interfaces**
- **Facilitates Biometric Evaluations**
- **Uses a Non-Proprietary Open Source Design**

Experiments

- Evaluate single system using multiple datasets
- Evaluate multiple systems with uniform data
- Complete audit trail
- Audit trails are portable and can be used as inputs to subsequent runs
- Similarity matrices offer a portable representation of raw results
- Rerun trial using intermediate results
- View graphs/reports on experiments performance
- Supports independent advanced post analysis



Reproducibility via XML

Datasets (inputs)

<Signature>

<Subject id="hgfR00001" />

<Image file="img.jpg" />

<Recording id="hgfR00001"/>

</Signature>

Similarity Matrix (raw results)

<Audit>

<Target file = "DataSet1.xml" />

<Query file="DataSet2.xml" />

<BioBox module="hFace 1.2"/>

</Audit>

Audit Trail (output)

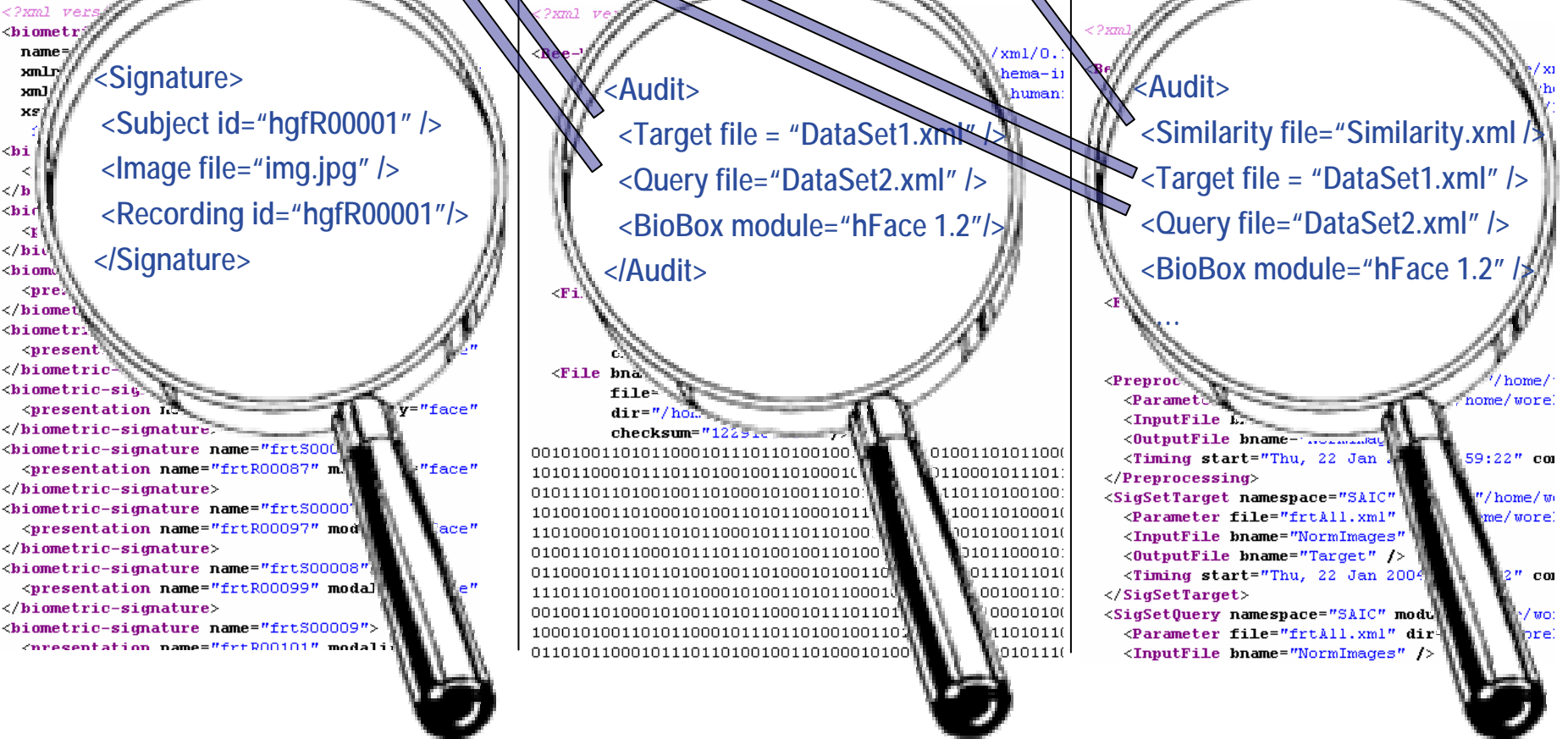
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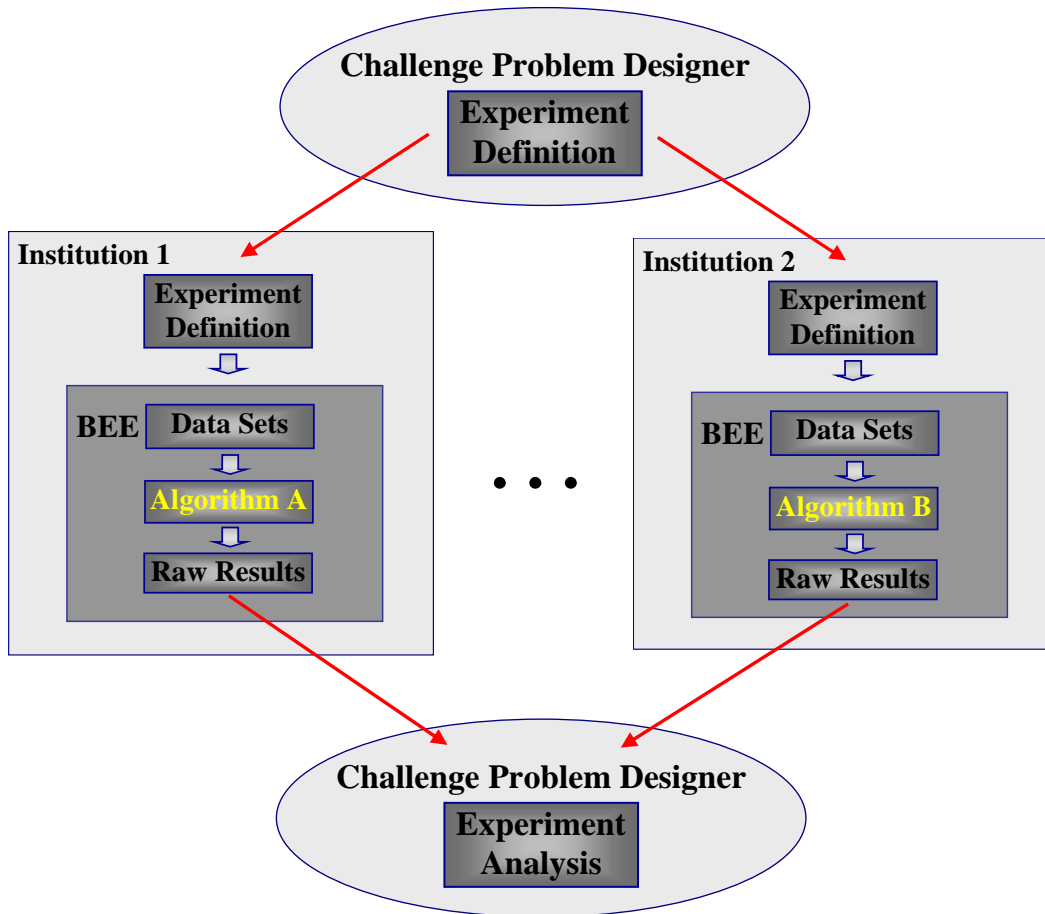
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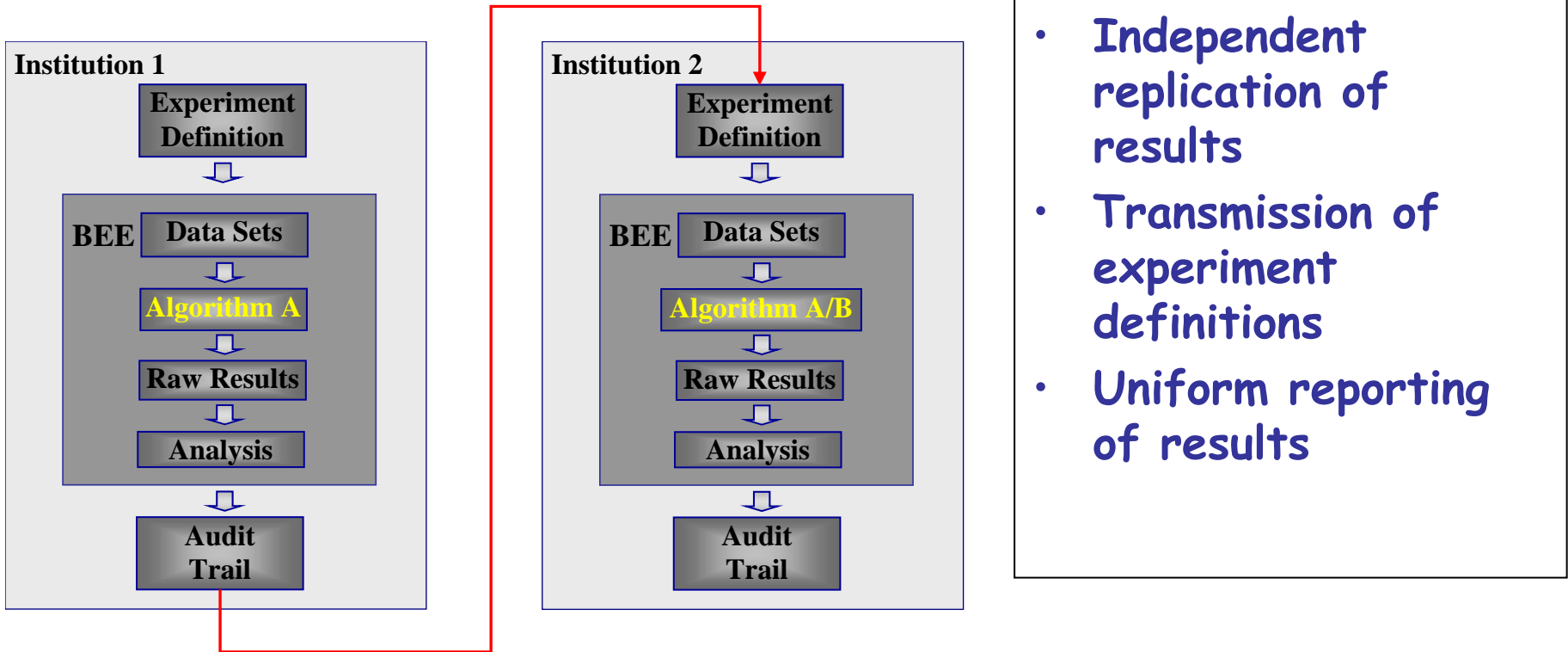


Cross Institution Experimentation



- Execution of multiple algorithms at multiple institutions with a common experiment definition
- Transmission of raw results
- Uniform reporting of results
- Cross institutional analysis

Cross Institutional Experiment Replication



- Independent replication of results
- Transmission of experiment definitions
- Uniform reporting of results

Grand Challenge Evaluation Team

- **Jonathon Phillips—NIST**
 - Director Face Recognition Grand Challenge
- **Notre Dame (Prof. Kevin Bowyer and Prof. Patrick Flynn)**
 - Data collections
 - Baseline algorithms
- **SAIC (Dr. Todd Scruggs)**
 - Design and implement BEE
 - Maintain hBase
- **Mitre (Joe Marques)**
 - Analysis
 - Assist with Grand Challenge
- **University of Texas at Dallas (Prof. Alice O'Toole)**
 - Human performance

Conclusion

- **Face Recognition Grand Challenge**
 - Order of magnitude increase in performance
 - Systematically investigate still and 3D
 - Formulate series of challenge problems
 - Final Grand Challenge evaluation
- **Biometric Experimentation Environment (BEE)**
 - Infrastructure for Grand Challenge
 - Uniform structure for challenge problem