Families in the Wild (FIW)

Large-Scale Kinship Image Database and Benchmarks

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Problem Formulation

- Automatic kinship recognition is a challenging feat
- Pre-existing datasets do not properly represent true data distributions
- Many factors are still undiscovered by the machine vision community
- Research has not yet reached reality, i.e., technology has not matured enough to address real world problems and data

Goal: Build and Benchmark a Large-scale Kinship Dataset to best support the task of kinship recognition

FIW Database

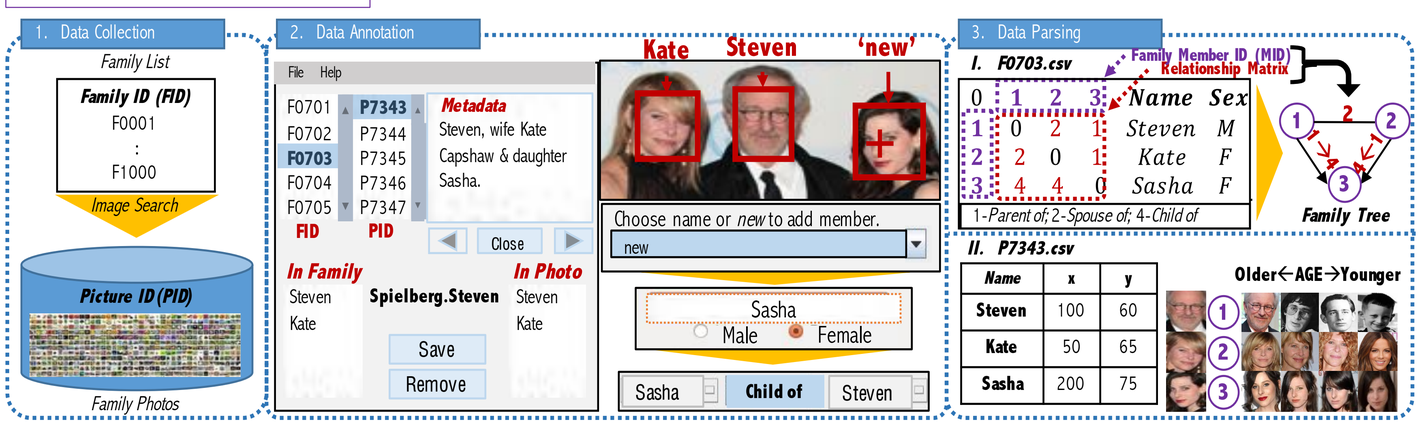

Fig 1 Process to build FIW **(1)** *Data Collection:* list of candidate families & photos were collected **(2)** *Data Annotation:* label tool to mark complex relationships for 1,000 families **(3)** *Post-Processing:* parsed two label-types generated by tool for verification & recognition.

Table 1 Comparison of FIW with related datasets.

Dataset	No. Family	No. People	No. Faces	Age Vary	Family Structure	Highlights
CornellKin	150	300	300	✖	✖	Parent-child pairs.
UB KinFace-I	90	180	270	✔	✖	Parent-child pairs at various ages.
UB KinFace-II	200	400	600	✔	✖	Parent-child pairs at various ages.
KFW-I	—	1,066	1,066	✖	✖	Parent-child pairs.
KFW-II	—	2,000	2,000	✖	✖	Parent-child pairs.
TSKinFace	787	2,589	—	✔	✔	2 parents-child for tri-verification.
Family101	101	607	14,816	✔	✔	Family structured, variations in age and ethnicity.
FIW(Ours)	**1,000**	**10,676**	**30,725**	✔	✔	1,000 family trees, providing both depth & breadth, plus multi-task evaluation offerings.

- Much larger, spanning with depth and breadth (i.e., multiple generations & samples per subject)
- Quality images taken in the wild
- Abundance of full family trees; many more pair-wise samples than pre-existing datasets (i.e., far outdoes our predecessors)
- Serves multi-task purposes supported by laboratory style evaluations & benchmarked results

Table 2 Image Pair Count Comparison

Type	KFW-II	Siblin g Face	Group Face	Family 101	FIW (Ours)
B-B	--	232	40	--	**86,000**
S-S	--	211	32	--	**86,000**
SIBS	--	277	53	--	**75,000**
F-D	250	--	69	147	**45,000**
F-S	250	--	69	213	**43,000**
M-D	787	--	—	148	**44,000**
M-S	101	--	70	184	**37,000**
GF-GD	--	--	--	--	**410**
GF-GS	--	--	--	--	**350**
GM-GD	--	--	--	--	**550**
GM-GS	--	--	--	--	**770**
Total	1,000	720	395	607	**418,060**

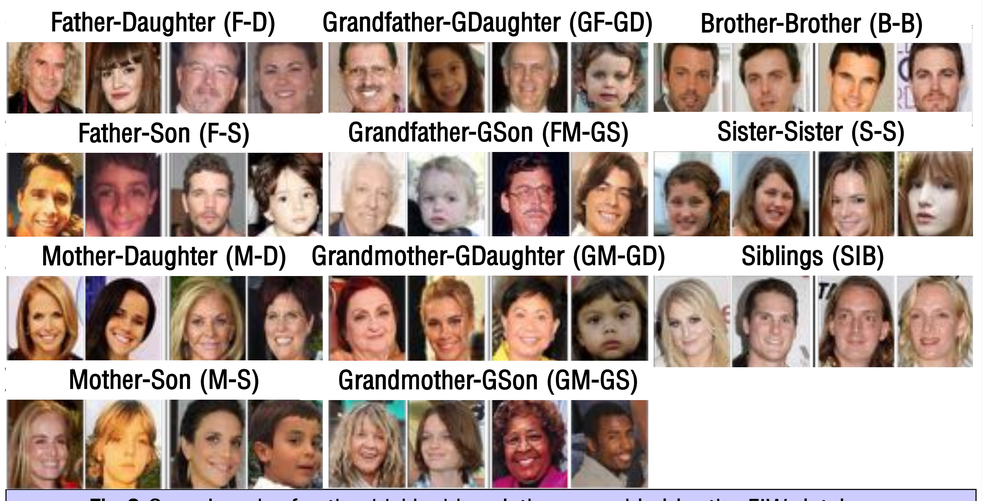

Fig 2 Sample pairs for the 11 kinship relations provided by the FIW database.

Benchmarks

- Top accuracies for each task resulted from fine-tuning the VGG-Face model.

Fig 4 Fine-tuned CNN for Kinship Verification

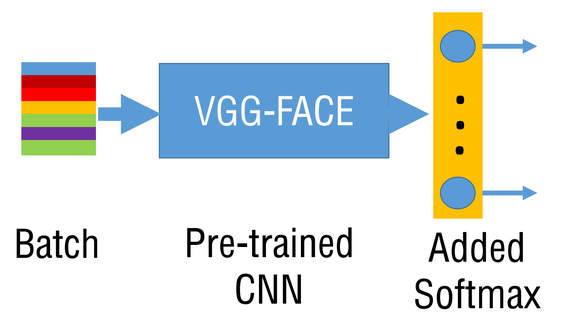

Fig 5 Fine-tuned CNN for Family Recognition

Table 3 Verification scores for 5-fold experiment.

	HOG	LBP	VGG-Face	Fine-Tuned
F-D	56.1	55	64.4	**69.4**
F-S	56.5	55.3	63.4	**68.2**
M-D	56.4	55.4	66.2	**68.4**
M-S	55.3	55.9	64	**69.4**
SIBS	58.7	57.1	73.2	**74.4**
B-B	50.3	56.8	71.5	**73**
S-S	57.4	55.8	70.8	**72.5**
GF-GD	59.3	58.5	64.4	**72.9**
GF-GS	66.9	59.1	68.6	**72.3**
GM-GD	60.4	55.6	66.2	**72.4**
GM-GS	56.9	60.1	63.5	**68.3**
Avg.	57.7	56.8	66.9	**71**

Table 4 Family recognition results, 5-fold experiment.

Fold	VGG-Face	Fine-Tuned
1	9.6	**10.9**
2	14.5	**14.8**
3	11.6	**12.5**
4	12.7	**14.8**
5	13.1	**13.5**
Avg.	12.3	**13.3**

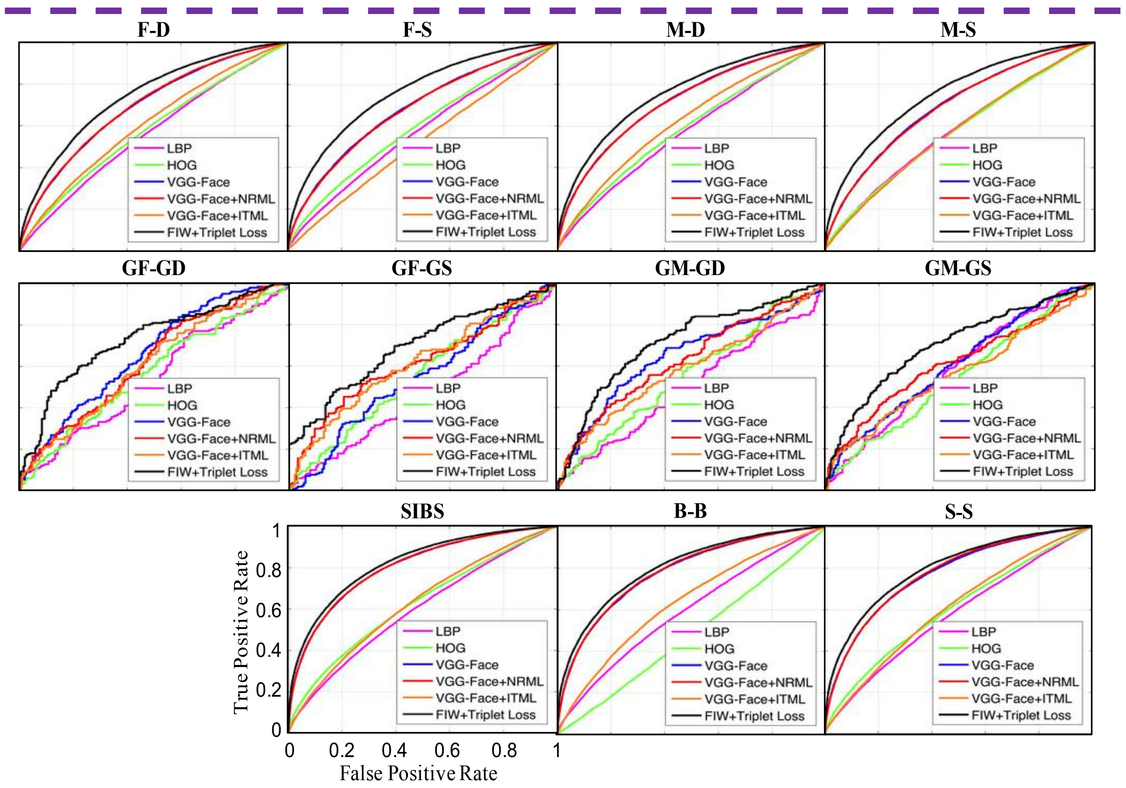

Fig 6 Relationship specific ROC curves depicting performance of each method.

Discussion

Dataset

- Finish project page with data, labels, features, source code, & CNN models

Evaluations

- Release additional benchmarks
  - Search & retrieval (missing child); fine-grain categorization (build family trees), & more

Better results

- Further investigation of deep learning techniques for these problems

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