

## 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

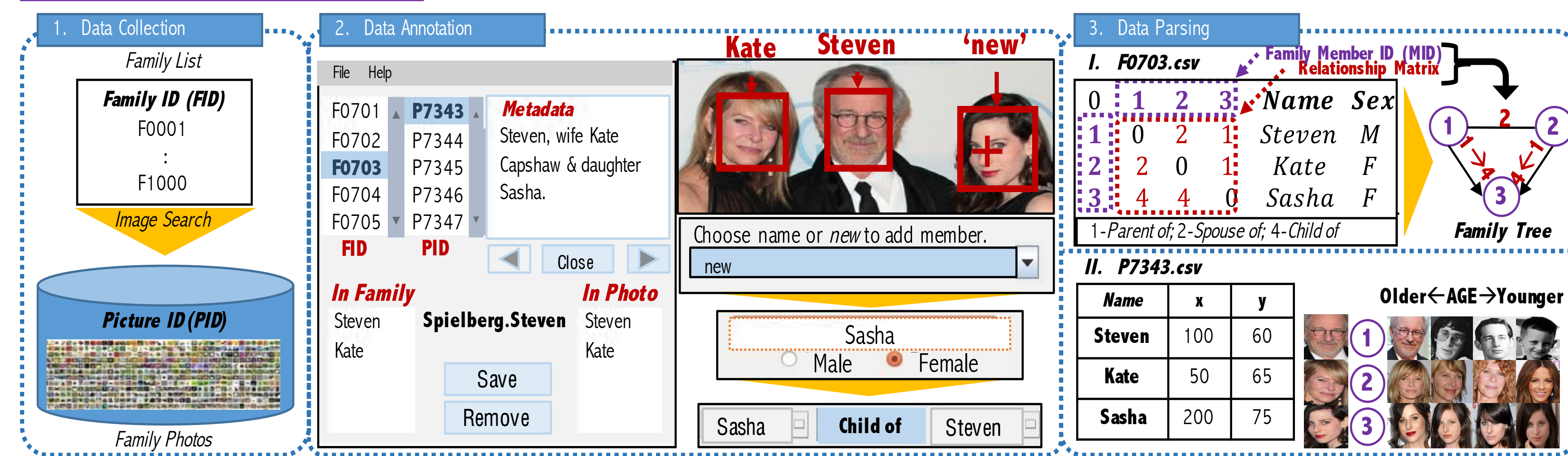


Fig 1 Process to build FIW (1) *Data Collection*: list of candidate families & photos were collected (2) *Data Annotation*: label tool to mark complex relationships for 1,000 families (3) *Post-Processing*: parsed two label-types generated by tool for verification & recognition.

- 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

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.

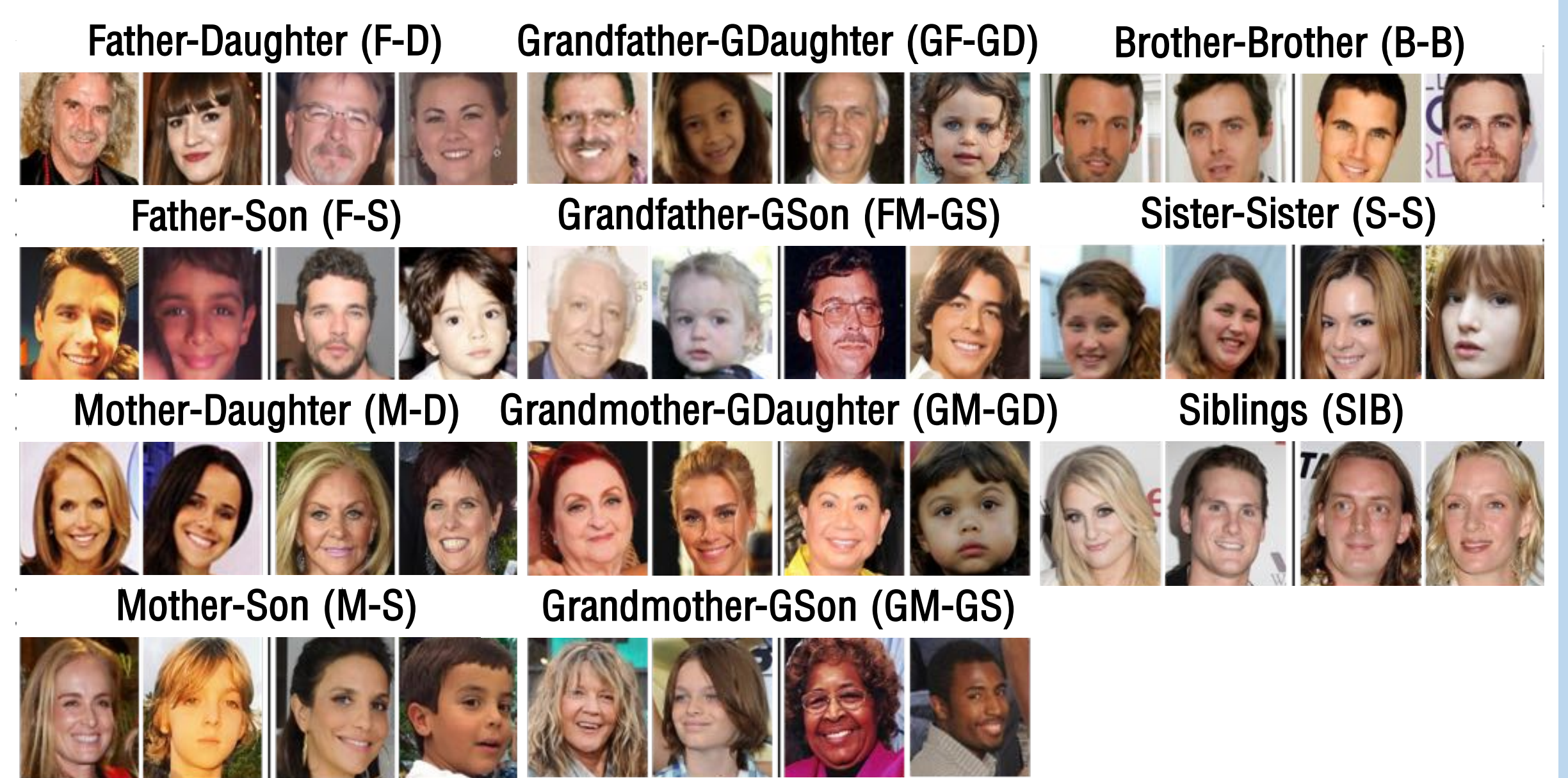


Fig 2 Sample pairs for the 11 kinship relations provided by the FIW database.

#### Benchmarks

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



Fig 4 Fine-tuned CNN for Kinship Verification

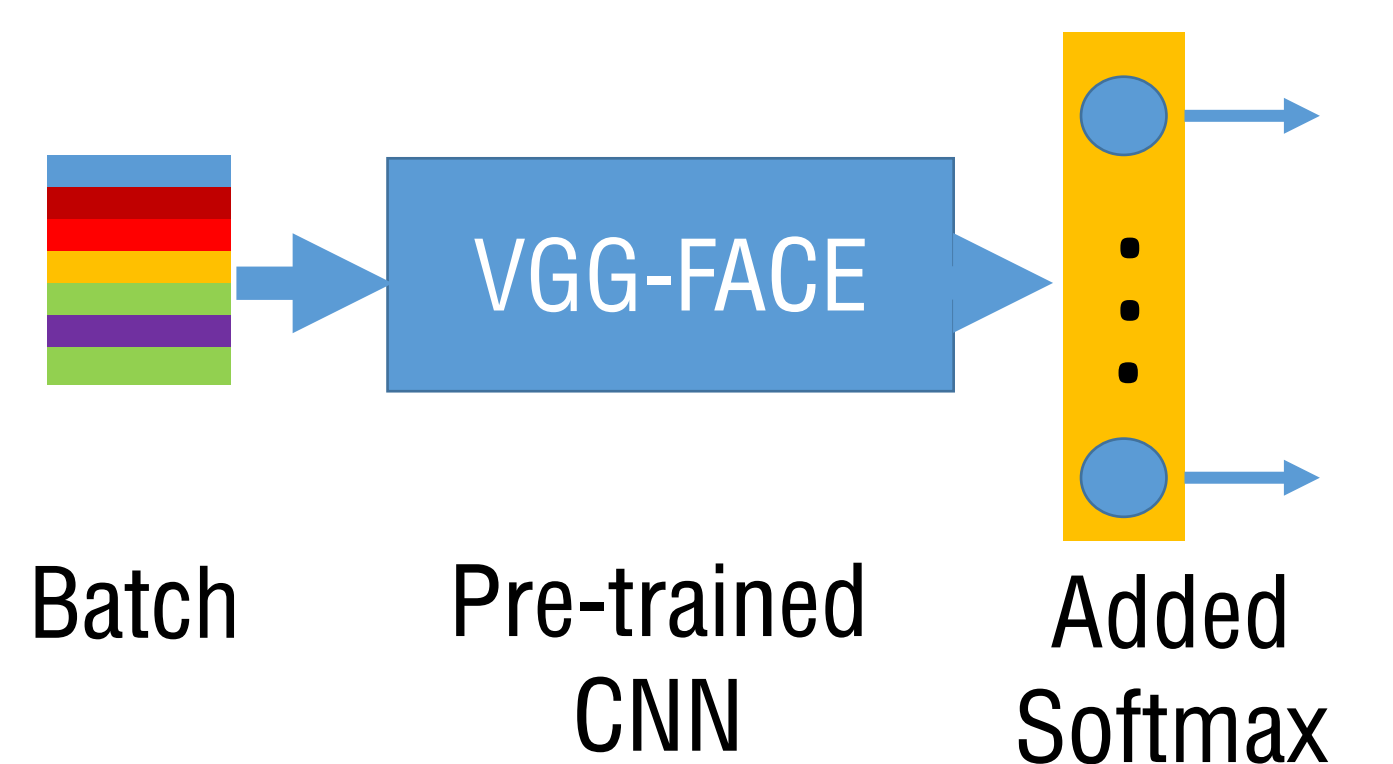


Fig 5 Fine-tuned CNN for Family Recognition

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

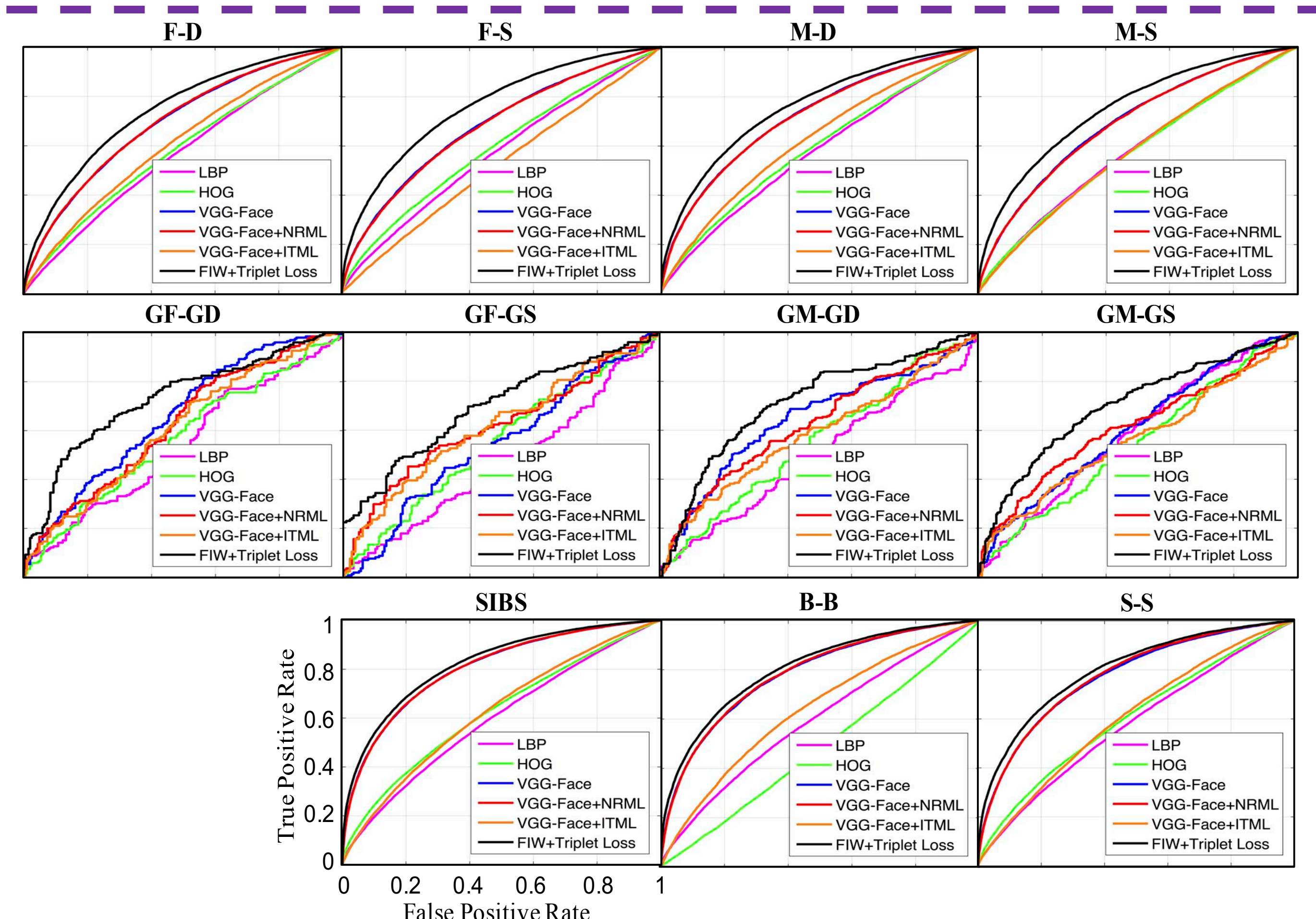


Fig 6 Relationship specific ROC curves depicting performance of each method.

#### 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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