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Boys2Men, an age estimation dataset with applications to detect enfants in pornography content

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Outline

- Motivation
- Gender classification
- Age datasets
- Boys2Men
- Approach
- Experiments
- Conclusions



Motivation

Cybercrime

Criminality evolution in Spain

Evolución de la criminalidad ⁽¹⁾

Tasas	2001	2004	2007	2010
Delitos que más aumentan				
Pornografía infantil	77	157	677	862
Corrupción de menores	59	157	255	301
Blanqueo de capitales	55	58	112	175

(1) Solo Cuerpo Nacional de Policía y Guardia Civil. Balance de criminalidad 2010.

Fuente: Ministerio del Interior

Motivation

Can we detect infants in an image?



Gender classification



Local Descriptors

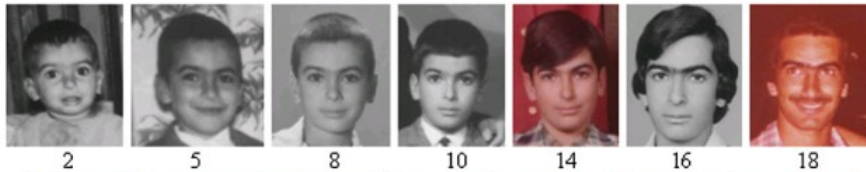
Entreno/Test	GROUPS	LFW	MORPH
GROUPS	90.85	94.10	89.98
LFW	80.22	95.00	89.16
MORPH	62.04	84.53	98.85

CNN

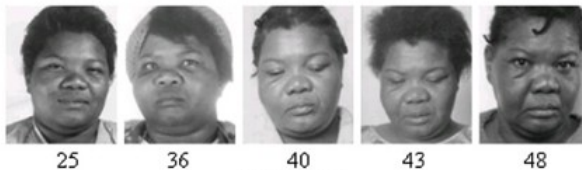
Entreno/Test	GROUPS	LFW	MORPH
GROUPS	90.90	94.46	87.56
LFW	85.92	96.70	91.84
MORPH	72.32	83.16	98.70

Age datasets

- FG-Net
- MORPH
- The Images of Groups



(a) FG-NET



(b) MORPH



Boys2Men dataset

Dataset concerns

- Males
- Online search



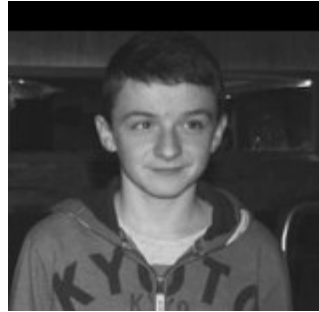
Boys2Men dataset

- 12-21 years old
- balanced dataset
- links
- eye locations



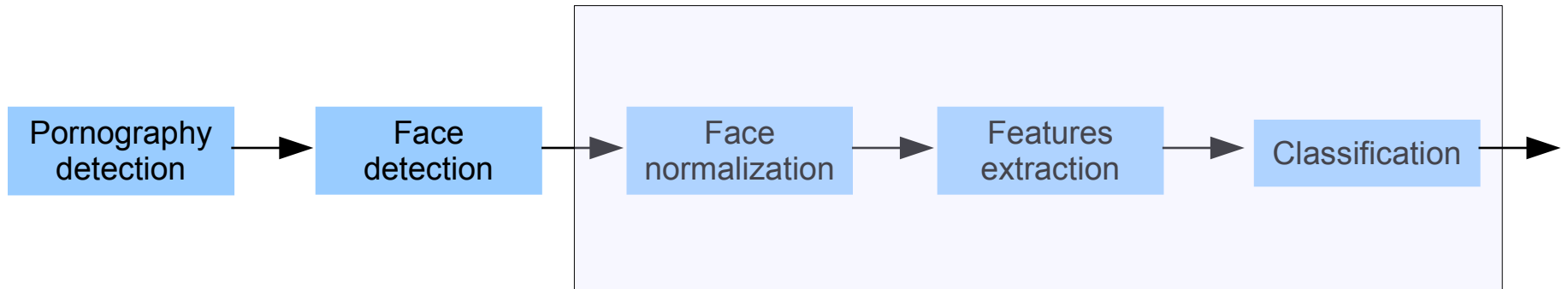
Boys2Men dataset

Normalized



Approach

- Regions of interest (ROIs)
- Features:
- Classification



Approach: ROIs

- HS (64x64)



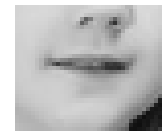
- F (59x65)



- P (39x19)



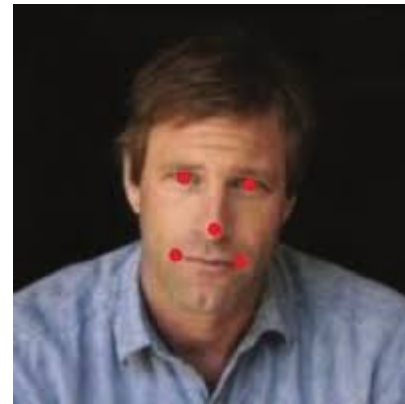
- M (37x31)



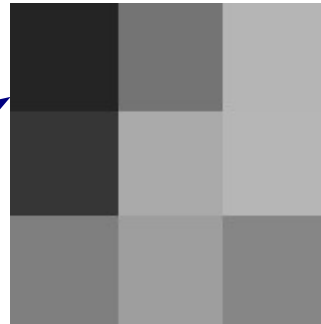
Approach: Features

Local descriptors:

- HOG
- LBP
- LSP
- LGP
- NILBP
- WLD
- LOSIB
- LTP
- LPQ



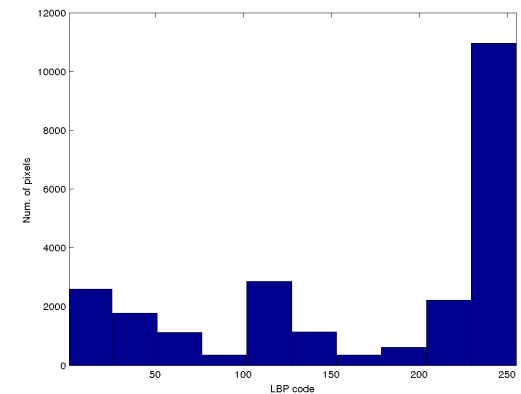
Approach: Features



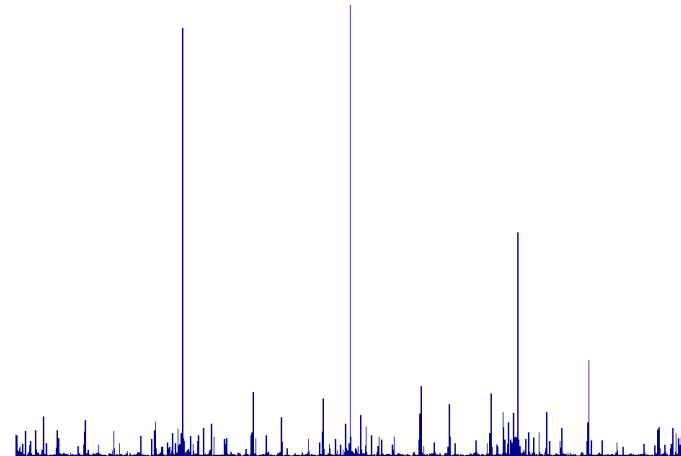
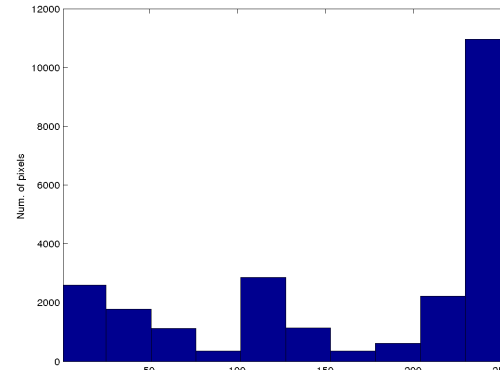
14	45	71
21	67	71
50	62	53

$$g_c \leq g_i?$$

0	0	1
0		1
0	0	0

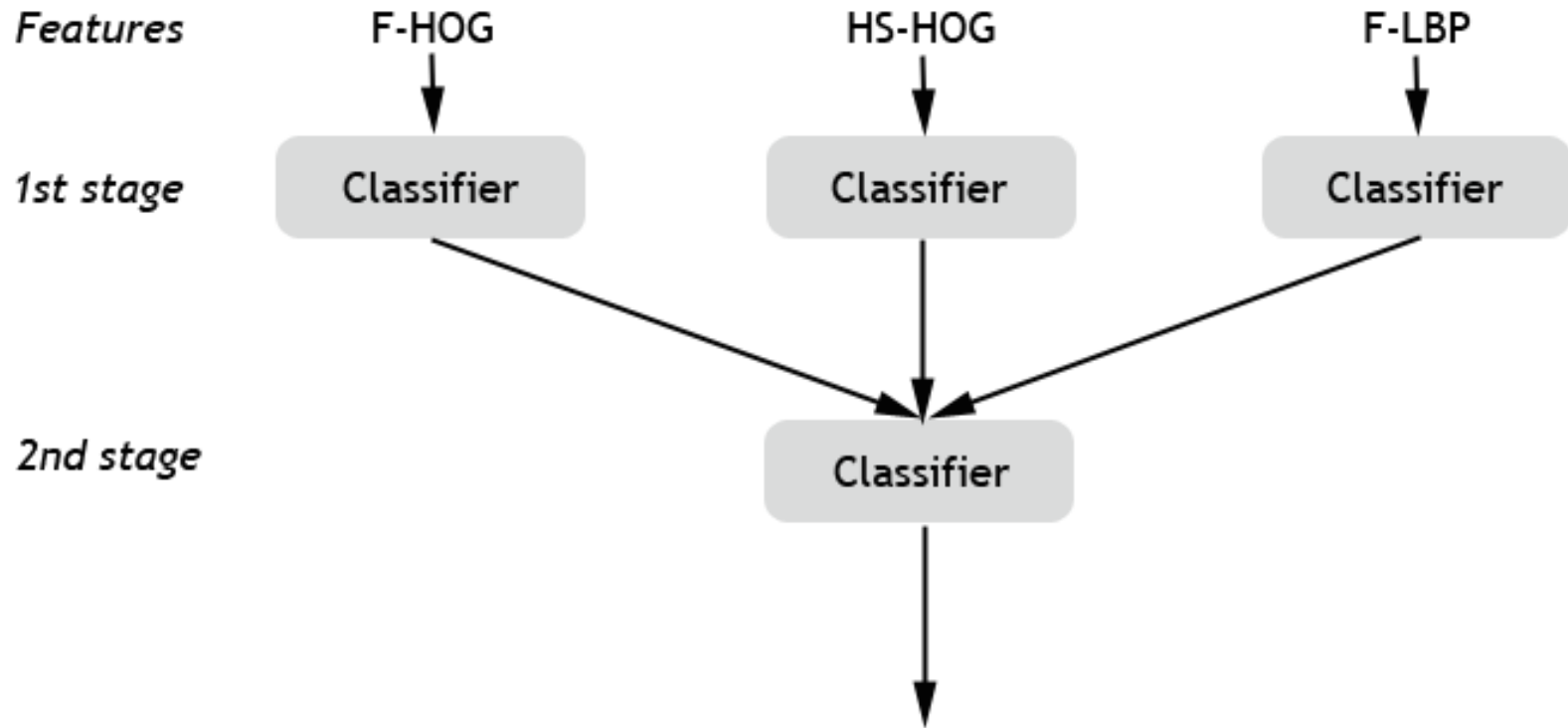


Approach: Features



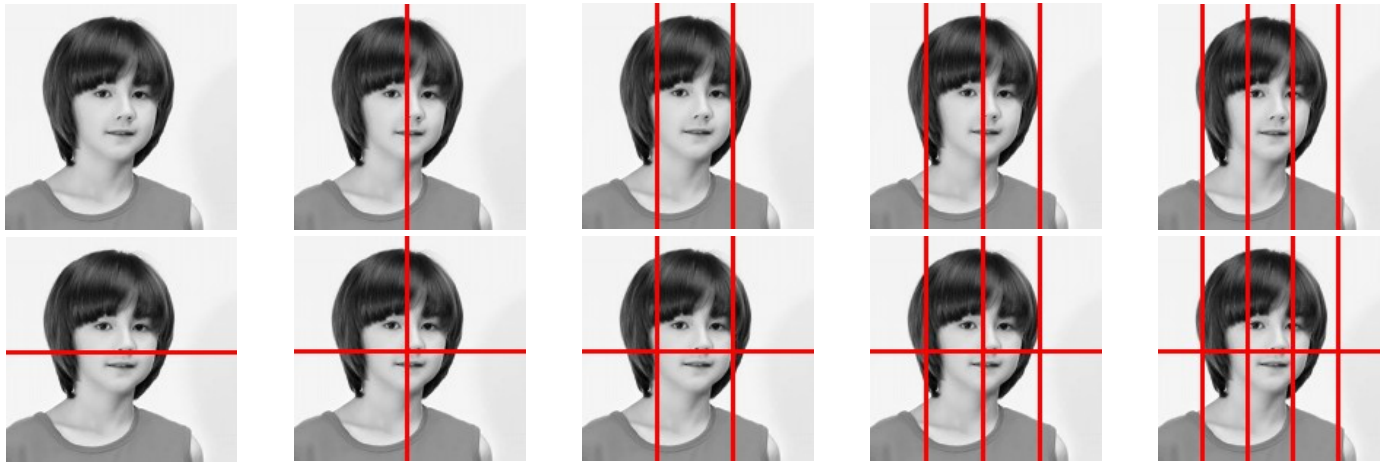
Approach

Classification: Score fusion level

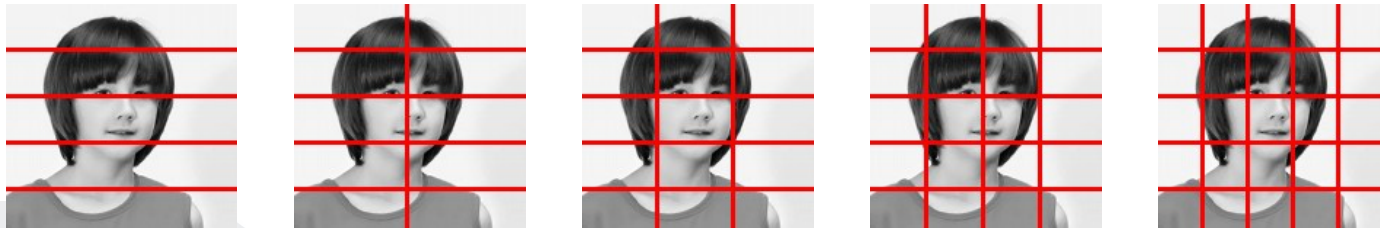


Evaluation

Grid configuration: from 1x1 to 5c5



...



Evaluation

15*4*25=1500 combinations

F-HOG

	1	2	3	4	5
1	59.1	59.1	59.1	59.1	59.1
2	59.1	59.1	59.1	59.6	58.6
3	59.1	61.1	65.2	65.2	62.1
4	62.1	63.6	66.7	67.2	65.7
5	61.1	61.6	66.2	66.7	68.2



HS-HOG

	1	2	3	4	5
1	59.1	59.1	59.1	59.1	59.1
2	59.1	59.1	59.1	59.1	59.6
3	59.1	59.1	59.1	61.1	60.1
4	59.1	59.6	60.6	62.1	61.1
5	59.1	61.6	62.6	64.6	62.1



	HS		F		P		M	
HOG	4x5	64.7	5x5	68.2	5x4	69.7	5x5	62.6
LBP^{U2}	3x3	69.7	3x3	68.7	5x3	67.7	5x2	66.7
LBP	3x1	68.2	1x1	61.6	3x2	64.1	3x1	65.6
LGP	4x5	64.1	5x5	67.6	5x4	69.2	4x3	63.1
LPQ	3x1	65.2	1x3	68.2	2x1	66.2	1x2	65.7
WLD	1x3	63.6	1x5	66.7	2x3	69.7	3x2	68.2
LOSIB	4x4	59.6	4x5	69.2	3x5	67.7	4x5	61.1
NILP	3x5	66.7	3x5	67.2	4x3	67.7	2x5	68.7
LSP₀	3x4	67.7	4x3	69.2	3x3	67.2	2x2	67.2
LSP₁	3x5	64.7	4x3	68.2	5x3	65.7	4x2	64.7
LSP₂	3x3	65.2	3x5	65.2	5x3	69.2	4x2	63.7
LSP₀₁	3x3	65.7	1x5	69.2	2x2	68.7	2x1	67.7
LSP₀₁₂	3x1	65.2	3x5	66.2	2x3	66.2	1x2	65.2
LTP_h	1x3	63.6	2x1	63.1	3x4	68.7	1x4	64.6
LTP_i	3x1	63.2	1x2	63.6	1x4	66.2	1x5	63.6

Evaluation

Best single descriptors 68-69%

	Accuracy	Descriptors
HS	72.7	LGP+LSP ₀ +LSP ₁
F	73.7	HOG+LSP ₂ +LTP ₁
P	73.2	WLD+LSP ₀₁ +LTP ₁
M	72.7	LPQ+NILBP+LSP ₀₁₂
HS+F+P+M	79.3	FLBP ^{u2} +FLSP ₀ +FLSP ₀₁ +HSHOG+ HSLTP _h +PLGP+PLPQ+MHOG+MLBP ^{u2}

Conclusions

No available dataset

Challenging problem

Local descriptors, ROIs and score level fusion

About 80%

Larger dataset

CNN in the future



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