Performance of Humans in Iris Recognition
The Impact of Iris Condition and Annotation-driven Verification

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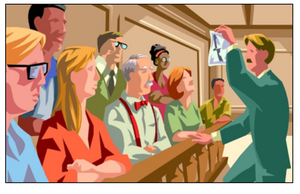
Highlights

- Assessment of the performance of non-expert humans in iris recognition.
- Presentation of irises in diverse conditions: healthy, disease-affected, twins', with difference in pupil dilation, and deceased samples.
- Novel approach of annotation-driven iris verification, based on matching and non-matching regions.

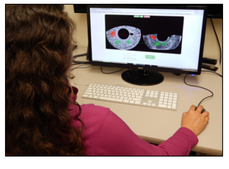
Motivation

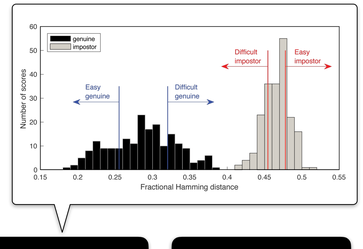
What? — Accountable iris recognition.

Why? — Solutions from the literature are effective, but not human-friendly enough. How to convince people who do not possess image processing expertise?



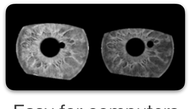
Approach
Observe people: how do they perform iris recognition?



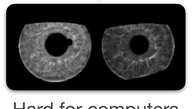


Iris Conditions

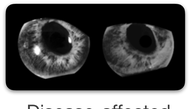
Dataset
1360 manually segmented near-infrared irises of 512 individuals, captured with varied sensors.



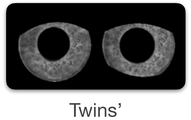
Easy for computers



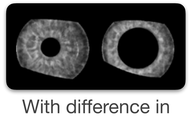
Hard for computers



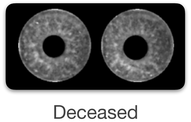
Disease-affected



Twins'

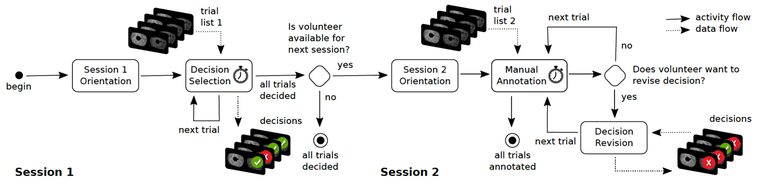


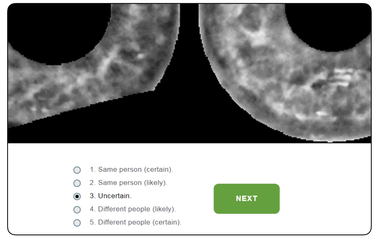
With difference in pupil dilation

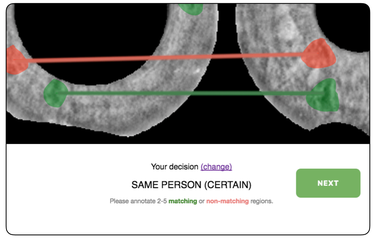


Deceased

Experiments







Accuracies

Session 1 (20 iris pairs, 114 people)

	Irises	Humans	Software*
Genuine	Healthy easy	91.28	95.00
	Healthy difficult	79.07	90.00
	Pupil-dynamic	43.90	61.25
	Deceased	**51.95**	33.57
	Disease-affected	**70.80**	25.00
Impostors	Healthy easy	84.30	100.00
	Healthy difficult	76.16	100.00
	Twins	55.81	100.00
	Deceased	83.90	100.00
	Disease-affected	91.00	100.00
	Overall	70.11	79.43

*OSIRIS (open-source iris recognition software)

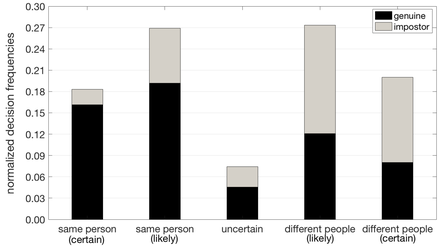
Session 2** (10 iris pairs, 85 people)

	Irises	without annotations	with annotations
Genuine	Healthy easy	87.06	**96.47**
	Healthy difficult	75.29	**84.71**
	Pupil-dynamic	41.18	**52.35**
	Deceased	45.29	**54.12**
Impostors	Healthy easy	85.88	**90.59**
	Healthy difficult	80.00	78.82
	Twins	59.41	**60.59**
	Overall	62.00	**68.47**

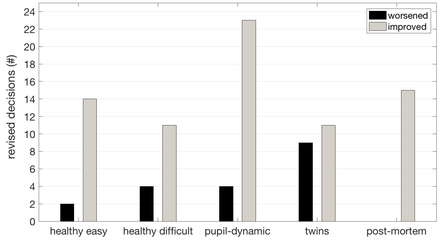
**with only humans

Findings

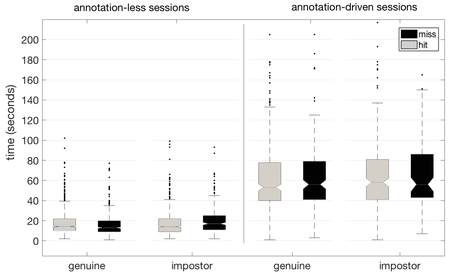
Confidence
How confident were people when they were right? How about when they were wrong?



Revised Decisions
Did all iris conditions benefit from annotation-driven verification?



Verification Time
Were people who spent more time verifying irises better than the others?



Conclusions

- Most challenging cases to people: with difference in pupil dilation and twins'.
- People performed better when they annotated matching and non-matching regions between pairs of irises.
- People performed better than automated solutions when verifying genuine pairs of deceased and disease-affected irises.