Age group identification using gaze-guided feature extraction

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Purpose

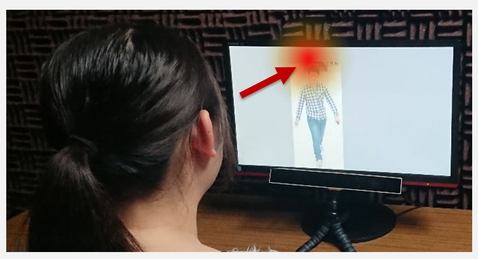
Our aim: **Improves the accuracy of age group identification by extracting features from the regions where an observer's gaze converges.**

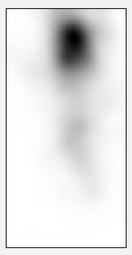
Existing methods were not evaluated for age group identification with the gaze distribution.
[Murrugarra-Llerena'17, Nishiyama'18]

Assumption: The image regions of interest to observers contain informative features for age group identification.

Procedure I. **Analysis**

We analysed which regions of the whole-body image an observer's gaze focused on and generated the gaze distribution.





Gaze distribution

Procedure II. **Identification**

We evaluated the accuracy of age group identification with training and test images weighted by the gaze distribution.

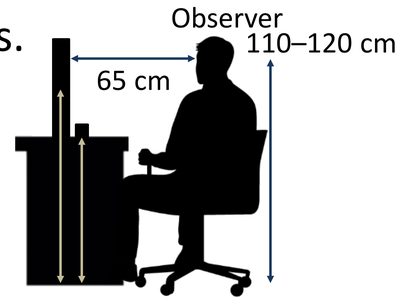
Procedure I. Analysis

We designed the method of measuring observer's gaze and generating the gaze distribution.

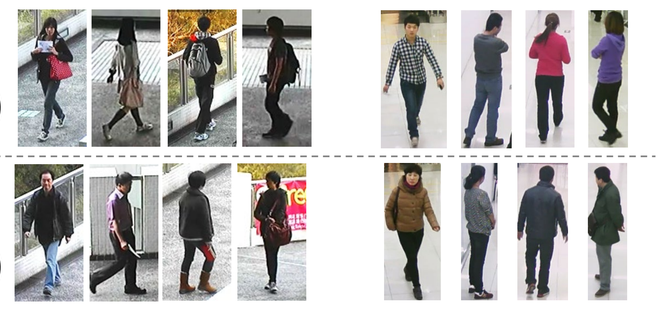
Our question: Which age group label, **young** or **middle**, do you identify the subject in the image as belonging to?

Measuring observer's gaze

- Displayed a stimulus image for 2 seconds.
- Measured observer's gaze positions.
- Answered the question.
- Repeated for each stimulus image.

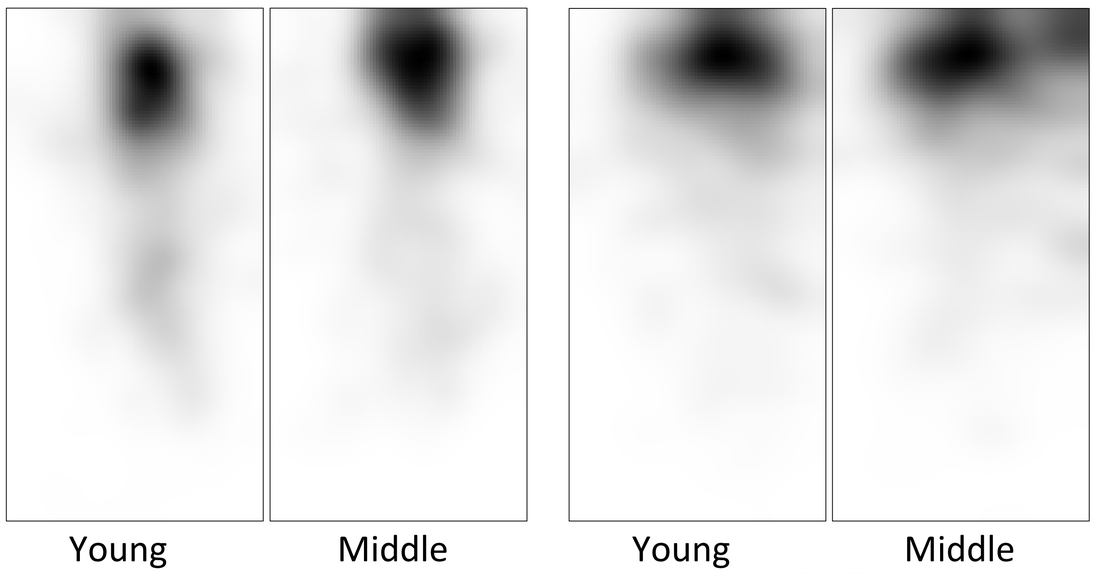


The examples of stimulus images: 32 images each dataset



Generating gaze distribution

For all observers and all stimulus images, the gaze positions were accumulated at the corresponding positions in the gaze distribution for each age group in each dataset.



The observers focused on the subjects' heads in the stimulus images when performing age group identification.

Procedure II. Identification

Comparison conditions:

- ***Without*** gaze-guided feature extraction
- ***With*** gaze-guided feature extraction

Number of images:

- CUHK dataset: 2286 training images, 254 test images
- RAP dataset: 3317 training images, 1321 test images

Deep learning or machine learning model:

- CNN, GB (gradient boosting decision tree), SVM, LR (logistic regression)

Method:

- We generated a single gaze distribution for each dataset by accumulating the gaze distributions generated for age group labels.
- The pixel values of the training and test images were multiplied by the gaze distribution weights pixel by pixel.

Accuracy of age group identification:

Dataset	Model	*Without* gaze	*With* gaze
CUHK	CNN	0.57	**0.59**
	GB	0.58	**0.60**
	SVM	0.60	**0.63**
	LR	0.57	**0.59**
RAP	CNN	0.57	**0.61**
	GB	0.63	**0.64**
	SVM	0.63	**0.65**
	LR	0.62	**0.63**

Our gaze-guided feature extraction improves the accuracy of age group identification.