1275

Siamese-structure DNN Recognizing Changes in Facial Expression According to the Degree of Smiling

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Introduction

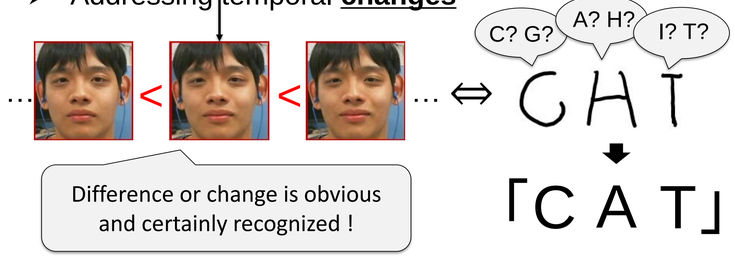
- Automatic QOL evaluation
  - Evidence-based lifestyle support in aging or stress-ridden society
  - Recognizing 'Smile' for estimating 'Happiness'

Problem

- Ambiguous facial expressions frequently occur
- Conventional classifiers will not work well

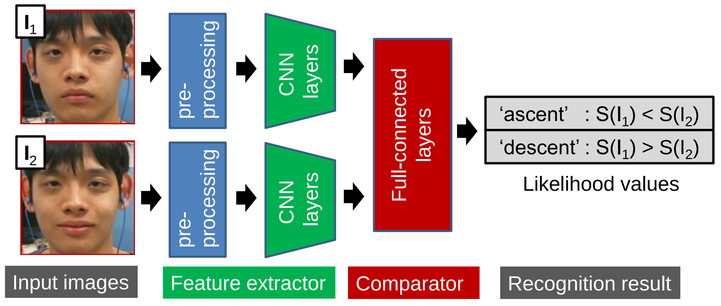
Approach

- Addressing temporal **changes**



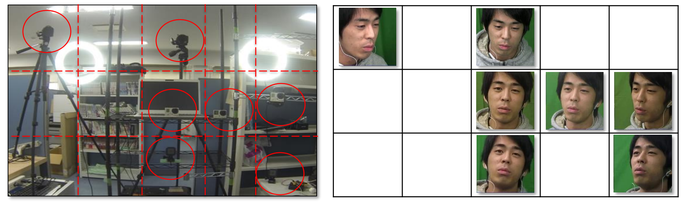
Research question

- How well a computer recognizes such changes ?
- Recognizing smiling intensity 'ascent' or 'descent' by a Siamese-structured network



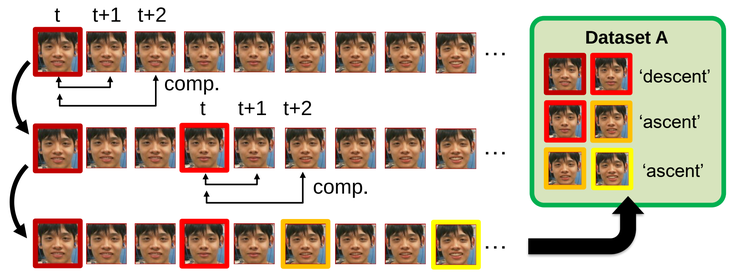
Face image capture

- Smiling face in daily situations
  - When listening a radio program or enjoying a talk
  - Captured from 7 different directions

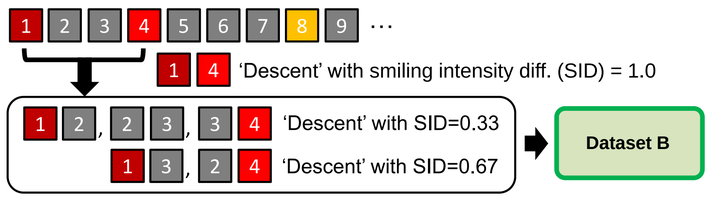


Dataset building

- **Dataset A** : sequential comparison of two images



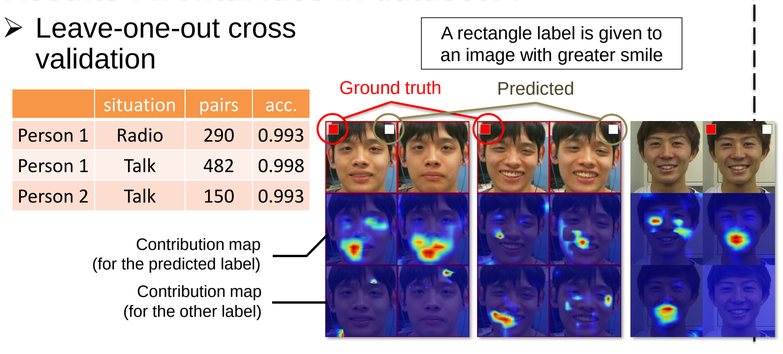
- **Dataset B** : automatic labeling of intermediate image pairs under a linear assumption



Results : frontal face in dataset A

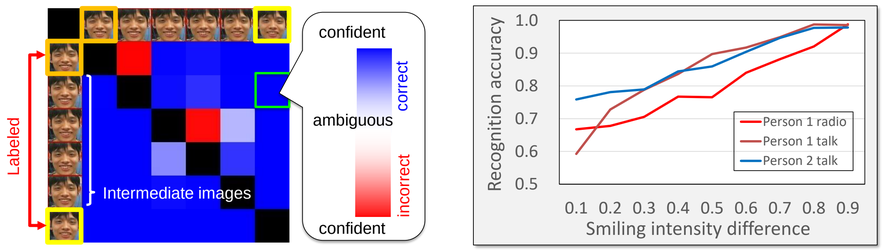
- Leave-one-out cross validation

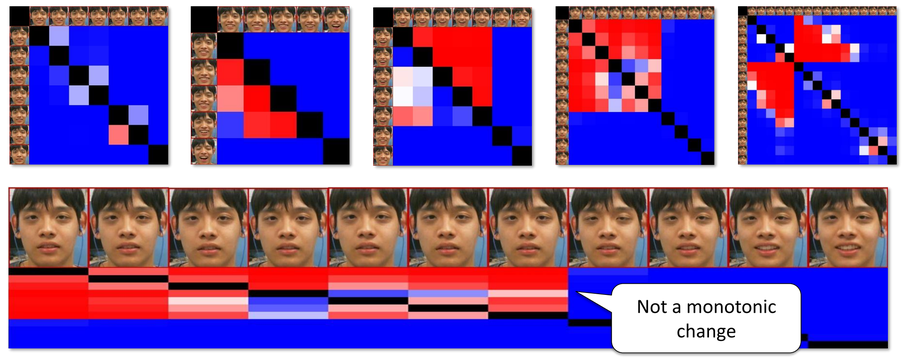
	situation	pairs	acc.
Person 1	Radio	290	0.993
Person 1	Talk	482	0.998
Person 2	Talk	150	0.993



Results : frontal face in dataset B

- Training with frontal face images in dataset A
- Test with frontal face images in dataset B





Results : multiple directions in dataset A

Data augmentation using horizontal flip

- Leave-one-out cross validation

Person 1 talk	0.918		0.886		0.857
	0.922	0.951	0.961	0.956	0.900
	0.933		0.972		0.950
Person 2 talk	0.902		0.963		0.927
	0.963	0.951	1.000	0.951	0.963
	0.963		1.000		1.000

- Direction-fold cross validation

0.837		0.929		0.902
0.878	0.946	0.951	0.989	0.878
0.889		0.956		0.939
0.902		0.927		-
-	-	0.943	0.890	0.927
-		0.932		0.932