# Facial Expression Recognition A.i.

By TEAM BIG

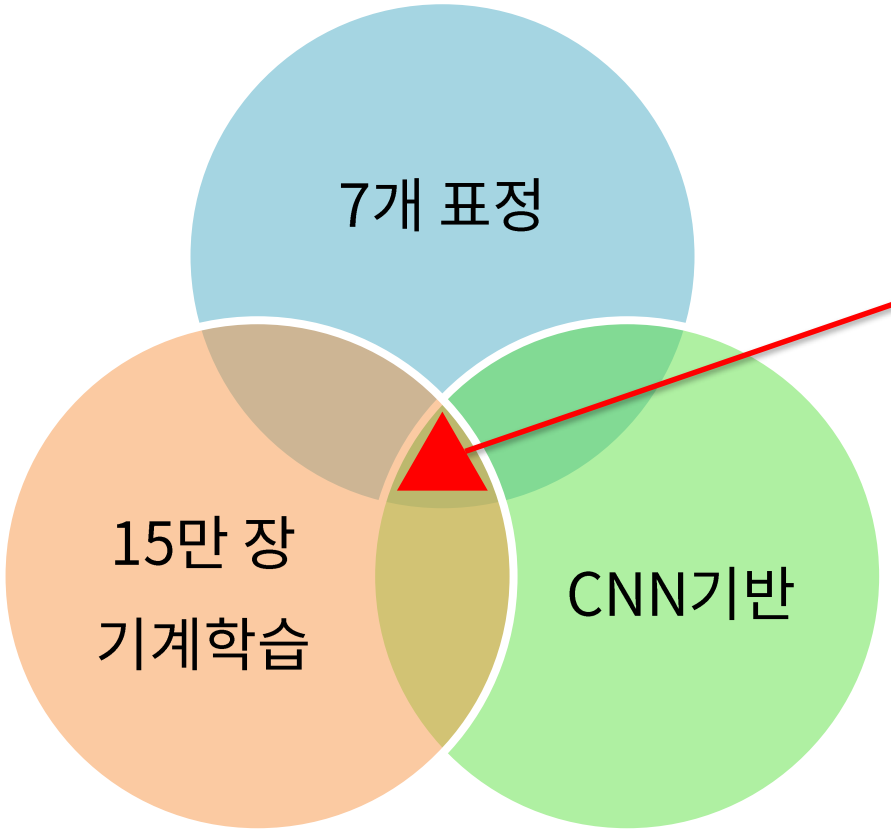
August 23, 2017

# Table of Contents

Introduction

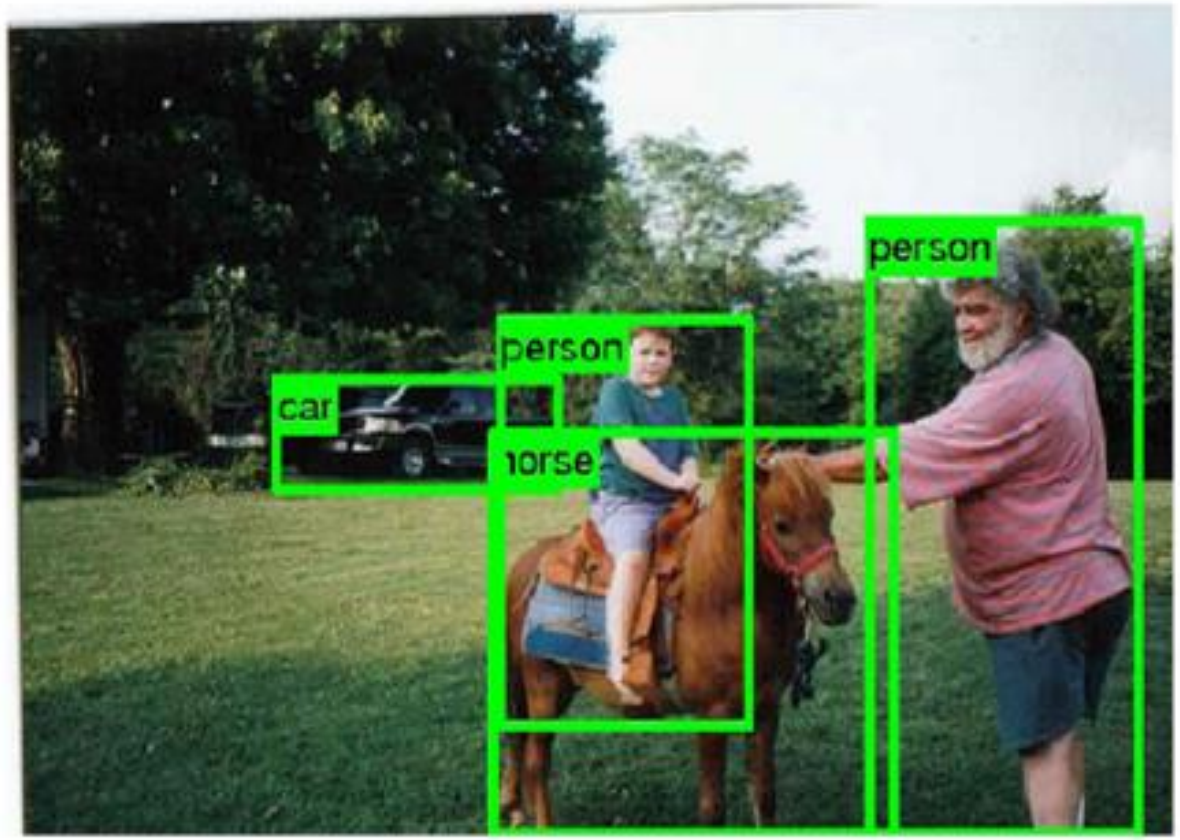
# Why did we build Facial Recognition A.i.?

# 우리 프로젝트는?




얼굴 표정을 인식하는 인공지능

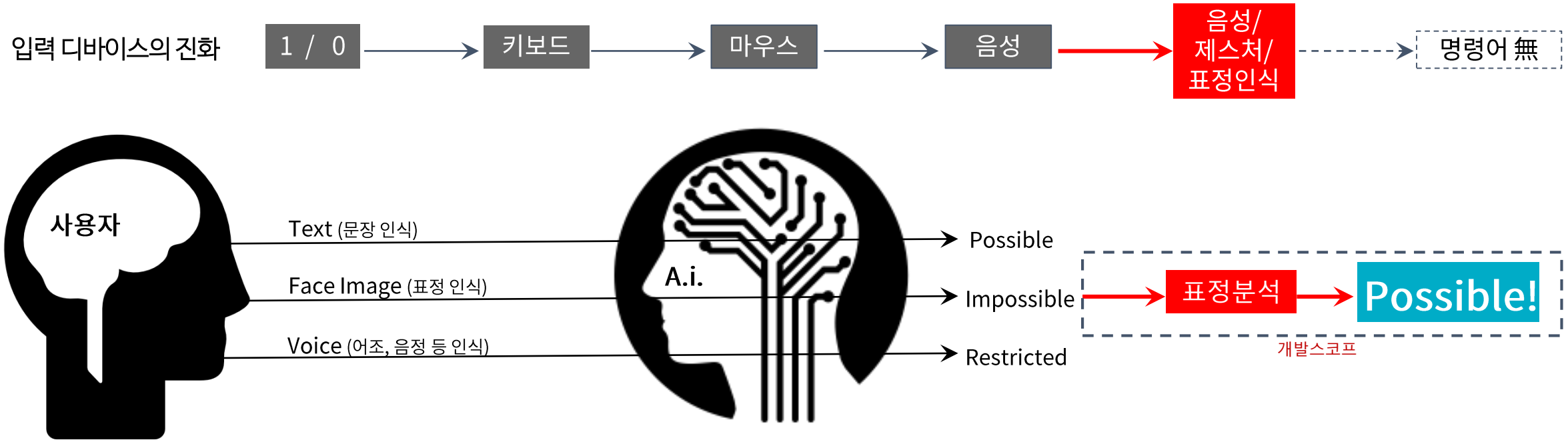
# 컴퓨터 비전이란…



# 표정분석은 일부분

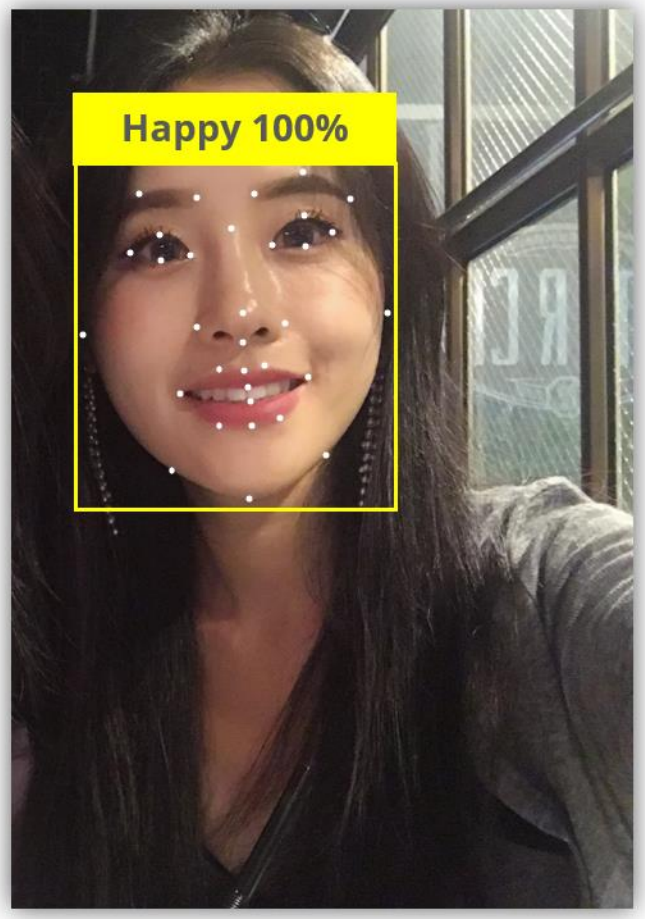
# 그럼, 왜 표정분석인가?

## 아이디어 도출 배경



# 표정분석이 가능해진다면…

“Bixby, 오늘 내 모습 어때?”




Bixby, 오늘 내 모습 어때?

미소가 정말 눈부셔요.
기분이 좋아 보이세요.
데이트가 있으신가요?

남자친구에게
스마일 이모티콘을 보내고
싶으시면 한 번 더 크게
웃어주세요.

# 빅데이터란?

비정형 데이터

사진

방대한 양

15만 장

진짜 빅데이터

+

사람을 이해하는
인공지능

=

15만 장의
CNN기반
표정분석 모델

**표정 인식 인공지능을 개발한 이유**

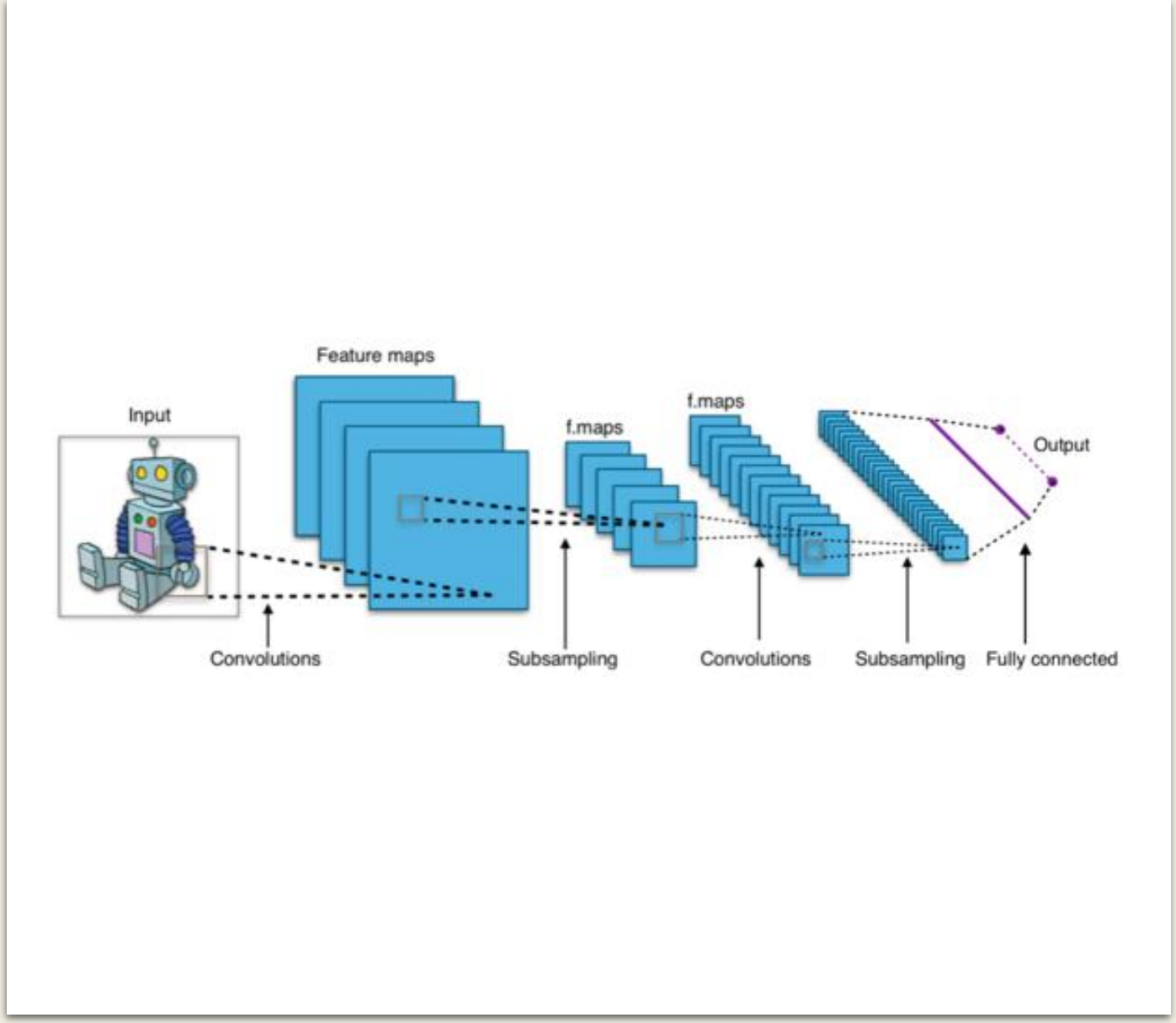
Body 1

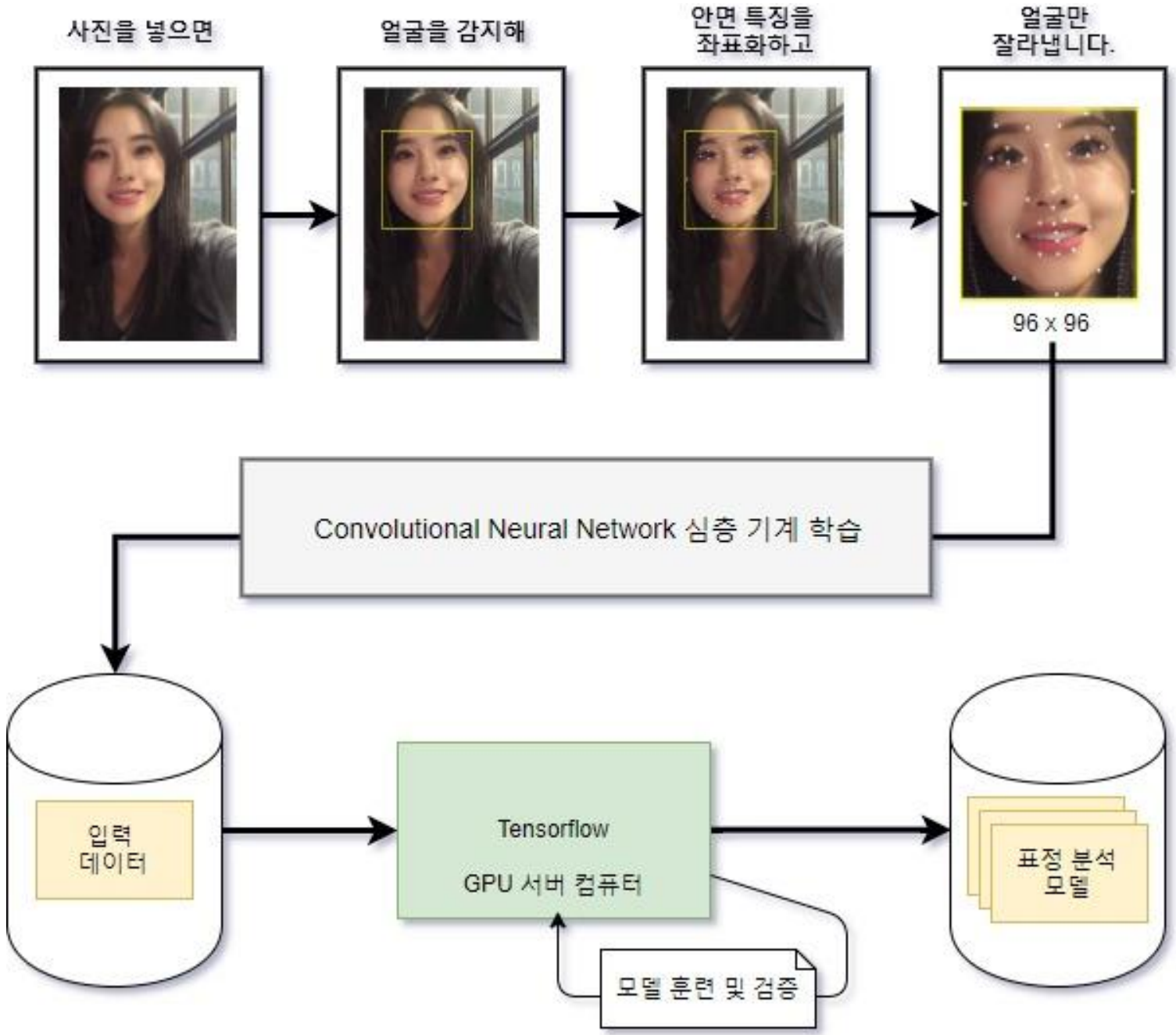
# What can our A.i. do?

# Paul Ekman의 7대 미세 표정

# 회선신경망이란?

- 동물의 시각령(visual cortex)
- 시각 분석에 적합




사진을 넣으면
얼굴을 감지해
안면 특징을
좌표화하고
얼굴만
잘라냅니다.
96 x 96
Convolutional Neural Network 심층 기계 학습
입력
데이터
Tensorflow
GPU 서버 컴퓨터
모델 훈련 및 검증
표정 분석
모델

1

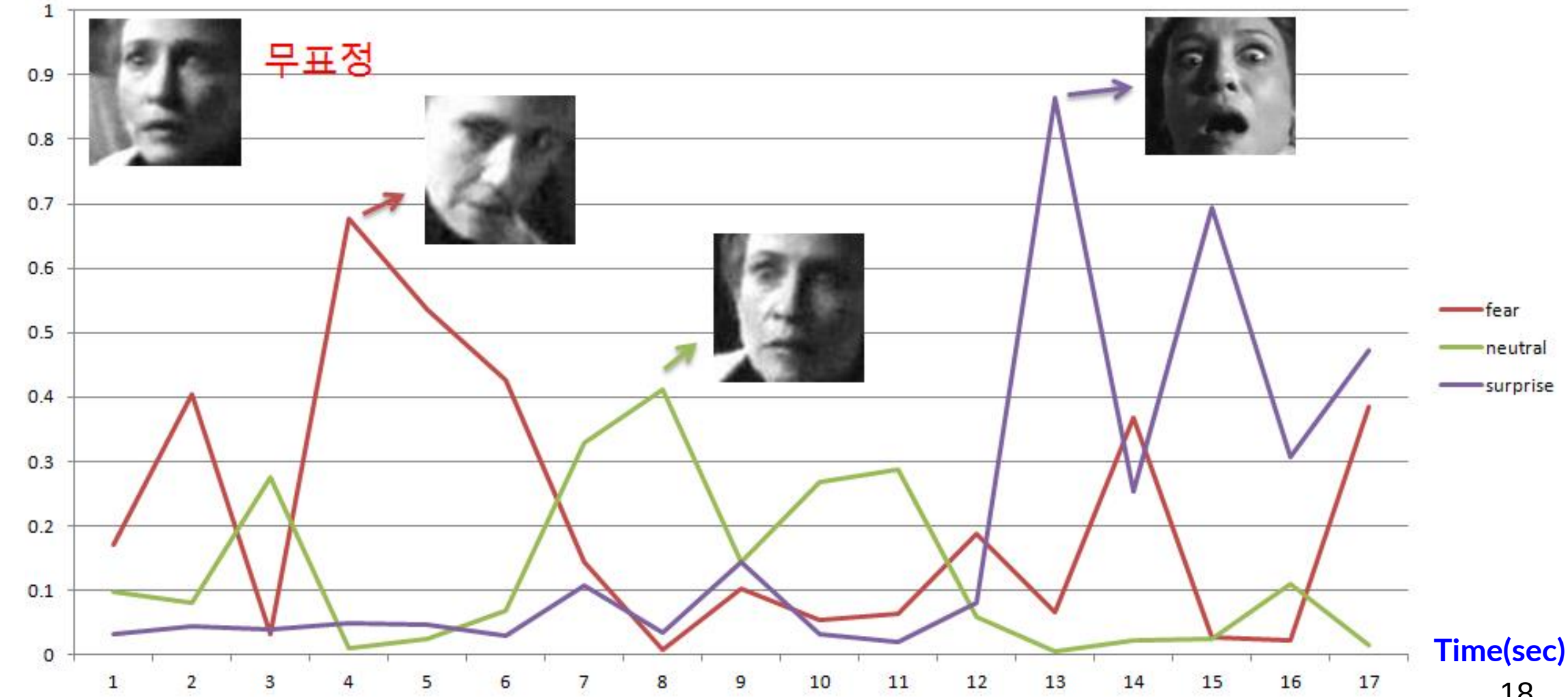
DEMO

# 짧은 클립에 적용

# The Link to Demo 1

https://www.youtube.com/watch?v=D60EDAkdOh4

# Demo 1 – Results



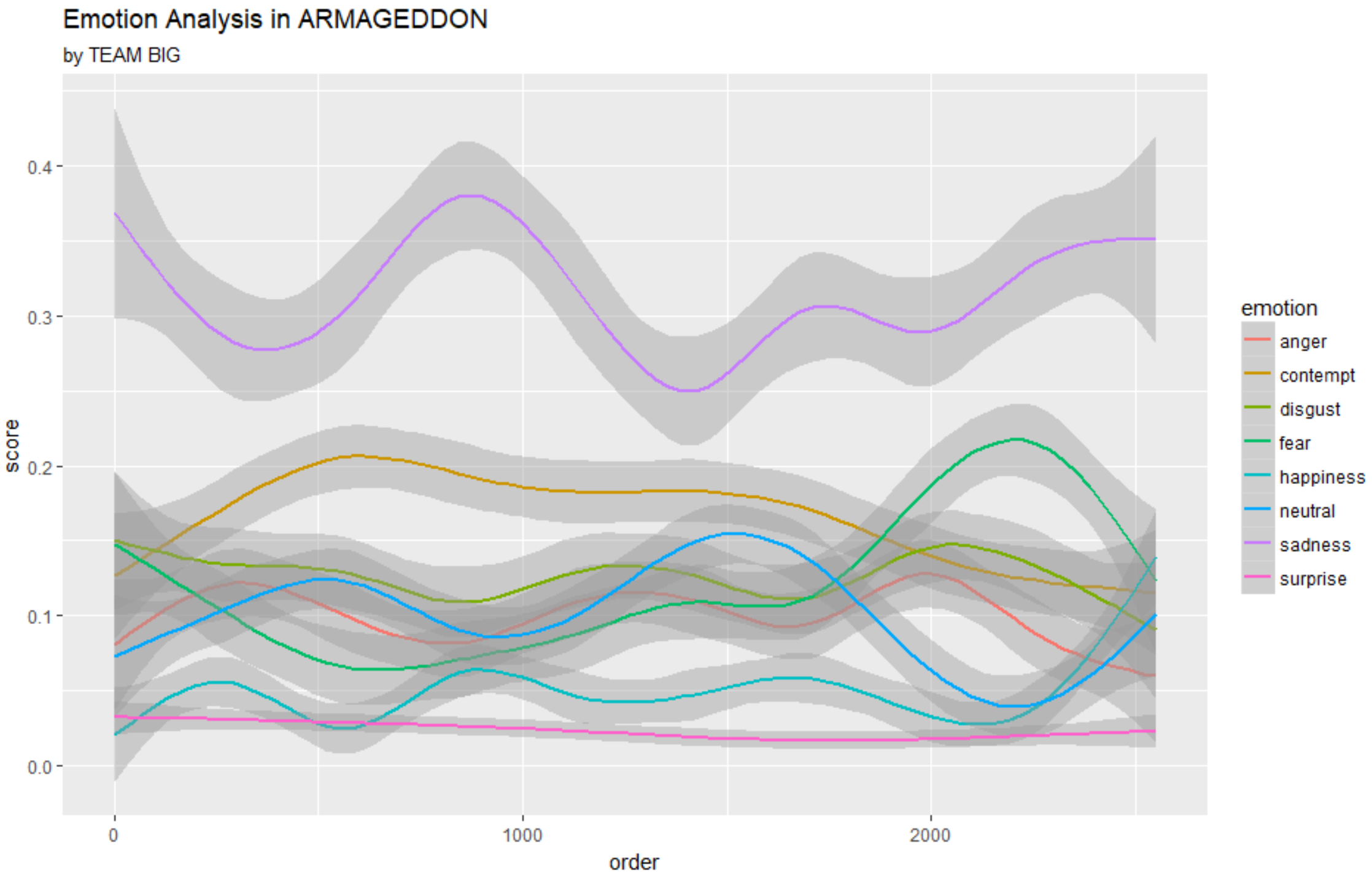
2

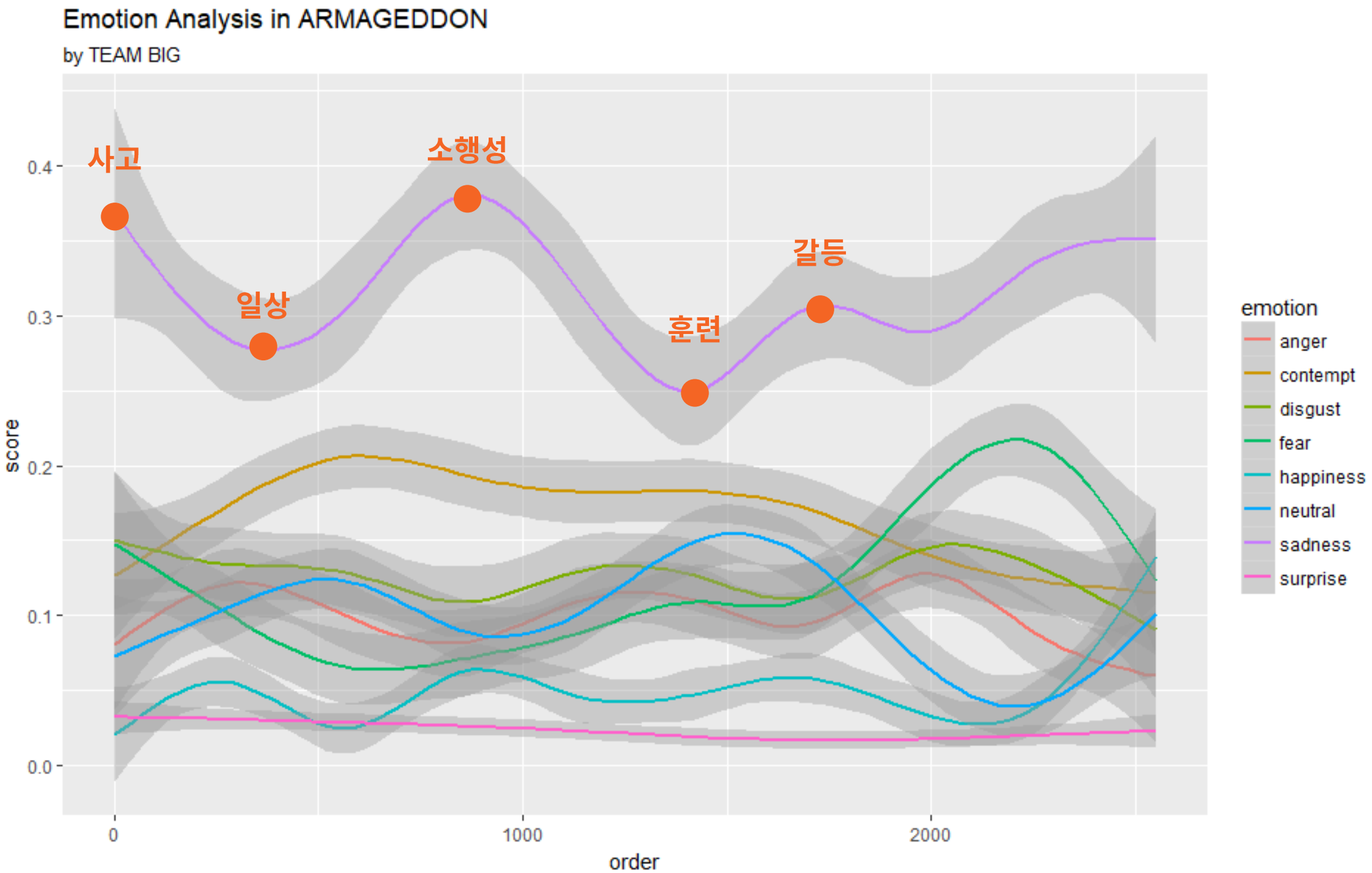
DEMO

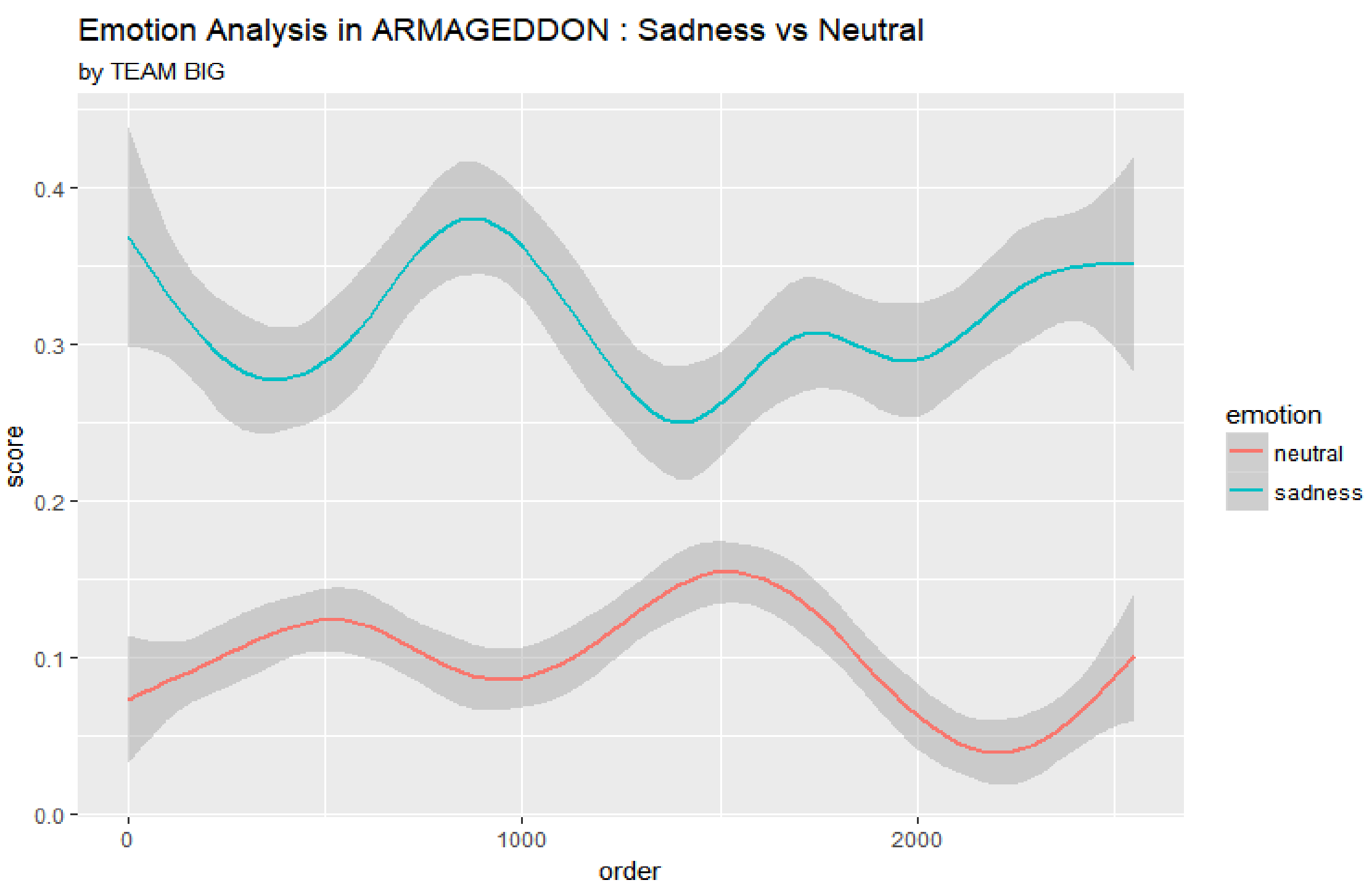
# 영화 전체에 적용

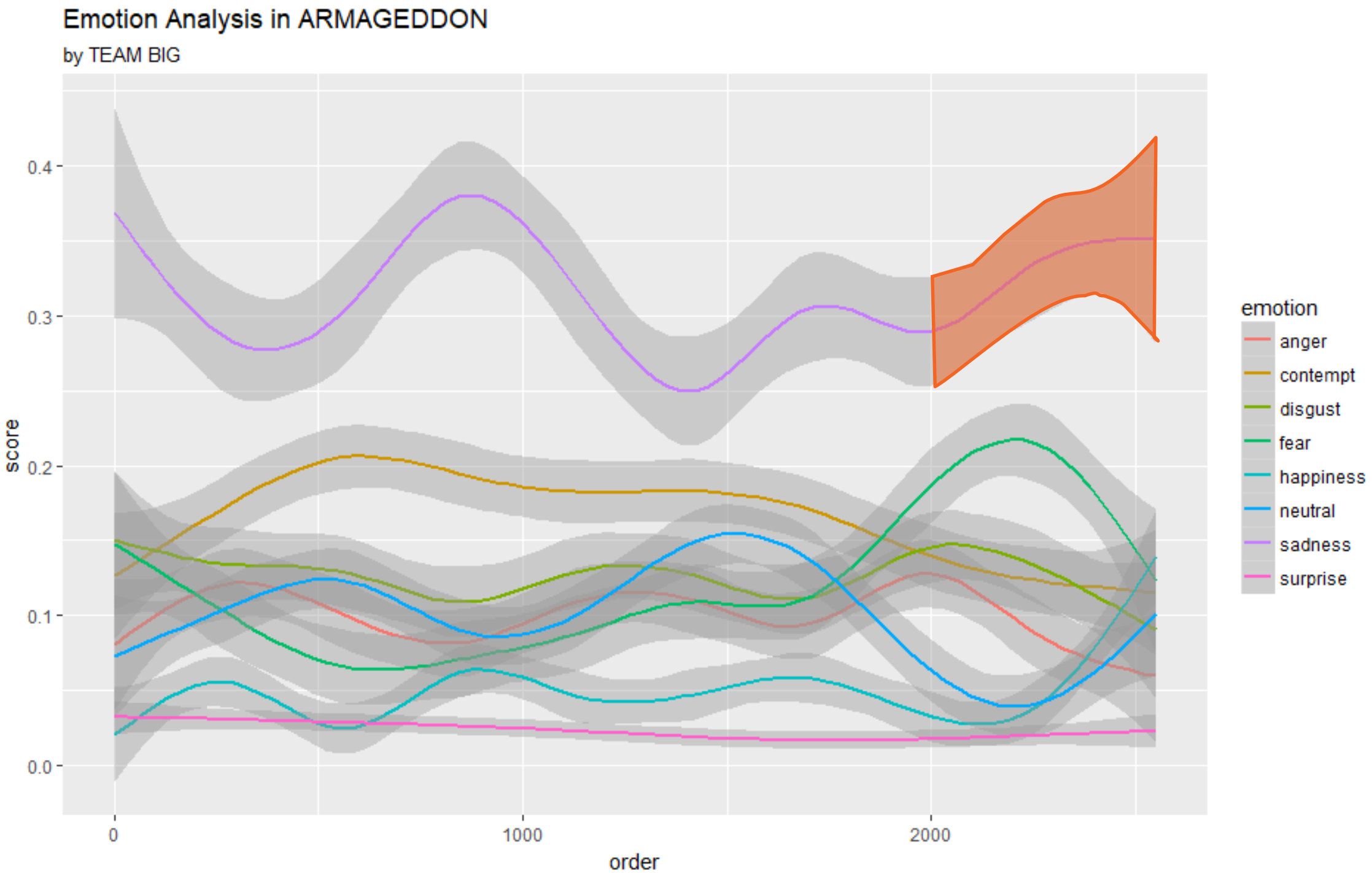
# The Link to Demo 2

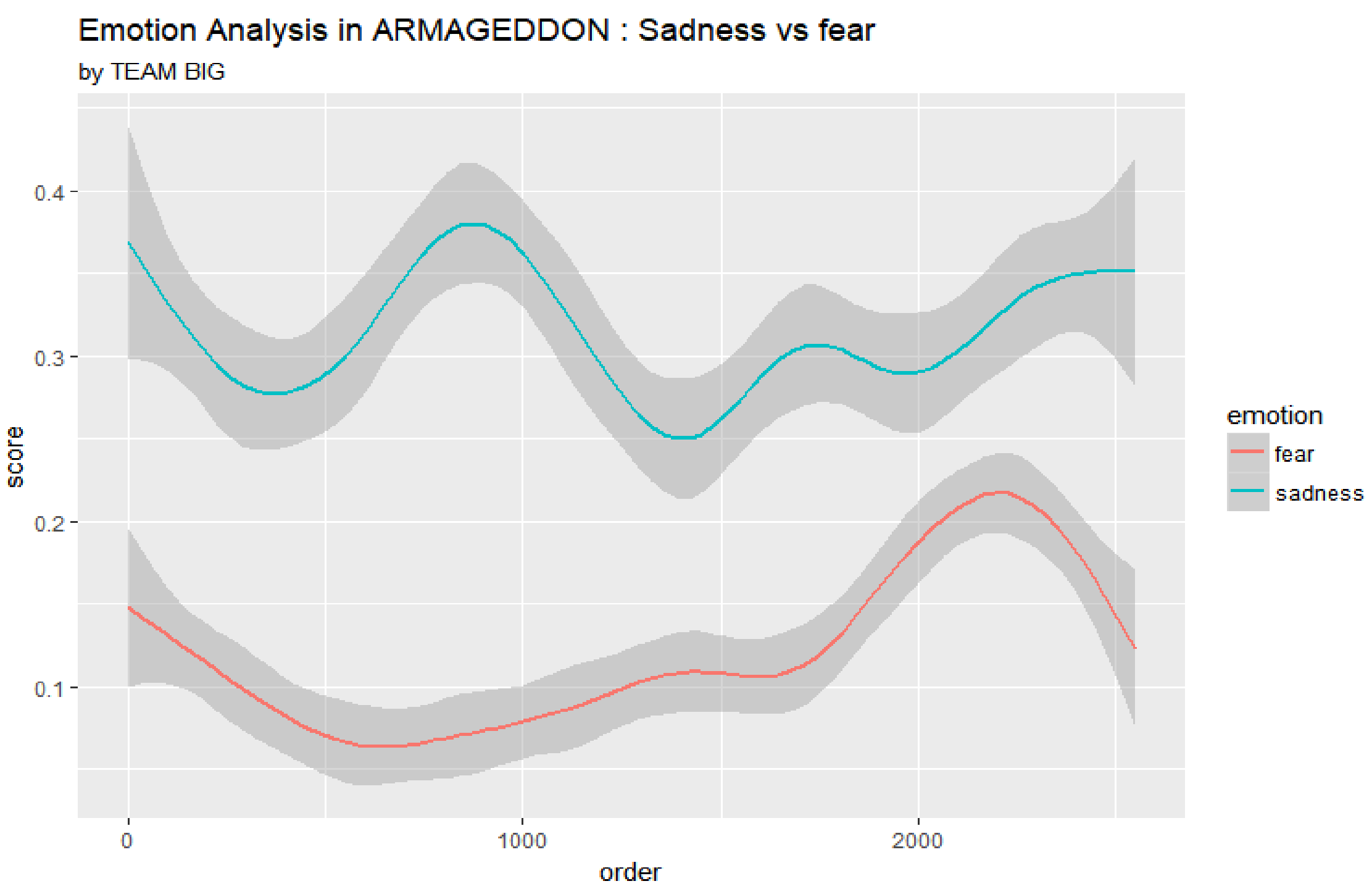
https://www.youtube.com/watch?v=d-7WBUGgyIo


Emotion Analysis in ARMAGEDDON
by TEAM BIG
score
0.4
0.3
0.2
0.1
0.0
0
1000
2000
order
emotion
anger
contempt
disgust
fear
happiness
neutral
sadness
surprise


Emotion Analysis in ARMAGEDDON
by TEAM BIG
사고
일상
소행성
훈련
갈등
score
0.0
0.1
0.2
0.3
0.4
0
1000
2000
order
emotion
anger
contempt
disgust
fear
happiness
neutral
sadness
surprise


Emotion Analysis in ARMAGEDDON : Sadness vs Neutral
by TEAM BIG
score
0.4
0.3
0.2
0.1
0.0
0
1000
2000
order
emotion
neutral
sadness


Emotion Analysis in ARMAGEDDON
by TEAM BIG
score
0.4
0.3
0.2
0.1
0.0
0
1000
2000
order
emotion
anger
contempt
disgust
fear
happiness
neutral
sadness
surprise


Emotion Analysis in ARMAGEDDON : Sadness vs fear
by TEAM BIG
score
0.4
0.3
0.2
0.1
0
1000
2000
order
emotion
fear
sadness

# 3

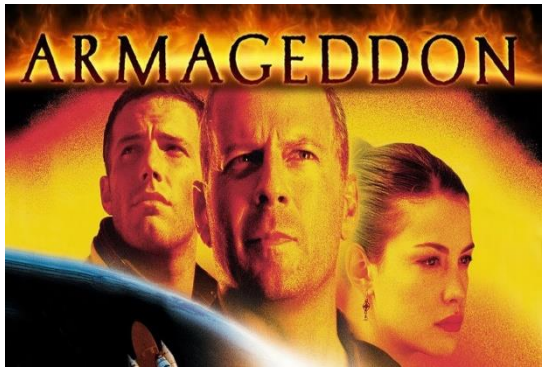
DEMO

# 직접 시연

Demo 1

짧은 영상

Demo 2




영화 전체

Demo 3

직 찍

**Team Big의 인공지능으로 진행한 시연**

Body 2

# How did we build our A.i.?

# 과정

## 모델 생성 과정

- ➔ 사진 수집 과정
- ➔ 전처리 과정

## 모델 적용 과정

- ➔ 영상을 1초 별 Frame 자름
- ➔ Azure API 활용 전처리
- ➔ 자체 모델에 입력
- ➔ CSV Output
- ➔ R을 활용해 시각화

# 사진 수집 경로

(단위: 1만 장)

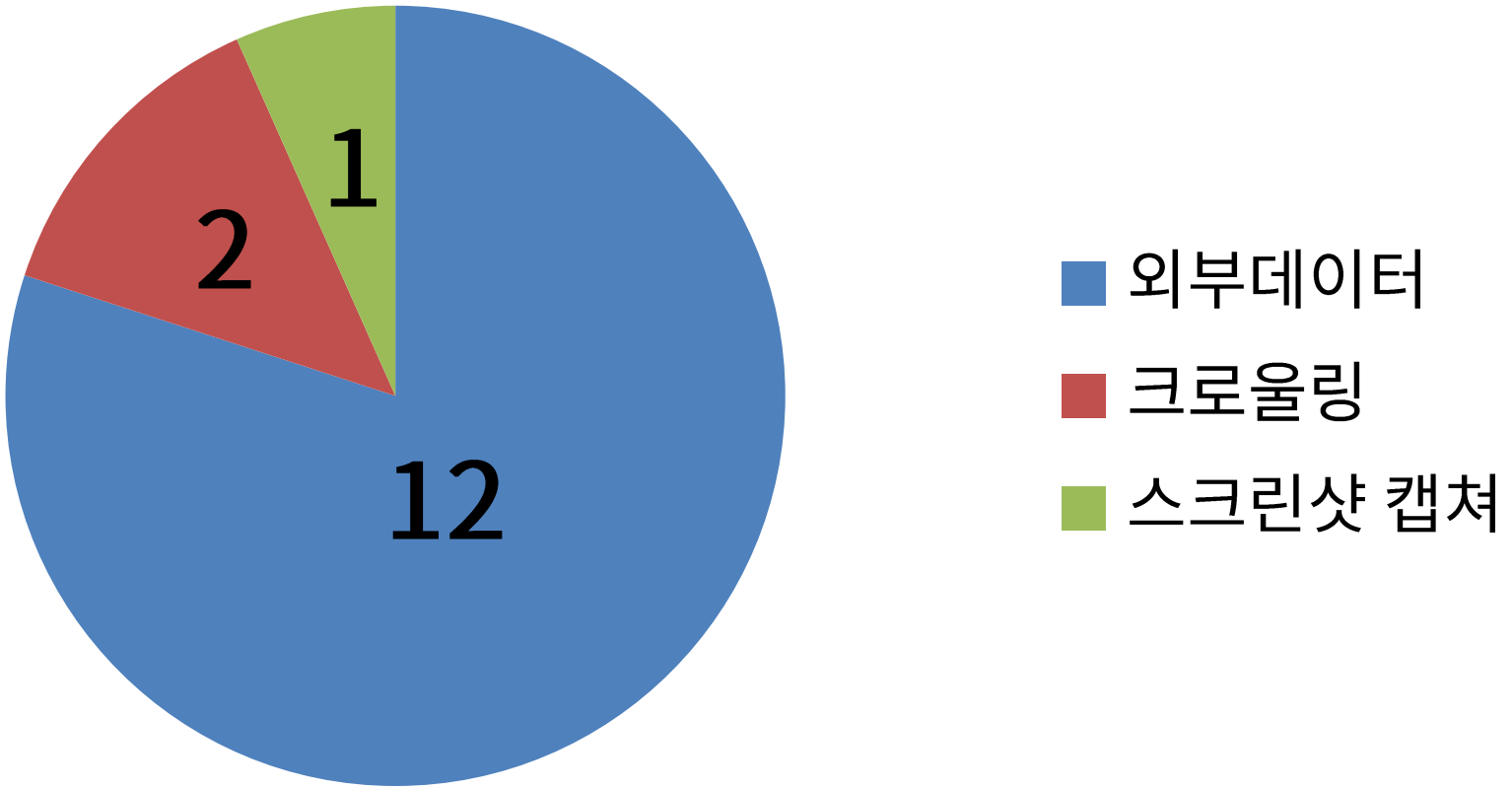
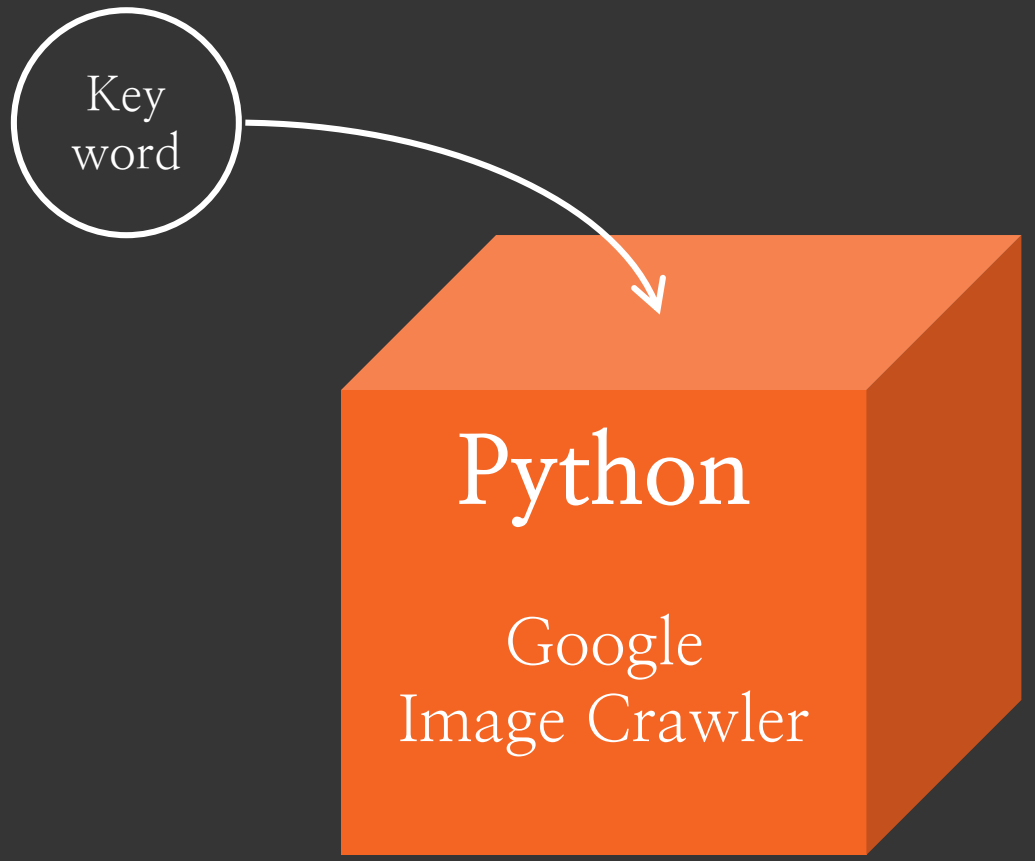


사진 수집 중

# 크로울링



# Crawling 방법

성비 · 연령 균일화가 문제…

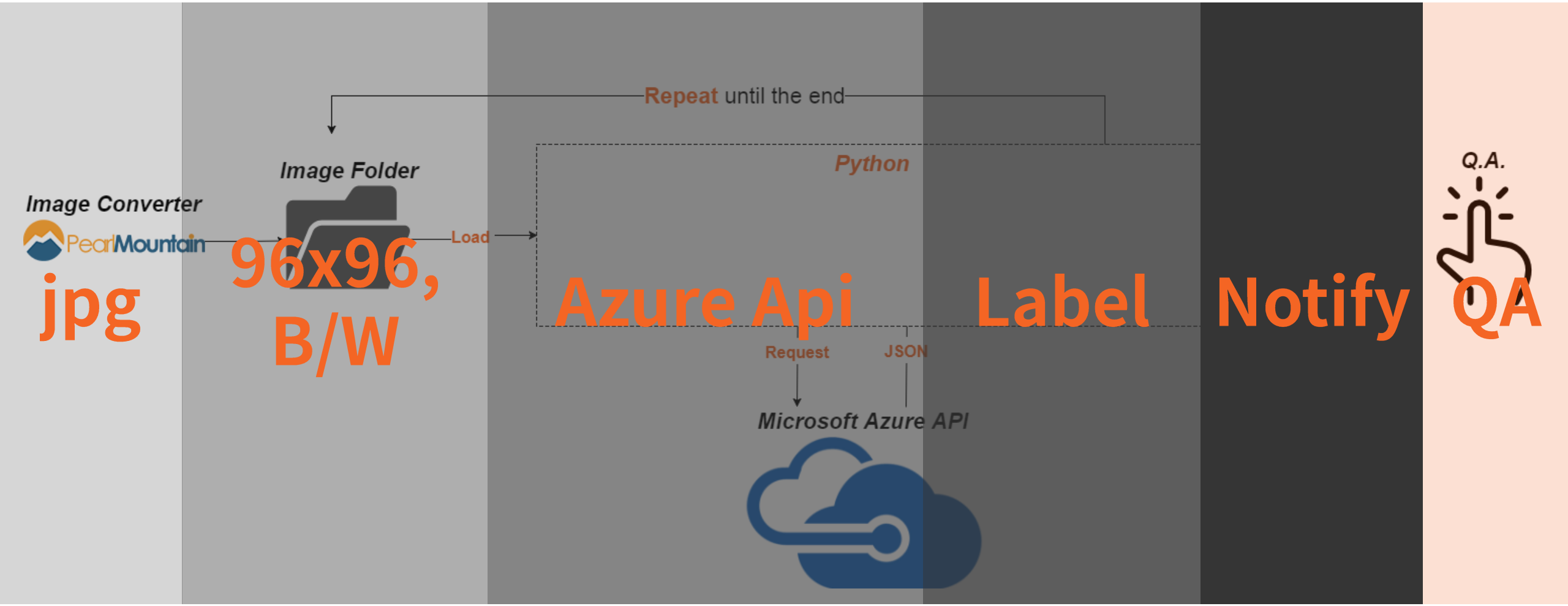
| ***검색어 시스템 ( 영어로 검색해 검색 결과 최대화)*** | | | |
|---|---|---|---|
| 형용사1 + | 형용사2 + | 형용사3 + | 명사 |
| 국가이름 | 나이 별 키워드 | 동명사 | 성별 키워드 |
| *Korean* | *teen* | *gaming* | *boy* |

# 사진 전처리 과정

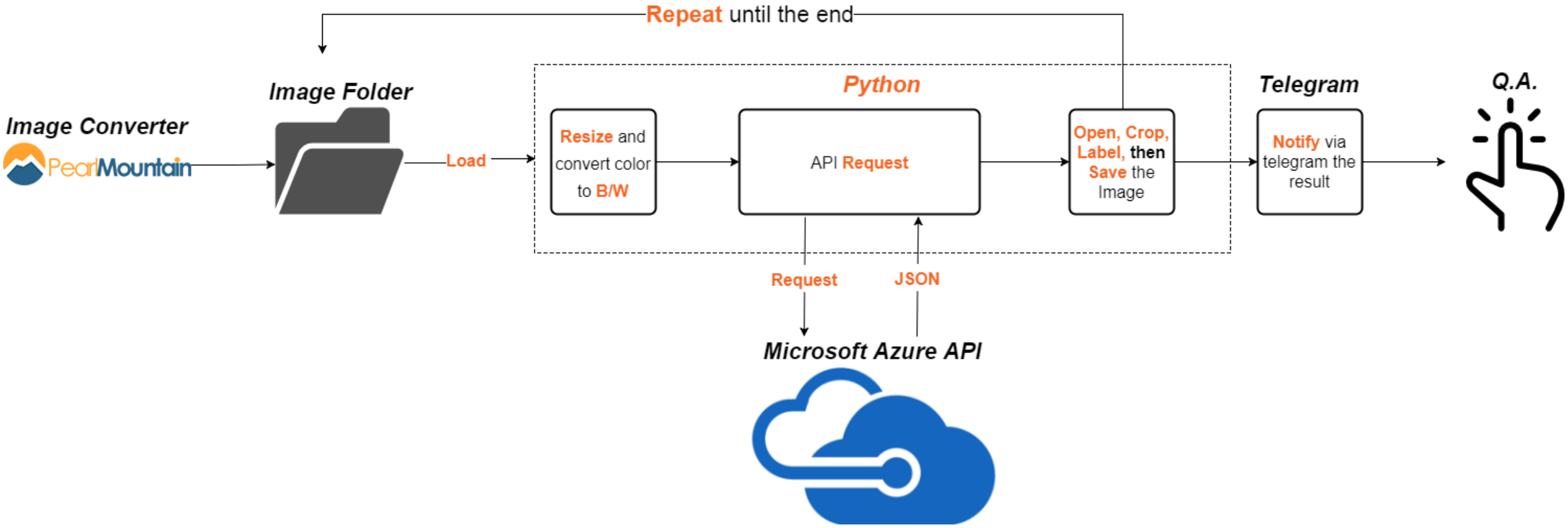
**기계분류**

수기

# 사진 전처리 과정

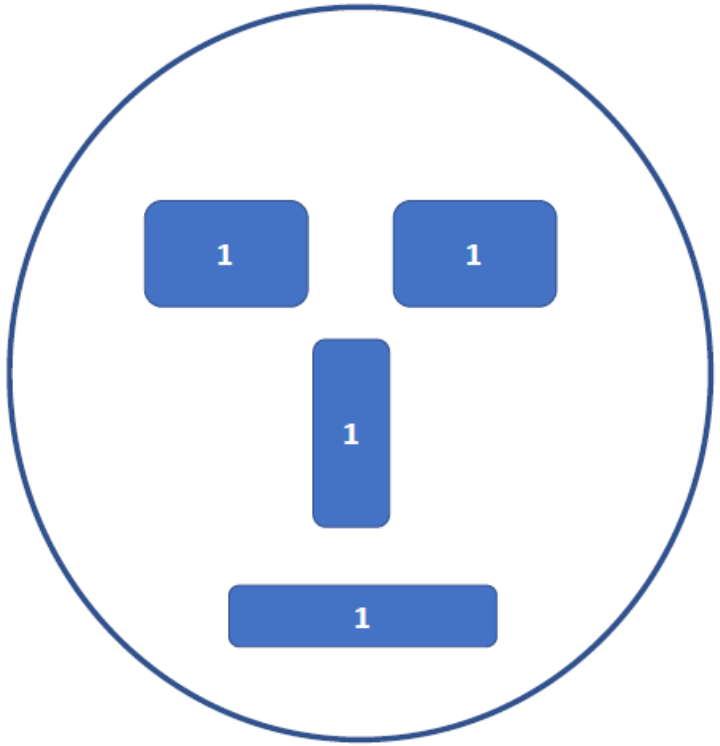

Repeat until the end
Image Folder
Python
Image Converter
PearlMountain
Load
jpg
96x96,
B/W
Azure Api
Label
Notify
Q.A.
QA
Request
JSON
Microsoft Azure API

# 사진 전처리 과정


Repeat until the end
Image Converter
PearlMountain
Image Folder
Load
Python
Resize and convert color to B/W
API Request
Open, Crop, Label, then Save the Image
Telegram
Notify via telegram the result
Q.A.
Request
JSON
Microsoft Azure API

# Q.A. – 결측치 기준

**결측치 기준 – 설명**

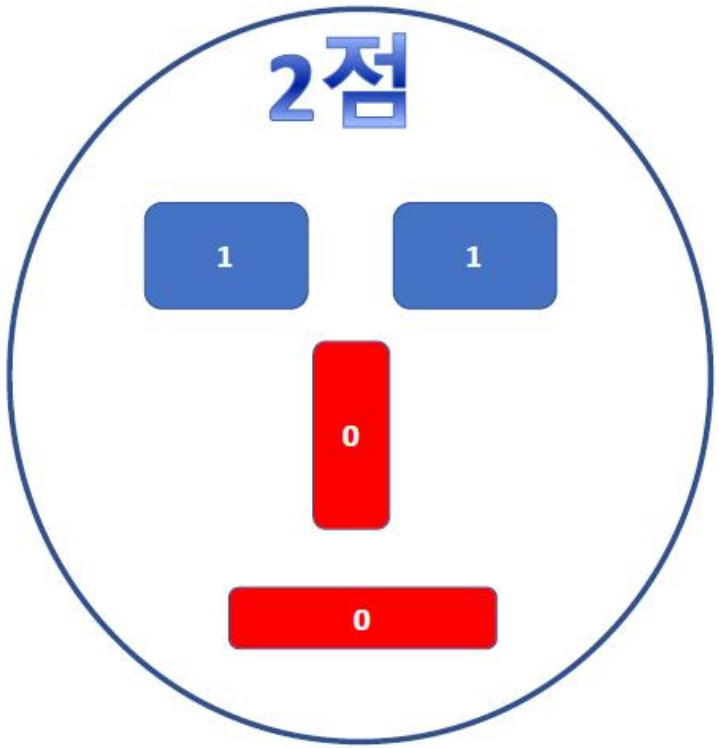



모든 사진은 **왼쪽 눈, 오른쪽 눈, 코, 입** 각 1점씩 총 **4점** 획득 가능

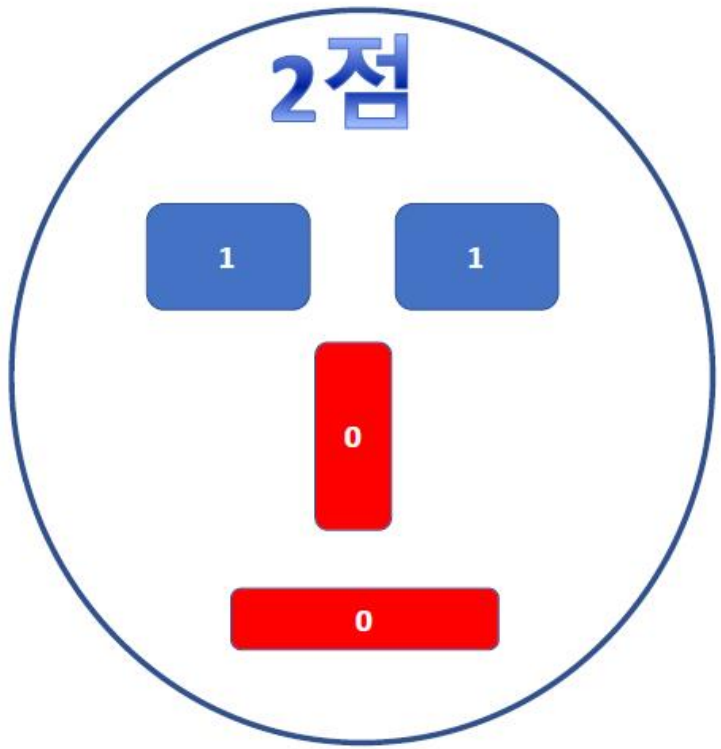
| | |
|---|---|
| 1점 | 결측처리 |
| 2점 | 결측처리 |
| 3점 | 정상범위 |
| 4점 | 정상범위 |

**부분적으로 가려도 결측!!!**
**→투시는 OK (예.) 안경)**

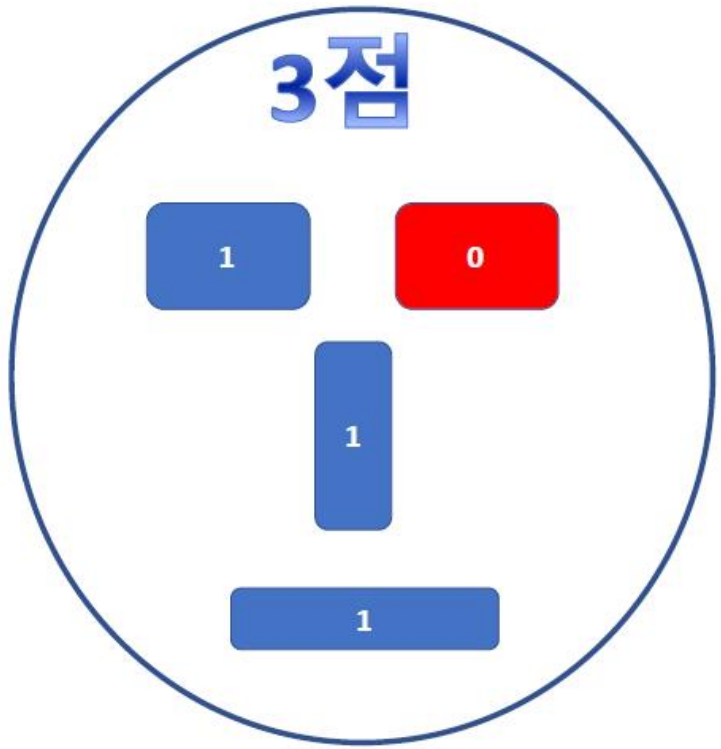
## 결측치 기준 – 예제. 1)

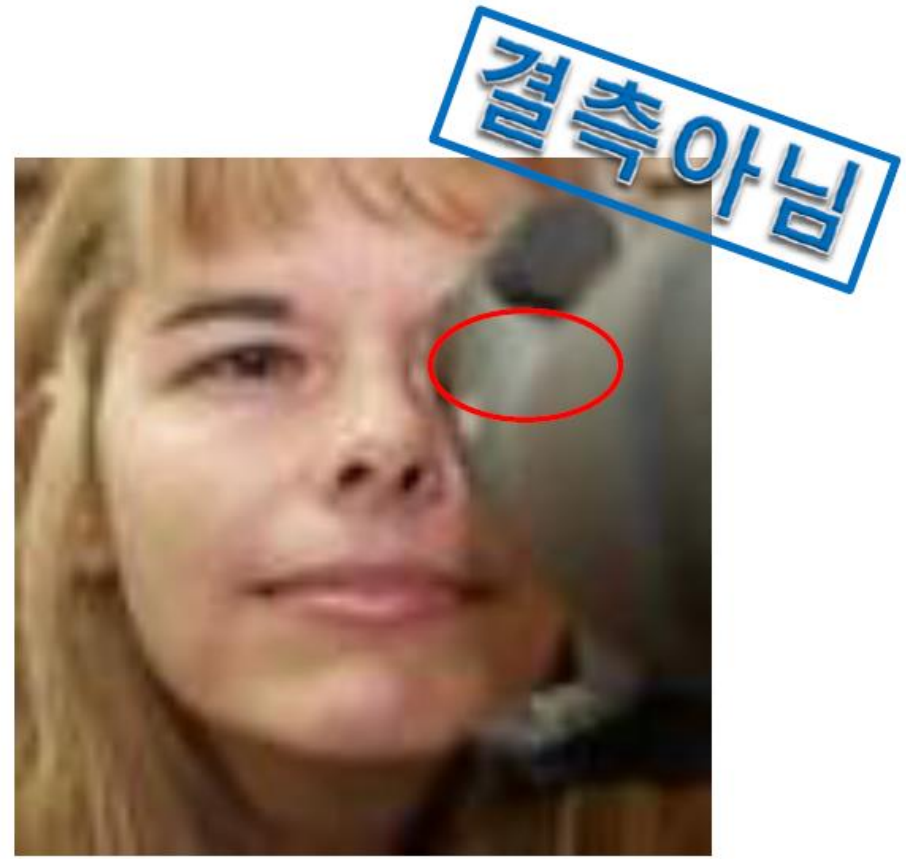



## 결측치 기준 – 예제. 2)



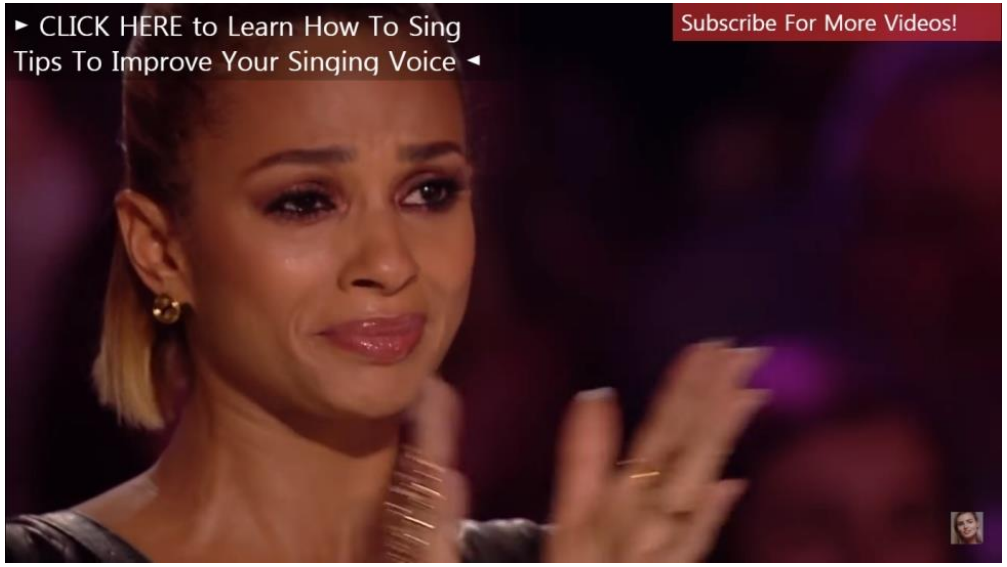

## 결측치 기준 – 예제. 3)



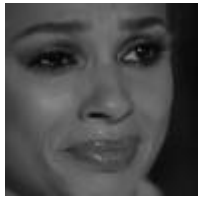



# 전처리 결과물

## Before




## After



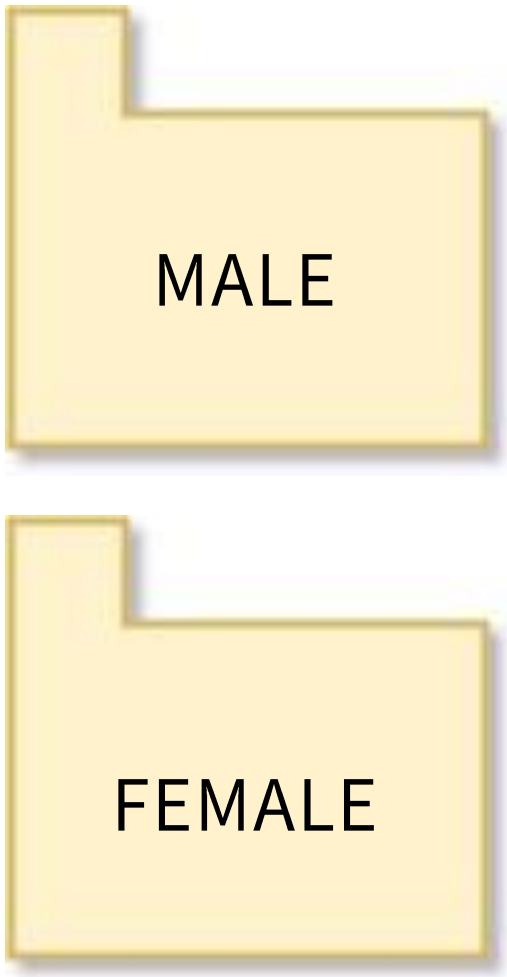
96 x 96

성별_연령범위_감정타임스탬프

## Example

female_3135_sadness172617

# 전처리 결과물





**최대치:**
1만6천 장, **Neutral**

**최소치:**
266장, **Fear**

# 모델은 최소치 값으로 제작 (266개)

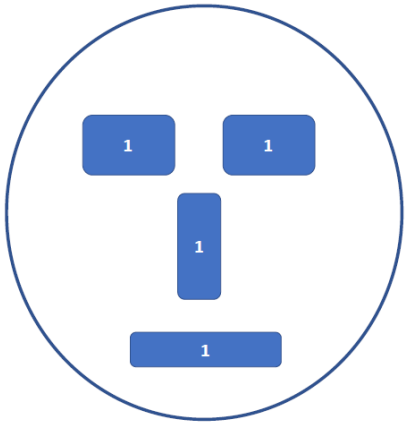
| 각 감정별 데이터 셋 | 최대치 1만 6천개 | 데이터 셋 |
| --- | --- | --- |
| 균일화 | 오버피팅 | 노이즈 |

순수한 데이터만 사용하기로 결정

Process 1

전처리:
코드

Process 2




전처리:
수기

Process 3

266

클린
데이터

**Team Big의 인공지능은 이렇게 제작됐습니다.**

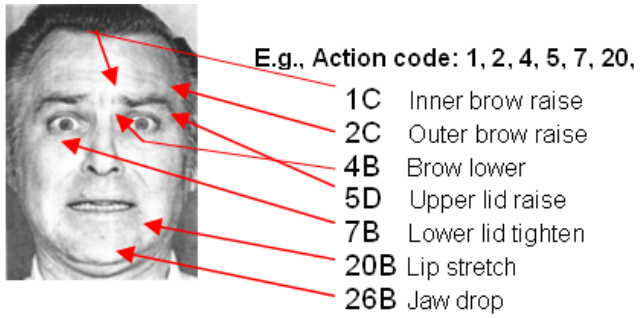
Conclusion

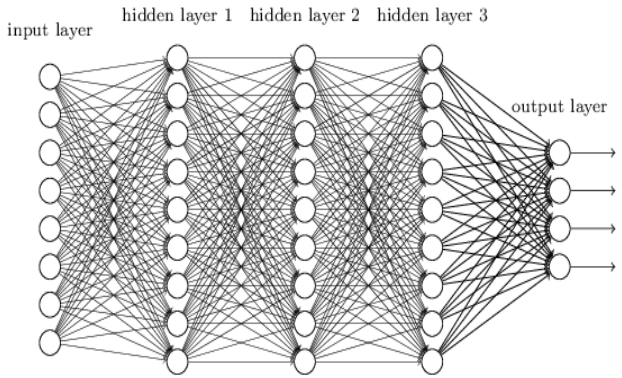
# How can we improve our A.i.?

# 향후 버전에 대한 로드맵…

**현재 정확도: 70%** → **목표: 90%**

얼굴 움직임 부호화 시스템 → Deep Neural Network → ~~JPEG~~ → TIFF 활용





10% 향상 예측 | 5%향상 예측 | 5% 향상 예측

# Reference


- An example of computer vision
  - https://blogs.msdn.microsoft.com/saqib/2014/05/27/a-very-brief-introduction-to-computer-vision/
- Humintell, “The Seven Basic Emotions: Do you know them?”
  - https://www.humintell.com/2010/06/the-seven-basic-emotions-do-you-know-them/
- Typical CNN Architecture
  - By Aphex34 - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=45679374
- ‘Modal’ image
  - https://www.sciencedaily.com/releases/2013/12/131213161150.htm
- Reading Facial Expression of Emotion
  - http://www.apa.org/science/about/psa/2011/05/facial-expressions.aspx

# Outside Programs Used

**외부 프로그램**

- Facecropjet
- Mountain Pearl
- Darknamer
- VirtualDub

**외부 라이브러리 (설치 필요)**

- Inception
- Tensorflow
- Telegram
- Anaconda
- Microsoft Azure Face API
- OpenCV


Thank you for watching.
Feel free to ask any questions!