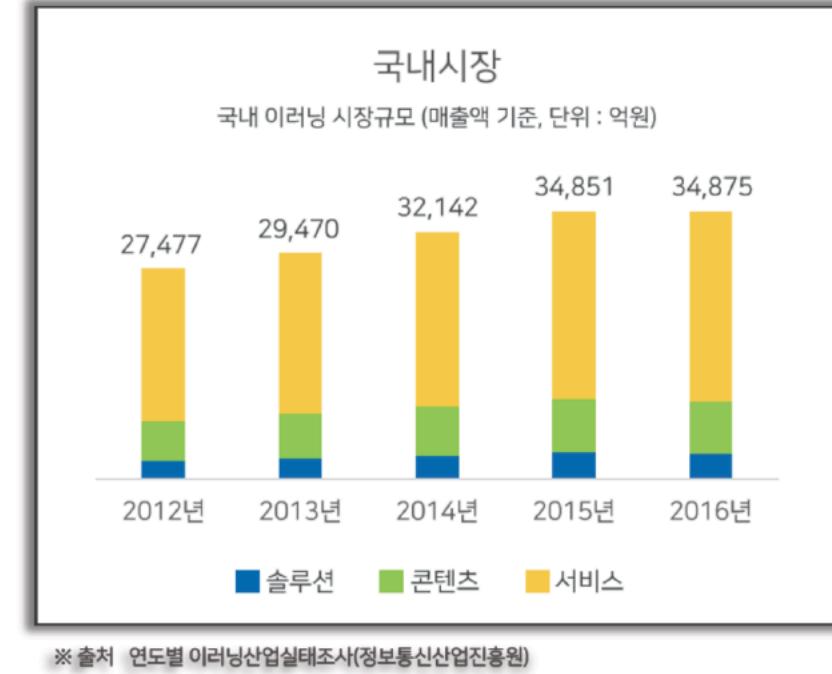
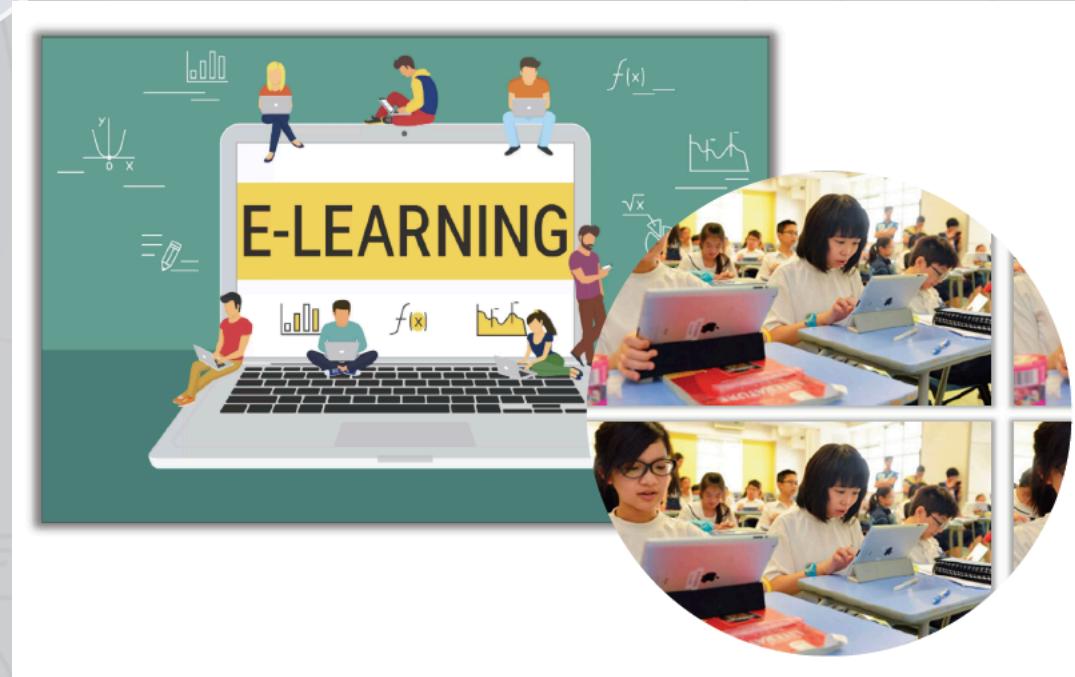
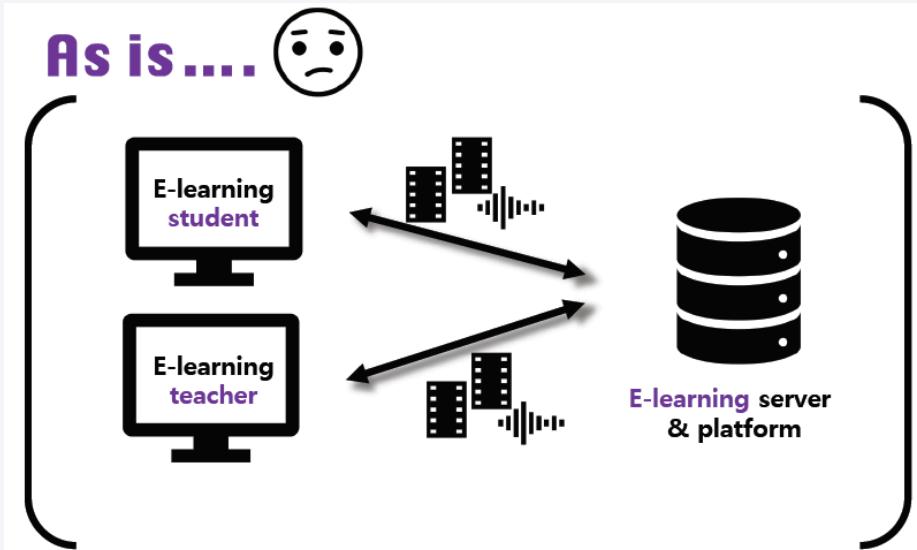


Motivation

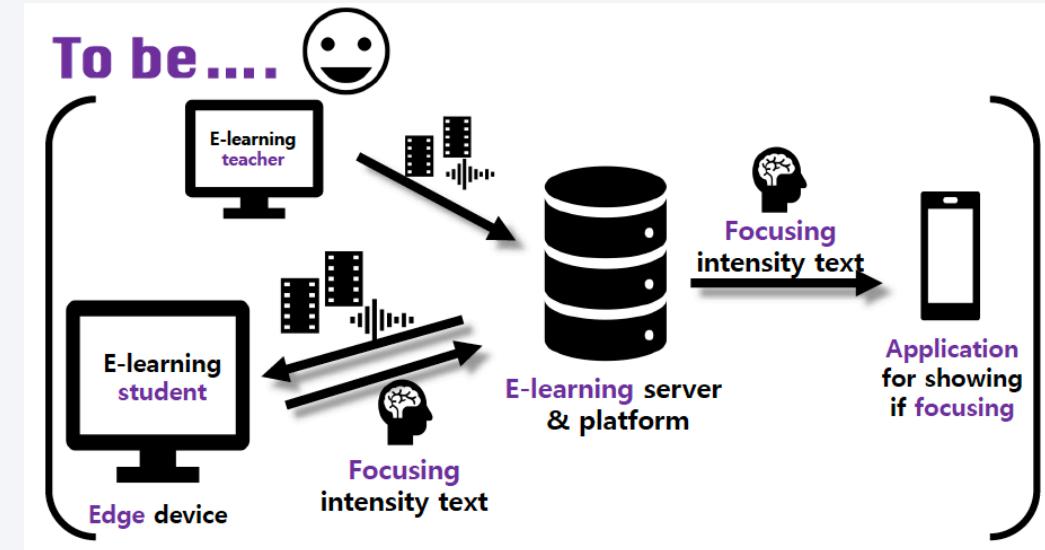
Attention monitoring system on edge computing for interactive e-learning system



- ✓ Along with **video streaming & network techniques**, many applications and services have been running their systems.
- ✓ One of the popular services is **e-learning**, which is a concept of an education via video streaming on the Internet



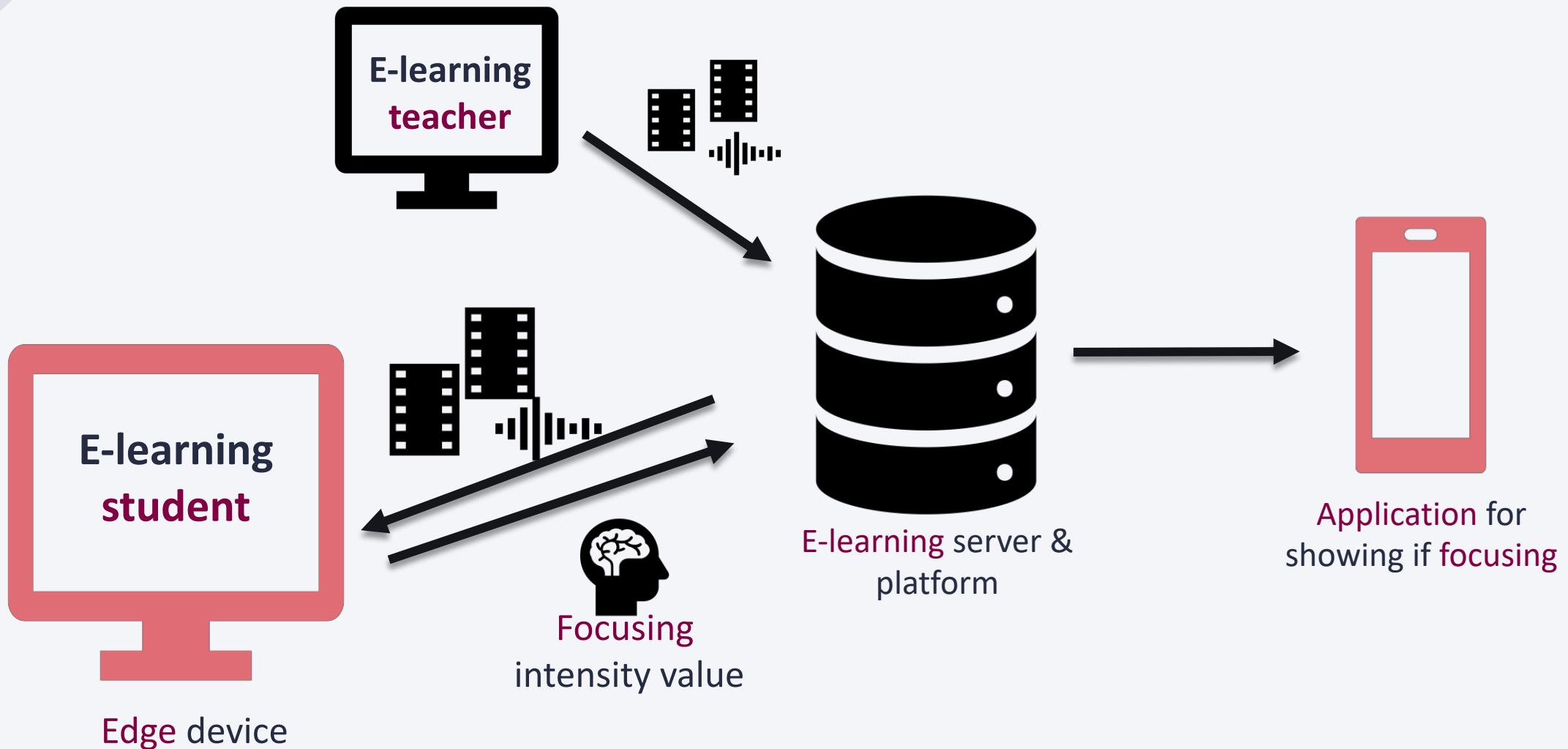
- ✓ E-learners study on **tablet, computer or laptop**.
- ✓ E-learning students & teachers **communicate** via **video streaming** which is costly expensive.
- ✓ It needs a lot of **network resources** causing delay.



- ✓ Sending only **detected and analyzed focusing intensity** from e-learning student side.
- ✓ Monitoring **service application** for demands of parents wanting to see if their child is **focusing or not**

Architecture

Attention monitoring system on edge computing for interactive e-learning system



Problems we focused on...

- ✓ Problem 1: Sending video itself uses a lot of **network resources** which is costly expensive
 - Reduce use of network resources by sending only **analyzed result as a double value** about concentration
 - Computing student's concentration level on the device works as an **edge computing**

- ✓ Problem 2: Users may not want to **send their video** for many reasons
 - Sending only analyzed result about concentration helps learners to focus **for interacting** with teachers while focusing on what's going on.
 - Solving **security and privacy issues** by computing on the device, which is an edge computing

Implementation

Attention monitoring system on edge computing for interactive e-learning system



E-learning edge device



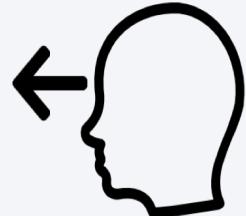
- ✓ Run **background running camera**
- ✓ Detect & collect facial data from camera frequently while interactively running e-learning system

- ✓ Get concentration state value
- ✓ Express the value with **emoticons & line graph** on mobile device

Combine three facial data from open API



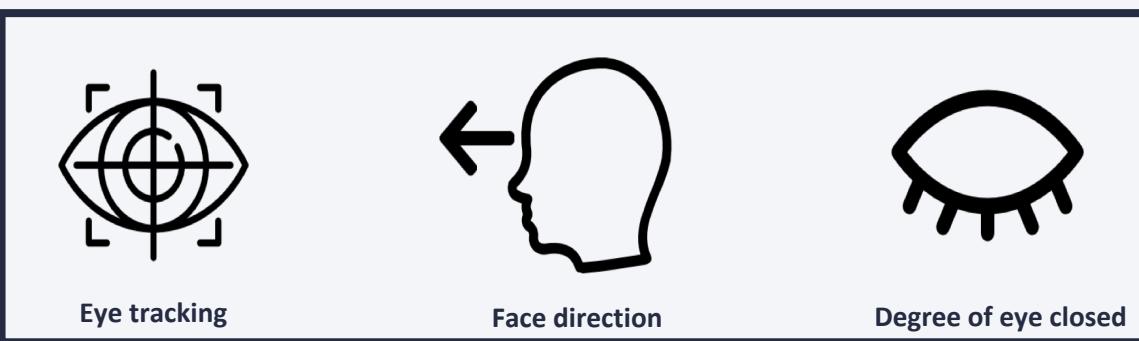
Eye tracking



Face direction



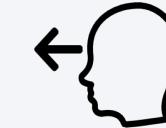
Degree of eye closed



- ✓ Combines 3 facial data, convert into **double value** between 0 and 1
- ✓ Send **calculated concentration value** to mobile device
- ✓ Mobile device **displays concentration state** of user with emoticons



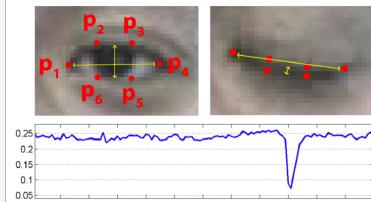
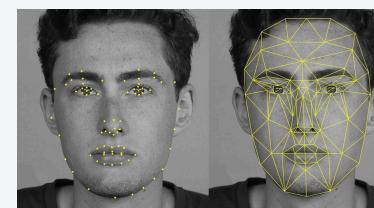
Eye tracking



Face direction



Degree of eye closed



Concentrated



Neutral



Not concentrated

Implementation

Attention monitoring system on edge computing for interactive e-learning system

Algorithm for computing concentration value

- ✓ Status of eye blinking < 0.2
- ✓ Face direction > 0.3
- ✓ Eye tracking > out of edge(frame)

On counting of 30 times
(default alert: 0)

Concentration percentage(%)
[0 ~ 30%]
alert+2

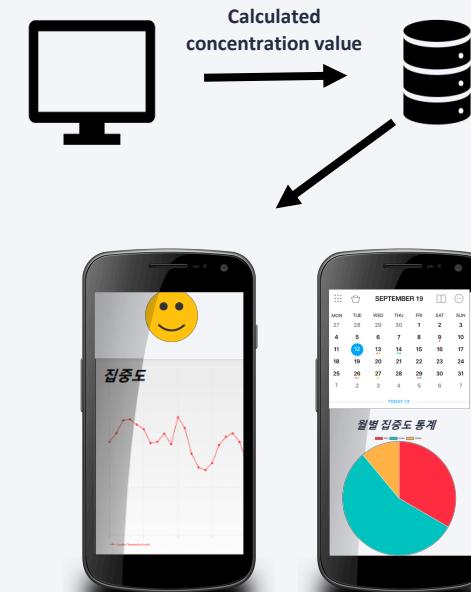
Concentration percentage(%)
[31% ~ 65%]
alert+1

✓ Functions on the mobile application

- Real time **line graph** of learners' **concentration status**
- **Emoticon expression** of focusing rates
- **Monthly graph** and data with calendar & pie chart
- **Alert service** when learners' status is too bad

- ✓ Get **alert** value for notifying alert

```
If(alert > 15)
    show alert;
    alert = 0;
```



Marketing plan

Attention monitoring system on edge computing for interactive e-learning system

SWOT ANALYSIS

Strength

- High educational demands
- E-learning's popular trend
- Efficient feedback system supported by application

Weakness

- High price for setting the service
- Modest advertising budget

Opportunity

- Potential for growth with public schools
- Growing interest in/support for startups
- Easy to co-work with different services

Threat

- Uncertain economic environment
- Intensifying competition from existing e-learning system
- Unpredictable potential users

Marketing plan

STP

ANALYSIS

Segmentation

- ✓ Parents of students
- ✓ Education companies
- ✓ Public schools

Targeting

- ✓ For every interest group having educational purpose



Positioning

- ✓ Total study management system for e-learning system users

