AI for Education in Korea: Cases of KNUE

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- AI Teacher Training Course
- Drone Flight Club with “Python” Coding
- “Entry” Block Coding Course for Pre-service Elementary Teachers

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AI Teacher Training Course

Why AI in our society?

- The 4th industrial revolution is closely related to AI.
- The revolution is a period when the productivity of work is dramatically improved as the whole process of production, distribution and consumption of goods or services is intelligent through the use of core technology like big data, Iot, robotics, autonomous driving vehicles, virtual reality and 3D printing which are all centered on AI.
- AI has a human attribute to make society far efficient.

What is AI?

- AI is a technology that uses computers to model human intelligence.
- AI is a technology that implements a variety of recognition, thinking, and learning activities through algorithms that can be performed by human intelligence so that computers can execute them.

Why AI Learning in School?

- AI is a human heritage. Students need to understand the key skills that guide the rapidly change of the modern period. (Humanistic perspective)
- AI is closely related to our daily lives. Students need to learn AI in order to get on with their daily lives. (Ordinary life perspective)
- AI is like a problem solver. Students can develop their own thinking power by exploring basic knowledge to operate AI. (Developmental perspective)

Why AI Learning in School?

- AI is changing the current society as well as will change our future society. Students have to learn the AI technology to speed up the development of workstation where they will contribute as workers after graduation from school. (Social Developmental Perspective)

Decision of Korean Government on "AI for Education"

- The South Korean government has decided to train 1,000 AI teachers every year for five years to strengthen AI learning in school.
- From the second semester of 2020, some universities will train in-service teachers with master's courses.
- Government will support half of the tuition for in-service teachers during three-year master's course.
- Using weekends and vacations, they will complete the degree in the form of in-service teacher training course.
- From the teachers who want the course, local school districts select candidates within the pre-designated quota, and the candidates will choose the university in which they want to study.

Is the Decision rational?

- Many universities worry about Korean government's decision without enough prior preparation for curriculum, teaching staffs and facilities.
- But I think it is an understandable direction.
- It takes a lot of time to prepare enough in advance and then open the course.
- Government thinks that AI learning in school is urgent and teacher training is more urgent.
- Government thinks that let’s open the course first then make preparation step by step.

KNUE’s effort

- After consulting with the local district offices, KNUE decided to train about 160 in-service teachers every year.
- This is a large number. It is one-six of the nation's whole quota of 1000.
- We are very happy but very worry. Why?
- No curriculum, Lack of professors and facilities to handle AI training

KNUE's effort

- We will urgently hire two AI professors this semester and secure facilities and space for teachers to practice in weekends.
- We will get support of professors from the university of science and technology, which is the nation's top science and technology university and is located near KNUE campus.

Tracks for AI convergence education

- There will be at least four tracks. Teachers can choose their majors as they like.
- Humanities and Social Study sub-major for elementary and humanity subject teachers
- Science & Engineering sub-major for normal high school teachers
- Science & engineering sub-major for gifted and vocational high school teachers.
- Art and culture sub-major for music and art teachers

Curriculum

The students will take 27 credits for the following eight subjects.

- An Introduction to AI (3 credits)
- AI and Data (3 credits)
- The Realization of AI (3 credits)
- AI for problem solving at the social and academic levels (3 credits)
- Mathematics for AI (3 credits)
- Python and AI (3 credits)
- Projects for Master Thesis (3 credit)
- Independent Study to relate AI and subject matters (6 credits)

An Introduction to AI

- In-service teachers will learn about various knowledge including the definition of AI and the changes in the society as a result of the development of high technology with AI.
- They also recognize the importance and value of AI in the future society, and find out how to use it correctly and how to solve ethical problems caused by the use of AI, and how to express knowledge and inference.

An Introduction to AI

1. An Overview of AI
- What is AI?
- AI in our lives?

2. The Future of the Intelligence Society
- What is the future of AI?
- What skills and jobs does the intelligence community need?

3. AI and Ethics
- Why do we need AI ethics?
- What is the issue of AI ethics?

4. Expression and reasoning of knowledge
- What is knowledge?
- How do you express the knowledge?
- How do you use the expressed knowledge?

AI and Data

- In-service teachers will learn how to collect and process data needed to solve problems according to the characteristics of AI being based on data.
- Identifying the characteristics of data, they will learn how to visualize and to analyze data to close up the features of data well.
- They will learn the basic concepts of machine leaning and the necessary mathematical concepts underlying the machine learning algorithm to enhance understanding of AI process.

AI and Data

1. Data collection and pre-treatment
- How can data be collected?
- How do I process data for easy analysis?

2. Data visualization and analysis
- How can data be expressed?
- What is Machine Learning?
- How to solve the problem with Machine Learning?

3. Basic concepts underlying Machine Learning
- Prediction and Errors ?
- How to minimize errors?

Realization of AI

- In-service teachers will implement machine learning and deep learning models directly using Python-based libraries.
- Based on examples close to real life, they could understand AI algorithms such as understanding problems, collecting and pre-processing data, learning and evaluating models, writing programs, testing and improving programs.
- They will create their own AI models that can be applied to solve real-life problems based on this understanding.

Realization of AI

1. Machine Learning Algorithm
- How do we predict the future phenomena?
- How can I easily implement the model for prediction?
- What is a better model?

2. Machine learning and deep learning
- Deep learning, why do we need it?
- What do you do with an artificial neural network?
- What problem do we solve with the deep neural network?

3. Computer vision
4. Natural language processing

AI for problem solving at the Social and Academic Fields

- In-service teachers will be empowered to develop abilities and attitudes to solve real-life problems arising from various social sectors based on AI modeling and capabilities learned earlier.
- They will carry out various projects to solve the problems raised in various academic fields.

AI for problem solving at the Social and Academic Fields

1. Utilization and sharing
- Can we use AI models for problem solving at the social and academic fields?
- How do we share the AI models to other persons in community and high school students?
2. Troubleshooting
- How to do AI projects?

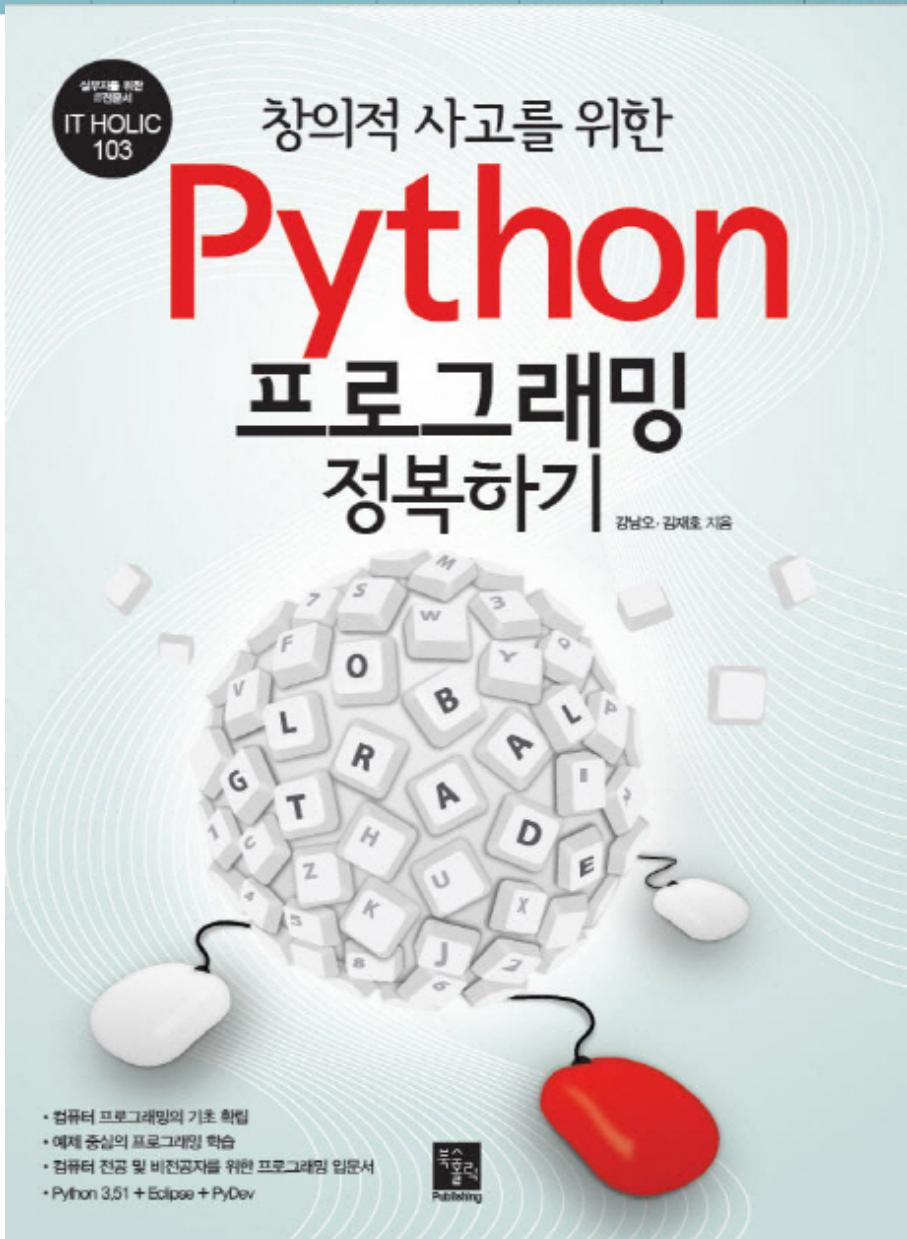
Mathematics for AI

Students will learn the fundamental level of mathematics for understanding AI and implementing AI and designing their own AI models:
Calculus, Statistics, Linear Algebra,

Characteristics of Python

Developed in 1991 by Guido Van Rossum, Python is :

- Strongly Extensible language
- Easy-to-use language
- Easy-to-understand language
- Easy-to debug language
- Free and open source language
- Object-oriented language



Python for AI

Students will learn the higher level of Python programming language to design their own AI models.

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Drone Flight Club with “Python” Coding

Drone flight experience for Pre-service teachers

- The drone is recognized as one of the technologies driving the fourth industrial revolution.
- There were various attempts to secure the capabilities needed in the era of the fourth industrial revolution by introducing drones control skills such as simple manipulation by radio, but it was difficult to expect educational effects as their competency.
- Therefore, we try to foster the problem-solving capabilities of KNUE pre-service teachers by providing drone experience controlled though programming.

Drone Flight Club for pre-service teachers

- As the first step, we made Drone Club for pre-service teacher to enjoy Drone flying experience through coding of Python.
- However, all of the first members of the club was students of Department of Computer education. It is because many students thought that learning Python is not easy.
- We expect more students come from various subjects. It might be possible now because we teach Python in high school under that current curriculum.

Some activities from the Club

드론 FPV 비행PC화면.mp4

드론 파노라마PC화면.mp4

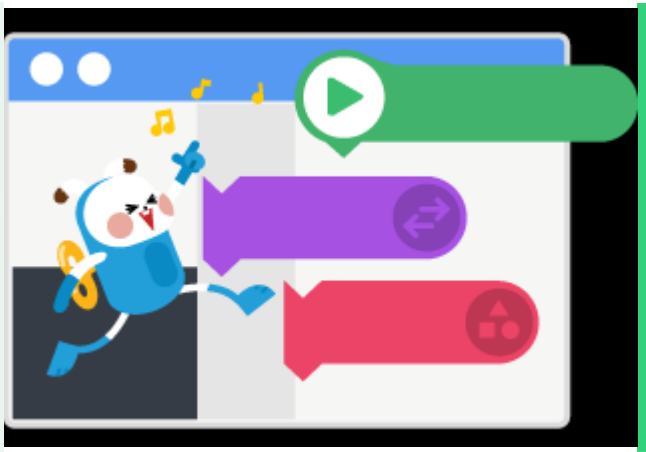
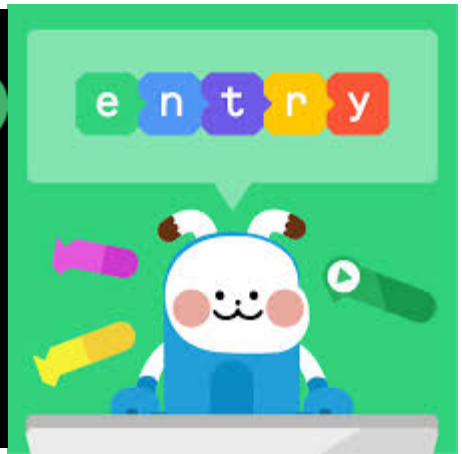
드론 얼굴 추적 비행.mp4

03

“Entry” Block Coding Course for Pre-service Elementary Teachers

Entry as a block Coding

- ENTRY is South Korea's programming language platform developed by the Entry Education Research Institute.
- It is a main block-based language used officially in Korea for elementary and junior high school students.
- It is similar to Scratch developed by Mitchel Resnick, MIT Media Lab, but much more easier.
- Visit play-entry.org to provide English version for learning, creating, and sharing.

Software Teacher Education

Preparing for the era of the 4th industrial revolution, KNUE aims to strengthen the capabilities of elementary school teachers to guide software education in order to nurture people with computing power to solve problems in various fields creatively and efficiently.

Goals of Software teacher education

- Securing the software education leadership capacity of elementary school teachers in preparation for the mandatory software education of the 2015 revised curriculum
- Reinforcement of the teaching ability of elementary school teachers to foster creative and interdisciplinary talents of students pursued by the 2015 revision of the curriculum
- Strengthening creative and logical thinking power of elementary school teachers by improving their computing power

Courses for All KNUE Elementary Students

Category	Name of Subjects	Grade	Credits	Hours per week
Interdisciplinary Education	Elementary Software Education and Computing Thinking *(Basic level coding)*	Gr.1	3	3
	Software Education in Elementary Education *(Middle level coding)*	Gr.2	3	3

Courses for Elementary Computer Education Major (with high level coding)

이수구분	과목명	이수학년	이수학점	이수시간
Deep Computer Education Major	S/W and Problem Solving	Gr. 2	3	3
	Creative Computing Thinking	Gr. 1	3	3
	S/W and Ordinary life	Gr. 4	3	3
	Multimedia and S/W	Gr. 4	3	3

Courses for elementary school subjects Major (high level coding)

Category	Name of Subjects	Grade	Credit	Hours per week
Deep Subject matter major (Choosing one subject only according to their major	S/W and Elementary Korean Language	3	3	3
	S/W and Elementary Mathematics	3	3	3
	S/W and Elementary Social Study	3	3	3
	S/W and Elementary Technology	3	3	3
	S/W and Elementary Art	3	3	3
	S/W and Elementary Music	3	3	3
	S/W and Elementary Science	3	3	3