

# Talent Education for Foreign Students to Learn Concepts of Artificial Intelligence

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**Abstract**—Artificial intelligence (AI) has contributed to many facets including manufacturing, finance, security, agriculture, and games. More and more AI technologies and knowledge are developed so that it is not easy for a beginner to learn AI by himself. Games have been played for a long time and easily draw users' attentions and interests. Therefore, Game AI is designed as the first course content in this class and through Game AI, other AI technologies are introduced one by one. According to students' feedbacks, this kind of teaching way seems good, but it has room to be enhanced and, in the next course, it will be modified based on the students' suggestions.

**Keywords**—Artificial Intelligence; AI; Game AI; AOI; Deep Learning; Python

## I. INTRODUCTION

Artificial intelligence (AI) is an area of computer science but it plays an important role for other areas and gets more and more attentions in lots of fields today. This is because AI emphasizes the creation of intelligent machines that work and react like humans, even better than humans in some field. However, it is not easy to learn all AI-related knowledge and technologies because the research associated with artificial intelligence is highly technical and specialized [1]. For a college student, even he or she studies in Computer Science and/or Electrical and Electronic Engineering, it is not easy for him or her to learn AI. Therefore, how to design a course for introducing AI to juniors is a difficult thing.

Games have been played for a long, long time now and many people intend to continue to play games in order to earn satisfactions. Furthermore, researches have shown that as opposed to non-gamers, gamers had better visuo-motor coordination, spatial representation, iconic skill, and visual attention [2]. For some university education in Korea, the authors in [3] described that games have been an important tool for motivating undergraduate students majoring in computer science and engineering.

Accordingly, in the summer program during two weeks (July 16~29, 2019), we used Game AI to be the first course content to draw the foreign students' attentions and explain the related AI concepts, technologies, and tools from basic to advanced and step by step in the following days of summer vacation.

## II. STUDENT COMPOSITION

Lots of foreign students respectively joined the classes of the authors, C.-Y. Ho and H.-T. Chu. In this article, we will focus on the first author's class with 10 foreign students. As for Prof. Chu's class, situation, and results, please refer to the article [4].

The genders of these 10 foreign students are half males and half females, i.e., the numbers of males and females are the same, equaling to 5. Seven and five students came from Indonesia and Singapore, respectively. Figures 1 and 2 show the year and dept. of each student at his/her home university. We can respectively find that sophomores and juniors are major years, and a half of students does not study in CS, EE, Math, and Statistics in this class. In addition, 70% students is first time to meet AI, and other 30% has learned AI between 3 months and 1 year.

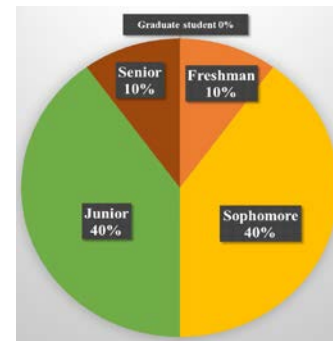


Figure 1. The year of each student at home university

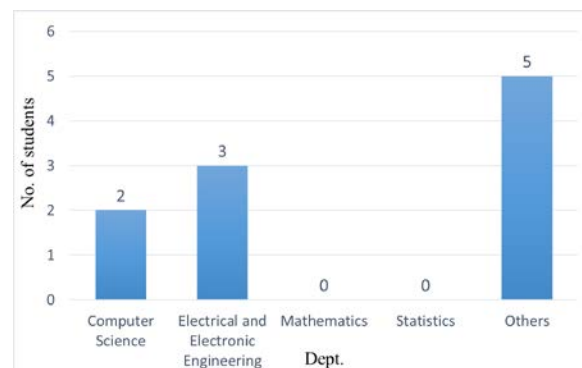


Figure 2. Department of each student at home university

### III. COURSE DESIGN AND CONTENT

#### A. Structure of the Course

The structure of the course including eight topics listed in Table I. Each topic has different hours since some needs more time to explain the concepts and details. Total teaching time for the whole course will be 27-35 hours. Note that Table I doesn't show the time for hands on and programming time. This is because a student's programming level / coding skill will influence code execution time, debug, and test time. Using a local computer, even with a powerful GPU card, to practice Game AI is more suitable than using a cloud version. However, from the second topic, deep learning, to the last topic, AOI, these seven topics can be practiced with online jupyter notebooks, e.g., Google Colaboratory (Colab) or Microsoft Azure Notebooks [4], unless the size of dataset is too large. For example, the entire AOI dataset size is about 1.67 G, the Colab and Azure cannot support all data at once. Hence, it is better to execute the codes on the local computer.

TABLE I. STRUCTURE OF THE COURSE

Topics	hours	Platform
Game AI	3-4 hour	Computer/Youtube
Deep Learning	6-7 hours	Colab/Azure
Python and Common Libs	3-6 hours	Colab/Azure
Keras	3 hours	Colab/Azure
CNN	3 hours	Colab/Azure
RNN	3 hours	Colab/Azure
LSTM	3 hours	Colab/Azure
AOI	3-6 hours	Colab/Azure /Anaconda
Project Presentation	---	---

#### B. Project Presentation

The project presentation is for students to explain their project - both the product and the process - to the teacher and other classmates. The project presentation is often collocated with the project documentations, e.g., slides and/or word/pdf documents, and the project demonstrations (if have and if needed). The project presentation gives the teacher and classmates a chance to clear up doubts and understand more things of the project by asking questions on the spot.

### IV. STUDENTS' FEEDBACKS

After the students completed the course, they gave their thoughts and suggestions. In this section, we summarized their feedbacks in the following paragraphs.

#### A. Things Learned from Course

Table II shows the student thought what he/she learned from the course. From the table, we could find that when AI technology is used into an application that would impress students. In other words, most students deeply remembered both Game AI and AOI project, and some recalled the AI deep learning model and on-line tool, Google Colab.

#### B. Learning Effectiveness

In this class, most students met AI first time or learned AI only for a very short time as described before. Therefore, most students didn't have enough programming skills in AI field. However, after the course, 80% students approved that

they improved their skills a lot in AI filed as shown in Fig. 3, where scores 1 and 5 present none and huge, respectively.

TABLE II. A STUDENT THOUGHT WHAT HE/SHE LEARNED

ID	Learned Things
A	I learn about the correlations between AI and Game
B	AOI is often used in the electronics industry in error checking and quality processes. When practicing its programming, I learn a lot about programming and also I learn that small errors greatly affects the accuracy.
C	I mostly learn about python deep learning using Colab since it was my team's final project. Furthermore, I also learn about AOI, AVI, AI in game, hadoop, and a lot more.
D	aoi, game ai
E	I learnt about many technologies' AI. That AI is really useful to make things easier. And it's about to rule the world of technology and accelerate the Industrial Revolution
F	I learn how toll road in Taiwan works with AOI (please correct me if I'm wrong, Sir), how AI works in playing game, how deep learning works and it was my first time seeing Google Colab
G	How to use python and Game AI
H	deep learning models
I	AI implementation in game, AI technology in sport
J	Game AI has two meanings. One is let AI play game, and the other is make NPC's and monsters have a smart brain by AI

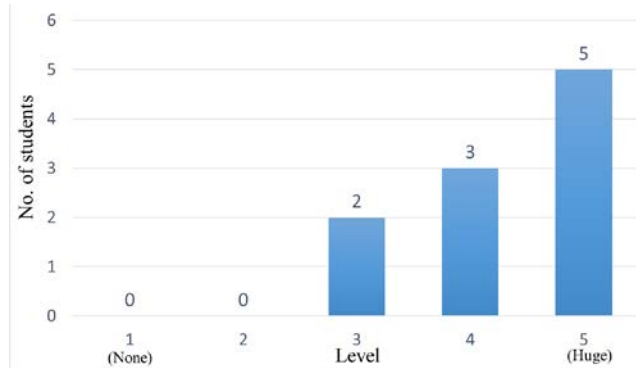


Figure 3. The level of improving skills in AI field after the course

TABLE III. STUDENTS SPOKE THEIR MINDS

ID	Suggestions
B	Thank you for the opportunity given to me, so I can learn a lot about AI.
C	"Overall, I think the courses are really good. However, I suggest that the course should include a practice whenever it can like in python course. I realize due to the limited time it could make the material become shorter. Instead, listening to the explanation sometimes I got sleepy and unable to get the information. One more feedback is about the class main topic. Actually in the beginning I expect to learn how to make a simple game with AI using Unity, Unreal Engine, or else, instead we mainly learn about Python and deep learning. But, it still interesting."
D	a lot new things that I gained. thank you sir!
F	Because there was only a few students in this class, I interacted much with other student in class. I have a great 2 weeks with the class.
I	There are lot of resource to learn AI that sometimes make 'junior' AI learner confused where&how to start. Also AI is a big subject, ML and DL are inside of it. Not everyone could easily learn AI even a CS student. We need to learn discrete math, coding, linear algebra, etc. to be prepared enough learning about AI so everything make sense. Maybe there's a requirement, for anyone who wants to learn AI need to know some basics CS materials so they could catch up with the lesson in class.

### C. *Suggestions to Teacher or Course*

Table III presents some suggestions given by students. We can find that only a half students were willing to write feedbacks and 20%~30% students spoke their minds. These suggestions are all good and will be considered for the next course design. Moreover, the teacher could think how he/she modify his/her teaching way for this course in the future.

### V. CONCLUSION AND FUTURE WORKS

There are many teaching methods to let local or foreign students learn artificial intelligence more easily. Game AI can draw the students' eyeballs and increase their interests. Suggest a teacher can try to design your course with a game.

According to the feedbacks, although the effectiveness of this course is well, the course still has a room to be improved. In the future, we will teach how to make a simple game by some tool like Unity and how to write an NPC with a little smart head. Also, we will develop more courses and collect more data for AI talent education.

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