PROVIDING MEDICAL PHYSICISTS WITH KNOWLEDGE AND SKILLS IN ARTIFICIAL INTELLIGENCE CODING

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Abstract –

Artificial Intelligence (AI) is gaining wide attention for its outstanding performance in image-recognition tasks, such as medical imaging. In the past few years, medical physicists have made many imaging interpretations of medical images. The need to train medical physicists with AI knowledge is thus urgent to prepare them for this transformation technology. This article details our experience conducting the 20th ACOMP workshop 'Introduction to Artificial Intelligence' on Sept 19-20, 2022. The workshop practiced a flipped classroom concept. Materials were given to participants prior workshop. During the workshop, interactive sessions and hands-on coding were conducted. We received positive feedback from the participants that they enjoyed and learned the most during the interactive session.

Keywords- **Artificial Intelligence, Machine Learning, Digital Medicine, Coding, Medical Physicists**

I. INTRODUCTION

With the increasing amount of imaging examinations in the radiology department, the workload of medical physicists increased tremendously, and the burnout concern is intensifying. The development of computer technology and the introduction of machine learning applications have shown encouraging results in improving the accuracy and efficiency of the healthcare process.

A recent international survey of opinion on the AI role in medical physics from 219 respondents representing 31 countries revealed that 81% of participants agreed that AI would improve daily work. However, the average AI knowledge is below average, with 2.3 on a scale of 5. 95% of participants showed interest in enhancing their AI skills [1]. It is vital for medical physicists to upskill their AI knowledge and efforts have been made to encourage for AI to be incorporated into the medical physic programme [2].

Last year, the first ACOMP workshop, which consisted of didactic lectures and coding classes, was conducted [3]. This year, we introduced flipped classroom concept in the workshop – "Introduction to Artificial Intelligence" (Figure 1). The workshop aims to introduce AI's basic concepts and techniques and provide hands-on coding experience to participants using contemporary AI methods to solve practical problems.

Figure 1 Workshop Poster

II. THE EXPERIENCE OF 'INTRODUCTION TO ARTIFICIAL INTELLIGENCE'

This workshop on 'Introduction to Artificial Intelligence' consists of a two-day workshop of one-and-a-half-hour session each of interactive sessions with participants, and hands-on coding delivered by Universiti Malaya lecturer, Dr. Shier Nee Saw and Bahçeşehir Üniversitesi lecturer, Dr. Mustafa Ümit Öner. The topics covered in the workshop are shown in Table 1.

Table 1 Topics covered in the two-day workshop

Topics

1. Lecture:
    a. Machine learning concepts
    b. Classification
    c. Regression

2. Hands-on Workshop:
    a. Classification problem hands-on Workshop.
    b. Regression problem hands-on workshop
    c. Develop machine learning model for medical problems

Materials were provided in advance so that participants could learn and have knowledge before entering the workshop. During the workshop, a 2-ways discussion between the lecturer and participants was conducted. Participants were encouraged to ask questions and participate actively in the discussion. Hands-on coding was conducted after interactive sessions.

During the two-day course, lecturers gave lectures on three topics: (i) machine learning concepts, (ii) classification and (iii) regression.
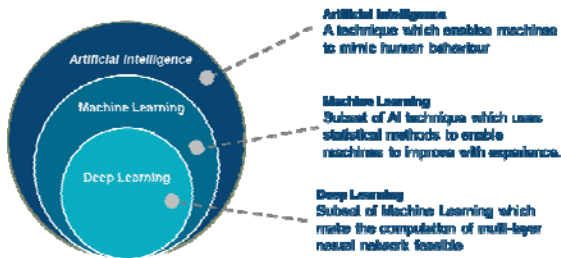

Figure 2 An example of a diagram to describe the relationship between AI, machine learning and deep learning.

Classification and regression lectures were given to enable students to grasp the concepts, followed by a practical session where students were asked to code in developing an AI model using the Google Colab platform. After learning the concepts and examples, students were tasked to develop an AI model to classify benign and malignant breast cancer. In this exercise, students were required to re-use the concepts and code learned in the workshop to create the AI model. The materials of the hands-on Colab coding workshop are available at https://github.com/shiernee/2022-ACOMP-AI-Workshop.

II. DEMOGRAPHICS OF PARTICIPANTS, FEEDBACKS AND OUTCOME OF THE WORKSHOP

31 participants from Thailand, Malaysia, Singapore, Sri Lanka, India, Bangladesh, Indonesia, and the Philippines attended this workshop. The participants include medical physic students, medical physics practitioners, and

academic lecturers. Overall, participants rated 4.5/5.0 for the workshop. Most of the participants enjoyed the interactive sessions and will recommend the workshop to others in the future. A certificate is given to all participants who had completed the course.

Figure 3 A screenshot of lecturers and participants.

This initiative aims to give participants knowledge of the foundations of AI and, more crucially, hands-on coding experience. Participants can use the knowledge gained and the code after the session, extending it to tackle other medical AI problems.

III. CONCLUSION

The ACOMP workshop - 'Introduction to Artificial Intelligence' has been successfully conducted. With the interactive and coding sessions, participants gain basic AI knowledge and will be able to understand how AI can aid in medical imaging diagnosis. This workshop serves as a model for higher education institutions to contemplate introducing AI in medical physics programs.

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