令和７年度

愛媛大学医学部医学科一般選抜試験問題

総合問題（医学科）

（14:40～16:40）

注意事項

（１）　試験開始の合図があるまで、この問題冊子の中を見てはいけません。
（２）　試験中に問題冊子の印刷不鮮明、ページの落丁・乱丁および解答用紙の汚れ等に気づいた場合は、手を挙げて監督者に知らせなさい。
（３）　すべての解答用紙に受験番号を記入しなさい。
（４）　解答は、すべて解答用紙の指定のところに記入しなさい。
（５）　問題冊子の余白は下書きにしてよい。
（６）　解答用紙はすべて机の上に出しておくこと。机の中に入れてはいけません。

問題１．次の文章を読み、設問に答えなさい。なお「*」のついた箇所は本文の後に語註があるので参考にしなさい。

I am very familiar with game addiction, as that's what I thought about every day for more than a decade. I hired product managers and engineers to track everything players did and analyze their behavior. Using the data we collected, we experimented with every feature of our games to see which versions allowed us to extract the most time and money from our players. For us, game addiction was by design: It meant success for our business.

Here's an example of how addiction is cultivated in gaming. If you have played mobile games like Candy Crush Saga*, you are familiar with the concept of "lives." You are given five lives a day; each time you lose a game, you lose a life. Run out of lives, and you can't play again until your supply is replenished*. ① Why, you might ask, would someone get addicted if the developers prevent players from gaming as much as they like?

I have used the same mechanic in my own games, and this is how I explained it to my engineering team. Say I have a delicious chocolate cake. If I give you the entire cake, you might eat the whole thing in one go because it's the best cake you ever had. But you likely will "overdose*" and may not want to touch chocolate cake again. What if, instead, I give you a tiny slice each day? Gradually, you develop a daily habit, and you might end up buying 10 cakes from me. That's the ultimate goal: to build habit-forming games that have players coming back every day. In other words, it takes away the decision-making. We wanted people to reach for their phones first thing in the morning and jump right into our games, just as they check their social media and emails.

For a long time, I didn't see a problem. ② I saw our mission as bringing joy and entertainment to players. This changed when my two toddlers* became old enough to take an interest in playing the very games I had built. Thinking about my games in my daughters' hands, I had to confront what these products really were and what they could do. Knowing all the techniques with which we tried to bring about addiction, I realized I didn't want my children exposed to that risk. My daughters are now 3 and 4 years old and I have yet to show them any of the games I have designed.

There is some debate among researchers and health care practitioners* that gaming can become a true addiction, but according to the World Health Organization*, "gaming disorder" can "result in significant impairment in personal, family, social, educational, occupational or other important areas of functioning."

The over-the-top experiences* and rewards built into video games can stimulate our brains to release dopamine*. Dopamine, the powerful "feel good" neurotransmitter*, motivates us to seek more of these pleasurable activities. This is what can lead to [③] .

One recent study followed adolescent video-game players for six years. Most were able to enjoy playing without any harmful consequences. But a significant minority, 10 percent,

developed pathological tendencies* related to video games, including having difficulty stopping play. Compared with the other group in the study, these players displayed higher levels of depression, aggression, shyness, problematic phone use and anxiety by the time they were emerging into adulthood.

I'm not proud that I had a hand in furthering these problems. As a matter of fact, I tell my daughters that I make board games like the ones they play at school. Whenever I encourage my daughters to strive to make a positive difference in the world, I question whether I have done the same.

I am not suggesting that we regulate video games as China has. But here are ④ three ways that we should think about addressing this issue: Start with parent training. Parents need to be made aware of the negative impact of the video games they may be letting their children play. I get that sometimes we need to occupy our kids, and it's very tempting to hand them a phone. But we need to be better gatekeepers. It's hard to change a behavior if you can't first measure it. Use tools, such as Apple's Screen Time or Google's Digital Wellbeing, to create awareness of just how much time you or your children are spending on games — you'll be surprised. Finally, strike a balance. Games can be fun, of course; we just need to find moderation. When I was growing up, my parents pushed me to eat more vegetables and fruits. With technology so integral to our lives, we need to treat digital wellness like physical wellness and make sure we encourage behavior that's good for us.

I have realized that I have a role to play, too, beyond keeping my daughters safe. Going forward, I've decided to use my knowledge about video game design for good, to ⑤ try to design educational games that are more engaging.

Recently I had a chance to participate in a math program for young children at Stanford's Haas Center for Public Services. I worked with two kindergartners and saw how technology and games could help them learn. I asked them what they were interested in and created math games with themes that they liked.

The children were excited to play the games, and in two months, they went from skipping numbers when counting to accurately counting from 1 to 100 and even doing simple addition. Even so, I believe there is a lot more waiting for kids beyond that screen.

出典；The New York Times, Opinion, Guest essay, Oct. 2, 2022. より抜粋、一部改変

［語註］

Candy Crush Saga	キャンディクラッシュというゲームのタイトル	health care practitioners	医療従事者
		World Health Organization	世界保健機関
		over-the-top experiences	大げさな体験
replenished	補充される	dopamine	ドーパミン
overdose	過剰摂取	neurotransmitter	神経伝達物質
toddlers	幼児	pathological tendencies	病的な傾向

問１．　下線部①に対する著者の説明として、本文内で比喩として用いられているものは何か、英語で答えなさい。

問２．　著者が下線部②のような考えを改めるようになったのはなぜか、本文に即して句読点を含め 30 字以内の日本語で答えなさい。

問３．　空欄③に入る語句として、著者の主張に最も適切なものを選択肢ア～オから選びなさい。

ア．play a game
イ．powerful activity
ウ．healthy condition
エ．addictive behavior
オ．significant minority

問４．　下線部④の三つの方法とは何か、本文に即してそれぞれ簡潔に日本語で答えなさい。

問５．　下線部⑤について、著者は実際にどのようなものを作り、どのような成果を得たか。本文中の文章を要約し、句読点を含め 100 字以内の日本語で答えなさい。

問６．　医学の分野でゲームを活用するとしたら、あなたならどのようなものを作るか。本文中に例示されていない例を二つ挙げて、それぞれの利用目的と期待される成果を含め、日本語の簡潔な文章で答えなさい。

問題２．次の文章を読み、設問に答えなさい。なお「*」のついた箇所は本文の後に語註があるので参考にしなさい。

We are witnessing the ascendance of ① AI. AI tools such as ChatGPT and DALL-E can appear to mimic* human intelligence, but they are computer programs that categorize, classify, learn, and filter data to solve problems, make predictions, and perform other seemingly intelligent tasks. AI tools used in medicine, like AI used in other domains, work by detecting patterns in large volumes of data. For example, AI can learn to detect anomalies* in medical images after being trained on large numbers of images of anomalies. Medical AI has displayed impressive capabilities, especially in the field of radiology. Some AI tools are at least as accurate as highly experienced radiologists in identifying disorders in medical images.

However, if medical AI tools are trained with data that are skewed* in some way, these tools can exhibit bias. For example, an AI tool could be developed to detect disease in chest films. ②

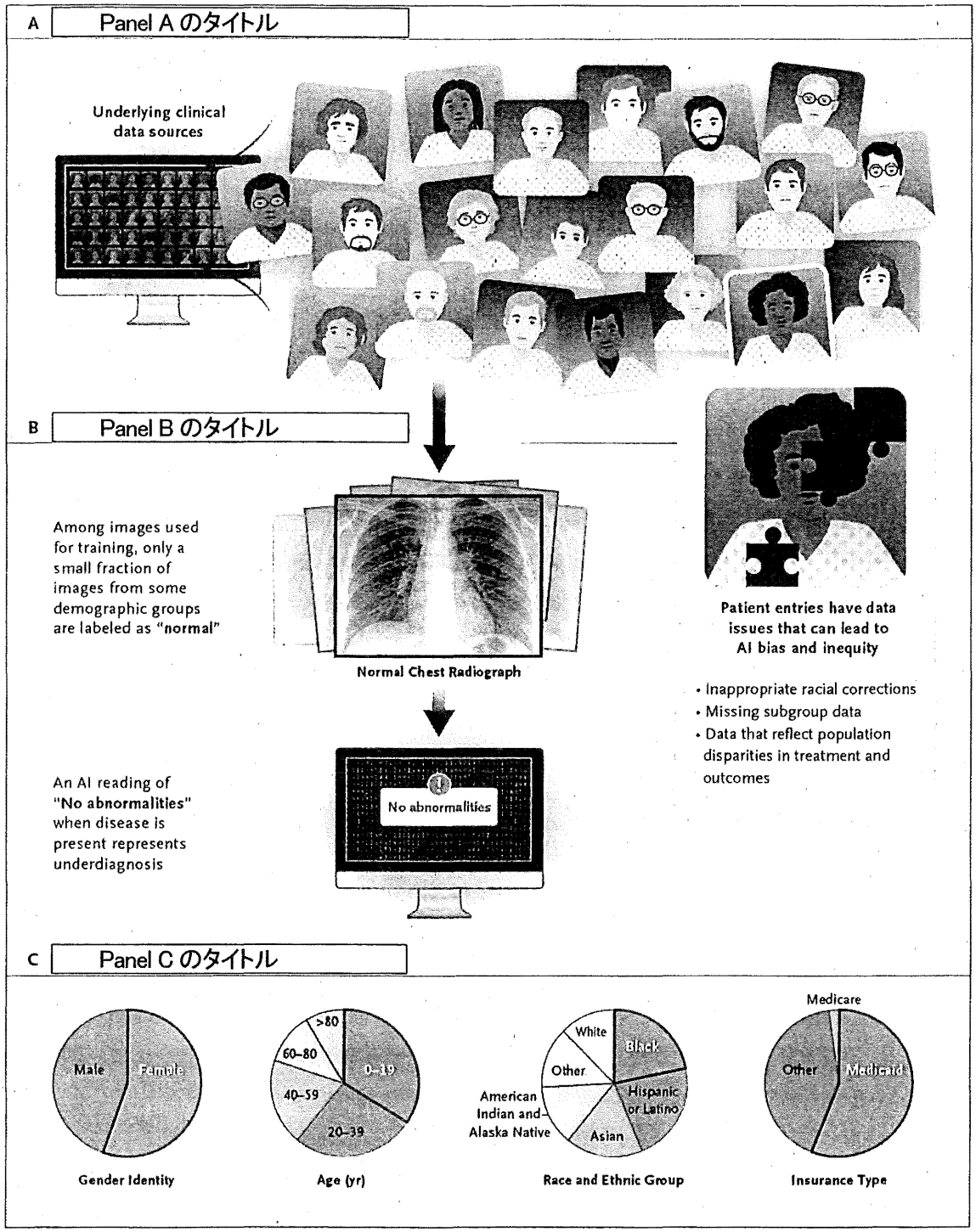
Ideally, this tool would be highly accurate at identifying disease, and it would also be accurate for everyone. However, ③ the tool would become biased if the training data included a preponderance of* images with particular characteristics, such as chests of a certain size or shape or a pattern of difference in the way that the images were marked as showing or not showing disease.

This example is rooted in reality. Medical AI tools, like other AI applications, can become biased because of biases, both known and unknown, in the training data, and the bias may reflect societal inequities. A recent article exploring the use of AI to diagnose disease on the basis of chest images noted that even when trained with data sets of thousands of images, the AI model exhibited a pattern of underdiagnosis in underserved* and racial and ethnic minority groups. This pattern was especially glaring in intersectional groups such as Black and Hispanic women. A medical AI tool like this one is not only biased but is also a source of health inequity because there are already unjust health disparities* in underserved and racial and ethnic minority groups (Figure 1). For example, in the United States, Black persons are less likely than White persons to receive an early diagnosis of lung cancer.

In this example, ④ AI bias, which is also referred to as algorithmic bias, is consequential because it can lead to algorithmic discrimination. The White House Office of Science and Technology Policy recently identified algorithmic discrimination as a key issue in its Blueprint* for an AI Bill of Rights. Research and scholarly communities also recognize the potential for AI bias to become algorithmic discrimination. Some have offered technical solutions such as attempting to fix biased clinical data used for AI training. One way to fix training data is to include demographically representative data sets by bringing together, or "federating*," data from various clinical institutions. Other solutions include artificially creating demographic* diversity by imputing* data that are missing from some demographic categories or by creating new synthetic data where data do not exist. Efforts are also under way to create new, diverse, and representative data sets for AI by including in the data sets a broad diversity of people rather than artificially creating diverse data or patching different data sets together. The National Institutes

of Health recently launched the Bridge2AI program, a $130 million effort to build, from the ground up, diverse data sets that can be used to train and build new medical AI tools.

Figure 1



出典；The New England Journal of Medicine, 389(9): 833, 2023.より抜粋、一部改変

(図の説明文)

Figure 1. Bias in Medical AI.

The use of AI in a health-related risk or outcome prediction task (in this case, detection of disease in chest radiographs in underserved patient populations) described by Seyyed-Kalantari et al. is shown. As shown in Panel A, data are first extracted from clinical sources that reflect the contexts in which the data were acquired and recorded. Human biases, device-related biases (e.g., pulse oximetry showing incorrect blood oxygenation in patients with dark skin), and systemic* biases from these sources are reflected in the data. As shown in Panel B, models are trained to maximize overall performance, which may result in benefit to one group at the expense of others. Models may also be unable to capture necessary interaction effects between clinical features and group attributes. As shown in Panel C, model audits* are performed after training to ensure that important metrics, such as the incidence of false positive "underdiagnoses," are not markedly lower in one subgroup than in others. In the pie charts, white letter indicates the greatest incidence of false positive underdiagnoses. Subgroup performance audits are a key first step in revealing underlying* issues that should be addressed before model integration.

[語註]

mimic	模倣する	blueprint	青写真
anomalies	異常	federating	連結すること
skewed	歪められた	demographic	人口統計
preponderance of	圧倒的多数の	imputing	補完すること
underserved	十分なサービスを受けていない	systemic	体系的な
		audits	監査
disparities	不平等	underlying	根本的な

問１．　下線部①に関して、本文中で使われているAIとは何の略称か。英語とその日本語訳を答えなさい。

問２．　②の部位には以下のア～ウの三文が入る。この三つの文を適切な順序に並べなさい。

ア．The AI would learn to identify diseases from these images.

イ．The tool would be trained with the use of a data set composed of thousands of images of chest films with or without disease.

ウ．When shown a new image, the AI tool would be able to determine whether evidence of disease was present on the chest radiograph.

問３．　下線部③を日本語に訳しなさい。

問４．　下線部④の解決策として本文にはいくつか具体例が述べられている。そのうちの一つを挙げ、日本語で答えなさい。

問５．　Figure 1 内の Panel A、Panel B、Panel C のタイトルとして最も適切なものをそれぞれ選択肢ア～コから選びなさい。

ア．Model training

イ．Data extraction

ウ．Ensuring important metrics

エ．Data acquisition and recording

オ．Maximizing overall performance

カ．Capturing necessary interaction effects

キ．Human, device-related, and systemic biases

ク．Benefit of one group and the expense of others

ケ．Distribution of underdiagnoses in demographic groups

コ．Subgroup performance audits as a key first step in revealing underlying issues

問６．　医療における AI の活用は無限の可能性がある一方、本文のようにデメリットや注意点も存在する。医療における AI 活用に対し賛成か反対か述べた上で、そのメリットとデメリットを挙げ、本文中には例示されていないあなたの考えを句読点を含め 400 字以内の日本語で述べなさい。