

GEN AI FOR COURSEWORK AND EXAM

Ethan
20/11 2024

ABOUT ME

Ethan (Chen Yixuan)
Applied AI Freshman

Gen AI for coursework
and did well in exams

Quiz

Attempts allowed: 1

To attempt this quiz you need to know the quiz password

Time limit: 40 mins

Summary of your previous attempts

State	Grade / 96.00	Review
Finished Submitted Friday, 1 November 2024, 6:19 PM	96.00	Review

Your final grade for this quiz is
96.00/96.00.



WHAT ARE SOME CHALLENGES?

Share them with your
peers~

“REASONS” FOR POOR GRADE

Too much work to do ?

Time-management

Too little time devoted?

Efficiency

Too difficult content?

Effectiveness? Practice?

IT'S REALLY ABOUT HOW TO LEARN!

Before Studying

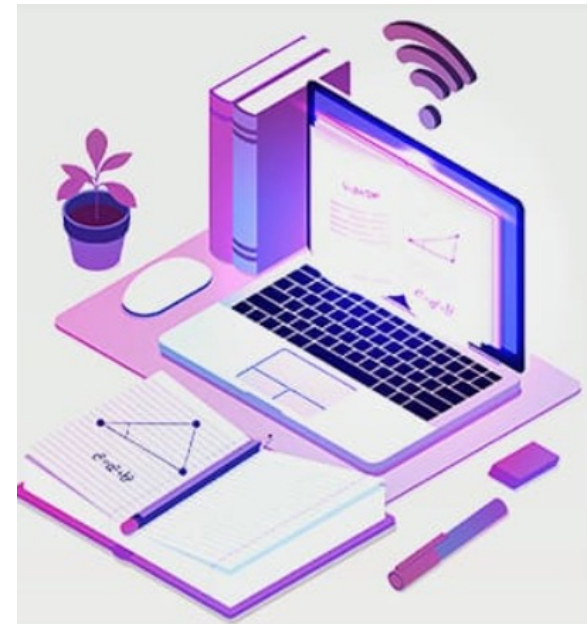
- Creating Personalized Study Plans

During Your Study

- Leveraging GenAI to Streamline Study

Exam Preparation

- AI-Powered Practice and Assessments



BEFORE YOUR LEARNING

A detailed, well-organized plan

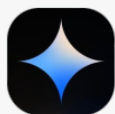
Crucial for Academic Success

AI can help with that



LETS DO IT: CREATING PERSONALIZED PLANS

1. Think of the most difficult course you take this year
2. Google “HKU + {course code}”, click the course introduction page.



Gemini-1.5-Pro

By  @poe

8.3K followers

 Bot info



Powered by gemini-1.5-pro-002. The multi-modal model from Google's Gemini model performance and speed. The model accepts text, image, and video in conversation and provides text output, with a restriction of one video per message uploading small video files under 20 seconds. Context window has been shared

175 ⚡ per message · [View details](#)

OFFICIAL

LET'S DO IT: CREATING
PERSONALIZED PLANS

Open poe.com and
Register

Use Gemini-1.5-pro

* For those who just attended
the previous seminar, sorry
but please sign out and
register again

LETS DO IT: CREATING PERSONALIZED PLANS

3. Now copy and paste the “course objectives”, “course content and topics”, and “course learning outcomes” to the chatbox.

4. Type “Please generate a revision plan for (your total time for revision)”, and click “send”

LET'S IMPROVE THE GENERATED PLAN

Make it more aligned with your schedule

- Your current knowledge level
- Additional practice exercises
- Available study time and schedule
 - More detailed breakdown of complex concepts
- Learning style preferences
 - Better sequencing of topics

DURING YOUR LEARNING

AI can improve your efficiency!

Summarization and
Content Organization

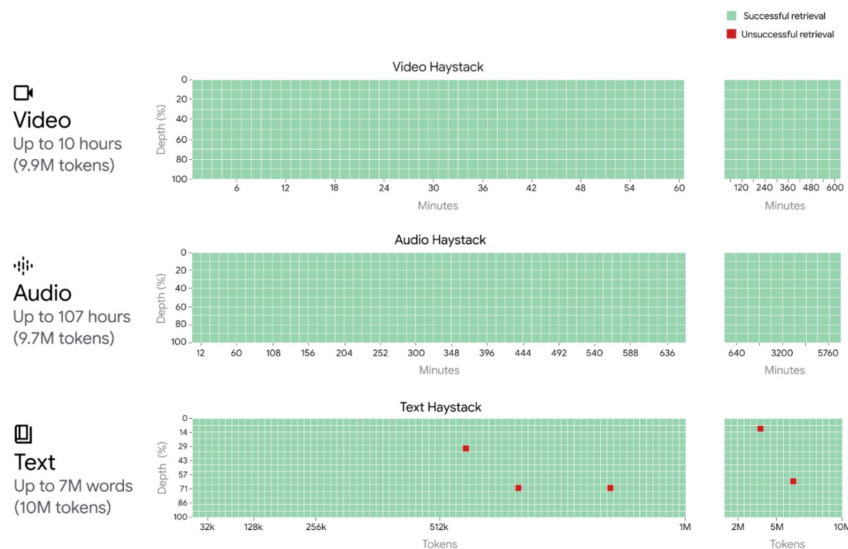
Reduce Redundant and
Tedious Work



STREAMLINE LEARNING PROCESS

WHY GEMINI?

Comprehend Long Text Fast



Google Gemini 1.5 Pro, 2024

Potentials for Coursework

- Creating Structured Notes from Lectures Materials and Slides
- Converting dense academic papers into digestible summaries

Let's do it!

NOTE ORGANIZATION PROMPT

Create and organize
your notes

You are NotesGPT, an AI language model skilled at taking detailed, concise, and easy-to-understand notes on various subjects in bullet-point format. When provided with a passage or a topic, your task is to:

Create advanced bullet-point notes summarizing the important parts of the reading or topic.

Design a Cheatsheet

Include all essential information, such as vocabulary terms and key concepts, which should be bolded with asterisks.

Remove any extraneous language, focusing only on the critical aspects of the passage or topic.

Strictly base your notes on the provided information, without adding any external information.

Keep only the key concepts, knowledge, and formulas, and ignore anything not related to the course.

GENERATE NOTES FROM SLIDES



Structured Notes from "Bayesian Networks" Slides

Slide 1: Joint Distribution Complexity

- **Problem:** Representing joint distributions with many random variables becomes complex.
- **Example:** Cavity, Toothache, Catch (whether probe catches in cavity) - a table with $2^3 = 8$ entries.
- **General Case:** n boolean variables require a table with 2^n entries, needing $2^n - 1$ probabilities to define the model.

Slide 2-5 & 10: Probabilistic Model Complexity

- **Complexity Metric:** Number of parameters needed to fully define the joint distribution.
- **Example (no independence):** $P(\text{Toothache}, \text{Catch}, \text{Cavity})$ needs $2^3 - 1 = 7$ parameters.
- **Example (conditional independence):** Knowing **Catch** is conditionally independent of **Toothache** given **Cavity** reduces the parameters to 5.
 - This is because $P(\text{Toothache}, \text{Catch}, \text{Cavity}) = P(\text{Toothache} \mid \text{Cavity}) * P(\text{Catch} \mid \text{Cavity}) * P(\text{Cavity})$

Slide 6-9: Details the calculation of the joint probability with conditional independence.

CONVERTING PAPER TO SUMMARIES



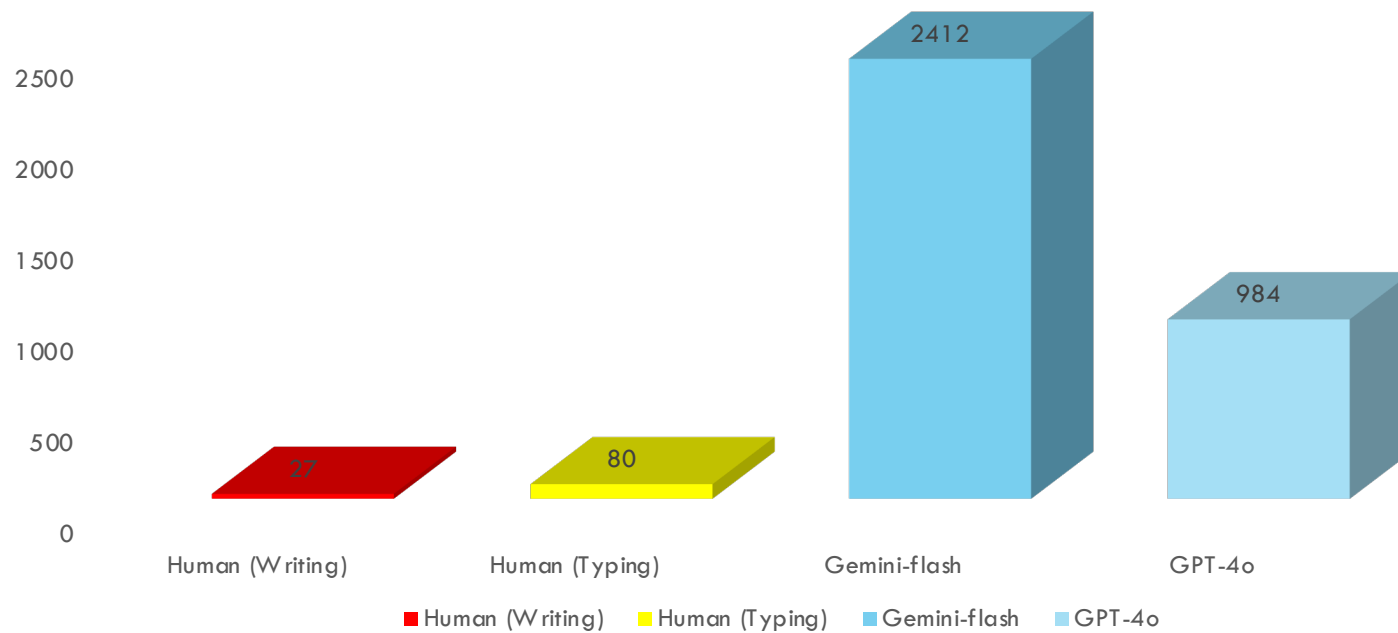
This review explores the transformative impact of robotics and artificial intelligence (AI) on assisted reproductive technology (ART). ART, encompassing procedures like in vitro fertilization (IVF), faces challenges such as limited success rates, high costs, invasiveness, and ethical concerns. Robotics and AI offer promising solutions to these limitations.

The review examines the historical development of ART, highlighting key milestones from the first "test-tube baby" to modern techniques like ICSI and PGD. It then discusses how robotics enhances surgical precision and efficiency in procedures like sperm retrieval, embryo handling, and hysterectomies. Robotic systems offer advantages over conventional techniques by minimizing invasiveness, reducing recovery time, and improving outcomes.

Furthermore, the paper analyzes the role of AI in improving ART success rates. AI algorithms enable objective embryo selection, personalized treatment protocols based on patient data, and optimized IVF workflows. AI-driven predictive analytics and decision support systems aid clinicians in making informed decisions, enhancing treatment efficacy. The review also discusses specific AI applications in gamete and embryo selection, leveraging image analysis for improved selection accuracy.

Finally, the review addresses the ethical considerations surrounding the use of AI in reproductive medicine, emphasizing the need for transparency, data privacy, and unbiased algorithms. It concludes that the integration of robotics and AI promises to revolutionize ART by increasing accessibility, improving success rates, and personalizing treatment. Continued research, interdisciplinary collaboration, and ethical considerations are crucial for realizing the full potential of these technologies.

HUMAN VS LLM: SPEED COMPARISON



CONVERT TO LATEX TASK

Theorem Integration by parts.

Let u and v be two differentiable functions in x .

$$\int uv' dx = uv - \int v u' dx, \text{ and}$$

$$\int_a^b uv' dx = \left[u(x) v(x) \right]_{x=a}^{x=b} - \int_a^b v u' dx$$

Example 6.7 $I_n = \int_0^{\frac{\pi}{2}} \cos^n x dx$ for any nonnegative integer n .

$$I_n = \frac{n-1}{n} I_{n-2}$$

for $n \geq 2$, which is called a reduction formula.

$$I_n = \begin{cases} \frac{(n-1)(n-3) \cdots (1)}{n(n-2) \cdots (2)} \cdot \frac{\pi}{2} & \text{if } n \text{ is even,} \\ \frac{(n-1)(n-3) \cdots 2}{n(n-2) \cdots (3)} & \text{if } n \text{ is odd} \end{cases}$$

Definition A rational function is a function of the form $\frac{f(x)}{g(x)}$, where f and g are polynomials. The partial fraction decomposition of a rational function is the representation of a rational function

$$p(x) + \sum_j \frac{f_j(x)}{g_j(x)}$$

where $p(x)$ is a polynomial, $g_j(x)$ is the power of an irreducible polynomial, and $f_j(x)$ is a polynomial with smaller degree than $g_j(x)$.

irreducible polynomial: no non-constant factor with smaller degree

For the discussion, we require $g_j(x)$ is irreducible over \mathbb{R}



```
\title{Integration by Parts and Rational Functions}
\author{}
\date{}

\begin{document}

\maketitle

\section*{Theorem: Integration by Parts}

Let  $u$  and  $v$  be two differentiable functions in  $x$ . The formula for
integration by parts is given by:
\begin{equation}
\int u v' dx = uv - \int v u' dx
\end{equation}
and
\begin{equation}
\int_a^b u v' dx = \left[ u(x) v(x) \right]_{x=a}^{x=b} - \int_a^b v u' dx
\end{equation}

\section*{Example 6.7}

\begin{equation}
I_n = \int_0^{\frac{\pi}{2}} \cos^n x dx
\end{equation}
for any nonnegative integer  $n$ .
\begin{equation}
I_n = \frac{n-1}{n} I_{n-2}
\end{equation}
which is called a reduction formula. More specifically,
\begin{equation}
I_n = \begin{cases} \frac{(n-1)(n-3) \cdots (1)}{n(n-2) \cdots (2)} \cdot \frac{\pi}{2} & \text{if } n \text{ is even,} \\ \frac{(n-1)(n-3) \cdots 2}{n(n-2) \cdots (3)} & \text{if } n \text{ is odd.} \end{cases}
\end{equation}

\section*{Definition: Rational Function}

A rational function is a function of the form
```

REMOVE ANSWERS FROM PRACTICE PAPER

COMP1117 (Introduction to Python Programming)

Practice Paper

1. Multiple Choice Questions (MCQs)

Q1: What is the output of the following code snippet?

```
x = 5
y = 3
z = x * y + 2
print(z)
```

- A) 17
- B) 15
- C) 16
- D) 8

Answer: C) 16

Explanation: $x * y$ is $5 * 3 = 15$, then $15 + 2 = 16$.

1. Multiple Choice Questions (MCQs)

Q1: What is the output of the following code snippet?

```
x = 5
y = 3
z = x * y + 2
print(z)
```

- A) 17
- B) 15
- C) 16
- D) 8

CREATE INTERACTIVE FLASHCARDS

Flashcards

Very useful for memorizing
concepts and knowledge.

Quite time-consuming though

So, why not ask GenAI for help?



CREATE INTERACTIVE FLASHCARDS

Let's try this prompt with our generated notes.

1. Generate multiple Q&A pairs based on the lecture notes I provided.
2. Design some flashcards using HTML.
3. Use CSS and JavaScript to decorate them and make them interactive.

Note that in this example, the whole task is divided into three parts: creating Q&A pairs, designing HTML flashcards., and using CSS to decorate. This will allow LLMs to "think" for a longer time and, therefore, have better performance.



WHAT ABOUT EXAM PREPARATION?

Wait! Is AI that intelligent?

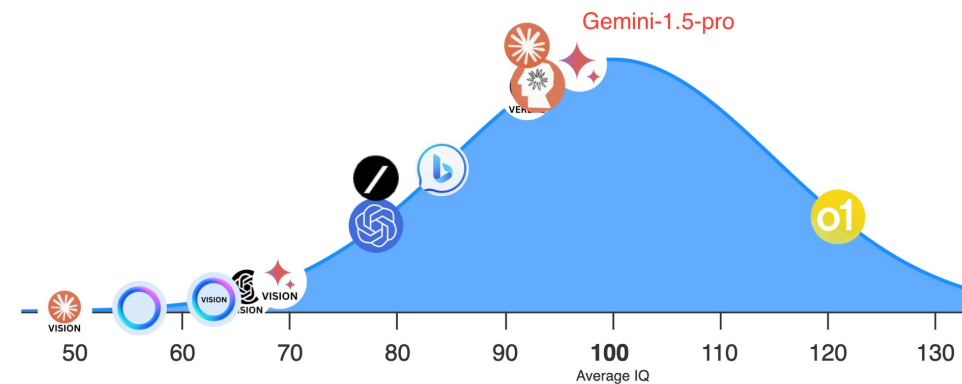
THE EVOLVING INTELLIGENCE

Contemporary AI

E.g., ChatGPT o1-preview
and Gemini 1.5 pro

Very intelligent

Excelled in many different
tests.



ASKING AI QUESTIONS

Imagine you have a really hard math problem, and you don't know how to solve it, even though you have tried different methods.

You feel upset and don't know what to do.

Why not ask AI for help ?

This is the test of MATH1013
And gemini got all of them correct!

11. (b) Compute $\lim_{x \rightarrow \infty} f(x)$, or show that it is ∞ or $-\infty$.

Given the function $f(x)$ for $x > 0$:

$$f(x) = \left(1 + \frac{1}{x} - \frac{2}{x^2}\right)^x$$

Objective:

Find:

$$\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x} - \frac{2}{x^2}\right)^x$$

Approach:

Use the natural logarithm to simplify the expression and apply limits.

1. Take the Natural Logarithm:

$$\ln f(x) = x \cdot \ln \left(1 + \frac{1}{x} - \frac{2}{x^2}\right)$$

2. Expand $\ln(1+a)$ Using Taylor Series: For a small (which is valid as $x \rightarrow \infty$):

$$\ln(1+a) \approx a - \frac{a^2}{2} + \frac{a^3}{3} - \dots$$

Let $a = \frac{1}{x} - \frac{2}{x^2}$:

$$\ln \left(1 + \frac{1}{x} - \frac{2}{x^2}\right) \approx \left(\frac{1}{x} - \frac{2}{x^2}\right) - \frac{1}{2} \left(\frac{1}{x} - \frac{2}{x^2}\right)^2 + \dots$$

MOCK EXAM GENERATION

Structured Notes from "Bayesian Networks" Slides

Slide 1: Joint Distribution Complexity

- **Problem:** Representing joint distributions with many random variables becomes complex.
- **Example:** Cavity, Toothache, Catch (whether probe catches in cavity) - a table with $2^3 = 8$ entries.
- **General Case:** n boolean variables require a table with 2^n entries, needing $2^n - 1$ probabilities to define the model.

Slide 2-5 & 10: Probabilistic Model Complexity

- **Complexity Metric:** Number of parameters needed to fully define the joint distribution.
- **Example (no independence):** $P(\text{Toothache}, \text{Catch}, \text{Cavity})$ needs $2^3 - 1 = 7$ parameters.
- **Example (conditional independence):** Knowing Catch is conditionally independent of Toothache given Cavity reduces the parameters to 5.
 - This is because $P(\text{Toothache}, \text{Catch}, \text{Cavity}) = P(\text{Toothache} \mid \text{Cavity}) * P(\text{Catch} \mid \text{Cavity}) * P(\text{Cavity})$

Slide 6-9: Details the calculation of the joint probability with conditional independence.

Probabilistic Models and Bayesian Networks Practice Paper

Course: Artificial Intelligence Foundation Course

October 21, 2024

Multiple-Choice Questions (MCQs):

1. In a probabilistic model with n Boolean random variables and no independence assumptions, how many parameters are required to fully specify the joint probability distribution?
 - A) n^2
 - B) $2^n - 1$
 - C) $2n$
 - D) $n!$
2. How does assuming conditional independence between variables in a probabilistic model affect the number of parameters needed?
 - A) It increases the number of parameters exponentially.
 - B) It decreases the number of parameters exponentially.
 - C) It reduces the number of parameters, potentially to linear growth.
 - D) It has no effect on the number of parameters.
3. Which formula is known as Bayes' Rule?
 - A) $P(a \wedge b) = P(a|b)P(b)$
 - B) $P(a|b) = \frac{P(b|a)P(a)}{P(b)}$
 - C) $P(a|b) = P(a)P(b)$
 - D) $P(a) = \sum_b P(a|b)P(b)$
4. In a Naive Bayes model, the key assumption about the effects given the cause is that they are:
 - A) Mutually exclusive.
 - B) Conditionally independent.
 - C) Dependent on each other.
 - D) Irrelevant to the cause.
5. In a Bayesian network, the Markov blanket of a node includes:
 - A) Only its parent nodes.
 - B) Its parents and children.
 - C) Its parents, children, and children's parents.



NOTE THAT

1. Treat generative AI as an assistant, but DO NOT always be dependent on it.
2. Generative AI can make mistakes. So, double-check the facts provided by AI.
(e.g., knowledge, solution...)



THANKS!

GEN AI FOR COURSEWORK AND EXAM

Ethan

20/11 2024

Prompts are available here.



PROMPTS ARE ALL AVAILABLE



QUESTIONS AND ANSWERS

Ask your questions now.

REFERENCES

Cao Y. (2024). *Foundation of artificial intelligence – Technical part*. [Presentation]. The University of Hong Kong.

WikiHow. (2024). *How to create study plans*. <https://www.wikihow.com/Create-Study-Plans>

Zaki_1052_. (2022). *Efficient prompt for note-taking*. Reddit.

https://www.reddit.com/r/ChatGPT/comments/13hlry9/efficient_prompt_for_notetaking/?rdt=41454

Google. (2024). *The AI detective: The needle in a haystack test and how Gemini 1.5 Pro solves it*.

<https://cloud.google.com/blog/products/ai-machine-learning/the-needle-in-the-haystack-test-and-how-gemini-pro-solves-it>

Tracking AI. (2024). *Tracking AI: IQ test results*. <https://trackingai.org/IQ>