

厦大马校物理： 迈向AI时代与国际发展的起点

滨华中学讲座
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物理系学院



XIAMEN UNIVERSITY MALAYSIA

厦門大學 馬來西亞分校



Malaysia's Big Data Analytics (BDA) market is projected to grow from US\$1.1B (2021) to US\$1.9B (2025)



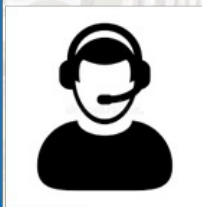
Covid-19 accelerates demand for data and cloud services



Strong government support (talent development)

Malaysia's digital ecosystem is regional base (strategic hub in southeast asia)

Which key sector?



Service



Banking



Telecommunications

Which skill set?



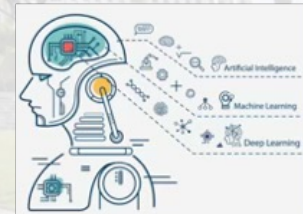
Big Data



Data analytic

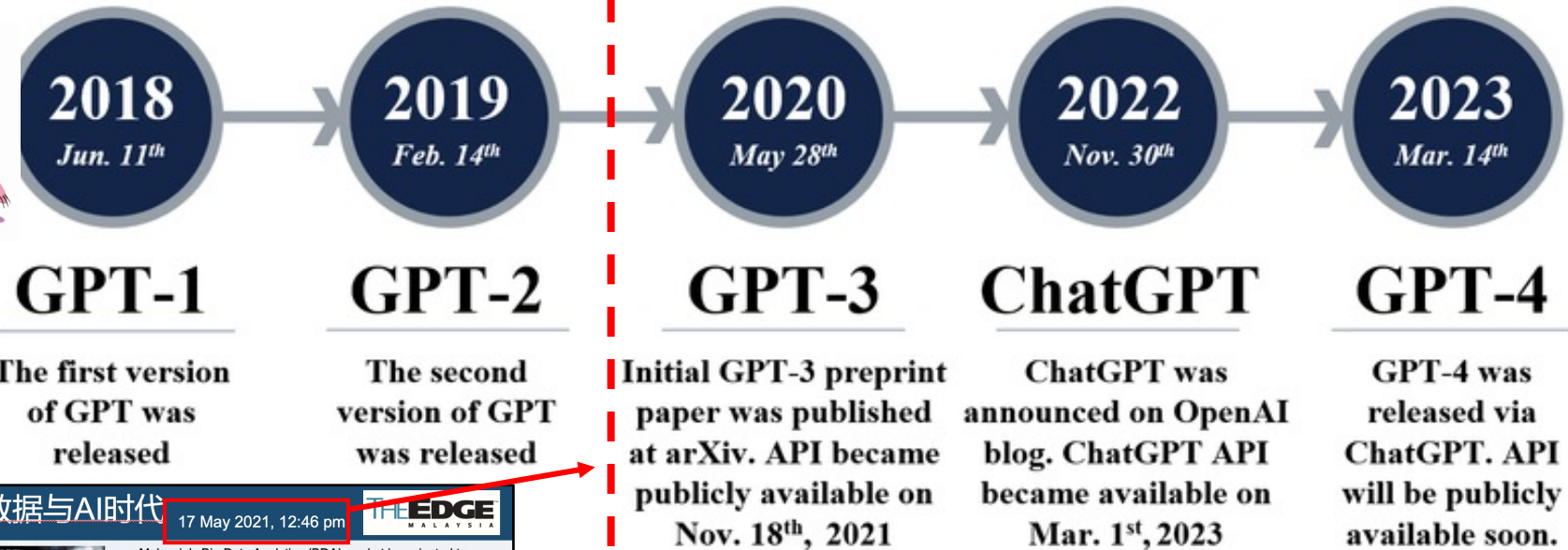


IoT



Data modeling

人工智能爆发时期



马来西亚大数据与AI时代

17 May 2021, 12:46 pm



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Big Data



Data analytic



IoT



Data modeling



[arxiv:2005.14165](https://arxiv.org/abs/2005.14165)



马来西亚的国家发展方向

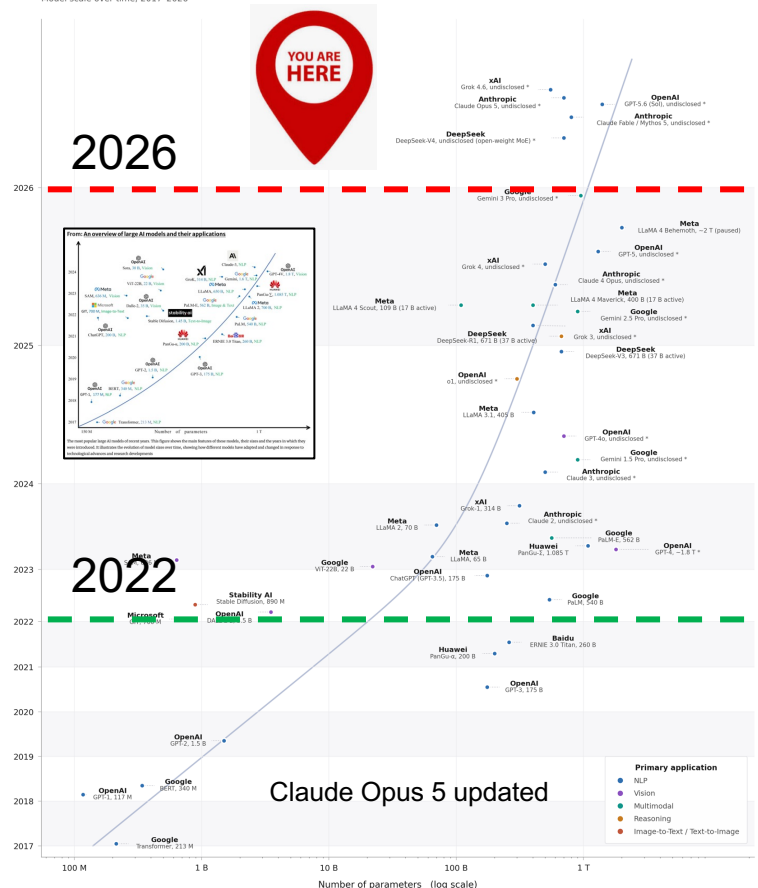


- “AI Nation 2030”人工智能国家愿景：列入第十三大马计划（RMK-13），目标让**人工智能全面融入经济、公共治理与社会生活**。
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- 人才缺口才是真正瓶颈：政策与资金已经到位，**国家真正欠缺的是能够支撑这些计划的人才**。

人工智能爆发时期（现在）

An overview of large AI models and their applications

Model scale over time, 2017-2026

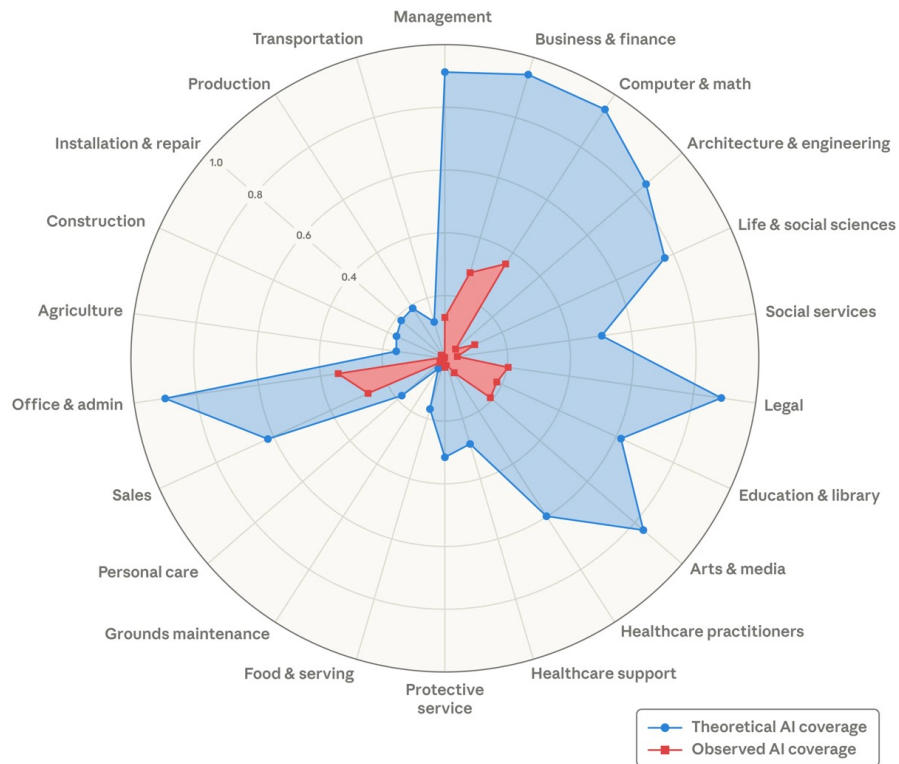


* Parameter count never officially disclosed by the developer. Position reflects a widely reported estimate, not a confirmed specification.
For mixture-of-experts models the total parameter count is plotted; active parameters per token are given in brackets.



人工智能的悖论

Theoretical capability and observed usage by occupational category



- 人工智能正在**重塑各行各业**, 从制造业到金融, 从医疗到教育。
- 但 AI 工具越普及, 行业越需要**能够构建、评估、负责任地应用 AI 的人才**。
- 这些能力的核心, 不是“会用 AI 工具”, 而是:
 - **扎实的数学基础**
 - **严谨的分析思维**
 - **系统性的问题拆解能力**

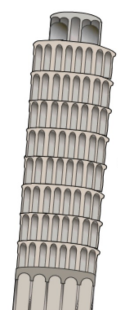
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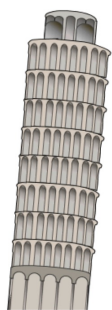
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廈門大學 馬來西亞分校

从现象中寻找规律



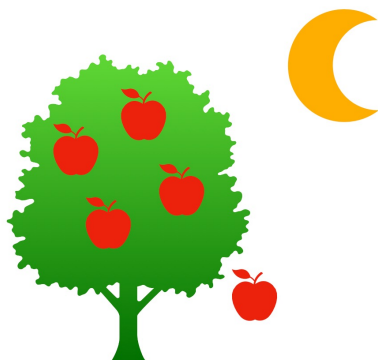
Old idea

亚里斯多德



Galileo

伽利略



牛顿

观察 → 提问 → 简化 → 实验 → 总结归纳成定律

质疑直觉

简化复杂现实

统一不同现象

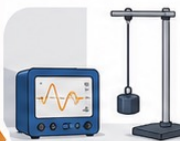
Observed AI coverage

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 - **扎实的数学基础**
 - **严谨的分析思维**
 - **系统性的问题拆解能力**
- **物理训练，正是培养这些能力最直接、最系统的方式。**

物理学真正训练你做什么

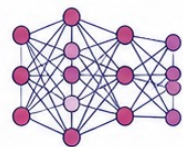
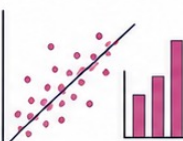


6
TEST, SIMULATE
& MEASURE



Compare predictions
with evidence.

7
ANALYZE DATA
WITH AI



Find patterns and
quantify confidence.

8
REFINE, SOLVE
& INNOVATE



Improve the model,
make decisions
and create.

CORE
SKILLS



Quantitative Thinking



Data Literacy



Computational Thinking

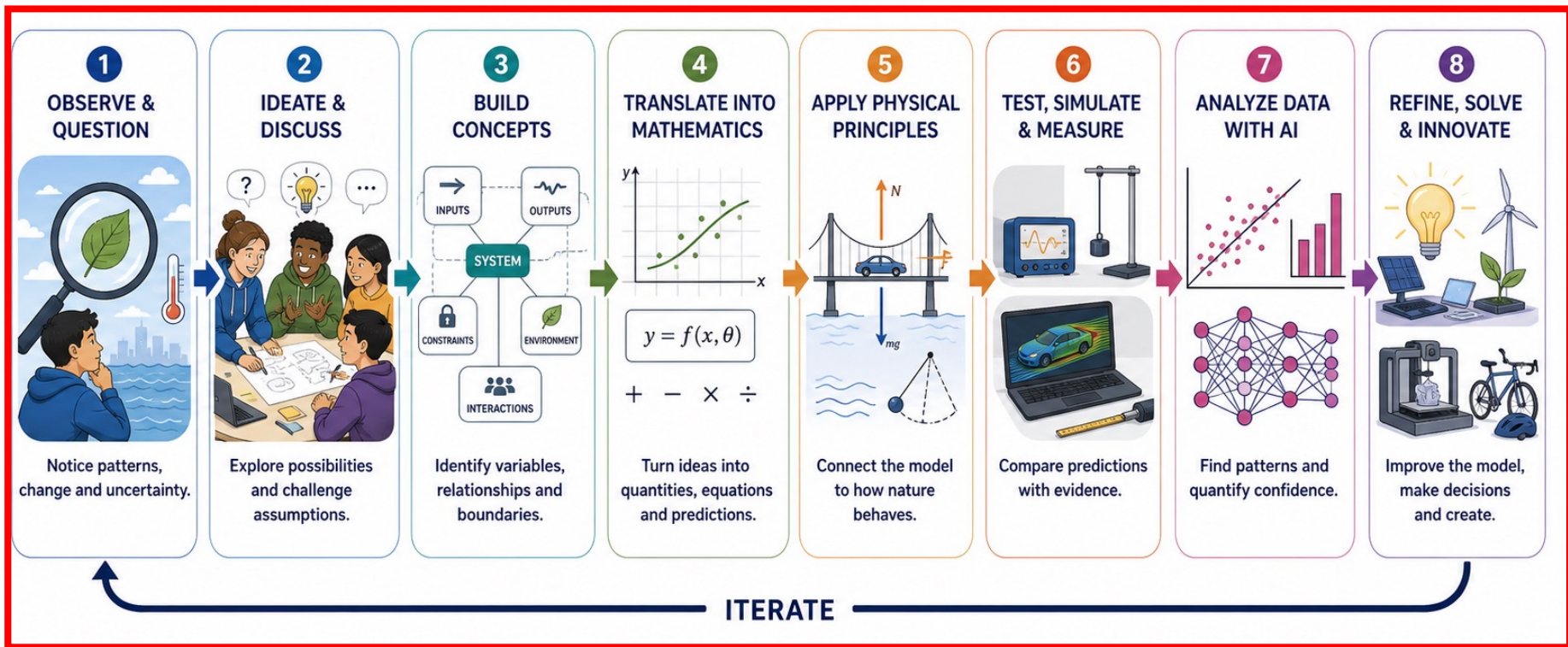


"We live in a society exquisitely dependent on science and technology, in which hardly anyone knows anything about science and technology."

- Carl Sagan

物理学真正训练你做什么

- 物理学从“教科书科目”重新定义为：**解决问题的能力**、**建模能力**、**量化思维能力**。



CORE
SKILLS



Problem Solving



Modelling



Quantitative Thinking



Data Literacy



Computational Thinking

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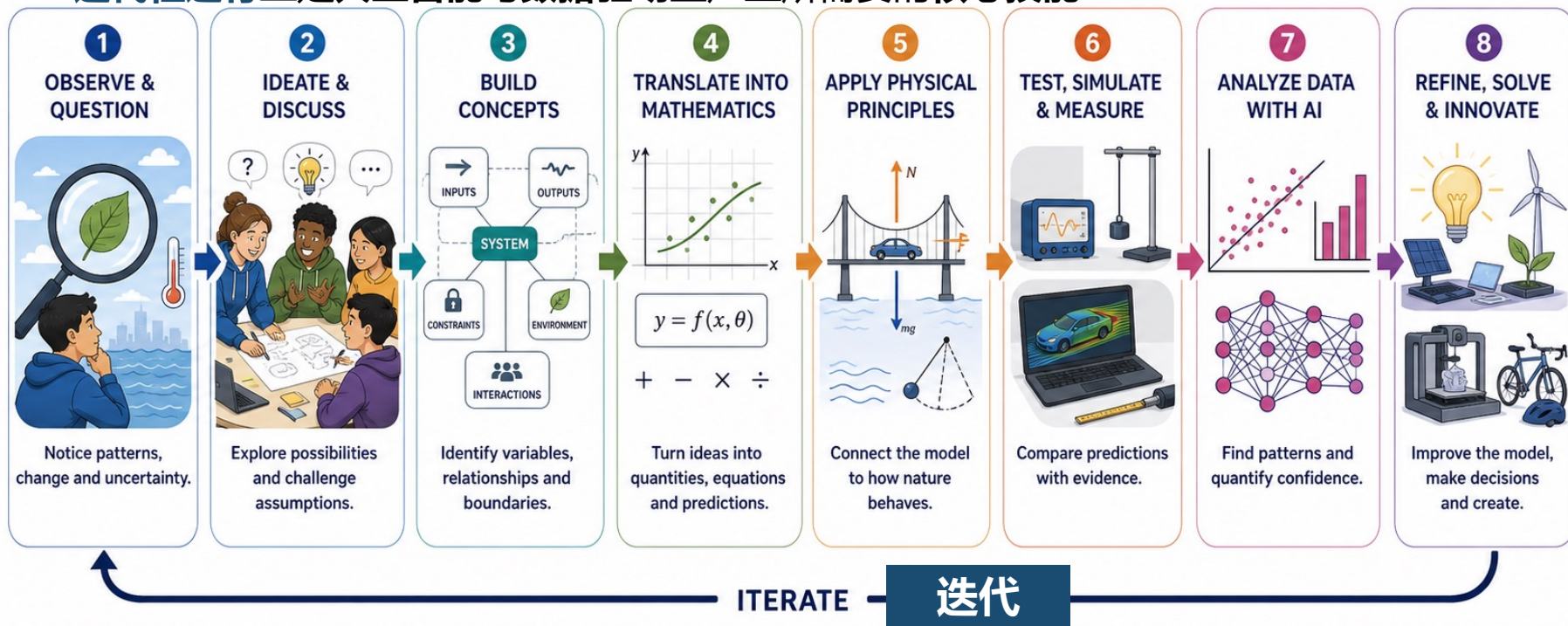
Data Literacy



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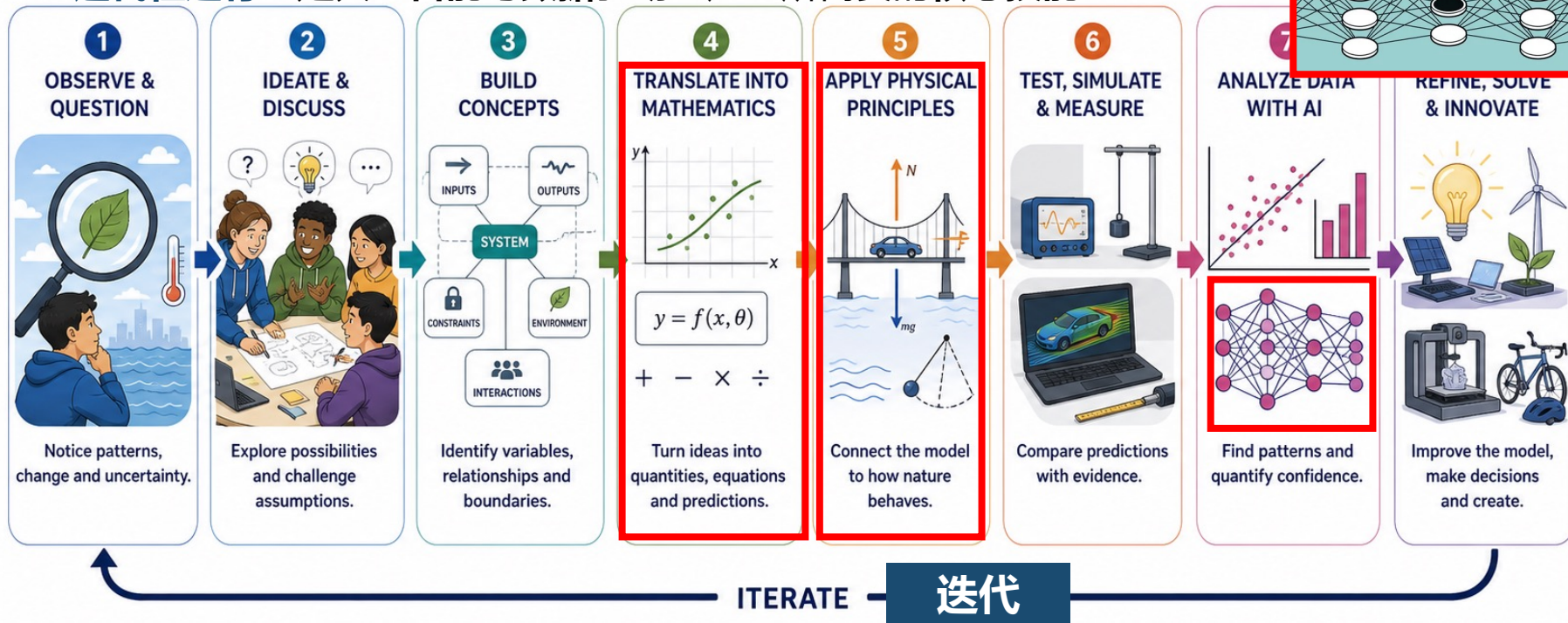
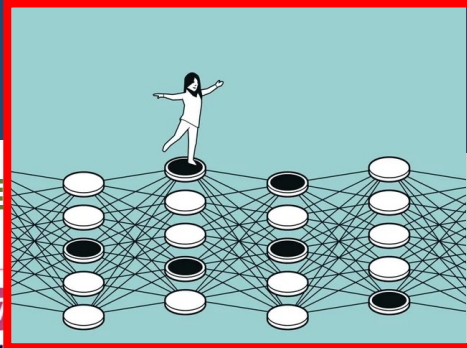
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CORE
SKILLS



Problem Solving



Modelling



Quantitative Thinking

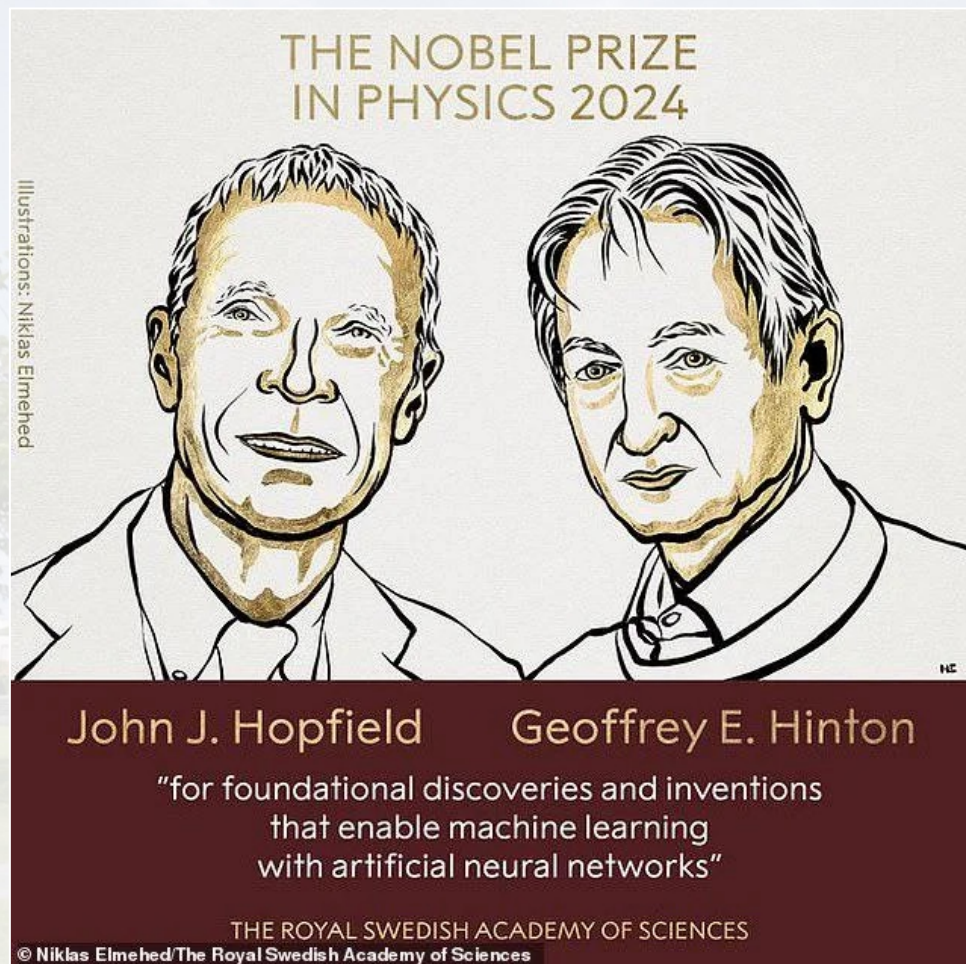


Data Literacy



Computational Thinking

从物理模型到机器学习



- **John Hopfield** used energy landscapes and many-body interactions to develop associative memory networks capable of storing and reconstructing patterns.
- **Geoffrey Hinton** applied statistical physics to develop the Boltzmann machine, enabling neural networks to discover features from data autonomously.
- Together, these breakthroughs laid important foundations for modern machine learning and artificial neural networks.

核心启示：物理学训练的建模、概率、优化与计算思维，正是人工智能时代需要的核心能力。

厦大马校物理系概括



Head of Physics Department



Prof. Ong Chong Kim

Supporting Professors



Prof.
Wang Huiqiong



Prof.
Zheng Jinchun



Prof.
Chen Huanyang

Professors



Prof.
Tomasz Paterek

Associate Professors



Lim Yen Kheng



Kelvin
Ooi Jun Aun



Turgut Yilmaz



Song Kok Wee



Hoh Siew Yan



Yap Seong shan

Assistant Professors



Mohammad
Nizam



Eu Shu Tian



Farahdiana Wan
Yunus



Chung Fei Fang

1. 虽然厦大马校物理系还很年轻，成立不到10年，可是**师资雄厚**。
2. 中国厦门大学本校是**985, 211 双一流高校**，在中国也是名列前茅。
3. 教授们都有**欧美和海外留学**、研究和教学经验。
4. 研究涵盖热门前沿方向，包括**高能物理**、**凝聚态物理**、**量子物理**和**黑洞物理**等等。
5. 课程设计和国际接轨，毕业生前往日本、新加坡、欧美名校深造。

厦大马校物理系



YEAR 1

Foundations: physics, mathematics, programming, modelling

YEAR 2

Foundations + elective research module

YEAR 3

Multidisciplinary electives + Internship (whole semester)

YEAR 4

Multidisciplinary electives + Final Year Project

Strong foundation:
Mechanics, thermal physics,
electrodynamics, quantum

Market readiness:
Modern interdisciplinary curriculum.
Internships.

Problem solvers:
Research modules from 2nd year.
Both on the campus and outside.

Civic-conscious:
Practical applications of physics.
Betterment of society in mind.

厦大马校物理系

YEAR 1 CORE COURSES

No.	Course Name	Course Code	Credit Value
1	Mechanics	PHY101	4
2	Thermal Physics	PHY102	4
3	Electromagnetism	PHY103	4
4	Modern Physics	PHY104	4
5	Physics Lab I	PHY105	1
6	Physics Lab II	PHY106	1
7	Ordinary Differential Equations	PHY107	3

No.	Course Name	Course Code	Credit Value
8	Calculus I	PHY108	4
9	Calculus II	PHY109	4
10	Linear Algebra	BSC124	3
11	Python Programming Language	BSC135	3
12	Probability and Statistics B	BSC126	2

必修课

YEAR 2 CORE COURSES

No.	Course Name	Course Code	Credit Value
1	Theoretical Mechanics	PHY201	4
2	Quantum Mechanics I	PHY202	4
3	Mathematical Methods in Physics I	PHY203	4
4	Electrodynamics I	PHY204	4
5	Principles of Optics	PHY205	4
6	Physics Lab III	PHY211	2
7	Physics Lab IV	PHY212	2
8	Numerical Methods	BSC128	4

+
ELECTIVE COURSES

YEAR 3 CORE COURSES

No.	Course Name	Course Code	Credit Value
1	Thermodynamics and Statistical Physics	PHY301	4

No.	Course Name	Course Code	Credit Value
1	Industrial Training	PHY302	6

+
ELECTIVE COURSES

YEAR 4 CORE COURSES

No.	Course Name	Course Code	Credit Value
1	Final Year Project I	PHY401A	2
2	Final Year Project II	PHY401B	4

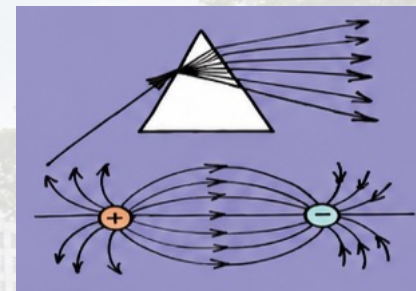
+
ELECTIVE COURSES

CLASSIFICATION OF COURSES

No.	Subject Classification	Credit Value	Percentage (%)
1.	Compulsory Courses(MPU)	10	6.9
2.	Core/Major(s)/Specialisation:		
	• Major Core	53	36.6
	• Projects/thesis /dissertation	6	4.1
	• Common Core	16	11.0
3.	Industrial Training/ Practicum	6	4.1
4.	Optional/ Elective Courses:		
	• Major Elective	36	24.8
	• General Elective	18	12.4
	Total Credit Value	145	100

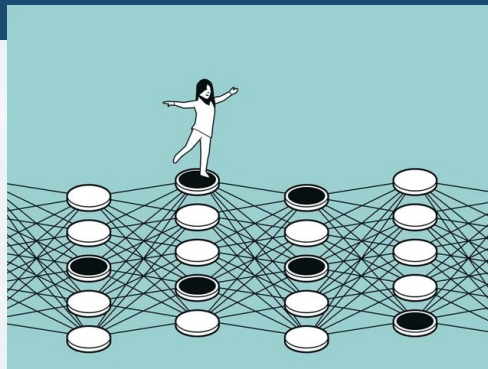
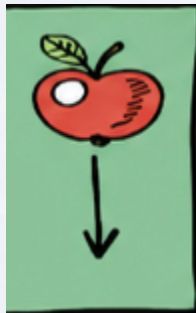
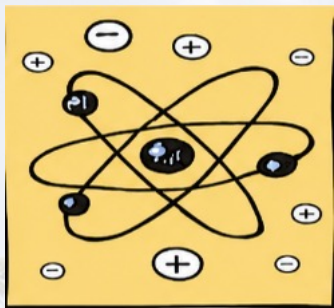


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厦大马校物理系



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XIAMEN
UNIVERSITY
MALAYSIA

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选修课

MAJOR ELECTIVE COURSES (36 CREDITS) - PHYSICS



XIAMEN
UNIVERSITY
MALAYSIA

No.	Course Name	Course Code	Credit Value	No.	Course Name	Course Code	Credit Value
1	Astronomy	PHY208	4	11	Quantum Information	PHY312	4
2	Electronic Circuits	PHY209	4	12	Cosmology	PHY402	4
3	Undergraduate Research I	PHY210	4	13	Nuclear and Particle Physics	PHY403	4
4	Electrodynamics II	PHY305	4	14	Semiconductor Physics and Devices	PHY404	4
5	Solid State Physics	PHY306	4	15	Relativity	PHY405	4
6	Astrophysics	PHY307	4	16	Nanoscience and Nanotechnology	PHY406	4
7	Atomic and Molecular Physics	PHY308	4	17	Machine Learning for Physicists	PHY407	4
8	Photonics and Optoelectronics	PHY309	4	18	Data Intensive Science	PHY408	4
9	Quantum Mechanics II	PHY310	4	19	AI in Quantitative Finance		
10	Mathematical Methods in Physics II	PHY311	4				

Student choose minimum 8 credits (2 courses) from this list

选修课

MAJOR ELECTIVE COURSES (36 CREDITS) - INTERDISCIPLINARY



XIAMEN
UNIVERSITY
MALAYSIA

No.	Course Name	Course Code	Credit Value	No.	Course Name	Course Code	Credit Value
1	Principles of Management	SEM106	4	13	Risk Management	FIN303	4
2	Microeconomics	SEM107	4	14	Global Logistics and Supply Chain Management	IBU304	4
3	Macroeconomics	SEM108	4	15	Probability Theory	MAT107	4
4	Principles of Finance	SEM202	4				
5	Statistics for Business	SEM206	4				
6	Discrete Mathematics	BSC129	4	16	Statistics	MAT203	4
7	Data Structure	CST204	4	17	Differential Geometry of Curves and Surfaces	MAT303	4
8	Digital Logic	CST205	4	18	Differentiable Manifold	MAT306	4
9	Design and Analysis of Algorithms	CST207	4	19	Algebraic and Geometric Topology	MAT307	4
10	Principles of Computer Composition	CST301	4	20	Matrix Groups	MAT308	4
11	Digital Signal Processing	CST304	4	21	Dynamical Systems	MAT312	4
12	Monetary Policy and Financial Supervision	FIN209	4				

A diagram of an atom. At the center is a nucleus containing two blue spheres with '+' signs (protons) and two white spheres with black dots (neutrons). Surrounding the nucleus are three black elliptical orbits. Three small blue spheres with '-' signs (electrons) are positioned on these orbits. The entire diagram is set against a yellow background.



科研起步早:从大二开始的科研机会、本科生科研项目、紧密的导师指导。这是本系区别于纯讲授型课程的特点



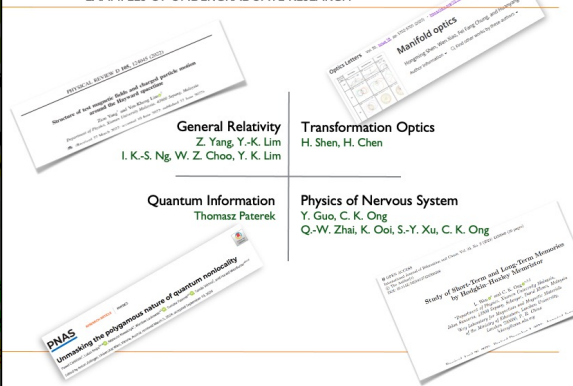
选修课

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(36 CREDITS) - PHYSICS**

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4	Electrodynamics II	PHY305	4	14	Semiconductor Physics and Devices
5	Solid State Physics	PHY306	4	15	Relativity
6	Astrophysics	PHY307	4	16	Nanoscience and Nanotechnology
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Student choose minimum

EXAMPLES OF UNDERGRADUATE RESEARCH



CLASSIFICATION OF COURSES

No.	Subject Classification	Percentage (%)
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	• Major Core	4.1
	• Projects/thesis /dissertation	6.9
		36
		24.8
		18
		12.4
		145
		100

亮点 1

Undergraduate Students Publications

Structure of test magnetic fields and charged particle motion around the Hayward spacetime

- **Ziou Yang** and **Yen-Kheng Lim**, *Physical Review D* 105 124045 (2022)

Nonreciprocal interaction between Lamb waves, shear horizontal waves and spin waves at confined ferromagnetic heterojunction

- [Lim Jing Yi, Ong Chong Kim, Yuping Yao, and Guozhi Chai, J. Magnetism and Magnetic Materials](#)
Vol. 628, (2025) 173120

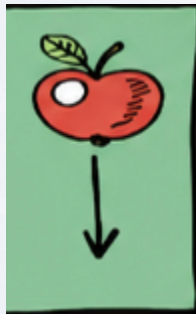
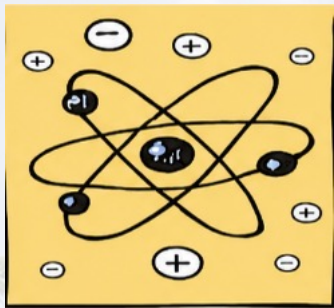
Properties of the magnetic universe with positive cosmological constant

- Yu-Xuan Toh, Yun-Ten Chin, Ethan Guanrun Wu and Yen-Kheng Lim*, *Class. Quantum Grav.* 42 (2025) 177001

Calculation of entanglement entropy of transverse-field ising model from neural network quantum state based on a restricted Boltzmann machine

- **Zhekai Yin, Zixuan Li**, *Fei Fang Chung, Kok Wee Song and C.K. Ong*, Eur. Phys. J. Plus Vol.140, 948 (2025)

9 Publications



<https://ai.gov.my>

- “AI Nation 2030”人工智能国家愿景：列入第十三大马计划（RMK-13），目标让**人工智能全面融入经济、公共治理与社会生活**。
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ES

Credit Value	Percentage (%)
10	6.9
53	36.6
6	4.1
16	11.0
6	4.1
36	24.8

亮点 2

选修课

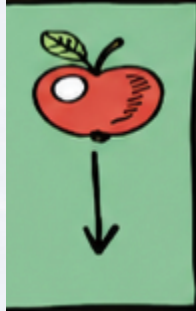
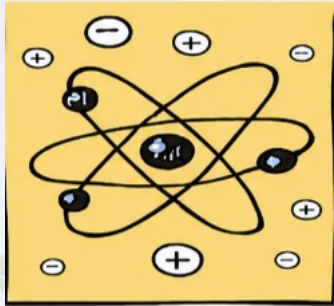
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5	Solid State Physics	PHY306	4	15	Relativity	PHY405	4
6	Astrophysics	PHY307	4	16	Nanoscience and Nanotechnology	PHY406	4
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10	Mathematical Methods in Physics II	PHY311	4				

Student choose minimum 8 credits (2 courses) from this list

(36 CREDITS) - INTERDISCIPLINARY

No.	Course Name	Course Code	Credit Value	No.	Course Name	Course Code	Credit Value
1	Principles of Management	SEM106	4	13	Risk Management	FIN303	4
2	Microeconomics	SEM107	4	14	Global Logistics and Supply Chain Management	IBU304	4
3	Macroeconomics	SEM108	4	15	Probability Theory	MAT107	4
4	Principles of Finance	SEM202	4				
5	Statistics for Business	SEM206	4				
6	Discrete Mathematics	BSC129	4	16	Statistics	MAT203	4
7	Data Structure	CST204	4	17	Differential Geometry of Curves and Surfaces	MAT303	4
8	Digital Logic	CST205	4	18	Differentiable Manifold	MAT306	4
9	Design and Analysis of Algorithms	CST207	4	19	Algebraic and Geometric Topology	MAT307	4
10	Principles of Computer Composition	CST301	4	20	Matrix Groups	MAT308	4
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- “AI Nation 2030”人工智能国家愿景：列入第十三大马计划（RMK-13），目标让**人工智能全面融入经济、公共治理与社会生活**。
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- 人才缺口才是真正瓶颈：政策与资金已经到位，**国家真正欠缺的是能够支撑这些计划的人才**。

<https://ai.gov.my>

Credit Value		Percentage (%)
16	6	1.1
36	18	24.8
18		12.4
145		100

亮点 3

选修课

MAJOR ELECTIVE COURSES (36 CREDITS) - PHYSICS

No.	Course Name	Course Code	Credit Value	No.	Course Name	Course Code	Credit Value
1	Astronomy	PHY208	4	11	Quantum Information	PHY312	4
2	Electronic Circuits	PHY209	4	12	Cosmology	PHY402	4
3	Undergraduate Research I	PHY210	4	13	Nuclear and Particle Physics	PHY403	4
4	Electrodynamics II	PHY305	4	14	Semiconductor Physics and Devices	PHY404	4
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10	Mathematical Methods in Physics II	PHY311	4				

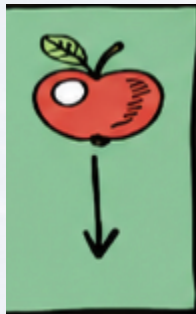
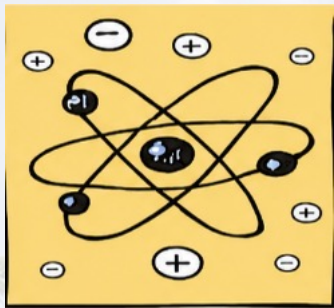
Student choose minimum 8 credits (2 courses) from this list

(36 CREDITS) - INTERDISCIPLINARY

No.	Course Name	Course Code	Credit Value	No.	Course Name	Course Code	Credit Value
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12	Monetary Policy and Financial Supervision	FIN209	4				

亮点 4

多元化的选修课可选。



CLASSIFICATION OF COURSES

No.	Subject Classification	Credit Value	Percentage (%)
1	Compulsory Courses (MPI)	10	6.9
		53	36.6
		6	4.1
		16	11.0
		6	4.1
		36	24.8
		18	12.4
		145	100

选修课

MAJOR ELECTIVE COURSES (36 CREDITS) - PHYSICS



XIAMEN
UNIVERSITY
MALAYSIA

No.	Course Name	Course Code	Credit Value	No.	Course Name	Course Code	Credit Value
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MAJOR ELECTIVE COURSES (36 CREDITS) - INTERDISCIPLINARY

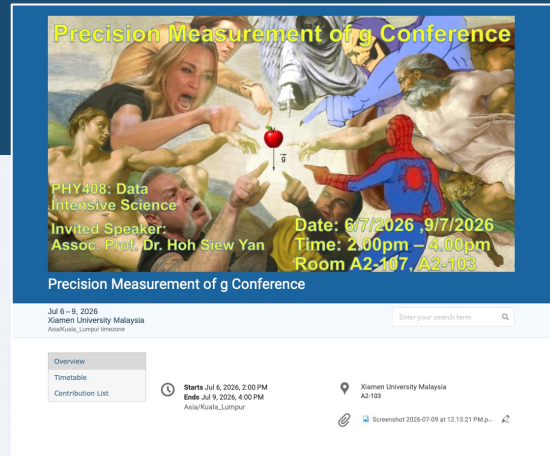


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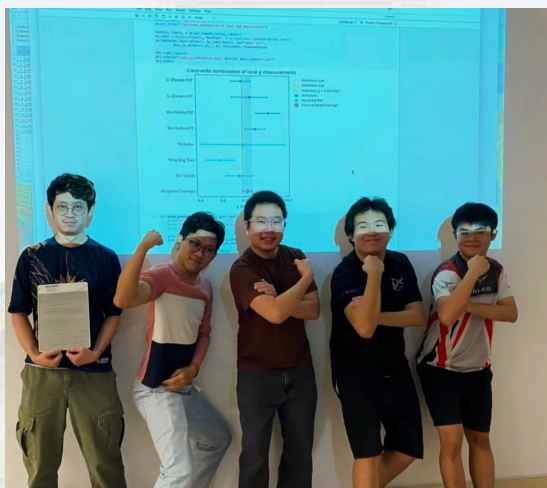
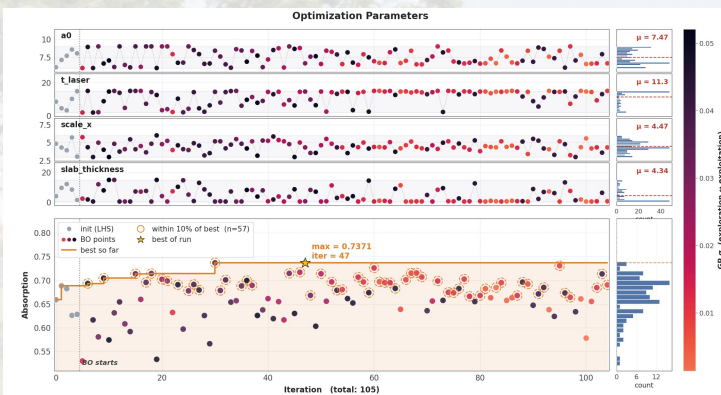
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12	Monetary Policy and Financial Supervision	FIN209	4				

计算能力核心

- 人工智能角度的核心内容（课程与时俱进）：
Python 编程、科学计算、统计学、数据分析、机器学习、等等。
- 这是厦大马分校物理系毕业生区别于普通理工科毕业生的关键优势。

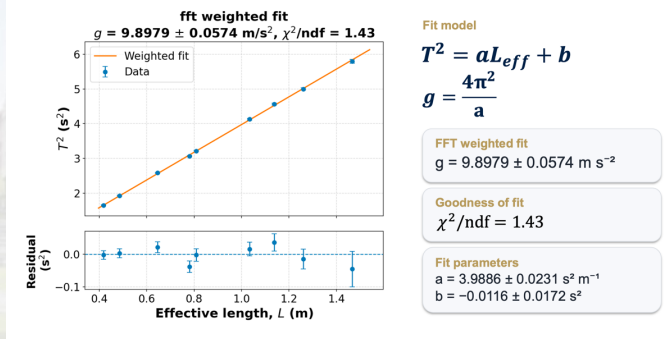


<https://indico-server.pegasus-basilisk.ts.net/event/30/>

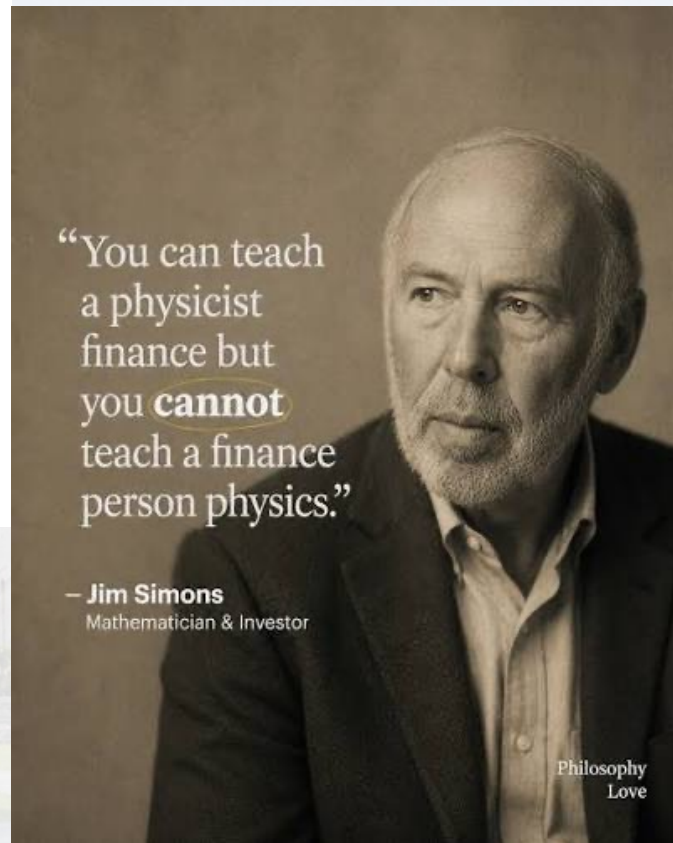
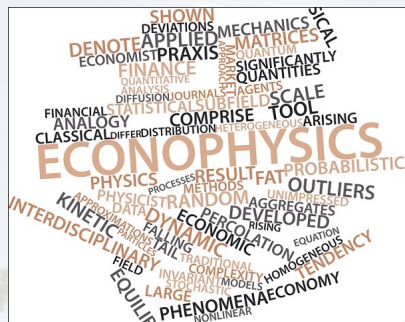


Data Intensive Science

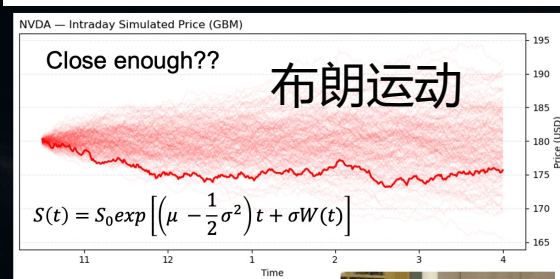
Weighted Linear Fit of T^2 against L_{eff}



Econophysics (经济物理学)



Monte Carlo Simulation



What is next?

Improve your model, run the MC until it matches



量化金融，金融物理

人工智能量化金融

The AI Quant Stack: A Practitioner's Blueprint



厦大马校高能物理研究组



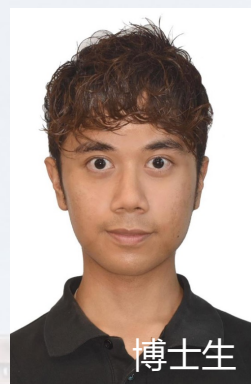
何守仁



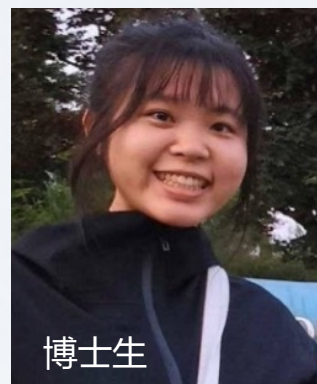
余舒恬



Mohammad Nizam



张嘉毅



Felicia 方婷婷



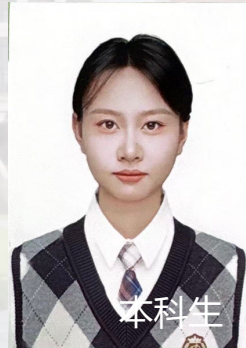
杨景天



刘迪豪



林欣怡



刘子语



李佑樑

毕业生去向:国际发展的起点



Graduates seamlessly transition into top-tier universities

Graduate Outcomes: A Global Footprint

Postgraduate Excellence (Top Global Universities)

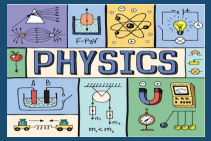


Industry Placement



Student	Status	Country
Yap Jia Cheng	Jiaotong University (School of Physics and Astronomy)	China
Choo Wei Cheng	Zhejiang University (Computer Science)	China
Ong Ming Khai	University of Tübingen (Astro and particle physics)	Germany
Ng Khai Shuen	XMUM (Mathematics)	Malaysia
Zhang Zhirui	Kibing Group	East Malaysia
Wen Lan	NUS	Singapore
Guo Yiming	Lanzhou University	China
Xue Jiaheng	Birmingham university	UK
Yang Ziou	Imperial College	UK
Liu zihao	University of Glasgow	UK
Toh Yu Xuan	XMUM	Malaysia
Yu Tingqiu	Beijing Tsinghua	China
Chen Jiaxin	NUS	Singapore
Aleister	NTU	Taiwan
Darius	NTU	Singapore
Shen Hongming	Duke	USA

More information



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ABOUT ▾ ADMISSIONS ▾ ACADEMICS ▾ RESEARCH & INNOVATION ▾ CAMPUS LIFE ▾ LIBRARY ▾ MORE ▾ 🔍

<https://www.xmu.edu.my/courses/bachelor-science-physics-honours>

**BACHELOR OF SCIENCE IN PHYSICS
(HONOURS)**

[N/0533/6/0001] 03/27 [MQA/FA12947]

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MASTER OF SCIENCE IN PHYSICS

[N/0533/7/0001] 06/30 [MQA/FA16346]

XMUM Launches New Master's Programme in Semiconductor Technology

Published on **July 7, 2025** General Department of Physics

<https://www.xmu.edu.my/general-school-physics/posts/news/xmum-launches-new-masters-programme-semiconductor-technology>



PHYSICS STUDENT COUNCIL
XIAMEN UNIVERSITY MALAYSIA



XIAMEN UNIVERSITY MALAYSIA
廈門大學 馬來西亞分校



**AGE 16-17?
[YOU'RE UP NEXT.]**



NEXT// FRONTIER

2026

QUANTUM, AI & MATERIALS



5 - 6 DEC

(A 2-DAY WEEKEND CAMPUS CAMP)



ACTIVITIES TO EXPECT:

POSTER COMPETITION • STATION GAMES
LECTURER TALKS • STARGAZING

AT RM 170 ONLY!!



SCAN ME!

ACCOMMODATIONS & MEALS INCLUDED

Backup



XIAMEN UNIVERSITY MALAYSIA

廈門大學 馬來西亞分校

为什么人类创造AI?

- 是我们的天性；**理解不确定性**，也是我们的**本能**！
- 我们是具有**生命的计算器**，是凭本能**解决问题的探索者**。

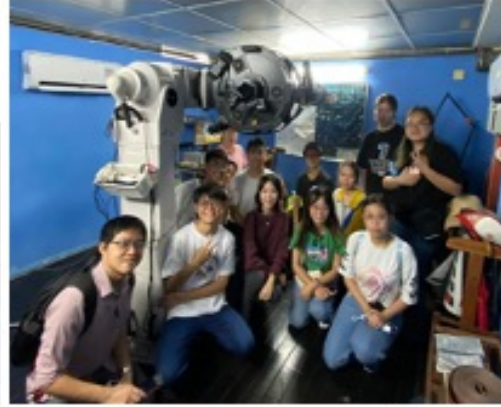


满足口腹之需的食物
(foods for stomach)



满足求知之需的精神食粮
(foods for thoughts)

课堂之外



Astronomical observations
Visiting other units
Conference organisation
Physics competition
Science camps



马来西亚的国家发展方向

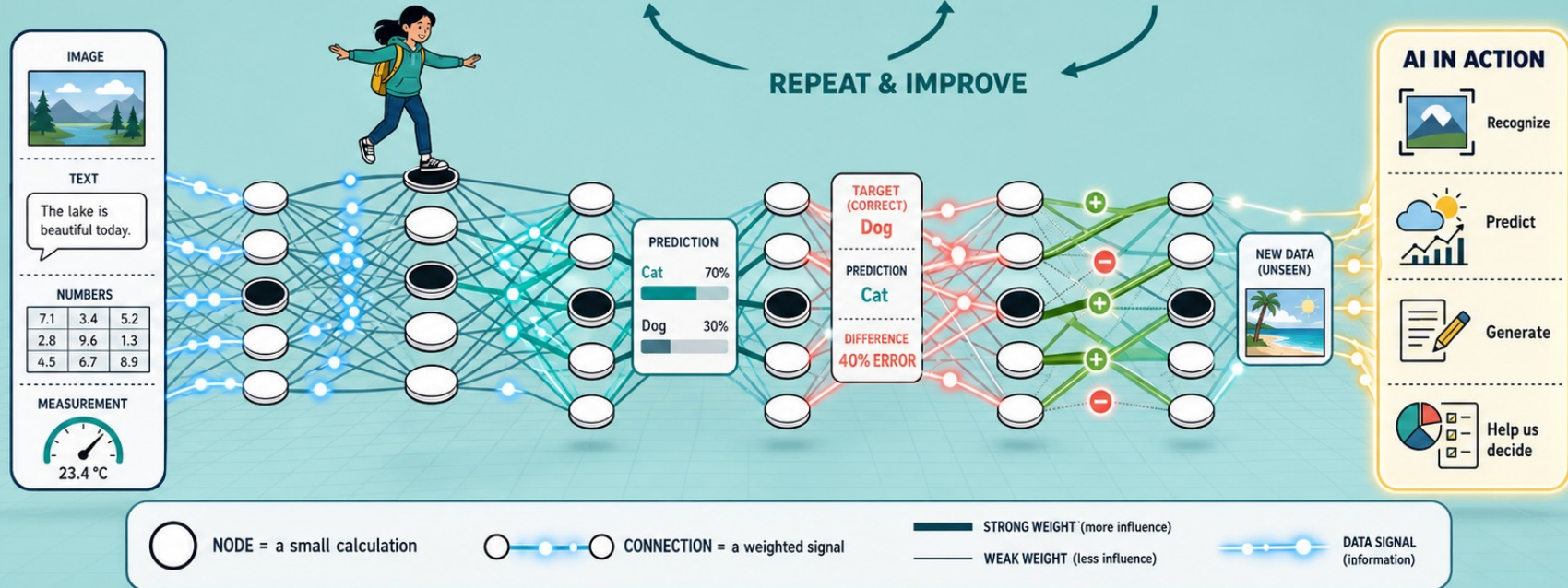


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How Machine Learns

HOW A MACHINE LEARNS

- 1 INPUT DATA**
Images • Text • Numbers • Measurements
- 2 SIGNALS FLOW**
Information moves through connected layers.
- 3 PREDICTION**
The network makes a first guess.
- 4 ERROR**
Compare the guess with the correct answer.
- 5 ADJUST WEIGHTS**
Useful connections strengthen; others weaken.
- 6 TRAINED MODEL**
It can now work with new data.



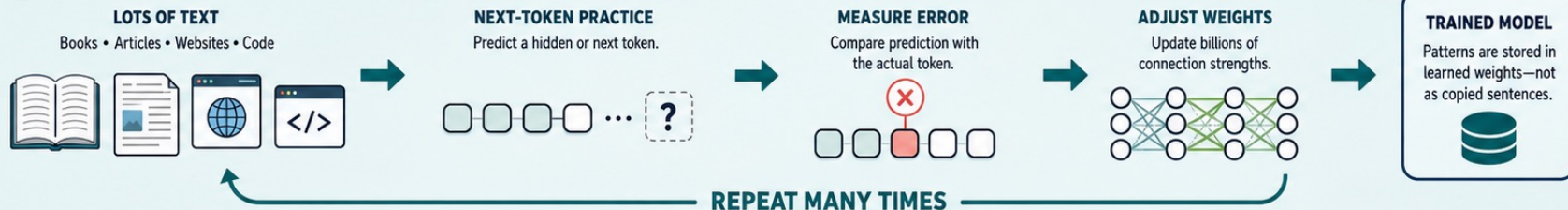
Machine learning is not magic—it learns patterns by **testing**, **measuring error** and **improving**.

How LLM Works

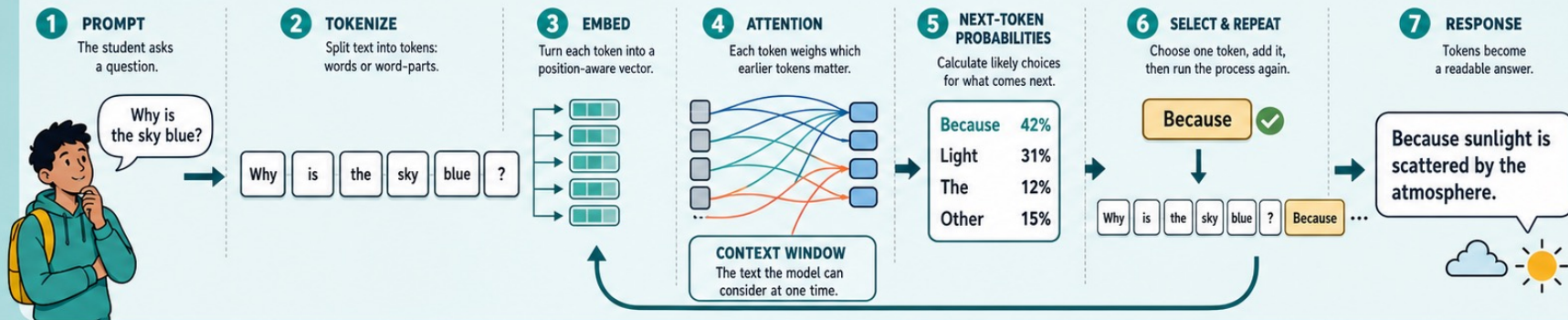
HOW A LARGE LANGUAGE MODEL WORKS

From text patterns to one-token-at-a-time generation

A TRAINING: LEARNING PATTERNS



B GENERATING A RESPONSE



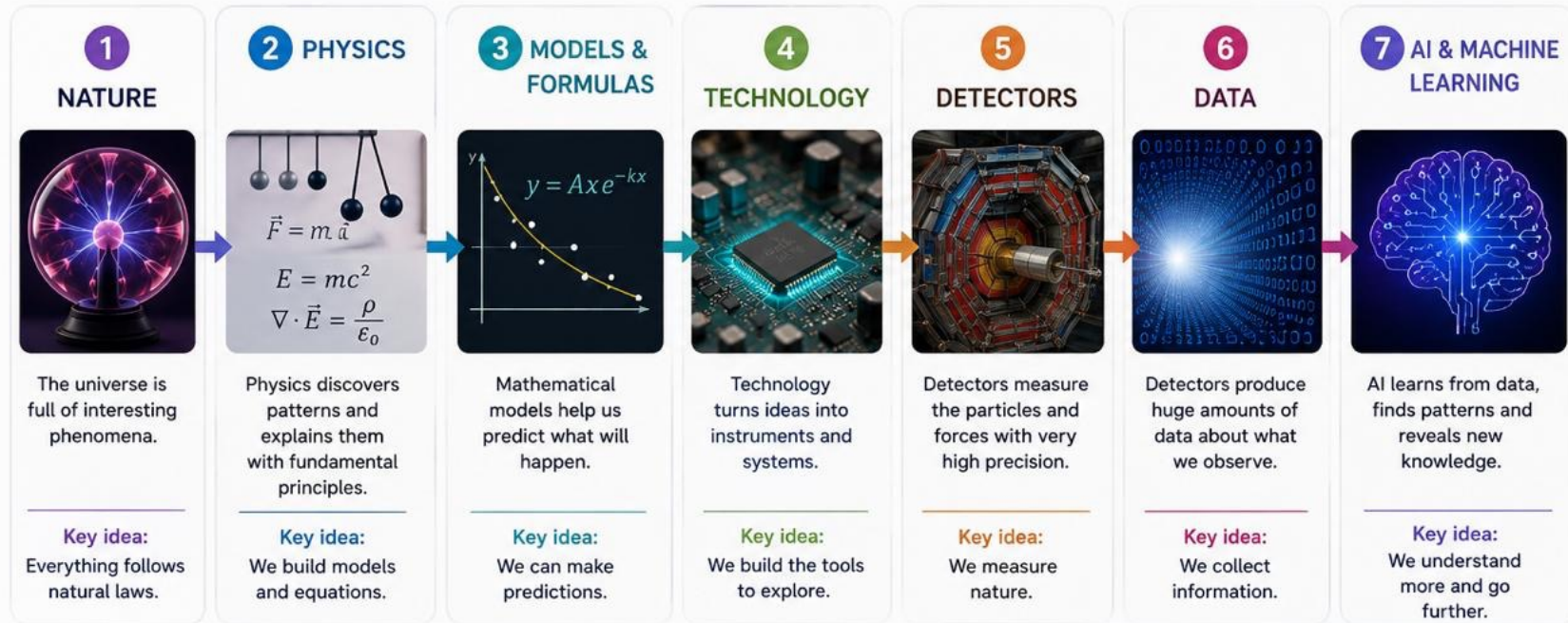
An LLM does not think in sentences first—it predicts the **next token**, one step at a time.



Fluent output can still be wrong: check important facts.

From Nature to Innovation

The journey of discovery – and the pathway to future careers



A cycle of discovery that leads to **innovation** and better lives.

Skills used in every step are in high demand:



Problem Solving



Math & Modelling



Engineering & Technology



Data Analysis



AI & Computing

These skills open many doors:



Semiconductors



AI & Data Science



Robotics & Automation



Medical Technology



Finance & Analytics



Research & Academia



And many more!

Physics is not just about studying the universe.

It's about learning how to **think**, **build** and **create** the future.