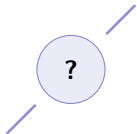


Impact of Computing

AP Computer Science Principles ■ Unit 5

AP Computer Science Principles



What we will cover

1 Beneficial & harmful effects

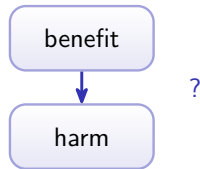
2 The digital divide

3 Computing bias

4 Crowdsourcing

5 Legal & ethical concerns

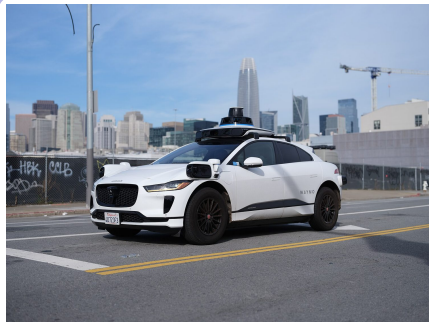
6 Safe computing



Beneficial & harmful effects

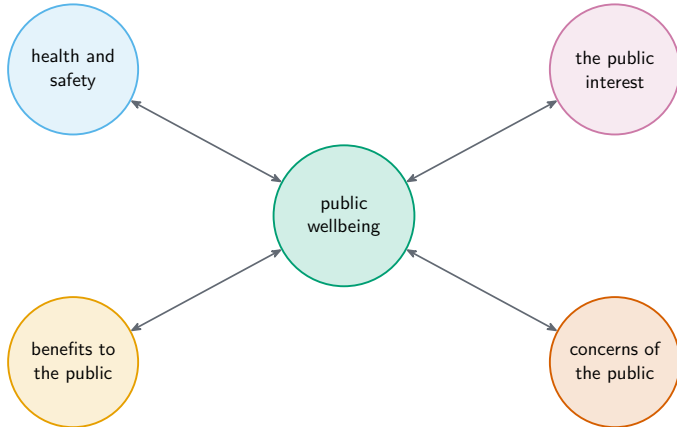
Every **computing innovation** 计算创新 can be both **beneficial** 有益的 and **harmful** 有害的 – often to different people at once (a ride-share app helps riders, hurts taxis).

Judge an innovation by weighing **both** sides. It can also bring **unintended consequences** 意外后果 beyond its intended purpose (a map app that tracks where users go).



Computing has beneficial and harmful effects

Beneficial & harmful effects



The digital divide

The **digital divide** 数字鸿沟 is the gap in **access** 访问 to computing and reliable Internet – shaped by income, geography & age.

Narrows the divide

subsidised broadband, public Wi-Fi

Widens

leaving regions

Access shapes opportunity, so many programs aim for **equity** 公平.



Access is uneven across communities

Computing bias

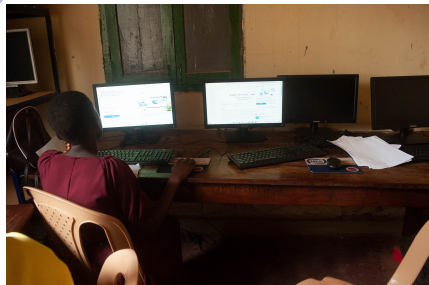
skewed **training data** 训练数据



program learns skewed patterns



Computing bias 计算偏见 is unfairness built into a program, often from unrepresentative data. Testing with **diverse** 多样的 users reveals it before release.



Public access can reduce the digital divide

Crowdsourcing

Crowdsourcing 众包 gathers input, content or money from a large online crowd (e.g. **citizen science** 公民科学).

Strength: diverse, large-scale, shared effort

Challenge:
control – not e

Showing each item to several people and keeping the majority answer protects quality.



Crowdsourcing pools many contributors

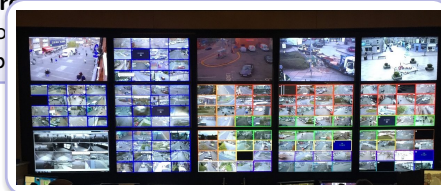
Legal & ethical concerns

Copyright 版权
protects creators

Creative Commons 知识共享
permission
in advance

Open-source 开源
free to
& imp

Beyond the law lies **ethics 伦理**: using data legally is not always ethical – respect **privacy 隐私**, be honest, and credit others.



Surveillance and privacy collide in computing

Safe computing

Guard your **personally identifiable information** 个人身份信息 (PII). Threats: **phishing** 网络钓鱼, **malware** 恶意软件, social engineering.

Symmetric 对称

one shared key locks
& unlocks – fast

Asymm

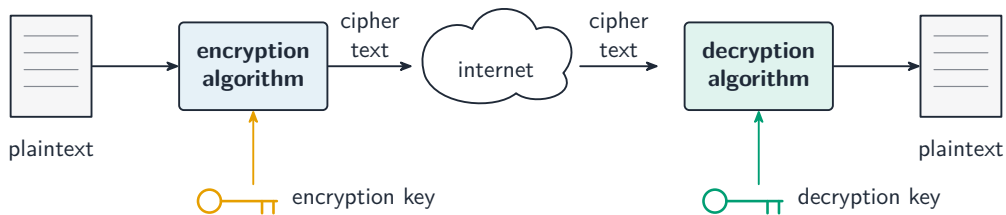
public key
key unlock

Encryption 加密 plus strong
authentication 身份验证 (two-factor login) keep
data safe.



*Hardware has
environmental costs*

Safe computing



Key points

Innovations bring **benefits, harms** & unintended effects

The **digital divide** & **computing bias** raise fairness

Copyright, Creative Commons & open-source; ethics

Encryption & authentication for safe computing

Worked example – naming a bias, and its cause

A hiring algorithm trained on past hires (mostly one group) now rejects qualified applicants from other groups

Name it: this is **computing bias**, caused by **biased training data** – the model learned the **historical pattern** instead of a fair rule.

A full-mark answer states the **harm** (qualified people are unfairly rejected) **and** its **cause** (the bias came from the **data**, not the code).

Check yourself

- 1 A model trained on skewed data discriminates. Where is the bias?
- 2 What is the digital divide?
- 3 What does crowdsourcing get you that one team cannot?
- 4 Name one legal concern when reusing someone's code.



Answers 1. in the training data, not the code 2. unequal access to computing
3. scale and many perspectives 4. copyright / licensing – credit the source