

Impact of Computing

AP Computer Science Principles • Unit 5

AP Computer Science Principles



Impact of Computing

What we will cover

1

Beneficial & harmful effects

2

The digital divide

3

Computing bias

4

Crowdsourcing

5

Legal & ethical concerns

6

Safe computing

benefit

↓

harm

?

1

Effects & access

Impact of Computing

Effects & access

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

Impact of Computing

Effects & access

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 the divide
leaving regions unconnected

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

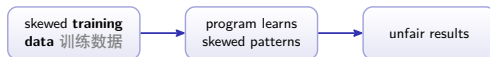


Access is uneven across communities

2

Bias & crowdsourcing

Computing bias



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

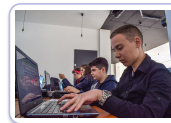
Crowdsourcing

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: **quality** 质量 control – not everyone is careful

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



Crowdsourcing pools many contributors

3 Legal, ethical & safe

Legal & ethical concerns

Copyright 版权 protects creators

Creative Commons 知识共享 permission in advance

Open-source 开源 free to use & improve



Surveillance and privacy collide in computing

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

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

Asymmetric 非对称 public key locks, private key unlocks – secure sites



Hardware has environmental costs

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

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