COMP08009 RESEARCH METHODS IN COMPUTING & IT

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AN OVERVIEW OF RESEARCH: DEFINITION AND PROCESS

A Lecture based in part on the materials of

A. Fekete, J. Davis and others

WHAT IS RESEARCH?

- Key components:
  - **A Research Question**
  - **A claim**
  - **Evidence**
  - **Argument (link evidence to claim)**

- What are some of the different kinds of research?

- How to do research

RESEARCH – A DEFINITION

- *Definition:* " As a general term, research is gathering information that answers a question and so solves a problem".

  (Booth, Colomb, & Williams "The Craft of Research")

- For example, a journalist finding out who contributed to election campaign fund, to understand political decisions.

- A technician finds out what procedure to use to fix a laptop computer.

ACADEMIC RESEARCH

- In academic research, you must not only answer a question, you must find something new and interesting.
- Typically, you join a community of researchers with the objective of advancing the collective understanding of the community.
- Each community has a cumulative tradition with a set of interesting questions, tools and methods, practices, a style and language for writing up the research.
  - Research is a conversation and ongoing social activity!

ACADEMIC RESEARCH

- You need critical and careful reading of **published** research:
  - to learn what the community already knows
  - to fit your work into the community
  - to be prepared for your own work to be evaluated

THE RESEARCH QUESTION(S)

- Every piece of research should address a question of interest to the community

- Each community has a tradition of style of question(s).
  - what happens?
  - why does it happen?
  - how should one do something?
  - what something should one do?

THE RESEARCH QUESTION(S)

- Many questions fit into an on-going agenda
  - *e.g.* find data models to represent different sorts of information
  - *e.g.* move data and computation in a network to exploit locality
  - *e.g.* understand a design process

THE CLAIM

- Every piece of research makes a claim (the “contribution”)
  - Quite simply; this should answer a question of interest
- Claims can be very diverse, among fields and within fields!

Types of Research Claims:

- ***This is what happens***
- ***This is why something happens***
- ***This is a better way to do something***
- ***This is a better something to do***

EVIDENCE

- You must back up the claim with evidence!
- **The evidence you present can vary:**
  - a prototype implementation to show that a system can be built to achieve claimed functionality.
  - a simulation model which is executed to show a system has certain properties.

EVIDENCE

- **The evidence you present can vary (continued…):**
  - measurements of a running system to show it has good performance
  - observations of behaviour in an organisation to show what is happening
  - a mathematical proof to show that some process has desired properties

EVIDENCE

- Each research method is defined by the sort of evidence that it can produce.

- Each community has its own standards of **quality** and **reasonableness.**

ARGUMENT

- You should show that the evidence you offer supports the claim you made.
- It's essential that you deal with natural or obvious objections to the correctness or importance of the work:
  - that is, you must think like your readers, and anticipate their reactions.
- In systems work, this is often called an "evaluation" of the design.

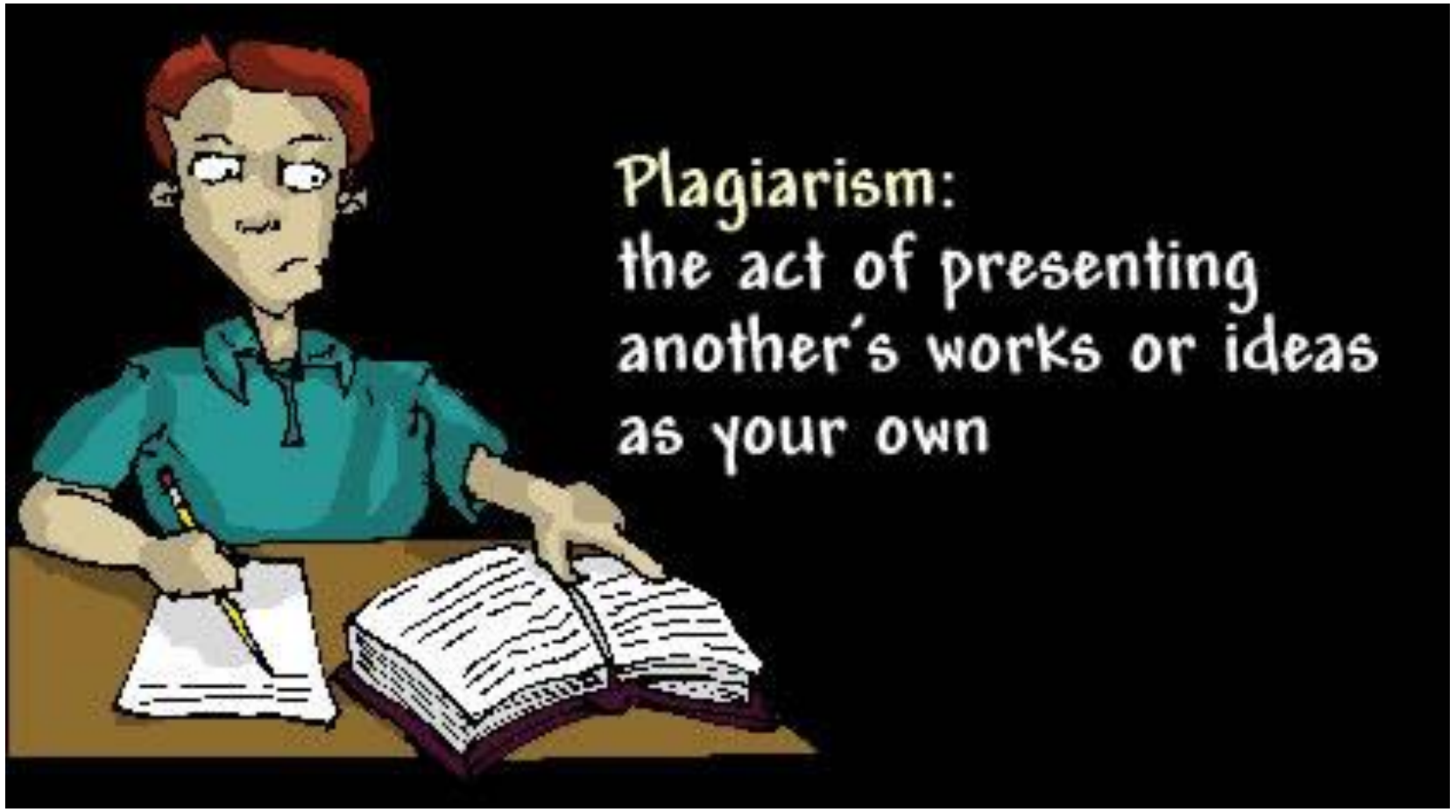
PLAGIARISM

WHAT IS PLAGIARISM?

Some definitions…(from Dictionary.com)

The unauthorised use or close imitation of the **language** and **thoughts** of another author and the representation of them as one's own original work.

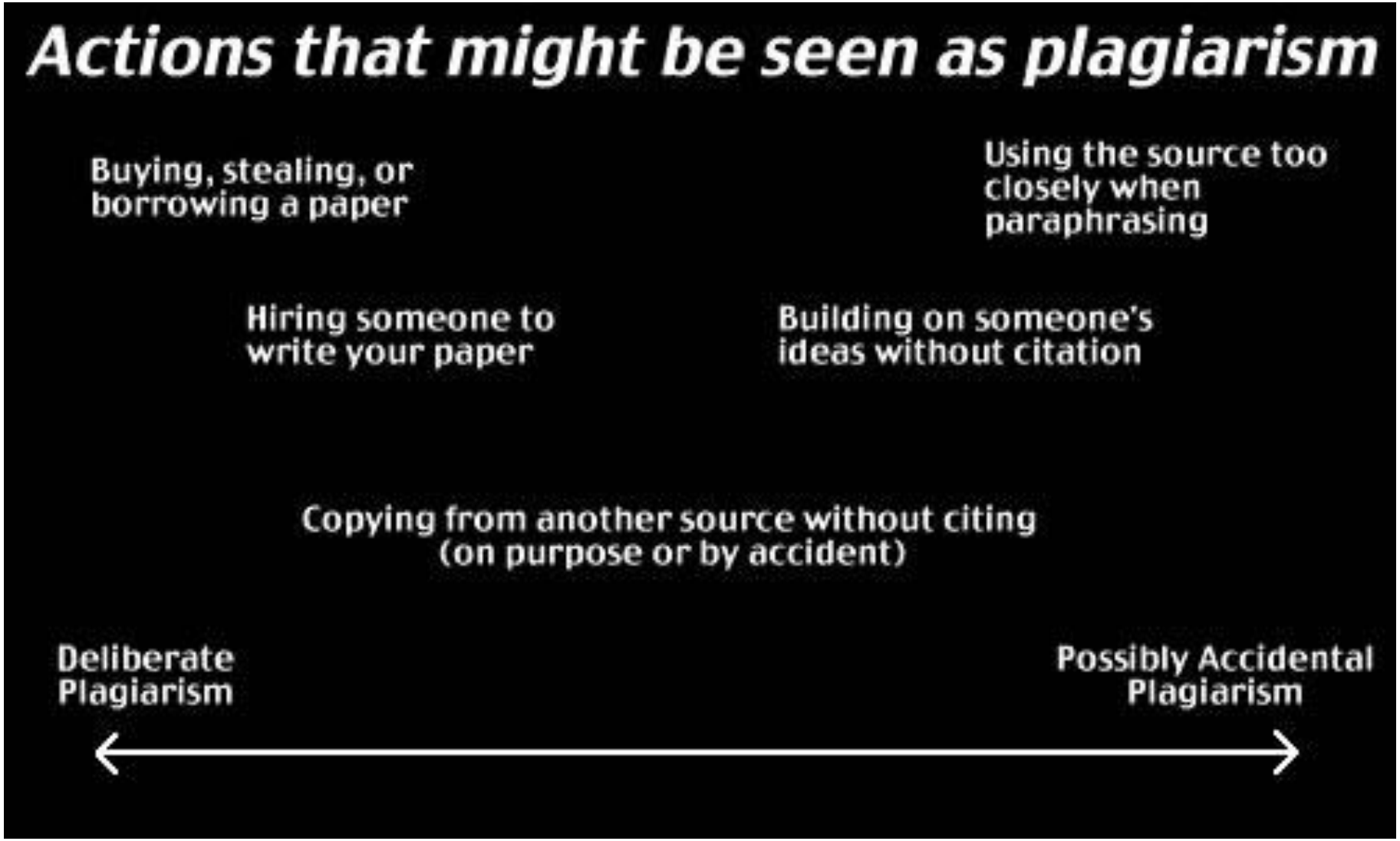
Literary theft. Plagiarism occurs when a writer duplicates another writer's **language** or **ideas** and then calls the work his or her own. Copyright laws protect writers' words as their legal property. To avoid the charge of plagiarism, writers take care to credit those from whom they borrow and quote.


Plagiarism:
the act of presenting
another's works or ideas
as your own

Plagiarism is a totally new concept for many students. In some cultures using the words of the experts is preferable.

University regulations and the reason for these should be clearly explained.


CUT &
PASTE


Actions that might be seen as plagiarism
Buying, stealing, or borrowing a paper
Using the source too closely when paraphrasing
Hiring someone to write your paper
Building on someone's ideas without citation
Copying from another source without citing (on purpose or by accident)
Deliberate Plagiarism
Possibly Accidental Plagiarism

GMIT CODE OF PRACTICE – READ IT!

http://www.gmit.ie/sites/default/files/public/directorate/docs/academic-policy-no2.pdf

REMEMBER. . . .

- **An ignorance of the rules is not a defence.**

- GMIT uses the TURNITIN service; (turn it in ….)

http://www.turitin.com

by submitting documents for assessment as part of your 'Research' course, you agree to allow your document(s) to be submitted to this service

"I need you to do a presentation on the topic of 'plagiarism'. If you don't have time to prepare anything, just steal something off the Internet."

LITERATURE REVIEW

LITERATURE SEARCH AND REVIEW

- Typically one is assessed on what is submitted at the end (a program, a system specification / design, a report etc.…).

- Often however, it is the initial investigation work that can really make a project shine. This initial investigation usually involves a literature survey.

  Literature Survey made of up Literature Search and Literature Review.

WHY LITERATURE SEARCH AND REVIEW?

- **Research aims to add to the world's body of knowledge. This requires a researcher to be aware of what the world's body of knowledge is (in the area s/he works in).**

- Frontiers of the world's body of knowledge are not documented in text books (exclusively), but in:

reliability ↑

timeliness

journal articles

conference papers

workshop papers

↓

technical reports

WHY LITERATURE SEARCH AND REVIEW

- It can help **justify** your project (*i.e.* by showing that your project is worth doing).
- It can help **contextualise** your project – by illustrating how your project fits within (and possibly contributes to) your research area.
- It provides readers and other interested parties with a starting point which may help them understand (and perhaps extend) your project.

GET ORGANISED!

BIBTEX

- Maintain a database of all the books and papers you read. Data stored should at least include title, author, place of publication, and storage location
- Preferably, you should also keep a record of the answers to some or all of the following questions:

1. *What is the main topic of the article?*
2. *What was/were the main issue(s) the author said they wanted to discuss?*
3. *Why did the author claim it was important?*
4. *How does the work build on other's work, in the author's opinion?*

GET ORGANISED! (CNTD…/)

BIBTEX

5. *What simplifying assumptions does the author claim to be making?*
6. *What did the author do?*
7. *How did the author claim they were going to evaluate their work and compare it to others?*
8. *What did the author say were the limitations of their research?*
9. *What did the author say were the important directions for future research?*

EVALUATING RESEARCH PAPERS

- Whenever you read a research paper, you should try to **evaluate** it at the same time.

Try to answer the following questions:

1. *Is the topic of the paper sufficiently interesting (for you personally or in general)?*
2. *Did the author miss important earlier work?*
3. *Are the evaluation methods adequate?*
4. *Are the theorems and proofs correct?*
5. *Are arguments convincing?*
6. *Does the author mention directions for future research that interest you?*

SEARCHING FOR LITERATURE

- What are you trying to find out?
  - Try to specify exactly what you need to know
- What type of information do you want to find?
  - An answer to a specific question?
  - An overview of a subject area?
  - A specific document?
- Why do you need this information?
  - Literature survey: Information needs to be comprehensive.
  - Short essay: Limited number of sources is sufficient.

SEARCHING FOR LITERATURE

- How quickly do you need the information?
  - Immediately: Internet?
  - In a day: Library?
  - In a week: Inter Library Loans?
- As a starting point, consider **the** "Internet Resources for Computing (Intute Booklet of Resources)", I've made available on *Moodle*.
- What's available through the GMIT library?
  Library visit next week – see schedule on Moodle!

INTERRELATIONSHIP OF SOURCES

- Authors submit paper to conference/journal for peer review.
- If accepted, the paper is revised (if necessary) by the authors and submitted to conference/journal editor.
- The paper is processed to bring it into the publisher's format (typesetting/layout).
- The paper is then:

  - included in the publisher's database
  - made available on-line via the publisher's website, and possibly published in printed form.

INTERRELATIONSHIP OF SOURCES

BIBTEX

- **Literature databases:**

  - collect the bibliographic information from several publishers, and authors

    - add additional information (references with links, citation index)

    - link back to publisher for full-text of papers

THE BIG 5

- **ACM Digital Library**

  (Full-text of all ACM journals and conference proceedings)

- **IEEE Xplore**
  (Full-text of IEEE journals, conference proceedings, and books)

- **ScienceDirect**

  (Full-text of Elsevier journals)

- **SpringerLink**
  (Full-text of Springer journals, conference proceedings, and books)

- **Wiley Inter-Science**

  (Full-text of Wiley journals and books)

SOME EXCELLENT FREE SOURCES TOO….

- Freely available (scholarly) web search engines include:

Citeseer
Digital library of 750k freely available papers in computer and information science

http://citeseer.ist.psu.edu

Google Scholar
Searches scholarly literature on the web.

http://scholar.google.com

Scirus
Searches journals (ScienceDirect) and web resources

http://www.scirus.com

Research Gate

https://www.researchgate.net/

QUESTIONS ?