Computer Applications for Biological and biochemistry

Introduction

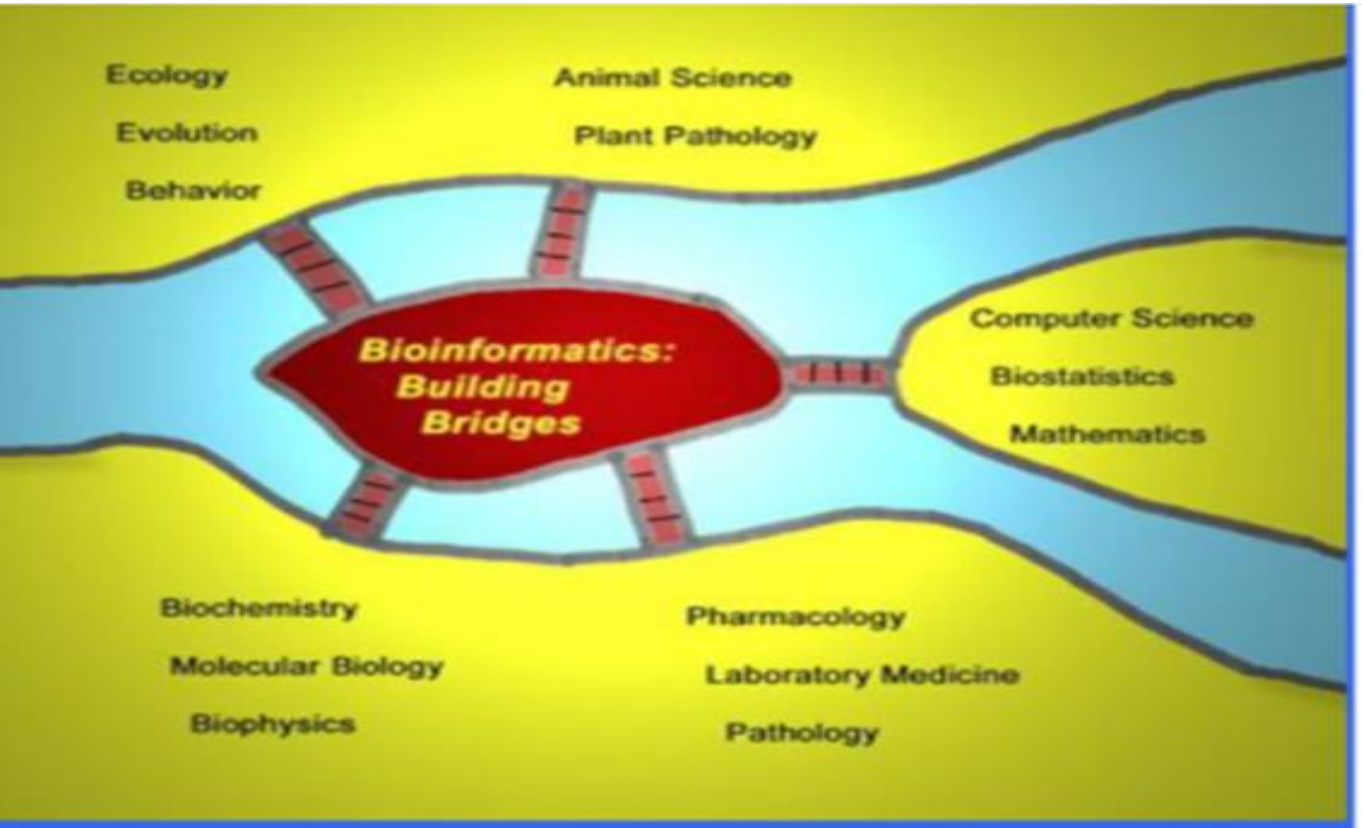
"Discovery is to see what everyone else has seen, but think what no one else has thought."

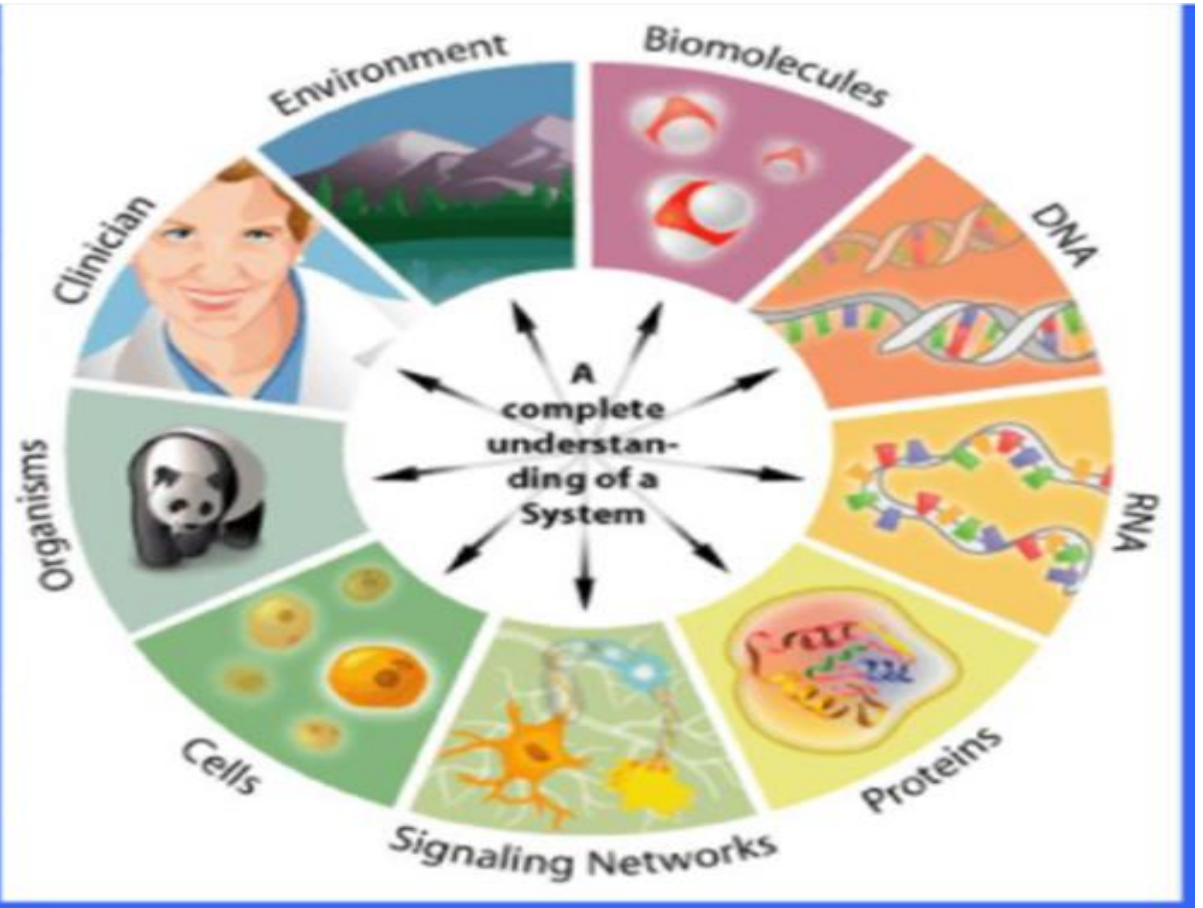
Albert Szent-Györgyi
(The Nobel Prize in Physiology or Medicine, 1937)

"By inventing elegant software tools, we can help biologists see and think."

"Invention → Discovery"

Kun-Mao Chao

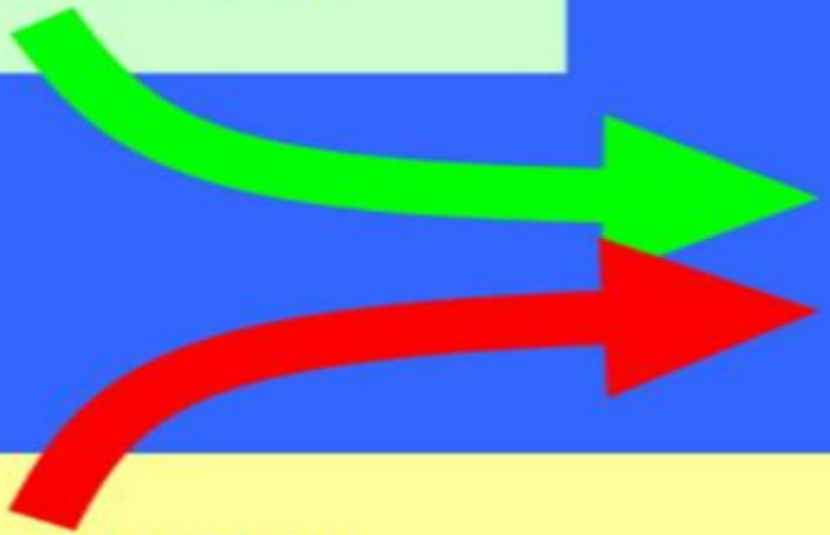




What is Bioinformatics?

The field of science in which **biology**, **computer science** and **information technology** merge into a single discipline

Biologists
collect molecular data:
DNA & Protein sequences,
gene expression, etc.



Bioinformaticians
Study biological questions by analyzing molecular data

Computer scientists
(+Mathematicians, Statisticians, etc.)
Develop tools, softwares, algorithms to store and analyze the data.

What can we do with sequences of information?

What is a Database?

A **structured collection** of data held in computer storage; *esp.* one that incorporates software to make it accessible in a variety of ways; *transf.*, any **large collection** of information.

database management: the organization and manipulation of data in a database.

database management system (DBMS): a software package that provides all the functions required for database management.

database system: a database together with a database management system.

What is a database?

- A collection of data
  - structured
  - searchable (index) -> table of contents
  - updated periodically (release) -> new edition
  - cross-referenced (hyperlinks) -> links with other db
- Includes also associated tools (software) necessary for access, updating, information insertion, information deletion….
- Data storage management: flat files, relational databases…

Database: a « relational » example

Relational database (« table file »):

Teacher	Accession number	Education
Amos	1	Biochemistry
Dan	2	Genetics
John	3	Scientology

Course	Year	Involved teachers
Advanced Pottery	2000; 2001	1; 2
Ballet for Fat People	2001; 2002	2; 3

Distribution of sequences

- Books, articles 1968 -> 1985
- Computer tapes 1982 -> 1992
- Floppy disks 1984 -> 1990
- CD-ROM 1989 ->
- FTP 1989 ->
- On-line services 1982 -> 1994
- WWW 1993 ->
- DVD 2001 ->

Google Scholar

http://www.scholar.google.com/

Google Scholar BETA

What is Google Scholar?

Enables you to search specifically for scholarly literature, including peer-reviewed papers, theses, books, preprints, abstracts and technical reports from all broad areas of research.

orders your search results by how relevant they are to your query, so the most useful references should appear at the top of the page

This relevance ranking takes into account the: full text of each article. the article's author, the publication in which the article appeared and how often it has been cited in scholarly

Scholar

[BOOK] Fundamentals of molecular evolution
WH Li, D **Graur** - 1991 - Sunderland, Mass.: Sinauer Associates
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[BOOK] Fundamentals of molecular evolution
D **Graur**, WH Li - 2000 - Sunderland, Mass.: Sinauer Associates
Cited by 186 - Web Search - Library Search

Patterns of nucleotide substitution in pseudogenes and functional genes
T Gojobori, WH Li, D **Graur** - J. Mol. Evol, 1982 - ncbi.nlm.nih.gov
Patterns of nucleotide substitution in pseudogenes and functional genes. Gojobori T, Li WH, **Graur** D. MeSH Terms: Base Sequence; Codon; DNA/genetics*; Evolution* ...
Cited by 116 - Web Search

[CITATION] Extent of protein polymorphism and the neutral mutation theory
M Nei, D **Graur** - Evol. Biol, 1984
Cited by 86 - Web Search

Is the guinea-pig a rodent?
D **Graur**, WA Hide, WH Li - Nature, 1991 - ncbi.nlm.nih.gov
The guinea-pig (Cavia porcellus), traditionally classified as a New World hystricomorph rodent, often shows anomalous morphological and molecular ...
Cited by 86 - Web Search

Phylogenetic position of the order Lagomorpha(rabbits, hares and allies)
D **Graur**, L Duret, M Gouy - Nature, 1996 - ncbi.nlm.nih.gov
Ever since they have been classified as ruminants in the Old Testament (Leviticus 11:6, Deuteronomy 14:7) and equated with hyraxes in the vulgate ...
Cited by 78 - Web Search

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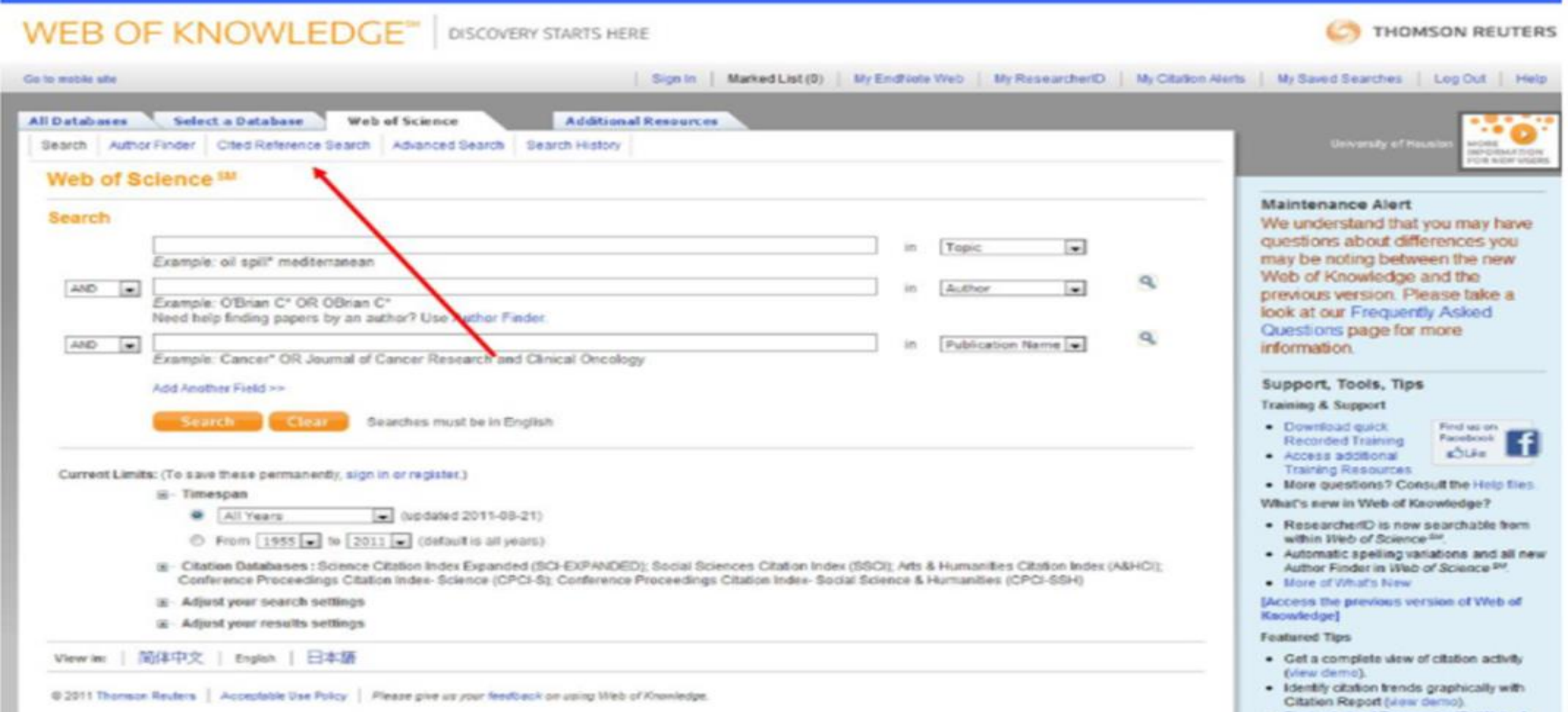

Web of Science

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Cited Reference Search (Find the articles that cite a person's work)

View our Cited Reference Search tutorial

Step 2: Select cited references and click "Finish Search."

Hint: Look for cited reference variants (sometimes different pages of the same article are cited or papers are cited incorrectly).

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Select References	Cited Author	Cited Work [SHOW EXPANDED TITLES]	Year	Volume	Page	Article ID	Citing Articles **	View Record
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☐	Arnason, U..Graur, D	J MOL EVOL	1996	43	41	10.1007/BF02352298	21	View Record
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☐	Barki, Y..Graur, D	MAR ECOL-PROG SER	2002	231	91	10.3354/meps231091	17	View Record
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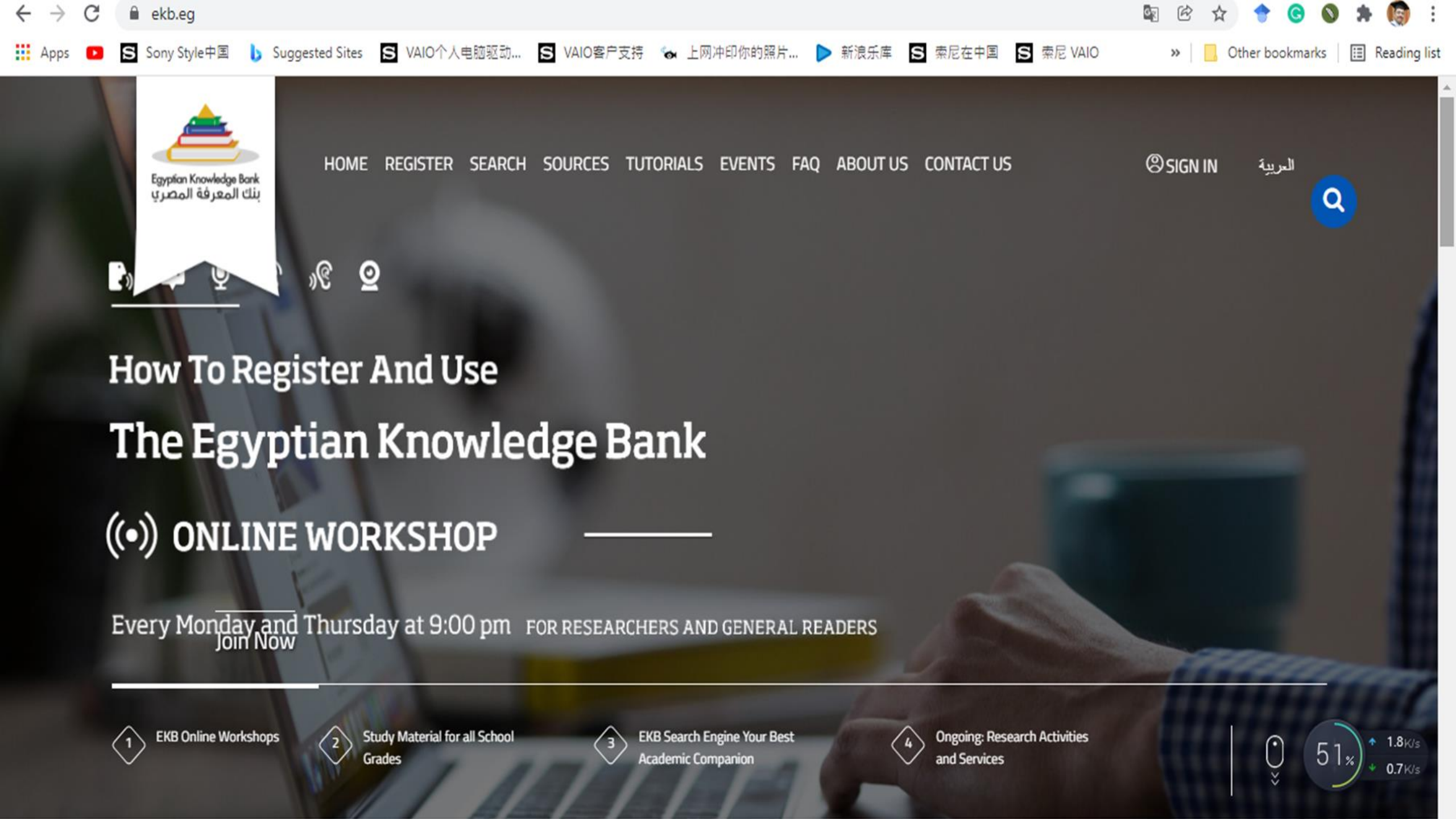
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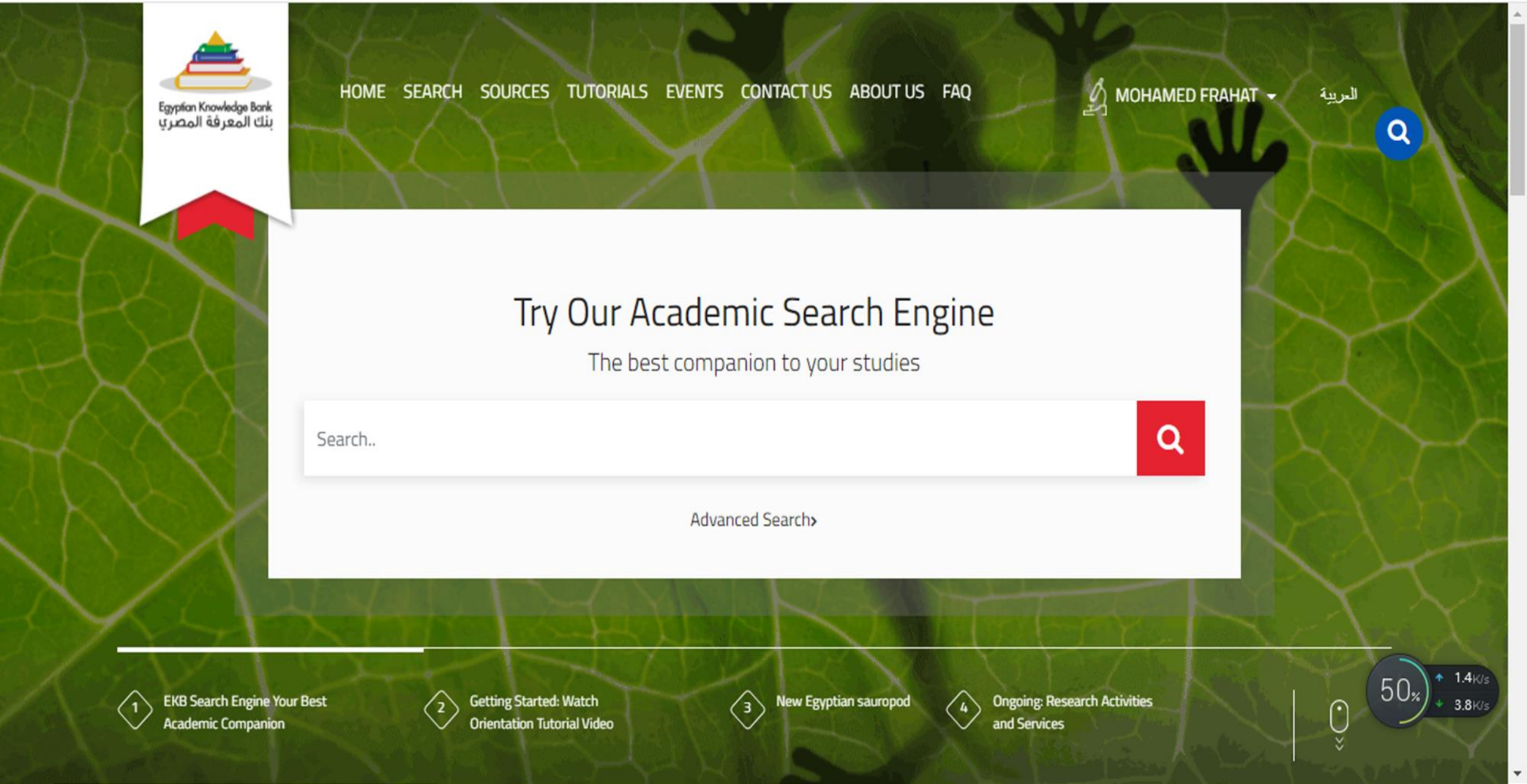

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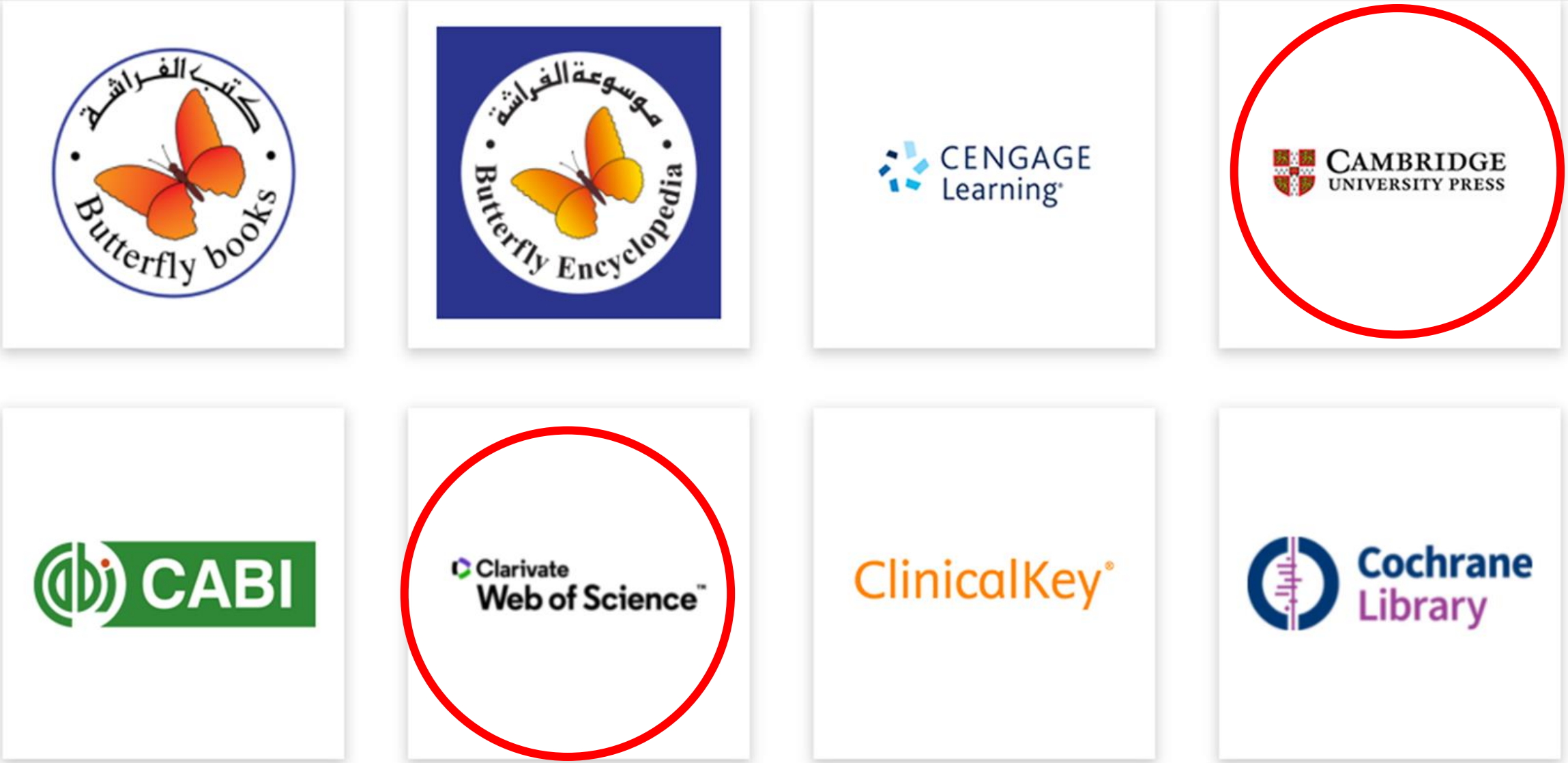
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