بسمه تعالی

School of Computer Engineering

Advanced Computer Networks

Selected Research Tips

Seyed Hamed Rastegar

Fall 1401

Overview

- **Contents we discuss:**
  - How to search a (research) topic?
  - How to read a research paper?
  - Major conferences and journals in computer networking
- **Notes:**
  - ❖ Many skills in how to research are learned by experience and it there is not essentially a single and completely organized way. However, there are important basic tips.
  - ❖ In the seminar course, we will be also got familiar with some related tips particularly for presentation.

How to search a (research) topic?

- In any research project, you usually start by searching about the topic.
- To reach the best result, it is essential to use appropriate search *keywords*.
- Keywords are a set of words you use in your search.
- For indicating the keywords, first of all you should know exactly what you are searching about. Thus you should use the important related words.

How to search a (research) topic?

- **Example**: A graduate student is interested to work in the topic of "**Placement of Services in Edge Computing**".

- The student might use the set of keywords as: Placement + Service + Edge Computing (or "Edge Computing").

- However, many students initially might not know specific topics to work on. So what should they do?

- A solution is to refer to the valid journal and conferences papers in the area of e.g. edge computing and investigate the emerging trends they are interested, and also reading good survey papers. (we'll talk about this further.)

How to search a (research) topic?

- Note that if you are going to see some general discussion about your topic on the web, you might use the exact sentence/question you concern about.

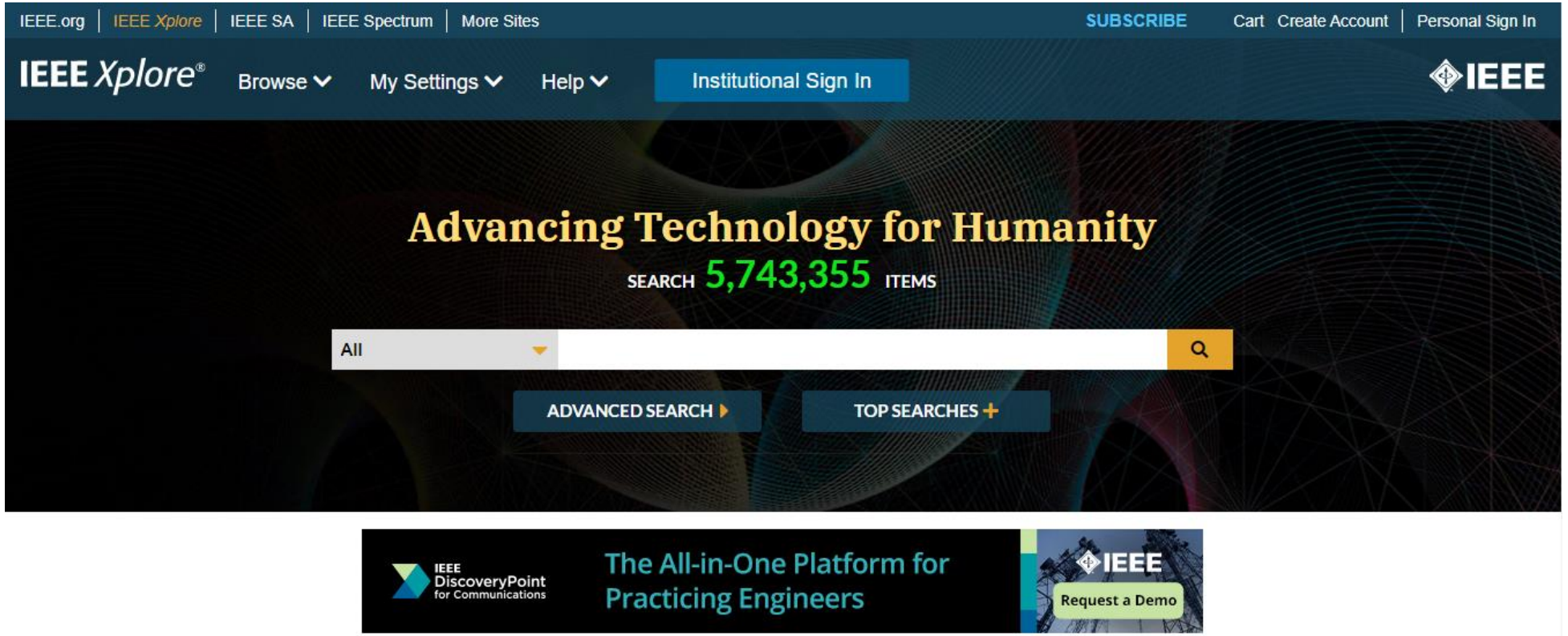
- However, in a scientific search procedure you must use keywords as the related search engines works with them and the literature is classified accordingly.

- Examples of scientific search engines (useful in computer networking research):
  - IEEExplore: IEEE Journal and Conference Publications
  - Sciencedirect: Elsevier publication
  - Google Scholar: Any scientific record found by Google on the Web

How to search a (research) topic?

- IEEExplore (https://ieeexplore.ieee.org/Xplore/home.jsp)

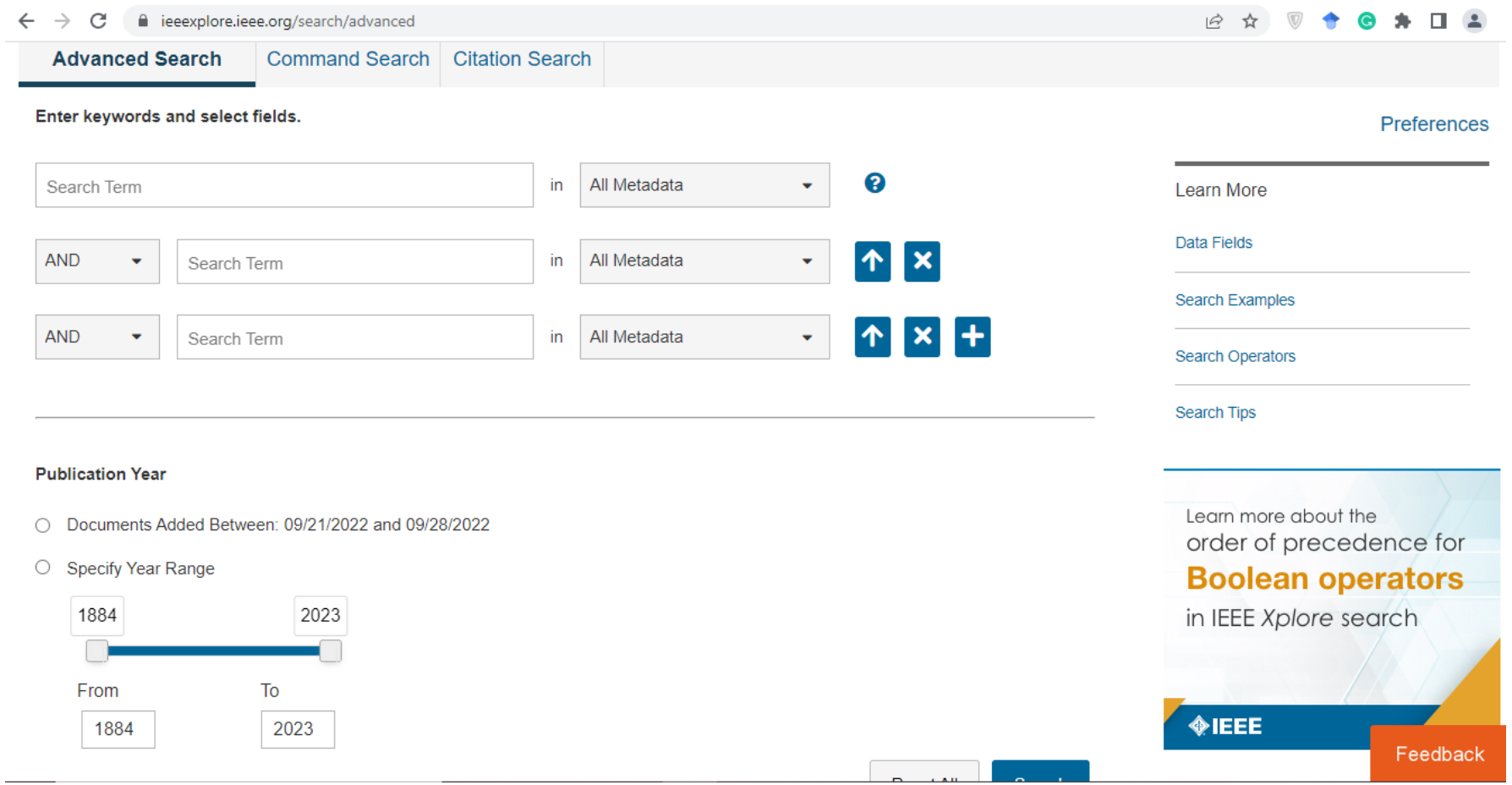
Basic Search



How to search a (research) topic?

- IEEExplore (https://ieeexplore.ieee.org/search/advanced)

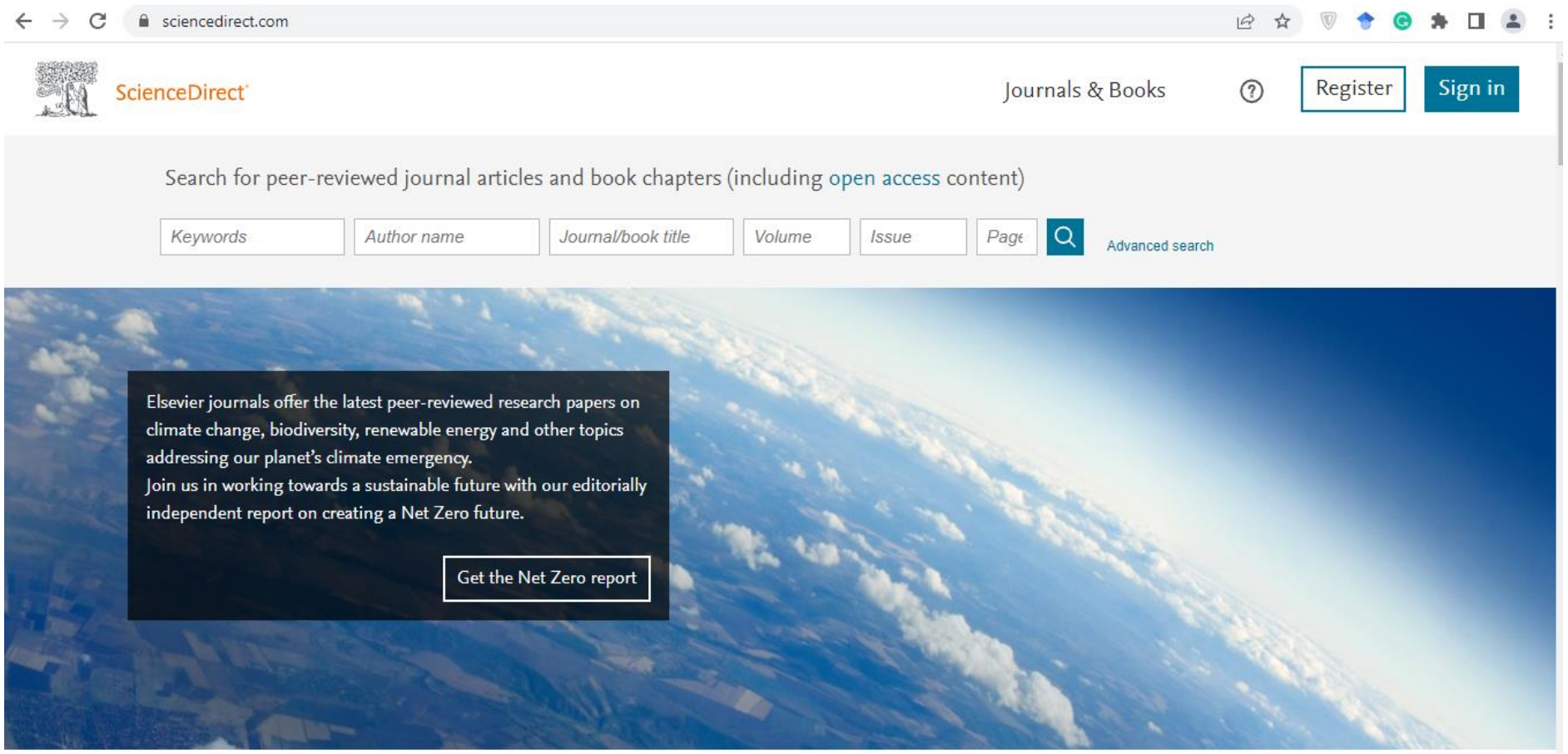
Advanced Search



How to search a (research) topic?

- Sciencedirect (https://www.sciencedirect.com/)

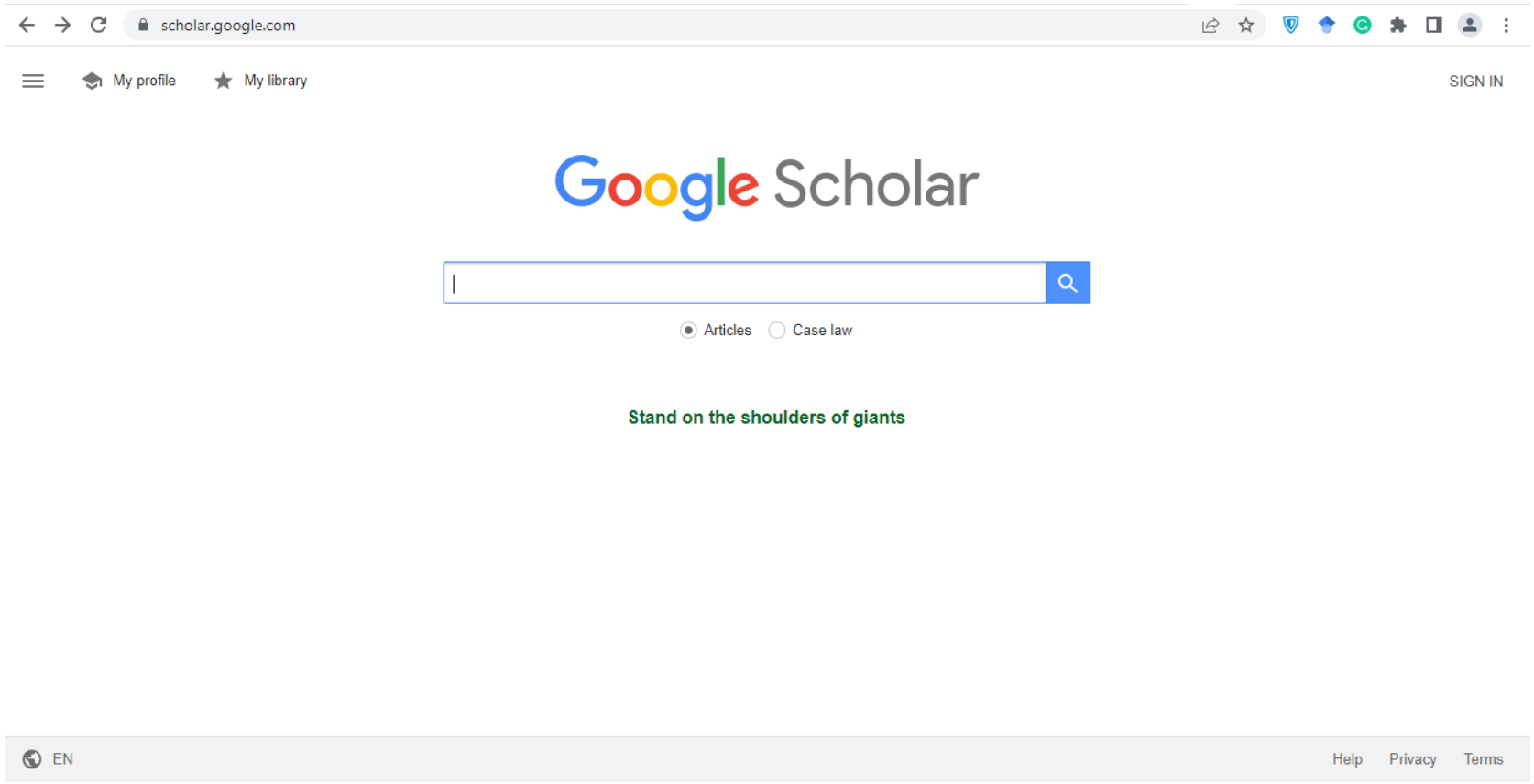
Basic Search



How to search a (research) topic?

- Google Scholar (https://scholar.google.com/)

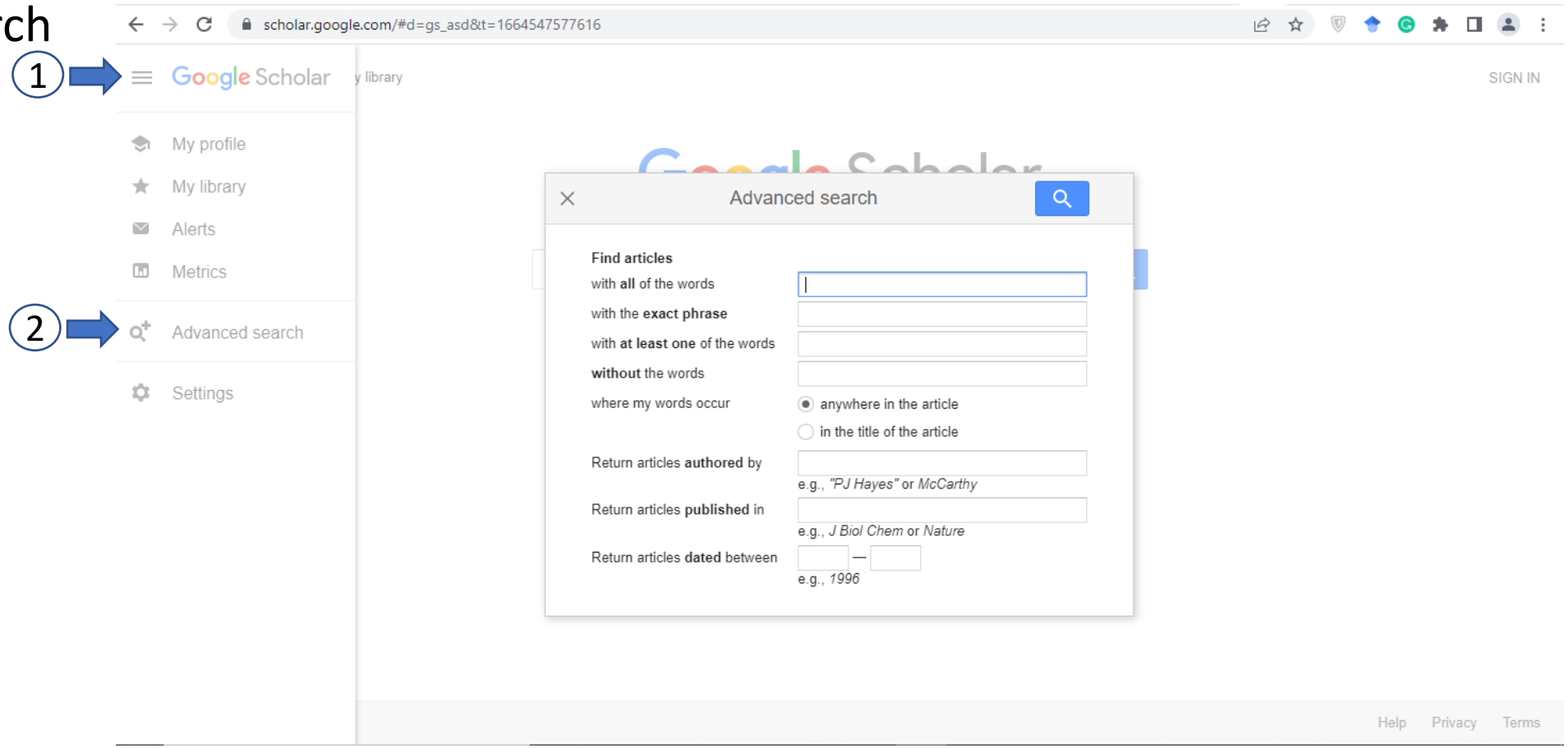
Basic Search



How to search a (research) topic?

- Google Scholar (https://scholar.google.com/)

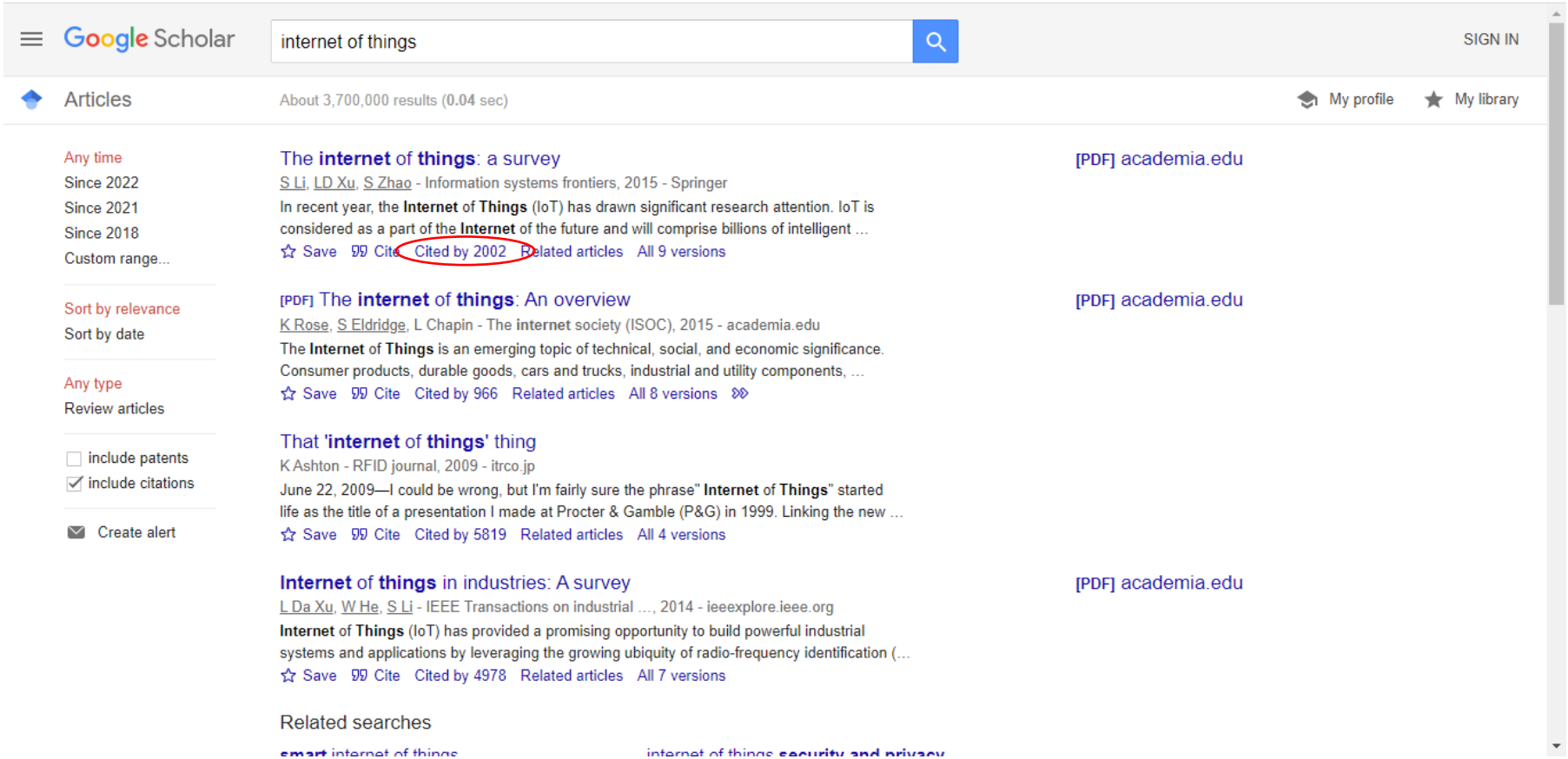
Advanced Search



How to search a (research) topic?

- Google Scholar (https://scholar.google.com/)

Citations



How to search a (research) topic?

- **Citation of a paper**: Number of times a paper has been used as a reference in other papers.

- High number of citation might be a sign of a good paper. However, there are other factors, such as
  - where (in which journal/conference) the paper has been published,
  - the number of high-quality papers in the citations,
  - the ratio of self-citations,
  - the position of the paper in practice,
  - …

- **Note**: A good way to find main and basic papers in a research topic is mining the references of the papers in the topic to reach the ones that first initiated the topic.

How to read a research paper?

- Different types of papers: **(not limited to these but the most important ones)**
  - ❑ **Research papers:**
    - Most papers lay in this category. This type of papers study a specific research problem and introduce novel methods (analytical/experimental) to tackle the problem. They show that their methods are superior to the other previously proposed one in terms of different criteria.
  - ❑ **Survey papers:**
    - This type of papers presents a comprehensive review of a specific research topic. They usually introduce the related concepts, categorize the papers in this topic, and discuss the potential research gaps.
  - ❑ **Demo papers:**
    - Introducing the experimental testbed for implementing a method or system. These are usually short papers (around 2 pages).

- Research papers: Example

On Fair Rule Caching in Software Defined Radio Access Networks

Seyed Hamed Rastegar, *Student Member, IEEE*, Aliazam Abbasfar, *Senior Member, IEEE*, and Vahid Shah-Mansouri, *Member, IEEE*

***Abstract*—In software defined radio access networks, base stations (BSs) operate according to commands received from a centralized controller. To avoid asking the controller frequently, BSs store these commands as rules in flow tables with limited size. This limitation necessitates fetching rules of some users from the controller causing longer processing delays. In this letter, we formulate the fair allocation of flow table spaces to the users within a cell as a mixed integer linear program which is an NP-hard problem. Nonetheless, we propose an optimal low-complexity solution. Finally, we show superior performance of this strategy versus other possible schemes.**

***Index Terms*—5G, SDN, radio access networks, rule caching,**

Such problem also needs to be addressed for future SDN-enabled wireless networks as 5G is going to support Internet of Things (IoT) with massive number of connected devices [9]. In this regard, [10] in SDN-enabled mobile access networks and [11] for an integrated cellular and IoT network, suggest predictive algorithms for placing the rules of mobile users in flow tables. Also, efficient schemes to reduce flow table utilization are proposed in [12] and [13] for SDN-based Internet of Vehicles (IoV) and wireless data centers, respectively.

This limited flow table space forces the network equipment to fetch the rules of some incoming packets from the controller, which introduces delay. Consequently, low latency

- Survey papers: Example

IEEE COMMUNICATIONS SURVEYS & TUTORIALS, VOL. 24, NO. 2, SECOND QUARTER 2022

Smartphone App Usage Analysis: Datasets, Methods, and Applications

Tong Li, *Member, IEEE*, Tong Xia, Huandong Wang, *Member, IEEE*, Zhen Tu, Sasu Tarkoma, *Senior Member, IEEE*, Zhu Han, *Fellow, IEEE*, and Pan Hui, *Fellow, IEEE*

***Abstract*—As smartphones have become indispensable personal devices, the number of smartphone users has increased dramatically over the last decade. These personal devices, which are supported by a variety of smartphone apps, allow people to access Internet services in a convenient and ubiquitous manner. App developers and service providers can collect fine-grained app usage traces, revealing connections between users, apps, and smartphones. We present a comprehensive review of the most recent research on smartphone app usage analysis in this survey. Our survey summarizes advanced technologies and key patterns in smartphone app usage behaviors, all of which have significant implications for all relevant stakeholders, including academia and industry. We begin by describing four data collection methods:**

***Index Terms*—Smartphone device, mobile app, app usage, behavior analysis, data mining.**

I. Introduction

PEOPLE can now use their smartphone apps to access a variety of Internet services, including instant messaging (e.g., WhatsApp, WeChat), online socializing (e.g., Twitter, Weibo), electronic commerce (e.g., Amazon, Taobao), and online payment (e.g., PayPal, Alipay). These services have

- Survey papers: Example

Resource Allocation in NFV: A Comprehensive Survey

Juliver Gil Herrera and Juan Felipe Botero

***Abstract*—Network functions virtualization (NFV) is a new network architecture framework where network functions that traditionally used dedicated hardware (middleboxes or network appliances) are now implemented in software that runs on top of general purpose hardware such as high volume servers. NFV emerges as an initiative from the industry (network operators, carriers, and manufacturers) in order to increase the deployment flexibility and integration of new network services with increased agility within operator's networks and to obtain significant reductions in operating expenditures and capital expenditures. NFV promotes virtualizing network functions such as transcoders, firewalls, and load balancers, among others, which were carried out by specialized hardware devices and migrating them to software-based appliances. One of the main challenges for the deployment**

OPEX	Operating Expenditures
OSS	Operations Support System
SDN	Software Defined Networking
SLA	Service Level Agreement
SN	Substrate Network
TSP	Telecom Service Provider
VM	Virtual Machine
VNF	Virtual Network Function
VNF-FG	Virtual Network Function Forwarding Graph
VNF-FGE	VNF Forwarding Graph Embedding
VNFR	Virtual Network Functions Request
VNFs-CC	VNFs Chain composition

- Demo papers: Example

Ruling Out IoT Devices in LoRaWAN

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***Abstract*—LoRaWAN is certainly one of the most widely used LPWAN protocol. The LoRaWAN 1.1 specification aims at fixing some serious security vulnerabilities in the 1.0 specification, however there still exist critical points that may affect the IoT security. In this demo, we show an attack that can affect LoRaWAN 1.0 and 1.1 networks, which hijacks the downlink path from the Network Server to an End Device, ruling out the target device from the network. The attack exploits the deduplication procedure and the gateway selection during a downlink scheduling by the Network Server, which is in general implementation-dependent. The attack scheme has been proven to be easy to implement, not requiring physical layer-specific operations such as signal jamming, and could target many LoRaWAN devices at once. We demonstrate this attack and its effects by blocking a device under our control by receiving any downlink communication.**

***Index Terms*—LoRaWAN, Security, Denial of Service, Replay**

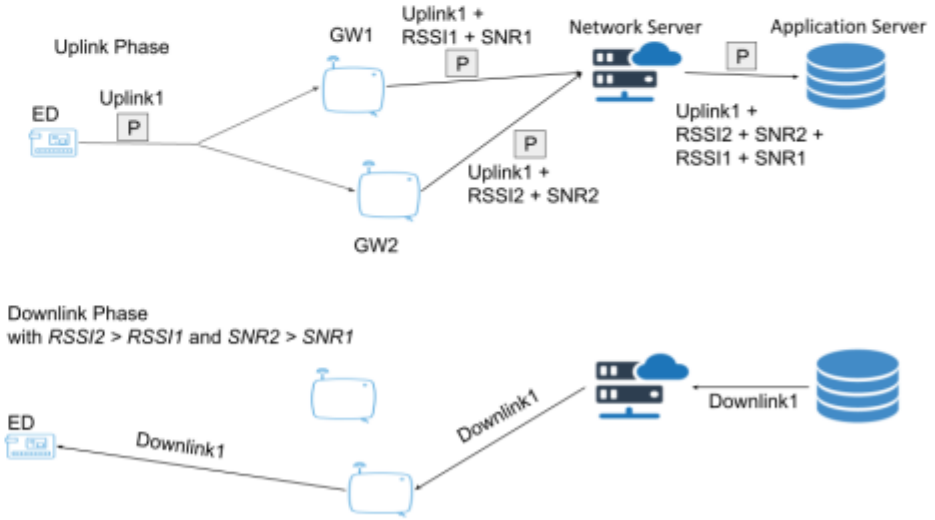


Fig. 1. LoRaWAN Architecture with an uplink, deduplication phase and the following downlink selection

How to read a research paper?

- An important usual task of a researcher is to read papers.

- The aim of reading a paper might be
  - a paper reading assignment (which you will do in this course!),
  - to keep current in the field,
  - to review as a referee,
  - to make a literature review for initiating a research,
  - ….
- Researchers devote a vast portion of their time reading papers. Thus if they do not read paper in the right way, they will waste a lot of time.

- Therefore, it is of great importance to do this efficiently.

How to read a research paper?

- Some general tips:
  - First of all read the **title** of the paper carefully.
  - Reading the **abstract** always is necessary in reading a paper. It gives you a short but efficient view of the whole paper.
    - After reading the abstract, you might decide to continue reading the paper or not (in the case you are not required to read the paper as a task).
  - **Introduction** section (always section II of the paper, it might have other names such as Motivation) usually discusses the necessity of doing this research in detail and review the related literature. (Some papers have a separate section for Related Works and the literature.)
    - In general the aim of the Introduction is to sketch why this research has been done and explain what the paper has been done and list the key contributions.

How to read a research paper?

- Some general tips:
  - Reading the **introduction** will give you a comprehensive overview of the general research topic. Thus it is often useful to read the introduction and it helps you learn more.
    - However, the best result would be obtained when the reader has a background knowledge of the field and introduction in some papers might not be useful for the general audience.

  - Although the names of the Sections (other than Abstract and Introduction) in various papers are different, the general structure of papers in the same research filed are very similar.

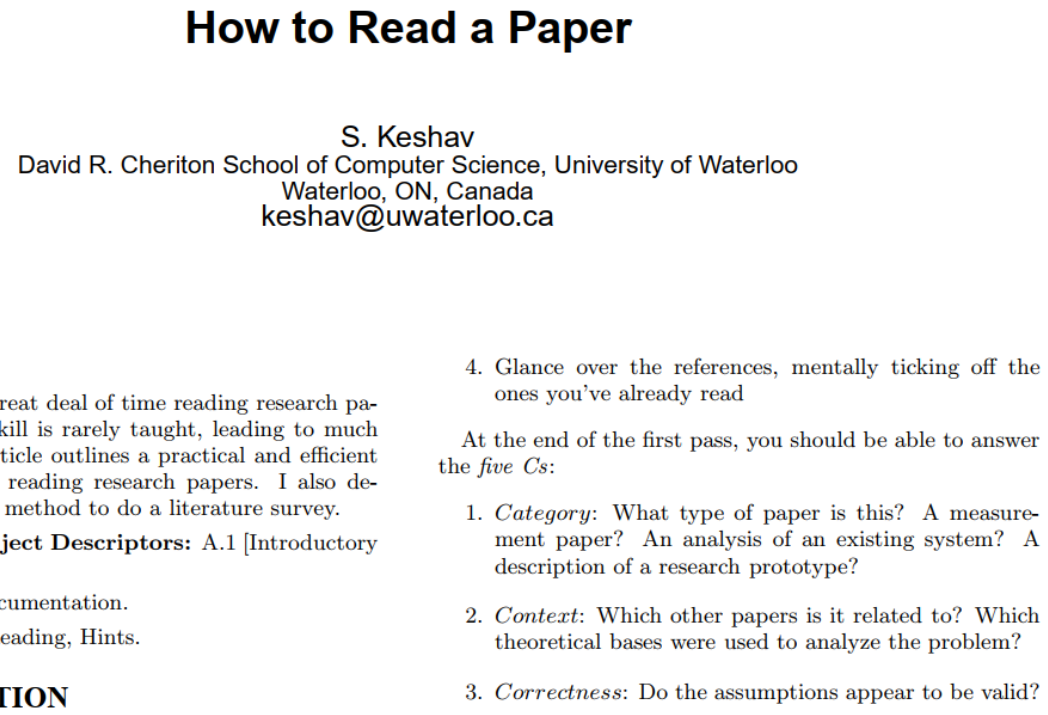
How to read a research paper?

- For papers in the filed of engineering, after Introduction, the sections are as follows:
  - ❖ Some papers might include some preliminary knowledge requirements for the reader.
  - ❖ The problem under study of the paper explain in a section. The section might state the problem in text or with mathematical equations and also system model as figure(s).
  - ❖ The method the authors propose to solve the problem and discussed challenge.
  - ❖ The experimental/numerical evaluations which verify the performance of the proposed method.

How to read a research paper?

- A more detailed discussion on how to read a paper: (Read this paper)

Keshav, Srinivasan. "How to read a paper." *ACM SIGCOMM Computer Communication Review* 37, no. 3 (2007): 83-84.



How to Read a Paper

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ABSTRACT

Researchers spend a great deal of time reading research papers. However, this skill is rarely taught, leading to much wasted effort. This article outlines a practical and efficient *three-pass method* for reading research papers. I also describe how to use this method to do a literature survey.

Categories and Subject Descriptors: A.1 [Introductory and Survey]

General Terms: Documentation.

Keywords: Paper, Reading, Hints.

1. INTRODUCTION

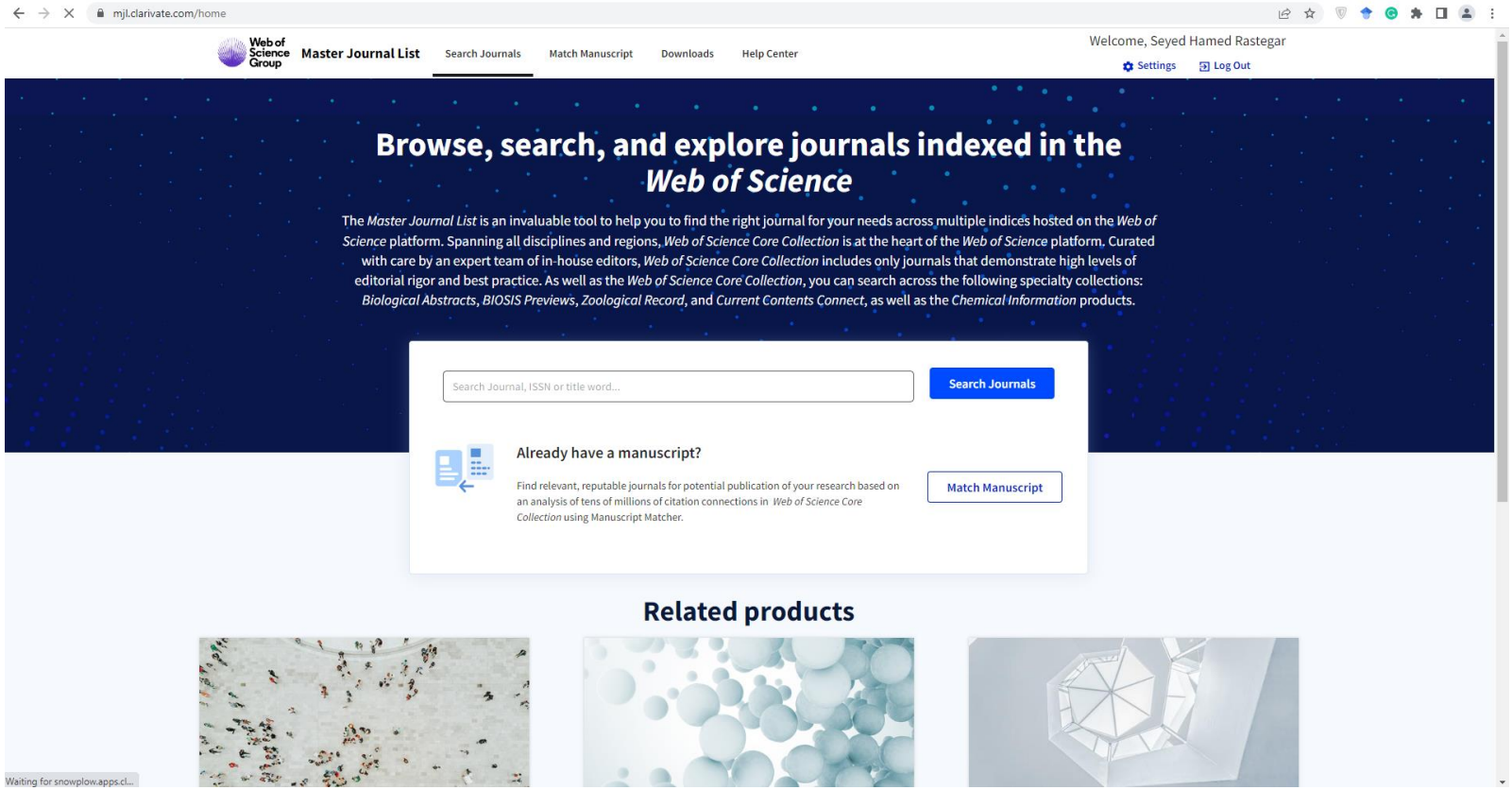
4. Glance over the references, mentally ticking off the ones you've already read

At the end of the first pass, you should be able to answer the *five Cs*:

1. *Category*: What type of paper is this? A measurement paper? An analysis of an existing system? A description of a research prototype?
2. *Context*: Which other papers is it related to? Which theoretical bases were used to analyze the problem?
3. *Correctness*: Do the assumptions appear to be valid?

Major conferences and journals in computer networking

Web of Science Master Journal List (https://mjl.clarivate.com/home)



Major conferences and journals in computer networking

Web of Science (WoS) Journal Ranking

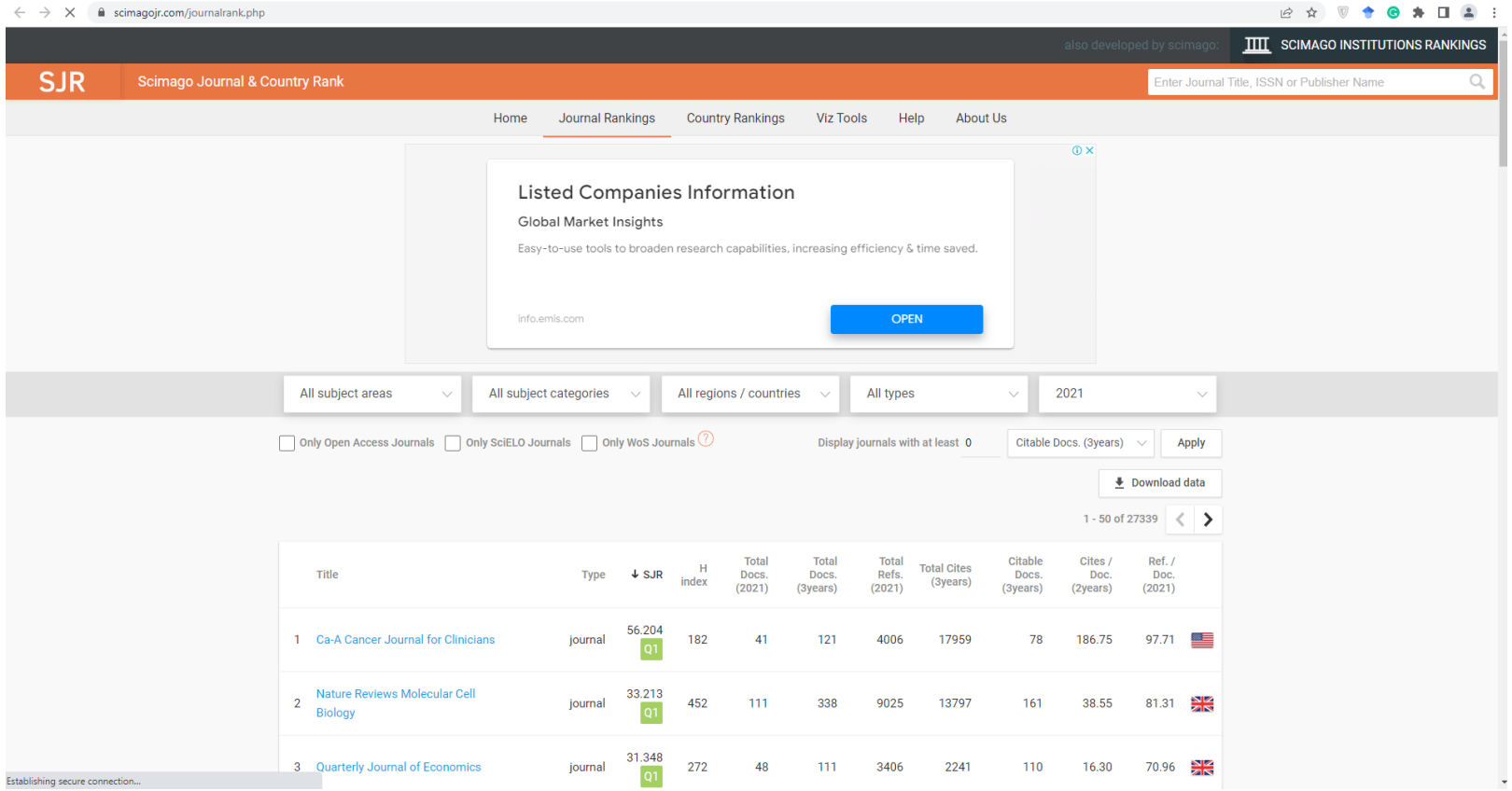
- WoS assign an index named Impact Factor (IF) to each journal.

- In any given year, the **two-year journal impact factor** is the **ratio** between
  - **The numerator**: the number of citations received in that year for publications in that journal that were published in the two preceding years
  - **The denominator:** the total number of "citable items" published in that journal during the two preceding years.

- WoS rank the journal based on their impact factors. Also, it categorized journals in its list as Q1, Q2, Q3, Q4. A Q*i* journal, belongs to the *i*th quartile of the journals when sort them in descending order of impact factors.

Major conferences and journals in computer networking

SJR (SCImago Journal Rank): https://www.scimagojr.com/journalrank.php



	Title	Type	SJR	H index	Total Docs. (2021)	Total Docs. (3years)	Total Refs. (2021)	Total Cites (3years)	Citable Docs. (3years)	Cites / Doc. (2years)	Ref. / Doc. (2021)
1	Ca-A Cancer Journal for Clinicians	journal	56.204 Q1	182	41	121	4006	17959	78	186.75	97.71
2	Nature Reviews Molecular Cell Biology	journal	33.213 Q1	452	111	338	9025	13797	161	38.55	81.31
3	Quarterly Journal of Economics	journal	31.348 Q1	272	48	111	3406	2241	110	16.30	70.96

Major conferences and journals in computer networking

SJR (SCImago Journal Rank)

- The SJR indicator is a measure of the scientific influence of scholarly journals that accounts for both the number of citations received by a journal and the importance or prestige of the journals where the citations come from.

- Similarly, here Q1-Q4 journals are defined based on their Quartiles in SJR ordering.

Computer Science | Computer Networks and Communications | All regions / countries | All types | 2021

Only Open Access Journals | Only SciELO Journals | Only WoS Journals | Display journals with at least 0 | Citable Docs. (3years) | Apply

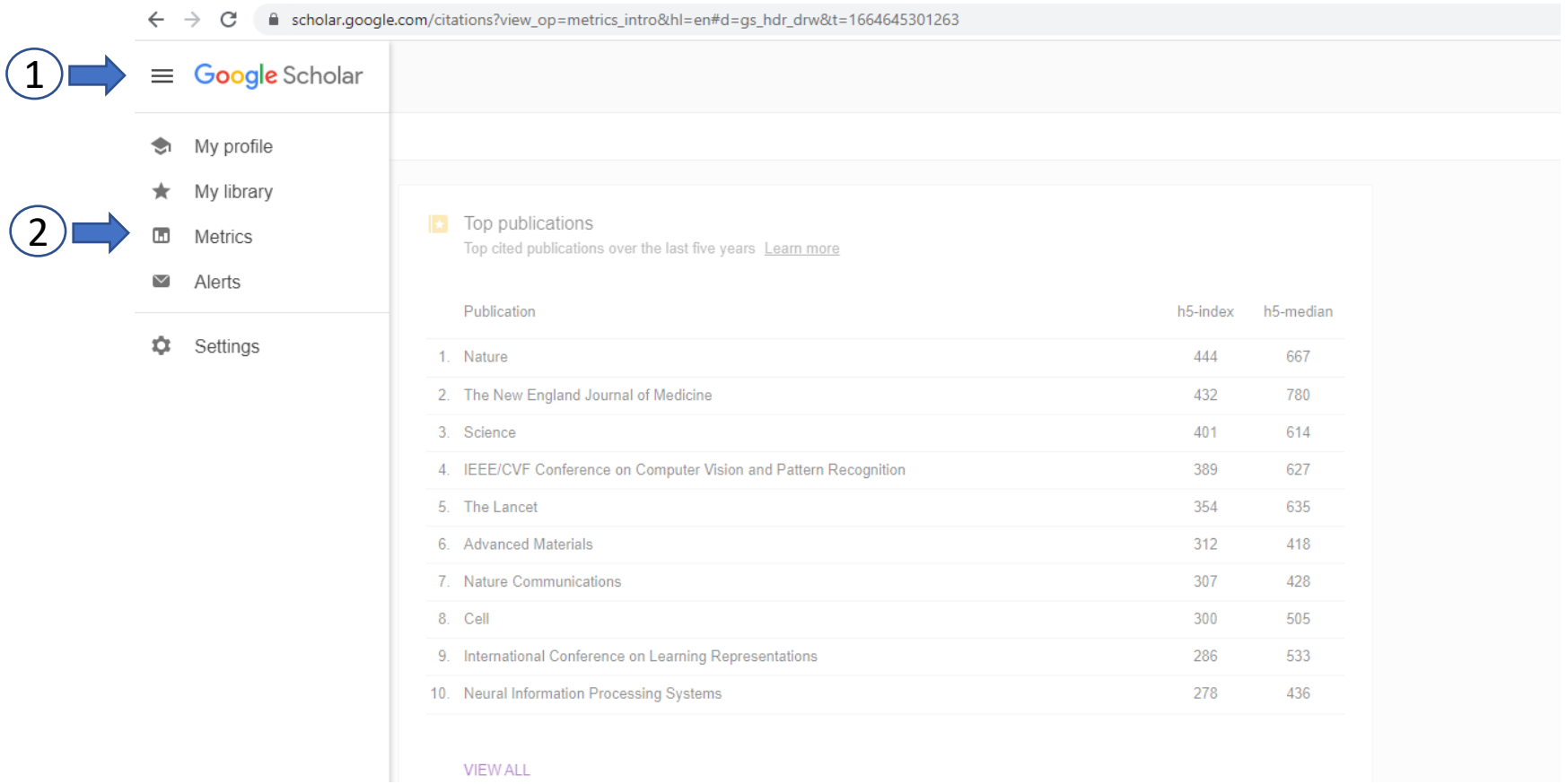
Download data

1 - 50 of 351

	Title	Type	SJR	H index	Total Docs. (2021)	Total Docs. (3years)	Total Refs. (2021)	Total Cites (3years)	Citable Docs. (3years)	Cites / Doc. (2years)	Ref. / Doc. (2021)
1	IEEE Journal on Selected Areas in Communications	journal	6.320 Q1	242	265	637	12221	8562	612	14.24	46.12
2	IEEE Communications Magazine	journal	5.147 Q1	260	234	804	2797	8835	684	9.00	11.95
3	IEEE Network	journal	5.053 Q1	135	263	557	3713	6966	531	11.29	14.12
4	Nature Machine Intelligence	journal	4.602 Q1	26	155	132	6072	1799	78	13.63	39.17
5	International Journal of Information Management	journal	4.584 Q1	132	166	504	16896	10690	496	21.35	101.78
6	IEEE Transactions on Neural Networks and Learning Systems	journal	4.222 Q1	221	1317	1358	23530	15011	1349	10.47	17.87
7	Internet and Higher Education	journal	3.906 Q1	99	28	68	1991	875	68	10.80	71.11
8	IEEE Internet of Things Journal	journal	3.848 Q1	119	1959	2373	62326	27738	2328	10.98	31.82

How to search a (research) topic?

- Google Scholar Metrics (https://scholar.google.com)



How to search a (research) topic?

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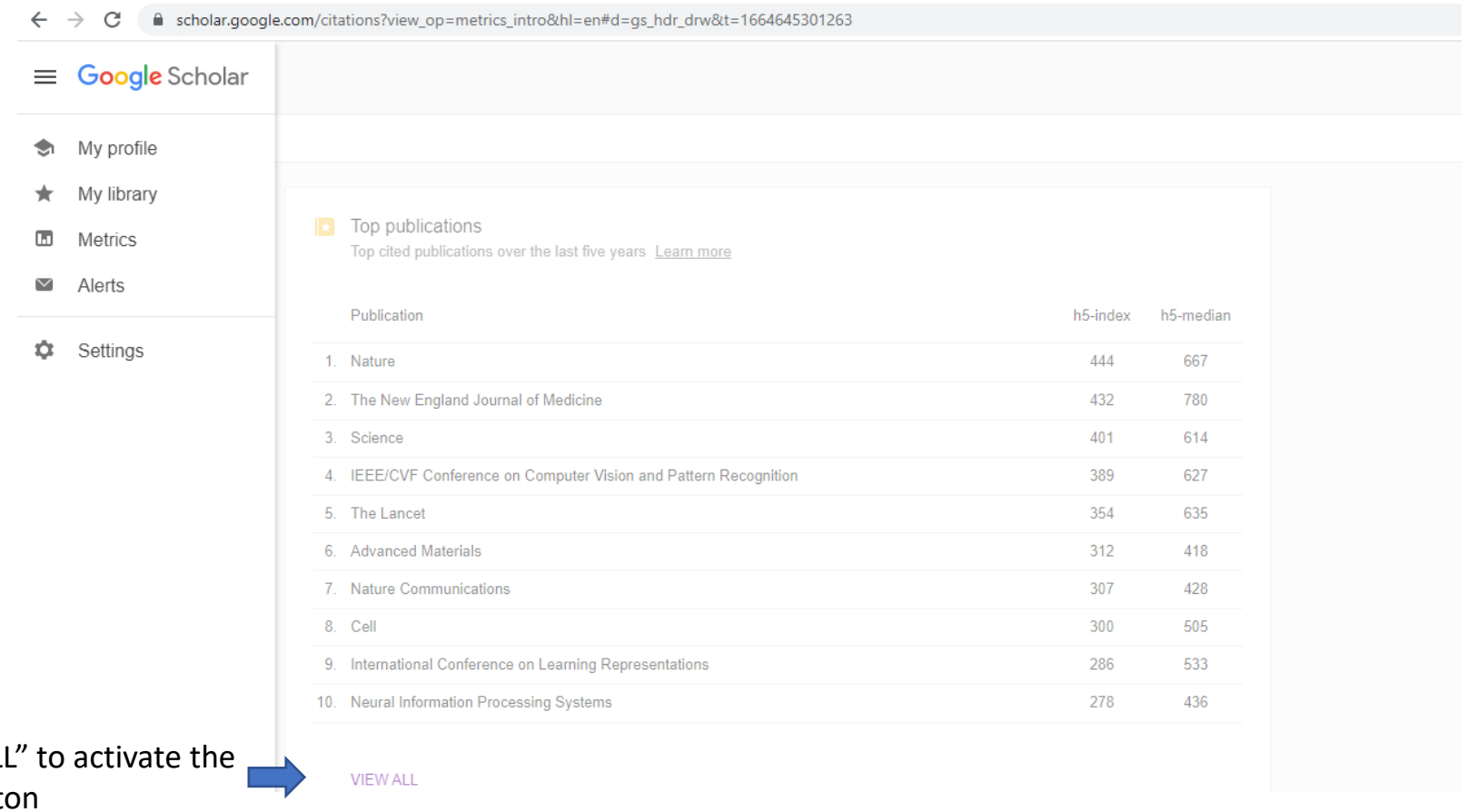
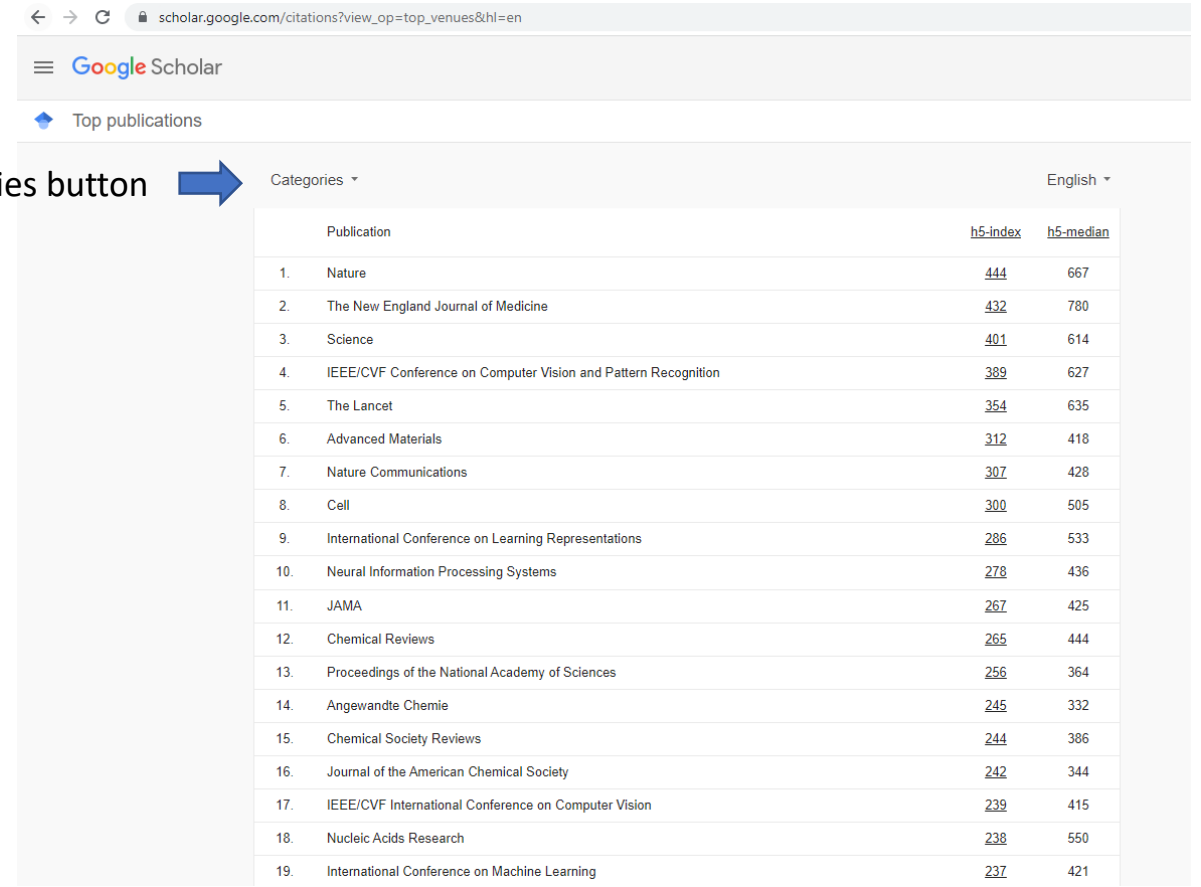


Push “VIEW ALL” to activate the categories button

How to search a (research) topic?

- Google Scholar Metrics (https://scholar.google.com)

categories button

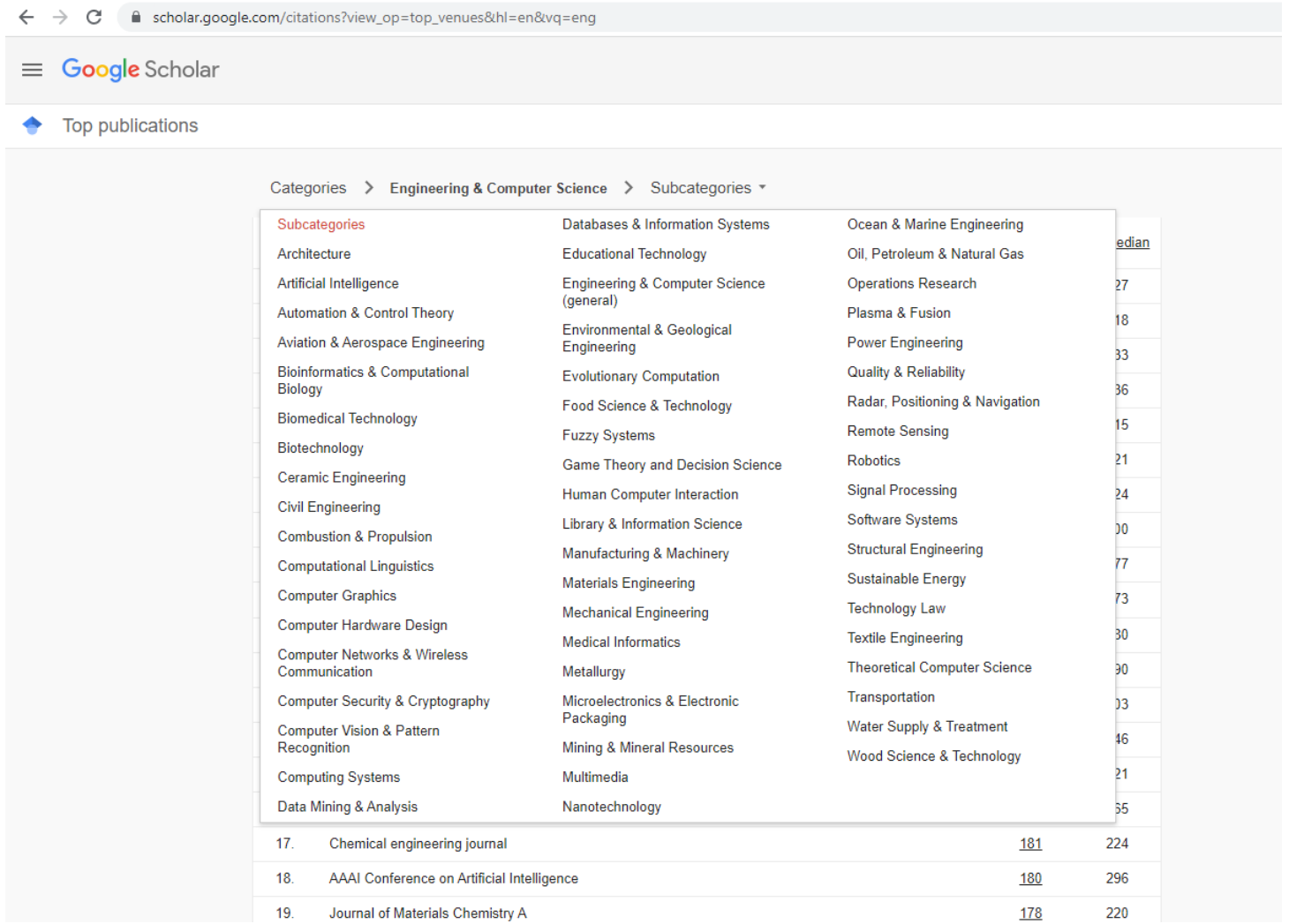


	Publication	h5-index	h5-median
1.	Nature	444	667
2.	The New England Journal of Medicine	432	780
3.	Science	401	614
4.	IEEE/CVF Conference on Computer Vision and Pattern Recognition	389	627
5.	The Lancet	354	635
6.	Advanced Materials	312	418
7.	Nature Communications	307	428
8.	Cell	300	505
9.	International Conference on Learning Representations	286	533
10.	Neural Information Processing Systems	278	436
11.	JAMA	267	425
12.	Chemical Reviews	265	444
13.	Proceedings of the National Academy of Sciences	256	364
14.	Angewandte Chemie	245	332
15.	Chemical Society Reviews	244	386
16.	Journal of the American Chemical Society	242	344
17.	IEEE/CVF International Conference on Computer Vision	239	415
18.	Nucleic Acids Research	238	550
19.	International Conference on Machine Learning	237	421

How to search a (research) topic?

- Google Scholar Metrics

➢ Pushing Categories button, then choosing Engineering & Computer Science, and then pushing Subcategories

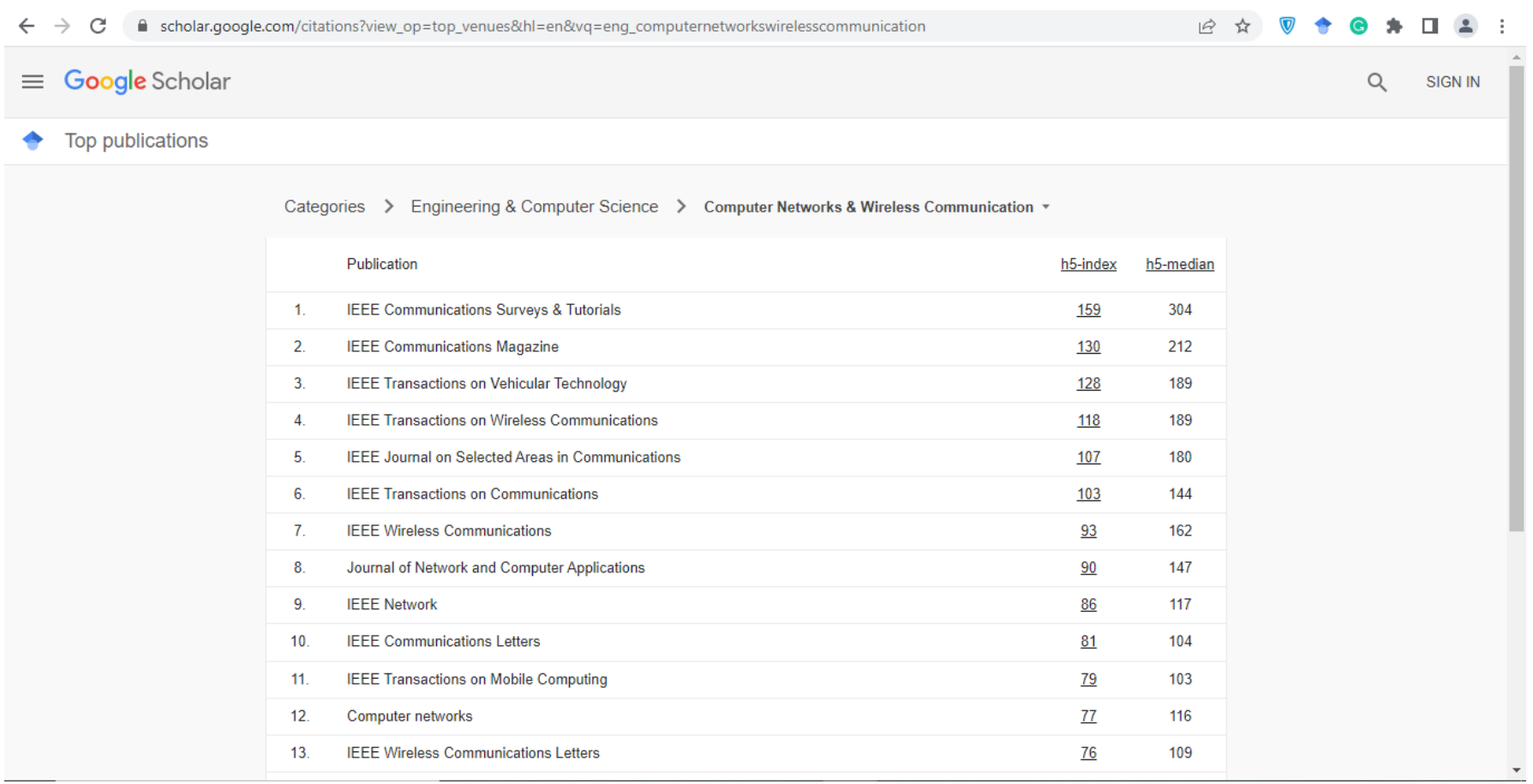


Major conferences and journals in computer networking

Google Scholar Metrics

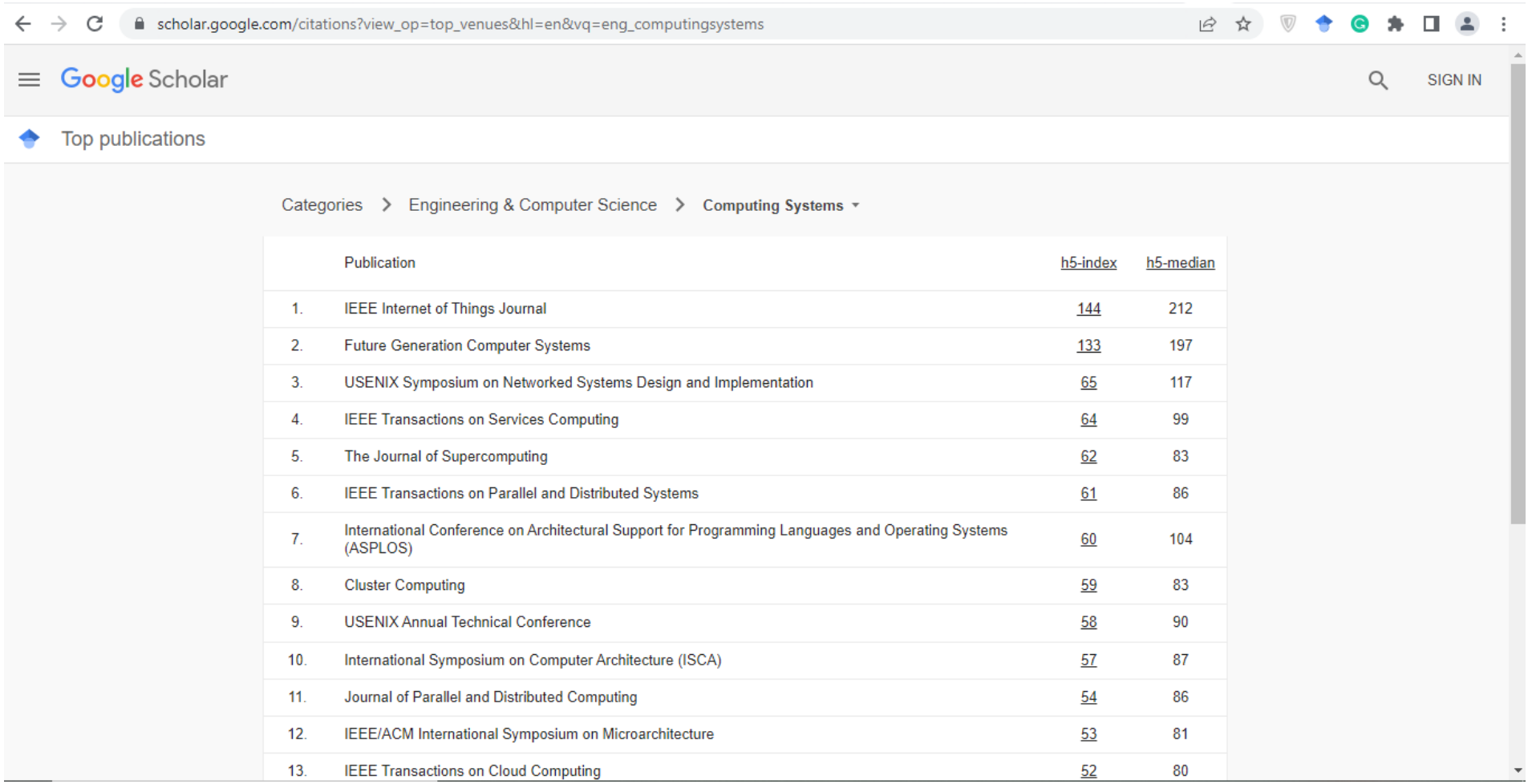
- **H5-index**: the largest number h such that h articles published in [the past 5 years] have at least h citations each

- **H5-median: it** is based on H5-index, but instead **measures the median (or middle) value of citations for the h number of citations**. A journal with an H5-index of 60 and H5-median of 75 means that, of the 60 articles with 60 or more citations, the median of those citation values is 75.



	Publication	h5-index	h5-median
1.	IEEE Communications Surveys & Tutorials	159	304
2.	IEEE Communications Magazine	130	212
3.	IEEE Transactions on Vehicular Technology	128	189
4.	IEEE Transactions on Wireless Communications	118	189
5.	IEEE Journal on Selected Areas in Communications	107	180
6.	IEEE Transactions on Communications	103	144
7.	IEEE Wireless Communications	93	162
8.	Journal of Network and Computer Applications	90	147
9.	IEEE Network	86	117
10.	IEEE Communications Letters	81	104
11.	IEEE Transactions on Mobile Computing	79	103
12.	Computer networks	77	116
13.	IEEE Wireless Communications Letters	76	109

Major conferences and journals in computer networking



scholar.google.com/citations?view_op=top_venues&hl=en&vq=eng_computingsystems

Google Scholar SIGN IN

Top publications

Categories > Engineering & Computer Science > **Computing Systems**

	Publication	h5-index	h5-median
1.	IEEE Internet of Things Journal	144	212
2.	Future Generation Computer Systems	133	197
3.	USENIX Symposium on Networked Systems Design and Implementation	65	117
4.	IEEE Transactions on Services Computing	64	99
5.	The Journal of Supercomputing	62	83
6.	IEEE Transactions on Parallel and Distributed Systems	61	86
7.	International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS)	60	104
8.	Cluster Computing	59	83
9.	USENIX Annual Technical Conference	58	90
10.	International Symposium on Computer Architecture (ISCA)	57	87
11.	Journal of Parallel and Distributed Computing	54	86
12.	IEEE/ACM International Symposium on Microarchitecture	53	81
13.	IEEE Transactions on Cloud Computing	52	80

Major conferences and journals in computer networking

- **Journals**: (Not limited to)

❖ IEEE

- IEEE/ACM Transactions on Networking (TON)
- IEEE Transactions on Network and Service Management (TNSM)
- IEEE Networking Letter
- IEEE Network Magazine
- IEEE Transactions on Network Science and Engineering (TNSE)
- IEEE Journal on Selected Areas in Communications (JSAC)
- IEEE Internet of Things Journal (IoT-J)
- IEEE Transactions on Computers (TC)
- IEEE Transactions on Communications (TCOM)

- Find out more journals on IEEE Publication Recommender

Major conferences and journals in computer networking

- **Journals**: (Not limited to)

❖ Elsevier

- ➢ Computer Networks (ComNet)
- ➢ Journal of Network and Computer Applications (JNCA)
- ➢ Computer Communications (ComCom)
- ➢ Future Generation Computer Systems (FGCS)

❖ Journals by ACM (Association for Computing Machinery)

- ➢ Proceedings of the ACM on Networking
- ➢ ACM Transactions on Sensor Networks
- ➢ See for a complete list: https://dl.acm.org/journals

Major conferences and journals in computer networking

- **Conferences**: (Not limited to)
  - IEEE International Conference on Computer Communications (INFOCOM)
  - Conferences by ACM SIGCOMM (Special Interest Group on Data Communications)
    - The annual SIGCOMM Conference, the flagship conference
    - SIG-sponsored or co-sponsored conferences and workshops: CoNEXT, IMC, Hotnets, Sensys, ICN, ANCS, SOSR and ANRW
    - Conferences and workshops in cooperation with SIGCOMM
  - ACM MobiCom (International Conference On Mobile Computing And Networking conference)
  - International Conference on Network and Service Management (CNSM)
  - IEEE Global Communication Conference (Globecom)
  - IEEE International Conference on Communications (ICC)

Assignment

- Find a good journal paper in your interested field of research and state its key points in one page. (DO NOT COPY the abstract)

- Due date: 1 Aban 1401