INTRODUCTION TO
SCIENTOMETRICS

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Workshop Objectives

- Definitions & Concepts
- Importance & Applications
- Citation Databases
- Basic Scientometric Indices
- Iranian Scientometric Information Database
- Journal Impact Factor, Journal Citation Reports
- CiteScore, SNIP, SJR
- New Scientometric Tools & Indices
- Citation Analysis & Scientometric Reports
- Researcher Profile Services
Definition

- **Scientometrics** is the study of measuring and analyzing science, technology and innovation.

- **Scientometrics** is the measurement of scientific output, and the impact of scientific findings.
History

Modern Scientometrics is mostly based on the work of Eugene Garfield creator and founder of the Science Citation Index and the Institute for Scientific Information (ISI) which is heavily used for scientometric analysis.

Scientometrics Variables

- Authors
- Publications
- References
- Citations
Importance & Applications

- Grant / Funding Allocations
- Benchmarking
- Research Priorities
- Scientific Collaboration Models
- Research Ranking
- Policy Decisions
- Science Mapping
- Academic Promotion
- Collection management
Levels of Scientometric Studies

- **Microlevel**
  Individuals, Groups

- **Mesolevel**
  Universities, Institutions, Journals

- **Macrolevel**
  National, Regional, Global
Citation Databases

- ISI Web of Science
- Scopus
- Google Scholar
ISI WoS Content Coverage

- 12,000 journals
- 160,000 conference proceedings
- Coverage dating back to 1900
- More than 250 disciplines
ISI WOS Core Collection

- Science Citation Index Expanded (SCI-EXPANDED): 1983-present
- Social Sciences Citation Index (SSCI): 1983-present
- Arts & Humanities Citation Index (A&HCI): 1983-present
- Emerging Sources Citation Index (ESCI): 2015-present
- Conference Proceedings Citation Index-Science (CPCI-S): 1990-present
- Conference Proceedings Citation Index-Social Science & Humanities (CPCI-SSH): 1990-present
Scopus Content Coverage

- More than 66 million records
- Over 22,700 peer-reviewed journals
- More than 4,470 are full open access
- Over 558 book series including 34,000 individual book volumes
- More than 138,000 non-serial books and 20,000 added each year
Iran Contribution to World Science

![Graph showing Iran's contribution to world science from 2005 to 2015. The contribution has increased steadily over the years, with values ranging from 0.45 in 2005 to 1.55 in 2015.](image-url)
Iran Science Production Rank in ISI

Year:
- 2005: 34
- 2006: 32
- 2007: 27
- 2008: 22
- 2009: 22
- 2010: 22
- 2011: 19
- 2012: 20
- 2013: 21
- 2014: 21
- 2015: 19
## Top Regional Countries: Comparison of Science Production in ISI

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Types of Scientometric Indices

- Quantitative Indices
- Qualitative Indices
- Quantitative-Qualitative Indices
Scientometrics Indices

- Scientific Productivity
- Citations
- Immediacy Index
- Cited half life
- Highly Cited
- Citation per Paper
- H-Index
- M-Index
- G-Index
- FWCI
H-Index

• The h-index was suggested in 2005 by Jorge E. Hirsch, an American physicist.

• The h-index is a measurement that aims to describe the scientific productivity and impact of a researcher.

• The h-index is defined by how many h of a researcher’s publications each have at least h citations.
H-Graph

- citations
- more than $h$ citations
- citations = papers = $h$
- first $h$ papers
- papers
Journal Impact Factor (JIF)

• The average number of citations received in a year by articles published in that journal during the two preceding years.

• JIF was devised by Eugene Garfield, the founder of the ISI to compare journals.

• JIFs are calculated yearly starting from 1975.
JIF Calculation

- Journal A published some papers in 2014 & 2015:

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<th>Item</th>
<th>2014</th>
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<td>Total Papers Published</td>
<td>130</td>
<td>170</td>
<td>300</td>
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<td>Citations Achieved in 2015</td>
<td>240</td>
<td>360</td>
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\[
\text{Impact Factor} = \frac{\text{Citations}}{\text{Papers}} = \frac{600}{300} = 2 \quad \text{IF}
\]
Journal Citation Reports (JCR)

Journal Impact Factors are calculated and released annually by one of the most important and useful ISI databases called Journal Citation Reports.
JIF Comparison

• NURSING RESEARCH
  IF 2015 = 1.856

• BONE RESEARCH
  IF 2015 = 3.549

• IMMUNOLOGY
  IF 2015 = 4.078
CiteScore

- **CiteScore** is the new journal evaluation metrics proposed by Elsevier.
- The concept is the same as *Impact Factor*.
- It's a 3 years period of time index
SCImago Journal Rank (SJR)

• SJR is normalized by the total number of citations in the citing journal for the year in question.
• Each journal is a node and each directed connection is a normalized value of the number of citations from one journal to another over a three year window.
SCImago vs JCR

- Source of data
- Coverage
- Algorithm
- Access
- Application
Source Normalized Impact Per Paper (SNIP)

- SINP normalizes the different fields based on the citing-side form of normalization, rather than normalizing with respect to the just total citations a journal receives.
- SINP normalizes with respect to the number of references in the citing journals.
Welcome to Journal Metrics from Elsevier

The academic community has long been demanding more transparency, choice and accuracy in journal assessment. Elsevier now provides three alternative, transparent and accurate views of the true citation impact a journal makes:

- Source Normalized Impact per Paper (SNIP)
- The Impact per Publication (IPP)
- ScImago Journal Rank (SJR)

The three different impact metrics are all based on methodologies developed by external bibliometricians and use Scopus as the data source. Scopus is the largest citation database of peer-reviewed literature and features tools to track, analyze and visualize research output. Via this website, the three journal metrics are provided free of charge.
Citation Analysis & Scientometric Reports
FIELD-WEIGHTED CITATION IMPACT (FWCI)

\[
\frac{\text{# of citations received by a document}}{\text{expected # of citations for similar documents}}
\]

Similar documents are ones in the same discipline, of the same type (e.g., article, letter, review) and of the same age. An FWCI of 1 means that the output performs just as expected against the global average. More than 1 means that the output is more cited than expected according to the global average; for example, 1.48 means 48% more cited than expected.
Altmetrics: Using Big Data to Measure Scholarly Impact

A way to measure the impact of a scholarly article or project by charting social media mentions as well as blog posts and bookmarks.
Why Altmetrics?

• **No one can read everything.**

• We rely on filters to make sense of the scholarly literature, but the narrow, traditional filters are being swamped.

• The growth of new, online scholarly tools allows us to make new filters

• Altmetrics reflect the broad, rapid impact of scholarship in this burgeoning ecosystem. We call for more tools and research based on altmetrics.
2913

Mentioned by
- 97 news outlets
- 59 blogs
- 2289 tweeters
- 10 weibo users
- 164 Facebook pages
- 3 Wikipedia pages
- 77 Google+ users
- 1 research highlight platform
- 1 Q&A thread
- 3 video uploaders
Researcher Profile Services

• Services through which researchers can set their own academic CV’s & profiles.

• Increasing the visibility of researchers and their work

• Choosing to be public or private in some services

• Many universities have their own RPS.

• Auto vs Manual generation
Top Researcher Profile Services

1) ORCID
2) Scopus Author ID
3) ResearcherID
4) Google Citation Service
ORCID
<orcid.org>

• ORCID (Open Researcher and Contributor ID) is a registry of persistent unique identifiers for researchers. (Over 3,500,000 IDs)

• As an international, interdisciplinary, open and not-for-profit organization, ORCID was created in 2010 for the benefit of research organizations, research funders, publishers and researchers.
DISTINGUISH YOURSELF IN THREE EASY STEPS

ORCID provides a persistent digital identifier that distinguishes you from every other researcher and, through integration in key research workflows such as manuscript and grant submission, supports automated linkages between you and your professional activities ensuring that your work is recognized. Find out more.

1. REGISTER  Get your unique ORCID identifier Register now!
   Registration takes 30 seconds.

2. ADD YOUR INFO  Enhance your ORCID record with your professional information and link to your other identifiers (such as Scopus or ResearcherID or LinkedIn).

3. USE YOUR ORCID ID  Include your ORCID identifier on your Webpage, when you submit publications, apply for grants, and in any research workflow to ensure you get credit for your work.
ResearcherID
<http://www.researcherid.com>

- ResearcherID is an identifying system for scientific authors.
- The system was introduced in January 2008 by Thomson Reuters.
- A unique identifier consists of alphanumeric characters, each number contains the year in which you registered.
- Example: A-9873-2013
What is ResearcherID?
ResearcherID provides a solution to the author ambiguity problem within the scholarly research community. Each member is assigned a unique identifier to enable researchers to manage their publication lists, track their times cited counts and h-index, identify potential collaborators and avoid author misidentification. In addition, your ResearcherID information integrates with the Web of Science and is ORCID compliant, allowing you to claim and showcase your publications from a single one account. Search the registry to find collaborators, review publication lists and explore how research is used around the world.

Top Keywords
Find researchers based on your area of interest.

- adsorption
- aging
- analytical chemistry
- artificial intelligence
- biochemistry
- biodiversity
- biogeochemistry
- biogeography
- bioinformatics
- biomaterials
- biomechanics
- biophysics
- biosensors
- biotechnology
- breast cancer
- cancer
- cancer biology
- carbon nanotubes
- catalysis
- chemistry
- climate change
- computational biology
- computational chemistry
- computer vision
- condensed matter physics
- conservation
- conservation biology
- data mining
- diabetes
- drug delivery
- ecology
- education
- electrochemistry
- energy
- epidemiology
- epigenetics
- evolution
- fluid mechanics
- genetics
- genomics
- geochemistry
- GIS
- graphene
- hydrology
- image processing
- immunology
- inflammation
- innovation
- inorganic chemistry
- knowledge management
- machine learning
- management
- marketing
- mass spectrometry
- medicinal chemistry
- microbiology
- microfluidics
- molecular biology
- molecular dynamics
- nanomaterials
- nanoparticles
- nanotechnology
- neural networks
- neuroscience
- nonlinear optics
- nutrition
- obesity
- optimization
- organic
Google Scholar Citations
<http://scholar.google.com/citations>

- A service provided by Google.
- A simple way for authors to keep track of citations to their articles.
- Researchers can check who is citing their publications.
- Computing several citation metrics.
- Quick to set up and simple to maintain.
Reza Malekzadeh
Professor of Internal Medicine, Tehran University of Medical Sciences, Iran
Digestive oncology, Chronic liver disease
Verified email at tums.ac.ir - Homepage

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<td>The lancet 380 (9859), 2224-2260</td>
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<td>Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010</td>
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<td>Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010</td>
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<td>Common values in assessing health outcomes from disease and injury: disability weights measurement study for the Global Burden of Disease Study 2010</td>
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Scopus Author Identifier

- The Scopus Author Identifier assigns a unique number to groups of documents written by the same author via an algorithm that matches authorship based on a certain criteria.
- Many authors have similar names.
- Author names can be formatted differently.
ISID Author Profile
<isid.research.ac.ir>