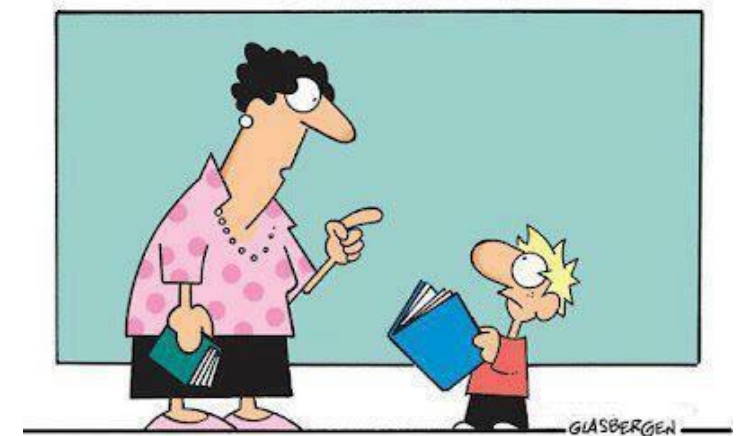


# Scientific Method: Introduction and literature search

Oskar Palinko, Associate Professor, SDU Robotics

Autumn 2023



It's called **reading**.  
It's how people install new  
software into their brains.

<https://kaysolo.wordpress.com/2012/10/20/why-is-reading-good>

# About the course - topics

- Practical aspects of SciMet
- Not philosophical
- Contents
  - Literature search
  - Presentation techniques
  - Plagiarism
  - Experimental design
  - Statistics
  - Ethics in science
  - Guest presentations



<https://www.wildlifeforensicscience.org/product/r/>

# About the course - activities

- Course activities
  - Weekly reading tasks
    - Each week one or more groups gets a reading task
    - Next week they report on it in the form of a 10min slide presentation
    - Discussion
  - Project in R on analyzing and reporting results
    - Henrik Skov Midtiby
  - Scientific Project
    - Plan, design, conduct, analyze, report on a scientific project
    - Must be robotics related
    - Write a 4-page paper about it
    - Present it at internal conference
    - New for this year: minimize effort by finding synergies with other projects on this semester
- Exam



<https://www.wildlifeforensicscience.org/product/r/>



# Learning objectives - knowledge

- Literature search and organizing the result
- Scientific methods used in different fields of research
- Hypothesis generation and testing
- How to choose and use statistical tests
- Real world applications

# Learning objectives – skills and competences

- Independently find literature on a specific research topic.
- Begin to evaluate the scientific worth of a paper
- Generate alternative explanations for a set of results
- Propose a systematic approach for validating a research result by experimentation or by building simple prototypes.
- Understand why different branches of science use different methodologies.
- Understand the basics of some major methodologies.
- Be able to apply the correct methodology for their chosen topic

# Use of AI in class

- Always needs to be declared
- Should not be used for hand-ins as a general rule
  - Specific cases might be exempted upon previous approval by me
- We will explore using AI for SciMet topics – SDU policy

# Expected practical outcomes

- Reviewing and presenting scientific work
  - Lectures 1-3
- Experiments
  - Setting up a hypothesis
  - Designing an experiment
  - Using proper statistics for data analysis
- Paper writing
  - Writing a scientific text over your scientific project



# Course outline

- **Literature**
  - Literature search
  - Scientific presentation
- **Experimental design**
  - Hypothesis and evidence
  - Descriptive and comparative statistics
  - Experimental design
- **Dissemination**
  - Avoiding plagiarism
  - Paper writing
- **Conference**
  - Your projects
- **Finalization**
  - **Activity**: project work

# Preliminary course schedule

Week	Date	Topic
W36	Sept 3	Intro to SciMet, Literature Search
W37	Sept 10	No class
W38	Sept 17	Scientific presentation
W39	Sept 24	Hypothesis and experimentation
W40	Oct 1	Basic and comparative statistics
W41	Oct 8	Experimental design
W42	Oct 16	Autumn break
W43	Oct 22	Paper writing and avoiding plagiarism
W44	Oct 29	Repeatable research using R - Henrik Skov Midtiby
W45	Nov 5	Patents, ethics, AI Guest presentation
W46	Nov 12	No classes – project work - consultations
W47	Nov 19	No classes – project work - consultations
W48	Nov 26	Conference (project presentations)
W49	Dec 4	Final project papers due

# Outline for today

- What is the Scientific Method
- Motivation for SCM
- Literature search
- Reading techniques
  - Case study: “Controlled Flight of a Biologically Inspired, Insect-Scale Robot”
- Citation metrics
- Activities
  - Make groups of 3 or 4 (**not** < 3, **not** > 4)
  - Think about an interesting topic for your project

# What is the Scientific Method?

- Merriam-Webster: “principles and procedures for the systematic pursuit of knowledge involving the recognition and formulation of a problem, the collection of data through observation and experiment, and the formulation and testing of hypotheses”
- Hypothesis: “a tentative assumption made in order to draw out and test its logical or empirical consequences”
- Basic procedure:
  - Recognizing **problems**
  - Formulating **hypotheses**
  - Applying **methods**
  - **Testing** hypotheses
  - Drawing **conclusions**

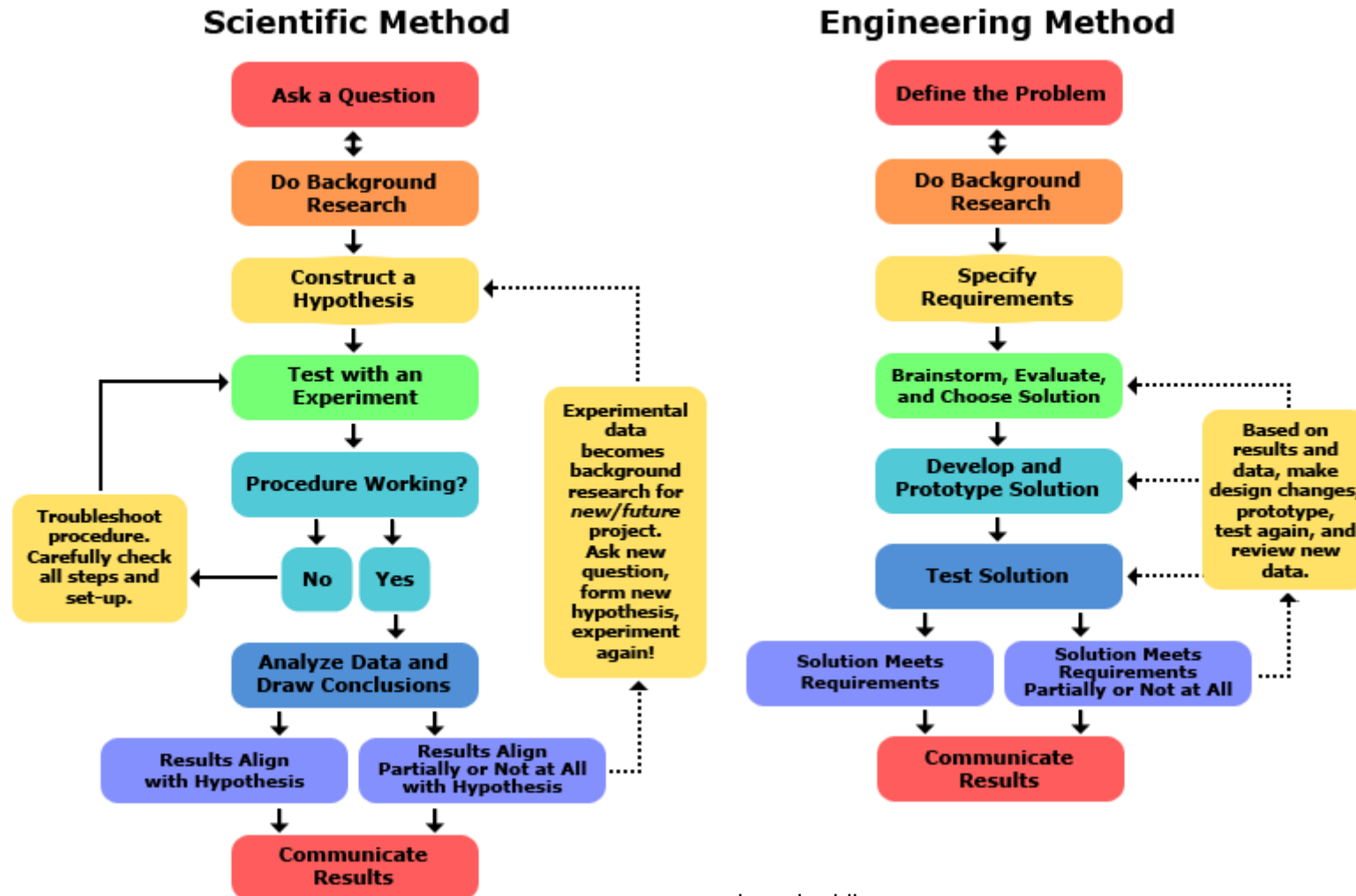
# Main principles of the Scientific Method

- Related to common sense
- Evidence-based
- Based on previous knowledge
- Transparency
- Repeatability
- Independent review
- Deliberate – done consciously, intentionally and carefully

# Why would I care about SciMet?

- I'm not going to become a scientist, but an engineer, why would I care?

# Why would I, an engineer, care about SciMet?



Literature search (W35)

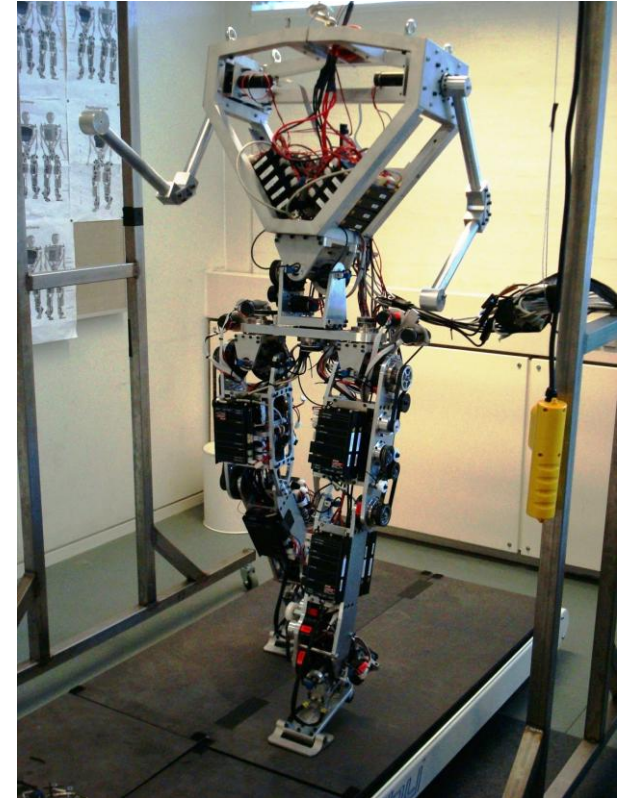
Hypothesis and experimentations (W37)

Statistics (W38, W39)

Presentation (W46), paper (W47)

# Why SciMet in robotics?

- New field
- Focus on proof of concepts
- Focus on specific applications
- SCM needed to understand the science of robotics
- Need for standardization of methods

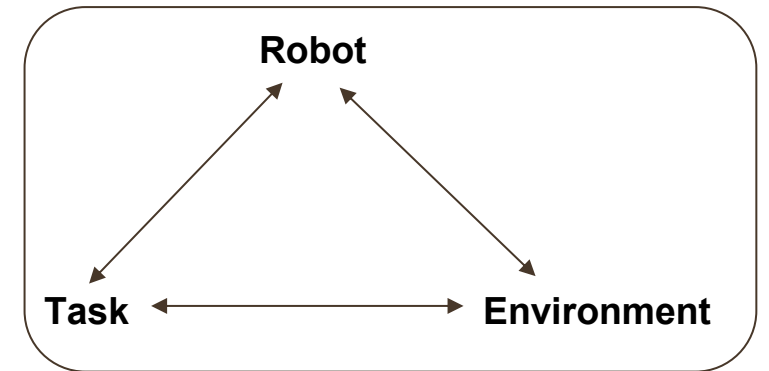


<http://www.aaubot.aau.dk/>



# Why SciMet in robotics?

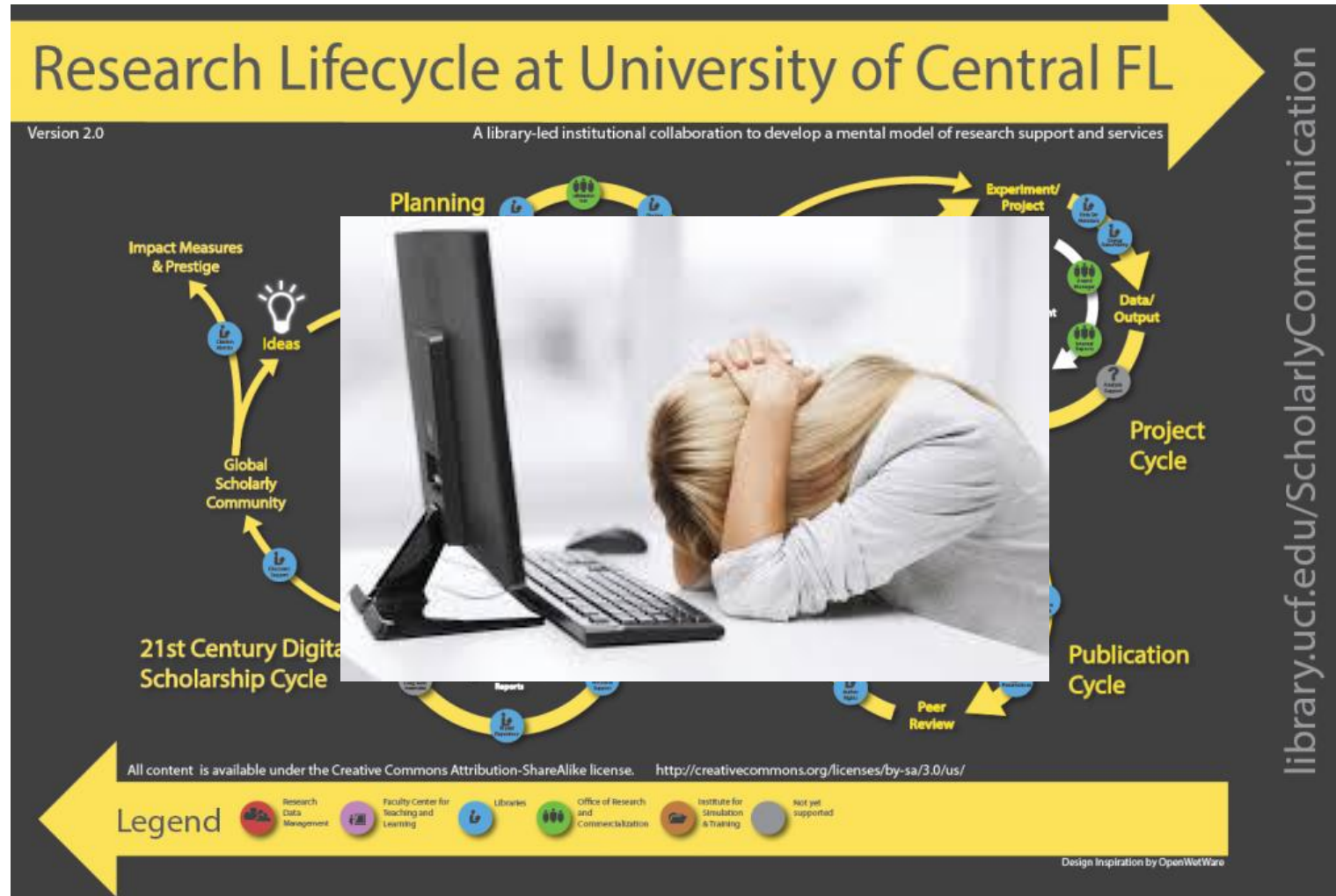
- In a chaotic world, even the best algorithms produce unpredictable results
- Small errors add up
- What is needed?
  - Empiricism
  - Quantification
  - Comparisons
  - Statistics



# The ideal scientific process

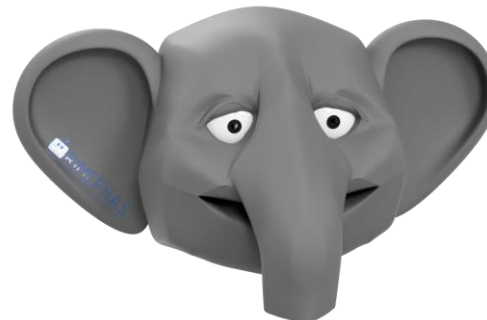
1. Survey existing knowledge
2. Find a problem that needs to be addressed
3. Formulate new hypothesis  $H$
4. Plan and perform experiments to gather evidence
5. Data analysis
  - If  $H$  is false, goto 2
  - If  $H$  is supported, but alternative explanations still exist, goto 3
6. Publication

# The realistic process



# Example - RIMEPHAS

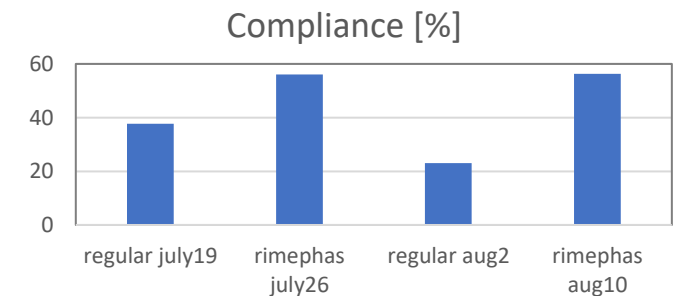
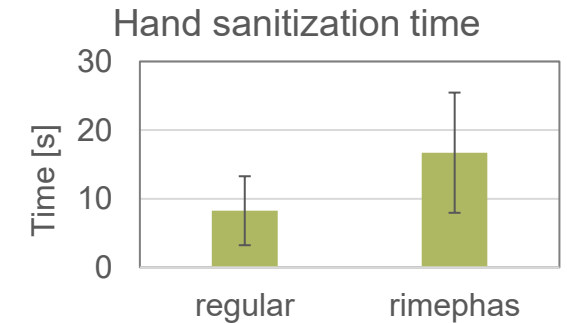
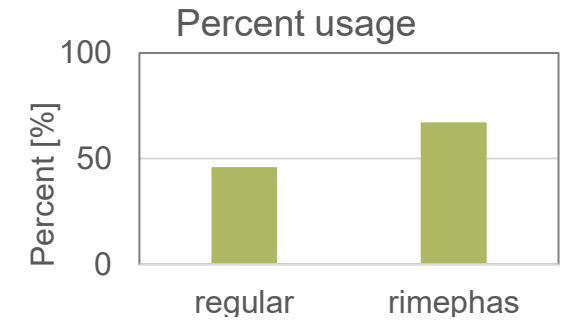
- InnovationFonden project
  - Robotic Interface for Motivating and Educating Proper Hand Sanitization
- Problem: People don't sanitize their hands enough. When they do it, they don't do it properly.
- Hypothesis: A robot interface can help with this.
- Method: Use affordable technology to build prototypes.
- Testing: Compare regular interface to robotic interface.
- [rimephas.com](http://rimephas.com)



# Example - RIMEPHAS



- The interface is compared to the regular automatic hand sanitizer
- Hand sanitization increased around 20% with the new interface (chi squared test)
- Hand sanitization duration increased significantly with RIMEPHAS (student's t-test)
- Testing was conducted at a university (SDU), a company (Abena) and a hospital (SHS – Aabenraa)
- Long-term testing confirmed the increased compliance using RIMEPHAS
- Published paper: ["A Robotic Interface for Motivating and Educating Proper Hand Sanitization using Speech and Gaze Interaction"](#)

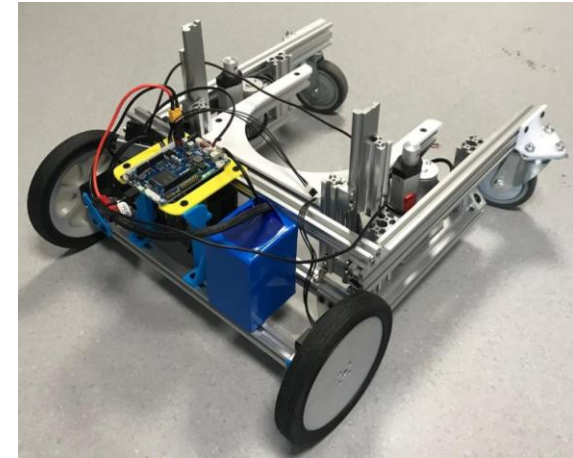


# Example - HanDiRob

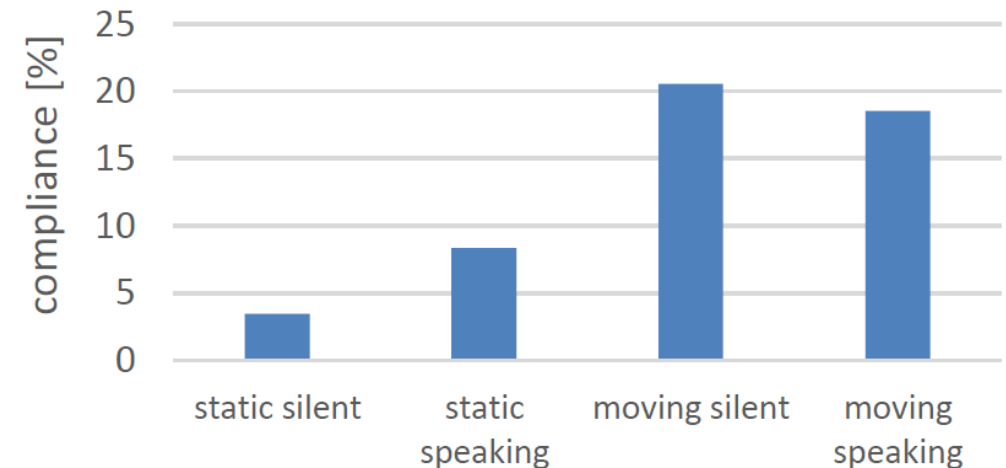




# Example - HanDiRob



- EU Interreg project
  - Hand Sanitization Robot
  - RIMEPHAS on wheels
- Problem: People don't sanitize their hands enough. When they do it, they don't do it properly.
- Hypothesis: A mobile robot interface can help with this by using speech and movement
- Method: Use affordable technology to build prototypes.
- Testing: Compare regular interface to robotic interface.
- [handi rob.eu](http://handi rob.eu)



# Example – Stuck robot

- Completed by two students of this course
- Published at HRI Late Breaking Reports
- [“What Will It Take to Help a Stuck Robot? Exploring Signaling Methods for a Mobile Robot”](#)

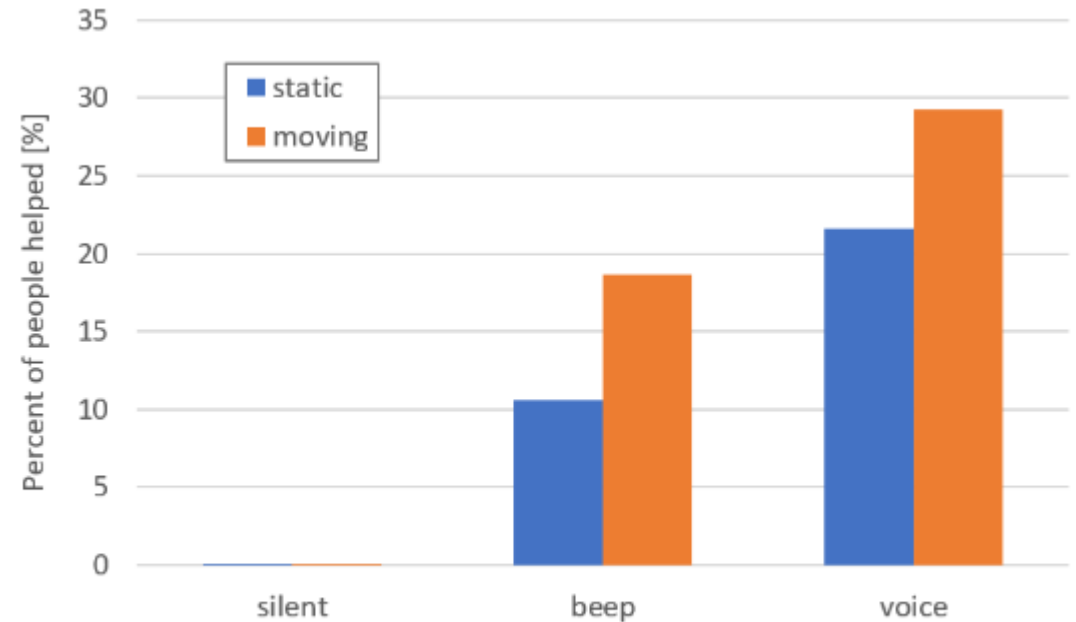


Fig. 2: Percent of people who helped the robot



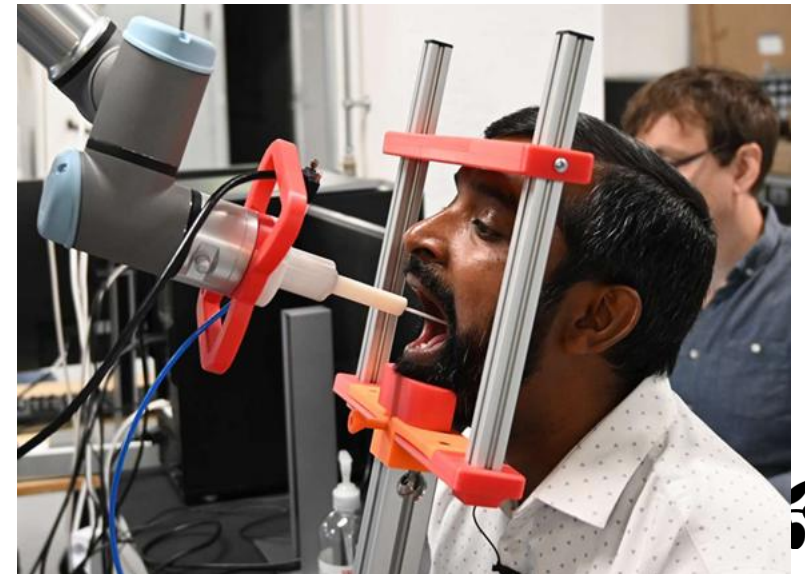
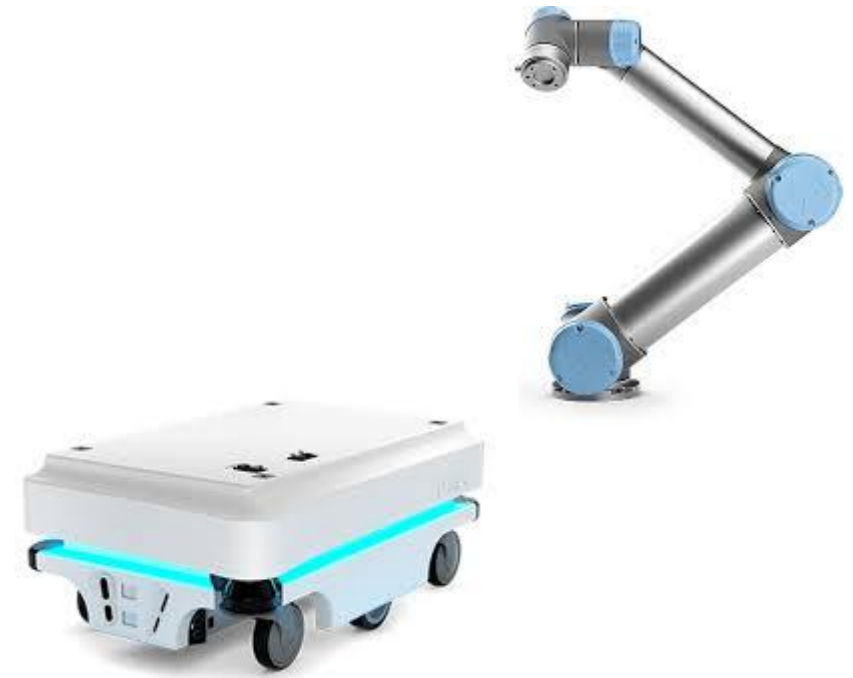
# Example – Stuck robot

What Will It Take to Help a Stuck Robot?  
Exploring Signaling Methods for a Mobile Robot



# Your task

- Using the scientific method design an experiment for:
  - Universal Robots (cobots)
  - Mobile Industrial Robots
  - Swabby
  - Atlas
  - HanDiRob



# Literature search

# Where to find knowledge

- Google, Wikipedia, the Web
- Textbooks
- Colleagues
- Conference presentations and posters
- Conference outputs or journals
  - Primary source of detailed descriptions of scientific work
  - Editorial and peer reviewed
  - Articles, publications, papers, etc.
- Patents
  - Very detailed information about specific innovations

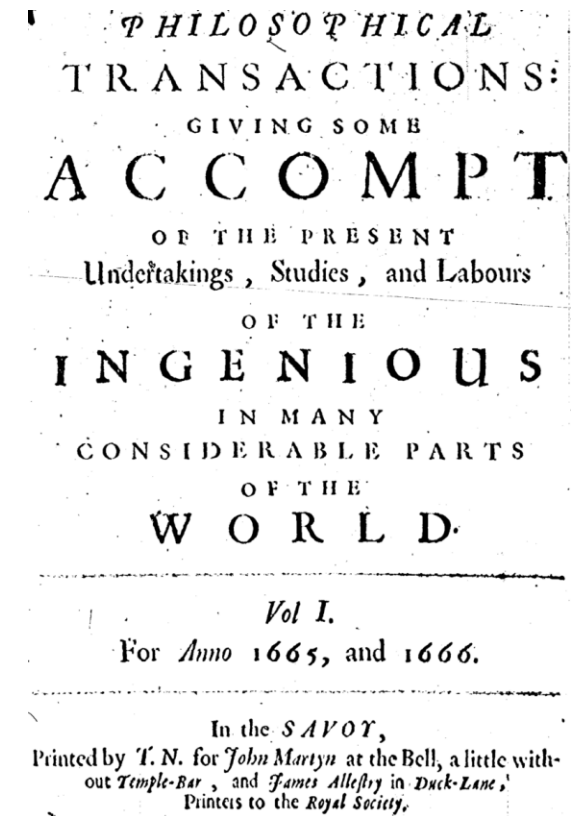
# Patents

- Been around for more than 500 years
- State granted monopoly  $\Leftrightarrow$  full disclosure of invention
- Motivates innovation and knowledge sharing
- Free
  - Example: <https://www.google.com/patents/US1394450>
- Results oversold?

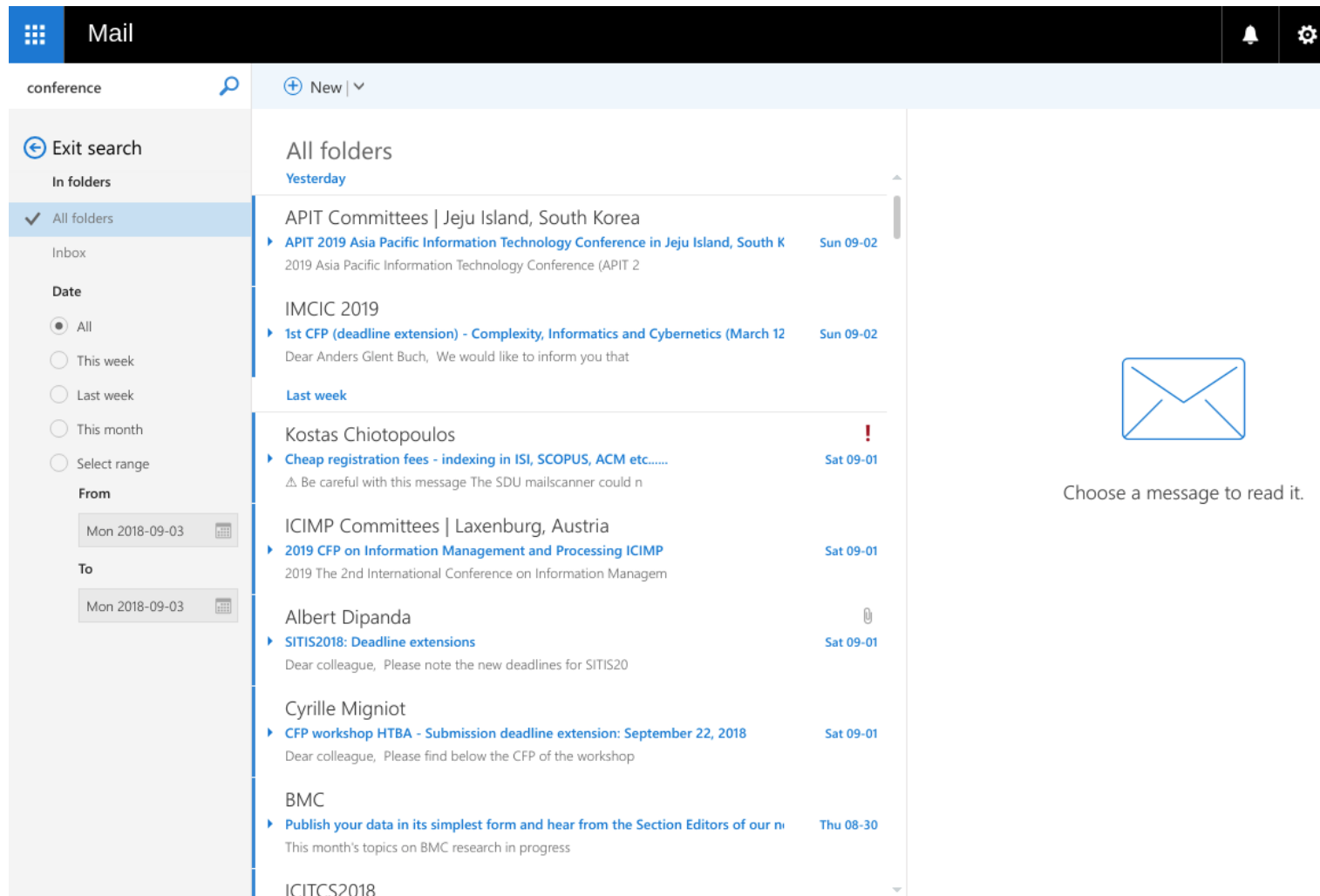
# Scientific journals

- Also been around for long
- Scientific content
- Exploded in the 1800s (hint: Nature)
- Today journals are big business
- Big players: Elsevier, Springer, etc.
- New journals appear all the time

[https://af.wikipedia.org/wiki/Royal\\_Society](https://af.wikipedia.org/wiki/Royal_Society)



# Scientific journals/conferences



The screenshot shows the Outlook Mail interface. The top bar is black with a white grid icon, the word "Mail", and notification and settings icons. Below this is a search bar with the text "conference" and a "New" button. The left sidebar contains a search filter section with "Exit search" and "In folders" options. Under "In folders", "All folders" is selected. Below this are date filters: "All", "This week", "Last week", "This month", and "Select range". The "From" and "To" fields are also visible, both showing "Mon 2018-09-03". The main pane displays a list of folders and emails. The "All folders" section is expanded, showing a list of emails. The emails are grouped by sender/folder: "APIT Committees | Jeju Island, South Korea", "IMCIC 2019", "Kostas Chiotopoulos", "ICIMP Committees | Laxenburg, Austria", "Albert Dipanda", "Cyrille Migniot", "BMC", and "ICITCS2018". Each email entry includes a subject line, a preview of the body text, and a date. The "Kostas Chiotopoulos" email has a red exclamation mark icon next to it.

conference

Mail

Exit search

In folders

All folders

Inbox

Date

All

This week

Last week

This month

Select range

From

Mon 2018-09-03

To

Mon 2018-09-03

All folders

Yesterday

APIT Committees | Jeju Island, South Korea

APIT 2019 Asia Pacific Information Technology Conference in Jeju Island, South K

2019 Asia Pacific Information Technology Conference (APIT 2)

Sun 09-02

IMCIC 2019

1st CFP (deadline extension) - Complexity, Informatics and Cybernetics (March 12

Sun 09-02

Dear Anders Glent Buch, We would like to inform you that

Last week

Kostas Chiotopoulos

Cheap registration fees - indexing in ISI, SCOPUS, ACM etc.....

Sat 09-01

Be careful with this message The SDU mailscanner could n

ICIMP Committees | Laxenburg, Austria

2019 CFP on Information Management and Processing ICIMP

Sat 09-01

2019 The 2nd International Conference on Information Managem

Albert Dipanda

SITIS2018: Deadline extensions

Sat 09-01

Dear colleague, Please note the new deadlines for SITIS20

Cyrille Migniot

CFP workshop HTBA - Submission deadline extension: September 22, 2018

Sat 09-01

Dear colleague, Please find below the CFP of the workshop

BMC

Publish your data in its simplest form and hear from the Section Editors of our n

Thu 08-30

This month's topics on BMC research in progress

ICITCS2018

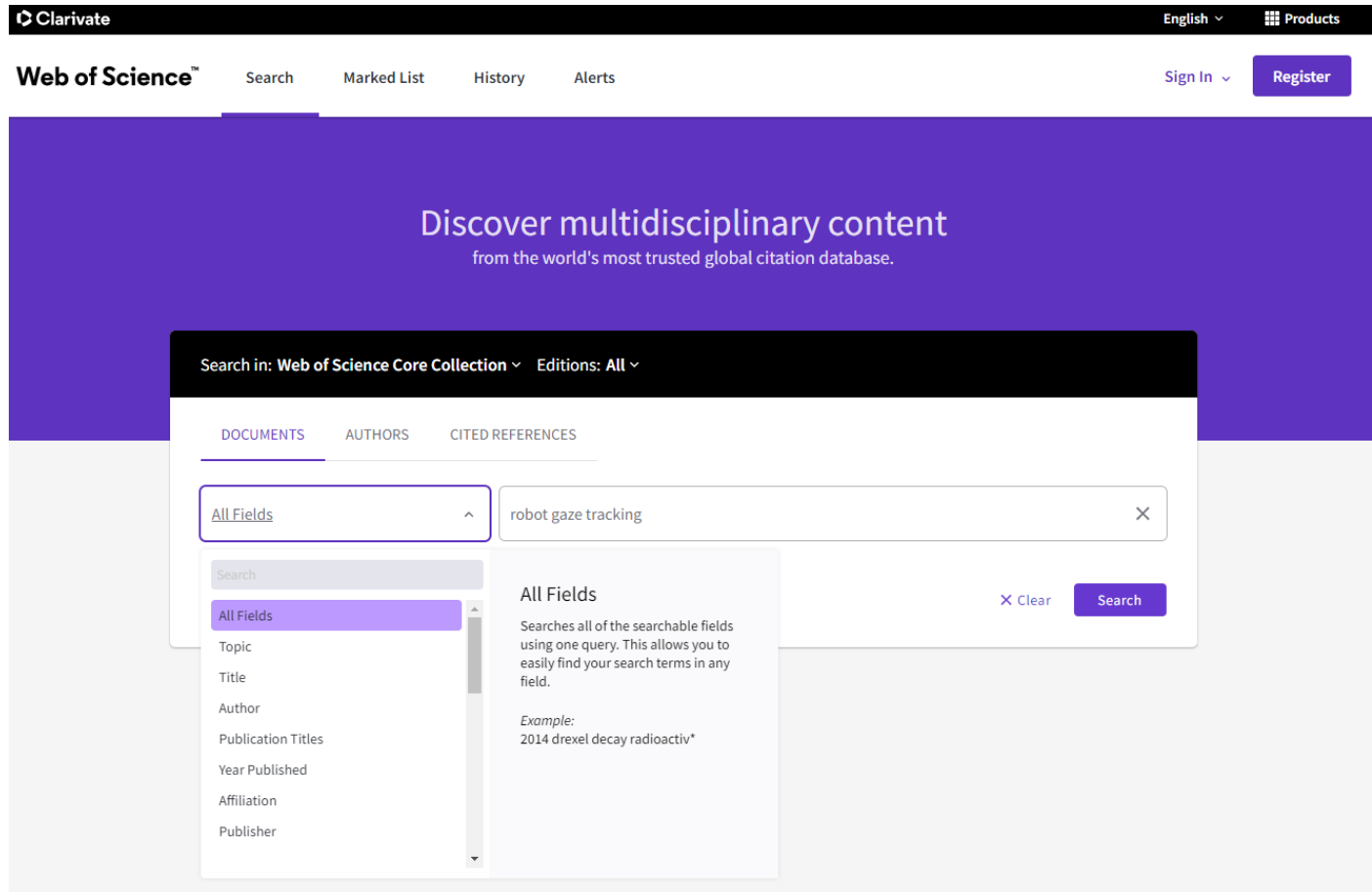
Choose a message to read it.

# Different types of journals

- Generalistic (e.g. Science)
- Specific (e.g. IJRR)
- Very specific (e.g. Autonomous Robots)
- Regional (e.g. New England Journal of Medicine)
- Different languages (e.g. Revista Iberoamericana de Automática e Informática Industrial RIAI)
- Conference abstracts and proceedings
- Review journals
- Method journals



# Search for papers – Web of Science



The screenshot displays the Web of Science search interface. At the top, the Clarivate logo is on the left, and 'English' and 'Products' are on the right. Below this, the 'Web of Science' logo is followed by navigation links: 'Search', 'Marked List', 'History', and 'Alerts'. On the far right of this section are 'Sign In' and 'Register' buttons. The main header area has a purple background with the text 'Discover multidisciplinary content from the world's most trusted global citation database.' Below this is a search bar with a dropdown menu showing 'Search in: Web of Science Core Collection' and 'Editions: All'. The search bar has tabs for 'DOCUMENTS', 'AUTHORS', and 'CITED REFERENCES'. The search input field contains 'robot gaze tracking'. To the left of the search input is a dropdown menu for 'All Fields' with a list of searchable fields: 'Topic', 'Title', 'Author', 'Publication Titles', 'Year Published', 'Affiliation', and 'Publisher'. A 'Search' button is to the right of the search input, and a 'Clear' button is to the left of it. A tooltip for 'All Fields' is visible, explaining that it searches all of the searchable fields using one query and provides an example: '2014 drexel decay radioactiv\*'.

Clarivate English Products

Web of Science™ Search Marked List History Alerts Sign In Register

Discover multidisciplinary content  
from the world's most trusted global citation database.

Search in: Web of Science Core Collection Editions: All

DOCUMENTS AUTHORS CITED REFERENCES

All Fields robot gaze tracking X

Search X Clear Search

All Fields

Searches all of the searchable fields using one query. This allows you to easily find your search terms in any field.




Example:  
2014 drexel decay radioactiv\*

Topic  
Title  
Author  
Publication Titles  
Year Published  
Affiliation  
Publisher

# Search for papers – Scopus (Elsevier)

## Start exploring

Discover the most reliable, relevant, up-to-date research. All in one place.

 Documents  Authors  Affiliations

[Search tips](#) 

Search within  
Article title, Abstract, Keywords

Search documents \*

[+ Add search field](#) [+ Add date range](#) [Advanced document search >](#)

Search 

[Search History](#) [Saved Searches](#)

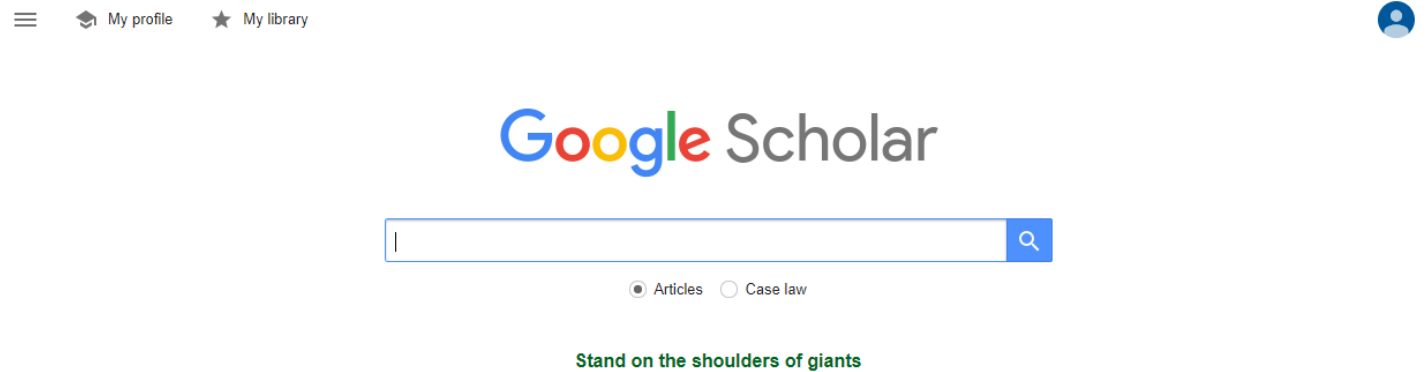
new



Start searching and your history will appear here. If you need help to start searching check out our [search tips](#).

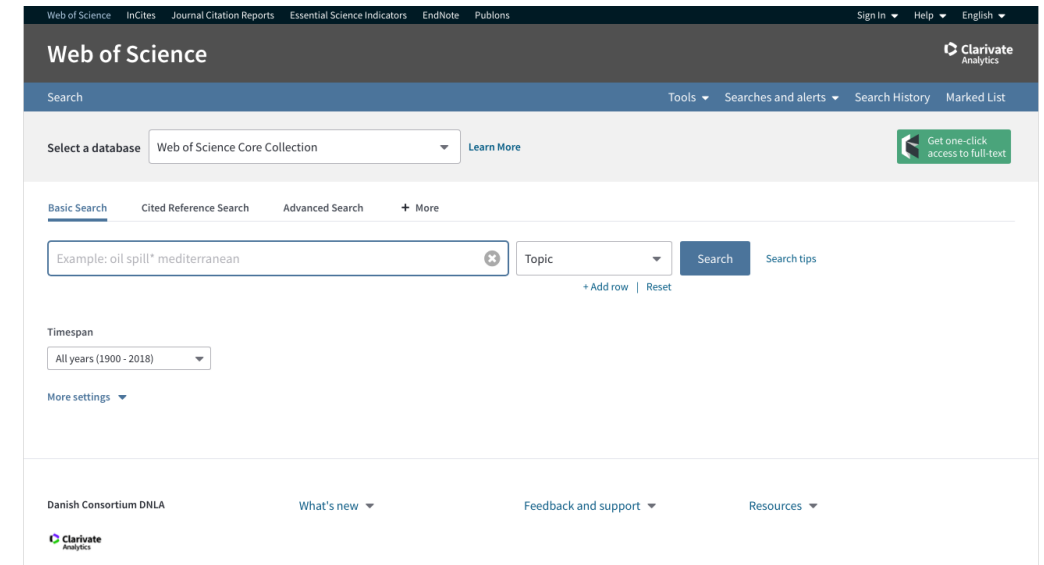
# Search for papers (the Google way)

- scholar.google.com



# Wording

- Use and combine scientific words
- Combine topics, titles, affiliations, years
- Do not use non-English letters (e.g. Æ)
- Searching for an author:
  - palinko, oskar



The screenshot shows the Web of Science search interface. At the top, there is a navigation bar with links to Web of Science, InCites, Journal Citation Reports, Essential Science Indicators, EndNote, and Publons. Below this is a search bar with a dropdown menu for 'Select a database' set to 'Web of Science Core Collection'. To the right of the dropdown is a 'Learn More' link. Below the search bar, there are tabs for 'Basic Search', 'Cited Reference Search', and 'Advanced Search'. The 'Basic Search' tab is selected. The search input field contains the text 'Example: oil spill\* mediterranean'. To the right of the input field is a 'Topic' dropdown menu and a 'Search' button. Below the search input field, there is a 'Timespan' dropdown menu set to 'All years (1900 - 2018)'. At the bottom of the page, there is a footer with links to 'Danish Consortium DNLA', 'What's new', 'Feedback and support', and 'Resources'. The Clarivate Analytics logo is also present in the footer.

# Search strategy – my approach

- A “science” for itself
- Choosing the right search keywords is the most crucial for finding the best papers
- You need to find keywords for your topic
- Look in already known papers – which keywords do they use?
- Use the quotation marks for searching for key phrases “eye tracking”
- Look at what the found papers cite (reference section)
- Look who is citing the found papers
- Once you are finding the same high-quality papers repeatedly, you “closed the loop”, i.e. researched the topic deep enough

[Eye gaze tracking for a humanoid robot](#)

[O Palinko, F Rea, G Sandini...](#) - ... on Humanoid **Robots** ..., 2015 - [ieeexplore.ieee.org](#)

Humans use eye **gaze** in their daily interaction with other humans. Humanoid **robots**, on the other hand, have not yet taken full advantage of this form of implicit communication. In this paper we present a passive monocular **gaze tracking** system implemented on the iCub ...

☆ 77 **Cited by 19** [Related articles](#) [All 4 versions](#)

# Activity

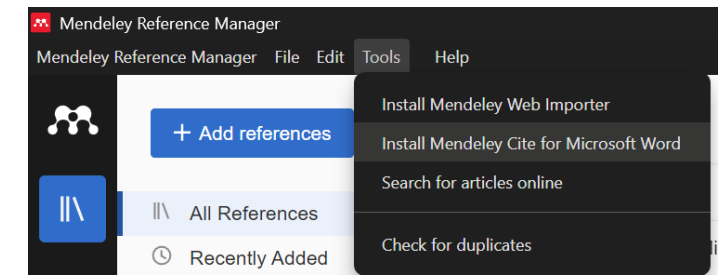
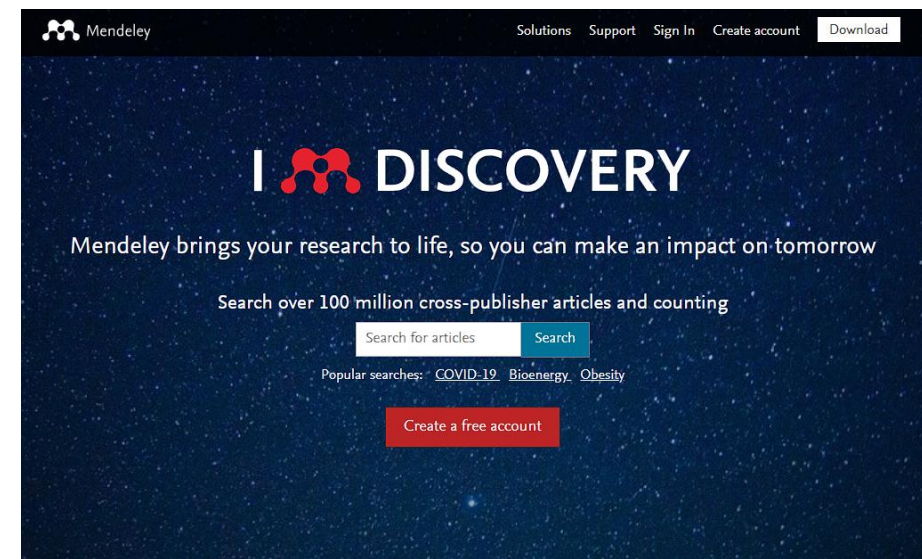
- Let's say you are interested in handshakes with robots.
- Do a literature search and find all the most relevant papers on it
- Put your results [here](#)

# Activity

- Prompt your generative AI of choice to write you a max 300-word literature review on handshakes with robots
- Put your results [here](#)
- Does it cite the most relevant papers which you found in the previous task?

# Tools for citing

- Word users
  - Built-in system of Word – not ideal
  - Zotero, Mendeley – better
- Overleaf users
  - Find templates for your journal/conference on their website or Overleaf website
  - Example of HRI conference

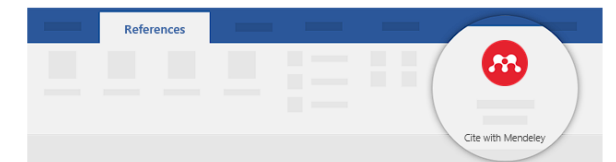


 Mendeley Cite

Launch the add-in

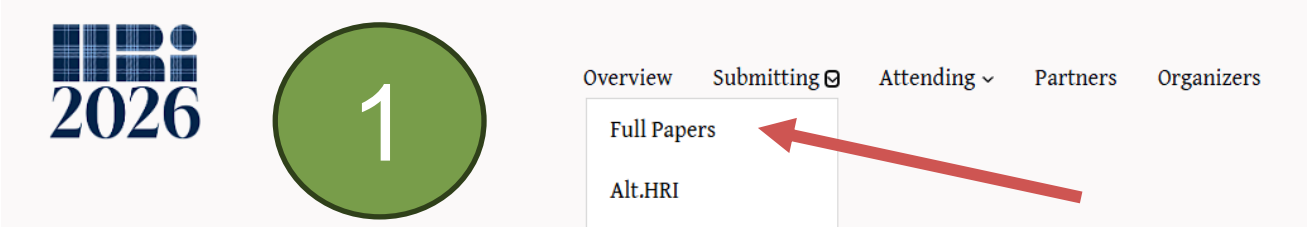
After you install the add-in, you can launch it by choosing the add-in button on the References tab

On the References tab

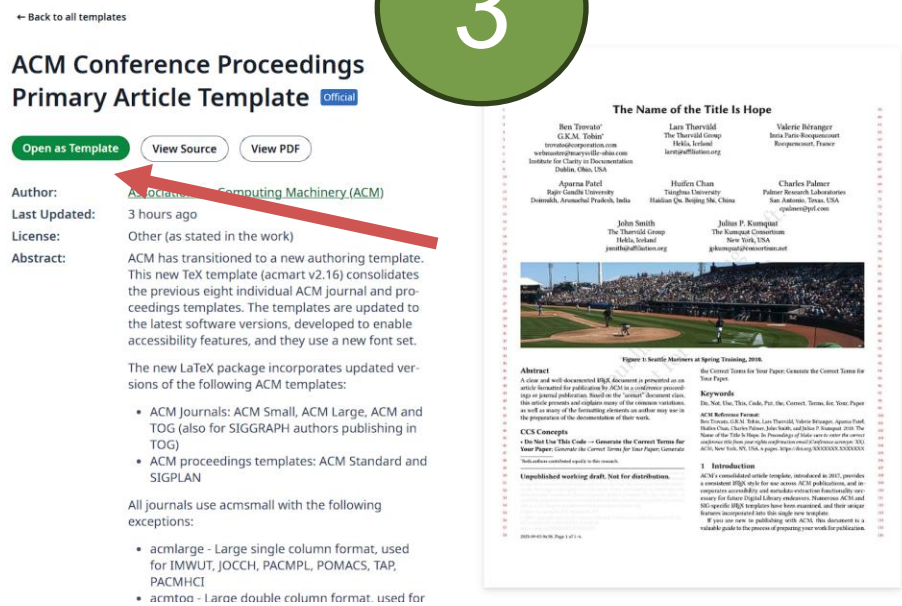




# HRI conference example - Overleaf



Overleaf



## Format and Submission

Full papers are up to eight camera-ready pages, including figures, but excluding references. Accepted full papers will be published in the conference proceedings and presented in an oral session. Submissions longer than eight pages of content excluding references will be desk rejected and not reviewed.

The HRI conference is highly selective with a rigorous, two-stage review model that includes an expert program committee meeting where papers are extensively discussed. As such, all submissions are expected to be mature, polished, and detailed accounts of cutting-edge research described and presented in camera-ready style. In cases of equally qualified papers, positive consideration will be given to submissions that address this [link](#) Empowering Society”.

All papers for the conference must be submitted in PDF form to [this link](#) to ACM Proceedings specifications. Please note that we are following the general ACM format (“sigconf”, double column format), not the SIGCHI format. Templates are available at [this link](#) (US letter).


In addition, ACM has partnered with Overleaf, where you can start writing using [this link](#) directly (note that this Overleaf document uses the new ACM workflow by default, which is not what HRI is using; to fix this, make sure the document uses the “sigconf” document class, rather than the “manuscript,screen,review” document class that is enabled in the Overleaf document by default).

# HRI conference example - Overleaf

palinko

About 5,690 results (0,06 sec)

User profiles for palinko

 Istvan Palinko - Verified email at chem.u-szeged.hu - Cited by 5518  
Oskar Palinko - Verified email at mmmi.sdu.dk - Cited by 1726

Estimating cognitive load using remote eye tracking in a driving simulator

[O Palinko](#), [AL Kun](#), [A Shyrovkov](#), [P Heeman](#) - Proceedings of the 2010 ..., 2010 - dl.acm.org

We report on the results of a study in which pairs of subjects were involved in spoken dialogues and one of the subjects also operated a simulated vehicle. We estimated the driver's ...

☆ Save ⓘ Cite Cited by 569 Related articles All 11 versions

[PDF] academia.edu

Cite

MLA Palinko, Oskar, et al. "Estimating cognitive load using remote eye tracking in a driving simulator." *Proceedings of the 2010 symposium on eye-tracking research & applications*. 2010.

APA Palinko, O., Kun, A. L., Shyrovkov, A., & Heeman, P. (2010, March). Estimating cognitive load using remote eye tracking in a driving simulator. In *Proceedings of the 2010 symposium on eye-tracking research & applications* (pp. 141-144).

Chicago Palinko, Oskar, Andrew L. Kun, Alexander Shyrovkov, and Peter Heeman. "Estimating cognitive load using remote eye tracking in a driving simulator." In *Proceedings of the 2010 symposium on eye-tracking research & applications*, pp. 141-144. 2010.

Harvard Palinko, O., Kun, A.L., Shyrovkov, A. and Heeman, P., 2010, March. Estimating cognitive load using remote eye tracking in a driving simulator. In *Proceedings of the 2010 symposium on eye-tracking research & applications* (pp. 141-144).

Vancouver Palinko O, Kun AL, Shyrovkov A, Heeman P. Estimating cognitive load using remote eye tracking in a driving simulator. In *Proceedings of the 2010 symposium on eye-tracking research & applications 2010 Mar 22* (pp. 141-144).

BibTeX EndNote RefMan RefWorks

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@inproceedings{palinko2010estimating,
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  year={2010}
}
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copy



sample-base.bib

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sampleteaser.pdf

software.bib

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192 @string{SIAMPub = "[SIAM] Publications" }

193 @string{Springer = "Springer-Verlag" }

194 @string{TexasPress = "University of Texas Press" }

195 @string{VanNostrand = "Van Nostrand" }

196 @string{WileyFreeman = "W. H. Freeman and Co." }

197

198 \Nentries

199

200 @inproceedings{palinko2010estimating,

201 title={Estimating cognitive load using remote eye tracking in a

202 driving simulator},

203 author={Palinko, Oskar and Kun, Andrew L and Shyrovkov, Alexander and

204 Heeman, Peter},

205 booktitle={Proceedings of the 2010 symposium on eye-tracking

206 research & applications},

207 pages={141--144},

208 year={2010}

209 }

paste



The title, \cite{palinko2010estimating} subtitle, keywords and abstract will be typeset in the main

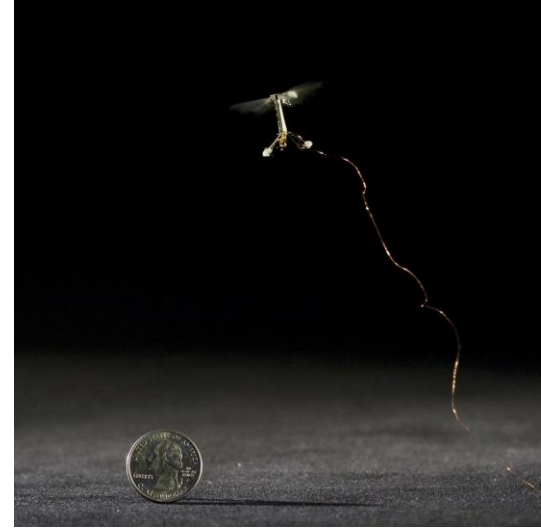


# Activity

Use WoS and Scholar to locate today's paper:

Ma, Kevin Y., et al. "Controlled flight of a biologically inspired, insect-scale robot." *Science* 340.6132 (2013): 603-607.

1. using as few search words/characters as possible,
2. uniquely, i.e. without any other matches (still with as few words as possible)
3. Compare WoS to Scholar (easier to use, better results, etc)



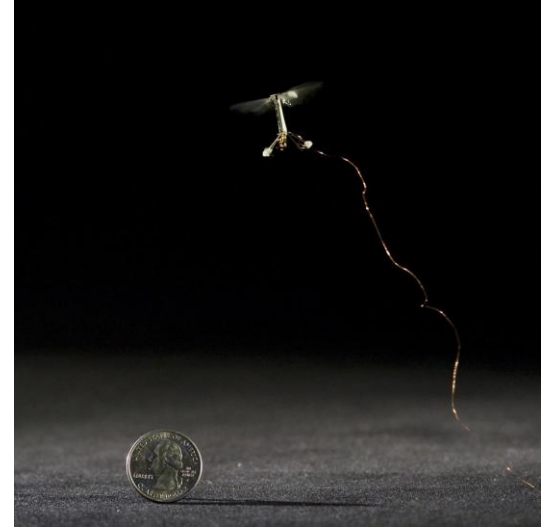
# Reading techniques

# Activity

Now read the paper:

Ma, Kevin Y., et al. "Controlled flight of a biologically inspired, insect-scale robot." *Science* 340.6132 (2013): 603-607.

1. Take notes, whatever comes to your mind about the content
2. Prepare *at least* one argument for and one argument against the paper
3. Spend 20 minutes



# Notes for paper

## FOR

- Good explanations of concepts, e.g. with analogies
- Good illustrations and at appropriate times
- Potential for mass production
- Limitations are presented (battery, external logics)
- Good basic idea behind the work
- Parameters specified

## AGAINST

- Vague argument for mass production capabilities
- Fig. 1A is out of focus
- Some details around e.g. fabrication missing
- Missing control equations
- Very few experiments
- Missing final use cases
- Written like an essay
- Non-reproducible results

# Assessing an article

- Read the abstract
  - Good abstract usually  $\Rightarrow$  good paper
- Author and affiliation
  - Is the author well-known or not, biased or not, etc.
  - Big vs. small and obscure universities/companies
- Journals
  - Major breakthroughs often found in high-impact journals
    - Dumbed down for a broader audience
    - Experimental details lacking
  - The rest (important part) of the story found in lower-impact, specialized journals



<http://www.sciencemag.org/news/2018/05/stephen-hawking-s-almost-last-paper-putting-end-beginning-universe>



<https://politiken.dk/indland/art6114936/Her-er-hvad-hovedpersonerne-I-C3%A6rte-af-sagen>

# Assessing an article

- Abstract
- Introduction
- Related work
- Method
- Results
- Discussion
- Conclusion
- Future work
- References



# Assessing an article

- **Abstract**

- Can you essentially grasp the whole story from the abstract?

- **Introduction**

- Is the aim/hypothesis/novelty clear?

- **Method and results**

- Are experimental protocols followed?
- Are experiments fair?
- Are statistics proper?
- Are results reproducible?

- **Discussion**

- Is it even included?
- Are alternatives and limitations disclosed?

- **Conclusion**

- Are they reasonable or too optimistic?

- **References**

- Are they adequate?
- What about self-citations?

# Citation metrics

# Citation metrics

- Used for judging researchers, journals and publications
- Publications: number of citations
- Journals: impact factor
- Researchers
  - Total citations
  - H-index
- Here at SDU, researchers actually earn money for their institute when publishing:  
<http://www.sdu.dk/forskning/forskningspublicering/den+bibliometriske+forskningsindikator>



Takayuki Kanda

Kyoto University

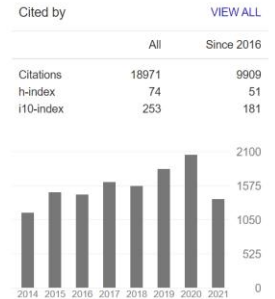
Verified email at kyoto-u.ac.jp - [Homepage](#)

[Social Robotics](#) [Human-Robot Interaction](#) [Intelligent Robotics](#)

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TITLE	CITED BY	YEAR
<a href="#">Interactive robots as social partners and peer tutors for children: A field trial</a> T Kanda, T Hirano, D Eaton, H Ishiguro Human-Computer Interaction 19 (1-2), 61-84	1099	2004
<a href="#">Interactive humanoid robots for a science museum</a> M Shiomi, T Kanda, H Ishiguro, N Hagita Proceedings of the 1st ACM SIGCHI/SIGART conference on Human-robot ...	387	2006
<a href="#">Experimental investigation into influence of negative attitudes toward robots on human-robot interaction</a> T Nomura, T Kanda, T Suzuki AI & Society 20 (2), 138-150	377	2006

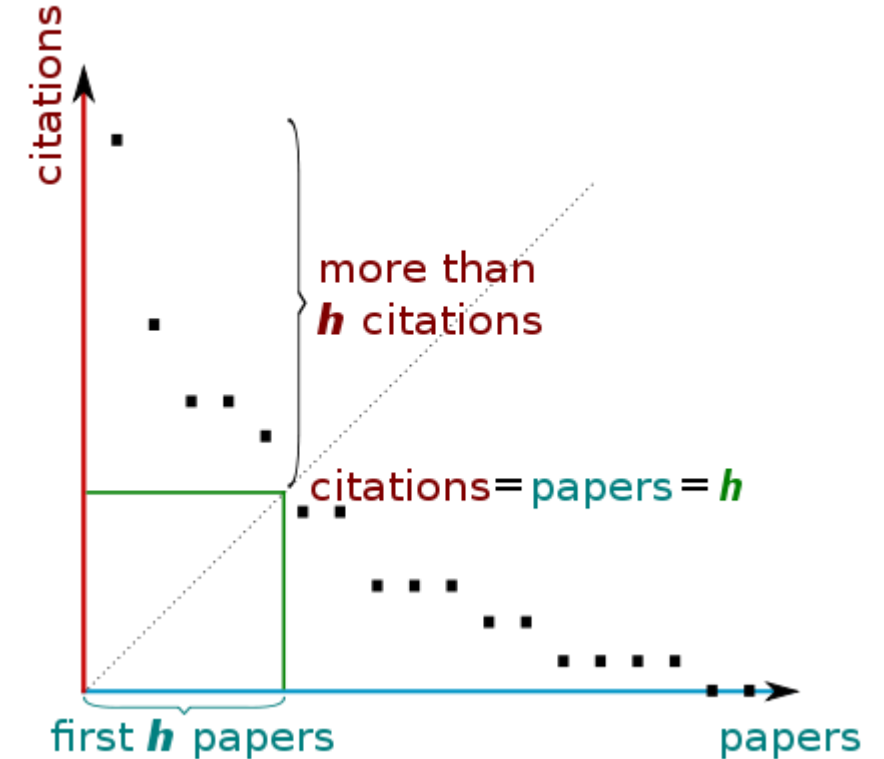


# Citation count

- Used for assessing articles
- Sometimes used for assessing journals and authors
- Simple measure
  - Assigns equal weight to old and new articles
  - Scales linearly with the number of articles
  - Not a real measure of productivity

# H-index

- Hirsch-index, suggested by Jorge Hirsch in 2005
- Measures the output of a researcher as follows:
  - The  $h$ -index is the number  $h$  of papers, which have at least  $h$  citations each
- Einstein:  $h = 115$
- Darwin:  $h = 113$
- Norbert Krüger:  $h = 41$
- Yours truly:  $h = 15$



<https://en.wikipedia.org/wiki/H-index>

# Impact factor

- Measures the impact of a scientific journal by how much it is cited:
- $2017\ IF = C / I$
- C: for all papers published the last two years (2015-2016), this is the total number of times all these papers were cited **in papers from 2017**
- I: the total number of *citable items* published by that journal in 2015-2016
- Citable items: articles, reviews, proceedings, notes

# Eigenfactor

- Measures the prestige of a journal in a [non-trivial](#) way
- Instead of two years back, consider papers from five years back (2012-2016)
- Like IF, count citations in current year (2017)
- Compute EF by weighting citations by other journals' citation counts

# Article influence score

- Normalizes EF by a number proportional to the total number of papers in the last five years
- Comparable to IF



# IF, EF and AIF

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Access provided by: University of Southern Denmark » Sign Out

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All ▾ Enter keywords or phrases (Note: Searches metadata only by default. A search for 'smart grid' = 'smart AND grid') 🔍

Search within Publication Advanced Search | Other Search Options ▾

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The IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI) is published monthly. Its editorial board strives to present most important research results in areas within TPAMI's scope.  
[Aims & Scope >](#)

9.455 Impact Factor	0.06412 Eigenfactor	4.714 Article Influence Score
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# IF, EF and AIF

nature.com > nature > about the journal > journal metrics

a natureresearch journal

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## Journal Metrics

Article metrics such as number of downloads, citations and online attention are available from each article page, and provide an overview of the attention received by a paper.

The 2017 peer review performance metrics (as median time in calendar days) for *Nature* are shown below:

- Submission to first editorial decision: 9
- Submission to first post-review decision: 43
- Submission to Accept: 193

The 2017 journal metrics for *Nature* are as follows:

- 2-year Impact Factor: 41.577
- 5-year Impact Factor: 44.958
- Immediacy Index: 9.700
- Eigenfactor® score: 1.35581
- Article Influence Score: 22.535
- 2-year Median: 25

For a further description of these metrics and a summary of the metrics for all *Nature*

# Problems with citation metrics

- Input database determines output numbers
  - Google usually produces much more optimistic results than JCR
- Self-citations
- Name homology
- So how do I judge the quality of a paper/journal/researcher?
  - READ!

# For researchers

- Citation count probably the one most popular criterion when
  - evaluated by a hiring committee,
  - evaluating his/her grant application
- Problem with this criterion?

# Activities

- Create groups of 3 or 4 (NOT  $< 3$  or  $> 4$ )
  - Put in your group info here: <http://tiny.cc/scm25>
  - Start thinking about a project
- Consider using a tool for shared papers, e.g. Overleaf, Google Docs, Teams
- **PAPER REQUIREMENTS**
  - Maximum 4 pages of content, excluding citations - non-negotiable!
  - You can have as many pages with citations as you wish
  - Ergo: your final PDF can have many more than 4 pages, but only the first 4 pages can contain the actual paper