Science 2.0 VU

Introduction

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15.10.2015
WS 2015/16
Lecturer

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Language

- Lectures in English
- Communication in German/English
- If in German: please informally (Du)
Outline

- Welcome
- Course Organization
- Introduction and Motivation
Teaching at KTI

Structured Data
- Databases (Relational data)
- Semantic Technologies (Ontologies)

Unstructured Data
- Knowledge Discovery and Data Mining I (Theory and basics)
- Web Science and Web Technology (Web data)

Data Analysis
- Knowledge Discovery and Data Mining II (Applications)
- Multimedia Information Systems II (Visualizations)

Applications
- Sensors & User Models (Sensor data)
- Science 2.0 (Science and Social Media)
- Evaluation Methodology (User studies)

Course Context

• Science 2.0 VU (707.032)
• Elective course in subject catalogue „Knowledge Technologies“
• Computer Science, Software Development & Business, Telematics
Goals of the course

• To learn about the fundamentals of Science 2.0
• To learn how to use Science 2.0 tools for research
• To learn how to measure scientific impact with alternative metrics based on content usage and social media
• To work on real-world Science 2.0 problems with real data
Preliminary Schedule

• 15.10.2015: Course Organization / Introduction
• 05.11.2015: Science 2.0 Approach to Research, Open Science, Open Data and Open Access
• 12.11.2015: Processing Science 2.0 data, Content Mining
• 19.11.2015: Bibliometric Network Analysis
• 26.11.2015: Scientometrics and Altmetrics
  • Start of assignment
• 03.12.2015: Altmetrics in Practice: Predicting Scientific Impact with Social Media and Social Network Analysis
• 10.12.2015: Big Science and E-Infrastructures
• 14.01.2015: Student Presentations
• 21.01.2015: Student Presentations
Course Logistics

- Course website:

  http://kti.tugraz.at/staff/elex/courses/science20/index.html

- Slides will be available on the course website

- Additional readings, references, links, etc. will be made available in a public Mendeley group:

  https://www.mendeley.com/groups/7679971/science20-vu/
Assignment

• Assignment: Write a scientific paper about a topic related to Science 2.0/Altmetrics (4 pages) (75%)  
  • Collect related work in Mendely group  
  • Implementation  
    • Implement altmetric measures, explain them (also why you selected them), and implement them using either: rAltmetric, Mendeley API, ...
  • Share your code  
  • Upload your paper

• Present your paper in class (25%)  
  • Like in a conference session
Questions?

- Raise them now!
- Ask after lecture
- Send me an email
- Also, interrupt me and ask any questions you might have during the lecture!
Introduction and Motivation
Do You...

- have experience with research and science?
- know something about Science 2.0?
- have a ResearchGate, Google Scholar, Figshare, github, Mendeley etc. account?
- know Web Science and Network Science (and if yes, did you attend these lectures?)
What is Science?

- Sciencia → „Knowledge“
- „Knowledge attained through study or practice“ (Webster‘s New Collegiate Dictionary)
- Characteristics of science:
  - Hypothesis formulation and testing
  - Need for validity
  - Replicability
  - Generalizability

„Science is a methodical process which seeks to determine the secrets of the natural world by using the scientific method.“
The Scientific Method

Scientific Method

1. Ask a Question
2. Do Background Research
3. Construct a Hypothesis
4. Test with an Experiment
5. Analyze Data and Draw Conclusions
   - Results Align with Hypothesis
   - Results Align Partially or Not at All with Hypothesis
   - Communicate Results

If Procedure Working is No, Troubleshoot procedure. Carefully check all steps and set-up.

If Procedure Working is Yes, Experimental data becomes background research for new/future project. Ask new question, form new hypothesis, experiment again!
Modern Science: What has changed?

- Example: JJ Thompson detected the electron (1897)
  - 3 Experiments, developed a cathode ray tube
  - Equipment: vacuum tubes, magnets, wiring
Modern Science: What has changed?

- 150 years later: Searching for new particles like Higgs boson with the Large Hadron Collider
  - Built in collaboration with over 10,000 scientists and engineers from over 100 countries, hundreds of universities and laboratories. In a tunnel of 27 km in circumference, 175 m deep, near Geneva
And?

- Scientific method still valid: Science will always look for explanations of the natural world and test those against evidence
- But: **How** this gets done changes
  - Increasing knowledge
  - Real time communication and collaboration (e.g. Google Docs, Sharelatex)
  - Influence of the Web and Web 2.0
Main dimensions of change in science 1/2

- Growth in scientific authorship and scientific publishing
  - exponential growth of global scientific publication output from 1980 to 2012 (Bornemann and Mutz, 2014)
  - (beta) publishing: smaller, less formal outputs to communicate/exchange ideas, e.g blogs, drafts (Nielsen, 2008) → „salami slicing“ effect, „publish or perish“
    - Harder to evaluate
    - Quality may be questionable

http://blogs.nature.com/news/2014/05/global-scientific-output-doubles-every-nine-years.html
Main dimensions of change in science 2/2

- Growth in data availability and processing

Past: Experiments expensive, choose hypotheses wisely

Today: Experiments cheap, do many, sophisticated and scalable statistical tools, data mining

Huge amounts of data → new understanding of the world!
Waldrop (2008)

• Science 2.0: use Web 2.0 tools for research
• Claims: Science 2.0 “more collegial”, “more productive”
• Challenges - network effects: cold start problem: build big enough networks of scientists to see benefits

“new partices of scientists who post raw experimental results, nascent theories, claims of discovery and draft papers on the Web for others to see and comment on”

See also http://www.stellarnet.eu/d/6/3/Definitions
Defining Science 2.0

Shneiderman (2008)

• Science 2.0: “New technologies continue to reorder whole disciplines” “increased collaboration” through Web 2.0 tools
• Understanding collaboration is key.
• Challenges: e.g. trust, privacy

„Science 2.0 – Investigation of how social media changes research and publication processes“
(http://www.science20-conference.de)

See also http://www.stellarnet.eu/d/6/3/Definitions
Features of Science 2.0 1/2

- Global networking facilitated by Web
  - Science becomes more and more **global**
- Research becomes more and more **accessible**
Research becomes more and more accessible

Open Access, Open Data
But: Not yet a general concept

**Science 2.0**
M. Mitchell Waldrop

**KEY CONCEPTS**
- Science 2.0 generally refers to new practices of scientists who post raw experimental results, nascent theories, claims of discovery and draft papers on the Web for others to see and comment on.
- Proponents say these "open access" practices make scientific progress more collaborative and therefore more productive.
- Critics say scientists who put preliminary findings online risk having others copy or exploit the work to gain credit or even patents.
- Despite pros and cons, Science 2.0 sites are beginning to proliferate; one notable example is the OpenWetWare project started by biological engineers at the Massachusetts Institute of Technology.
Main features of Science 2.0

- Bibliographic management systems become also social networks of researchers (e.g. Mendeley)
- Increased use of usage based, complex research metrics, e.g. readership of publications

→ altmetrics (alternative metrics)
Example: Mendeley – Social Network
Example: Mendeley – Readership statistics

Science 2.0.
by M Mitchell Waldrop

Computer and Information Science  ›  Miscellaneous Papers

Overview

Scientific American (2008)
Volume: 298, Issue: 5, Pages: 68-73
ISSN: 0036-8733
ISBN: 00368075
DOI: 10.1038/scientificamerican0508-68
PubMed: 18444327

Available from Scientific American
or Find this paper at:

Abstract
Science 2.0 generally refers to new practices of scientists who post raw experimental results, nascent theories, claims of discovery and draft papers on the Web for others to see and comment on. Proponents say these "open access" practices make scientific progress more collaborative and therefore more productive. Critics say scientists who put preliminary findings online risk having others copy or exploit the work to gain credit or even patents. Despite pros and cons, Science 2.0 sites are beginning to proliferate; one notable example is the OpenWetWare project started by biological engineers at the Massachusetts Institute of Technology.

Related

Related Full-Text Papers
Science 2.0 (change will happen....)
Jean Claude Burgelman, David Osimo, Marc Bogdanowicz in First Monday (2010)
Save PDF to library 45 readers

Readership Statistics
144 Readers on Mendeley
by Discipline
43% Computer and Information Science
15% Education
11% Social Sciences
by Academic Status
17% Ph.D. Student
15% Student (Master)
10% Post Doc
by Country
5% United Kingdom
5% United States
4% Germany
Example: Research Gate Score (RG Score)

RG score = contributions and interactions with other RG users
Consequences of Science 2.0? 1/2

On the plus side:

- Increase in massively collaborative research
  - E.g. Polymath project
- Emergence of complex, huge projects
  - E.g. Large Hadron Collider (LHC)
- More transparency
  - Increased efficiency of research assessment
  - E.g. Open data, open access
Consequences of Science 2.0?

BUT:

• Researchers need to have a large number of research outputs ("publish or perish")
• Researchers need to be "social"
  • "waste of time" to garden SN platforms
• Complex research metrics create incentive to gamification
  • "the measure becomes the target", e.g. Ref Poaching, Secret Citation Circles
• Low chance of being caught
Examples
Example: Visualizing the evolution of a scientific conference with altmetrics

Top twitter accounts by reshares of research articles

http://dx.doi.org/10.6084/m9.figshare.1172401
Retrieved 08:40, Oct 15, 2014 (GMT)
Social Network Analysis of people tweeting at conferences

E.g. Top 10 Vertices (Betweenness Centrality)

dtunkelang
websciconf
clarejhooper
jabawack
damewendydbesuukii
computermacgyve
azades
stefanbazan
jahendler

#websci14 Twitter NodeXL SNA Map and Report for Thursday, 26 June 2014 at 14:23 UTC

https://nodexlgraphgallery.org/Pages/Graph.aspx?graphID=21518
And now a short announcement...
EEXCESS HACKATHON
‘Hacking for Culture & Science’ is a Hackathon for increasing the visibility of cultural and scientific resources in the Web.

It is organised by the EEXCESS EU-funded research project (http://eexcess.eu/) and sponsored by Elsevier.

The Hackathon is located at the i-KNOW 2015 conference (http://i-know.at/) which you can ATTEND FOR FREE, enjoy the keynotes and the atmosphere!

There will be plenty of food and drinks including cool evening events.
Enhancing Europe’s eXchange in Cultural and Scientific reSources

Hacking for Culture & Science

We are SEEKING YOU,

Talented people interested in showing your skills, ideas and creativity on how to utilize digital objects and improve their distribution in the Web.

You are free to implement algorithms and visualisations, design innovative UIs, integrate data sources or even come up with a marketing strategy for the project platform.

And if you have your own idea - just bring it on!
Enhancing Europe’s eXchange in Cultural Educational and Scientific reSources

EEXCESS

Hacking for Culture & Science

Your Benefits
Get to know nice people
Increase your skills
Attend the i-Know Conference 2015
Win nice rewards
(1. place -500€, 2. place 300€ & 3.place 200€)

Want to know more?
Got to http://i-know.tugraz.at/hackaton/
or register directly at eexcess-hackathon@know-center.at!
Questions?
See you in the next lecture!