Altmetrics for Research Impact Actuation (ARIA):

A Multidisciplinary Role-based Tool for Cross-metric Validation

Dr. Mojisola Erdt
Aravind Sesagiri Raamkumar

Altmetrics Project

Centre for HEalthy & Sustainable CitieS (CHESS)

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Agenda

Part I
  • Altmetrics Project Overview
  • Research Findings

Part II
  • Introduction to ARIA and its Features
  • Demo Video
ALTMETRICS: Rethinking and Exploring New Ways of Measuring Research Outputs

What is Altmetrics?

• "Altmetrics", an emergent new research area, is interdisciplinary in nature combining bibliometrics, social media, big data systems and scientific visualization to look into alternative metrics to measure research impact.

Aim

• To investigate new approaches offered by Interactive Digital Technology and Social Media to rethink and explore “Altmetrics”, new ways to measure research outputs, focusing specifically on scholarly and scientific publishing.
• To design and develop an “Altmetrics for Research Impact Actuation” (ARIA for conciseness) system prototype, implementing new ways of computing altmetrics to measure research impact.

Beneficiaries

• Funding agencies, educational and research institutions developing their systems to quantify research outputs will benefit. They need to know a myriad of metrics to measure research outputs more accurately.
• Policy-makers and researchers to measure and benchmark research outputs, and hence raise
• Possible market tie-ups with companies (e.g. Elsevier) that develop systems to measure research outputs.

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Our Team

Dr. Theng Yin Leng
Professor and Director, WKWSCI

Aarthi Nagarajan
Research Engineer

Dr. Helen Mojisola Erdt
Research Fellow

Zheng Han
Research Assistant

Luo Feiheng
Research Engineer

Aravind Sesagiri Raamkumar
Research Associate

Harsha Vijayakumar
Research Engineer
Project Overview

**WP1**
- Systematic literature review and meta-analysis of altmetrics.
- Altmetrics of Altmetric Literature.
- Analysis of Singapore’s Altmetric landscape.
- Proposed a multidisciplinary Framework for Cross-metric validation.
- Survey to investigate awareness and usage of traditional metrics and altmetrics.
- NTU case study to investigate awareness and usage of traditional metrics and altmetrics.

**WP2**
- A case study of Kudos to investigate which actions on Social Media lead to improved metrics.
- Exploratory study as basis for recommender system.
- Understanding Twitter usage by academic journals.
- Altmetrics-based Recommender System.

**WP3**
- Weighted citation based on QS university rankings investigated across all disciplines.
- Using the Microsoft Academic Dataset.

**WP4**
- Social media presence of academic journals from different disciplines has been investigated.
- Content analysis of tweets and Facebook posts.

**WP5**
- Influential journals and conferences in the innovative area of Artificial Intelligence (AI) were investigated.
- Papers authored by universities and companies were compared by bibliometrics and altmetrics.

**WP6**
- Feature analysis study of altmetrics dashboards and tools of existing altmetrics systems.
- Design and implementation of ARIA prototype.
- Collection of NTU dataset consisting of publication metadata, bibliometrics, and altmetrics data.
- Usability study of ARIA.
- Evaluation of ARIA is planned in Dec. 2017.
**WP1: Survey on Awareness and Usage of Traditional Metrics and Altmetrics**

**Objectives:**
- To investigate the awareness and familiarity of traditional metrics and altmetrics
- To examine their usage of traditional metrics & altmetrics and hindrances for not using them
- To investigate the researchers’ strategies to promote their research
- To find out the influential factors affecting usage of altmetrics among researchers

**Method:**
- Online survey distributed to researchers.
  - First Phase Aug – Dec 2016 (without incentive): 85 participants
  - Second Phase Jan – June 2017 (with incentive): 448 participants

**Findings:**
- Awareness and usage of altmetrics in academia is still quite low.
- Social media usage, perceived ease of use, and usefulness of altmetrics are associated with the actual usage of altmetrics.
WP1: Investigating Singapore’s Altmetric Landscape

Objectives:

- To investigate Singapore’s altmetric landscape as a case study of a young, fast growing research community
- To find out if the coverage of publications with available altmetric data is keeping up with the increase in number of publications
- To analyse how altmetrics relate to the established traditional citation counts

Findings:

- Number of publications with altmetric data increasing alongside number of articles published in Singapore: from 7% in 2009 to 28% in 2013
- Overall, 18% altmetric coverage across all disciplines from 2009 - 2013
- Most disciplines showed an increase in altmetric coverage over the years.
- A small to medium correlation was found between citation counts and altmetrics.
WP2: Kudos Data Analysis

Findings:

• Overall, a significant difference between the treatment group (with Kudos actions) and the control group (without Kudos actions) was measured comparing the median scores (an increase in full text downloads) of the publications using Mann Whitney Tests.

Note: publications without publication dates excluded from analysis

<.05 Significant difference between medians of the two groups
>.05 Significant difference between medians of the two groups

*Due to the small sample size (n<30), the results must be interpreted with caution
WP3: Prestigious Citations Sourced from Top Universities

Objective:
- Investigate the impact of prestigious citations, from both bibliometrics and altmetrics perspectives

Methodology:
- Data from Microsoft Academic Graph dataset, QS university rankings, Altmetric.com
- Identify QS citations based on the QS university rankings

Findings:
- Papers with QS citations have a better performance from both bibliometrics and altmetrics perspectives.
- Authors or journals have a better citation performance if they have a higher proportion of papers with QS citations over all their papers.
WP4: Social Media Presence of Academic Journals

Objectives:

• Investigate social media presence of academic journals across disciplines
• Analyse journals’ posting behaviour and their friendship network

Methodology:

• Collate list of journals from Science Citation Index Expanded (SCIE), Social Science Citation Index (SSCI), and Arts and Humanities Citation Index (AHCI) of Web of Science
• Compile list of journals with social media accounts and crawl data from their accounts
• Publishing frequency, ISSN, Facebook and Twitter accounts of the journals were collected

Findings:

• Across disciplines, between 14.2% and 7.1% of journals have a Facebook or Twitter account.
• A higher JIF of a journal is associated with a higher number of followers on social media.

<table>
<thead>
<tr>
<th>Indexes</th>
<th>N</th>
<th>Journals with Facebook accounts</th>
<th>Journals with Twitter accounts</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHCI</td>
<td>1,769</td>
<td>251</td>
<td>14.2%</td>
</tr>
<tr>
<td>SCIE</td>
<td>8,827</td>
<td>679</td>
<td>7.7%</td>
</tr>
<tr>
<td>SSCI</td>
<td>3,230</td>
<td>232</td>
<td>7.2%</td>
</tr>
<tr>
<td>Multi</td>
<td>1,010</td>
<td>73</td>
<td>7.2%</td>
</tr>
</tbody>
</table>

N: Number of journals
Facebook Posts per Year

AHCI: Arts & Humanities Citation Index
SSCI: Social Sciences Citation Index
SCIE: Science Citation Index Expanded
Multidisiplinary Index

Facebook Posts per Year
WP6: ARIA Prototype

Objectives:

▪ To develop a prototype called “Altmetrics for Research Impact Actuation” (ARIA) to measure research impact for researchers, universities, research institutes and policy-makers

▪ To compute cross-metric validation between traditional metrics and altmetrics for the “hard sciences” disciplines, the “non-hard sciences” disciplines, and “innovation and commercialization”
ARIA Data Sources

- **Academic Sources:**
  - Scopus
  - Web of Knowledge
  - Crossref
  - Google Scholar

- **Social Media Sources:**
  - Twitter
  - Altmetric
  - PlumX
  - Facebook
  - Mendeley
  - CiteULike
  - Wikipedia

*Data collection frequency is currently once a month*
ARIA Metadata and Metrics

**Paper Metadata**
- Paper Title
- Publication Timestamp
- Publication Venue
- Author(s)
- Paper Type
- References Count
- Affiliation

**Bibliometrics**
- Publications Count
- Scopus Citation Count
- QS Citation Count
- WoS Citation Count
- Journal Impact Factor/Quartiles

**Altmetrics**
- Tweet Count
- Views Count
- Downloads Count
- Mendeley Readers Count
- Altmetric Attention Score

**Frequency**
- Monthly
- Quarterly
- Half-Yearly
- Yearly

**Aggregation Level/Metrics**
- School
- Research Centre
- Top 5%, 10%, 20% (Average)
- Bottom 5%, 10%, 20% (Average)
ARIA Data Extraction Methodology

1. **Public Scopus API**: Publications metadata extracted from Scopus using NTU Affiliation ids

2. **Public Crossref API**: Publications metadata extracted using Scopus DOIs. Crossref provides all author names from each publication

3. **Restricted WoS API**: Basic citations data extracted using Scopus DOIs

4. **Google Scholar Profiles**: Basic citations data scraped from profiles with NTU affiliation

5. **Restricted Altmetric.com**: Altmetrics data extracted using Scopus DOIs

6. **Public PlumX API**: Altmetrics data extracted using Scopus DOIs
ARIA Dataset for NTU Researchers

Data collection (Feb to Sep 2017; monthly)

- 4,207 faculty and research staff (list @ Jan 2017)
- 2,637 faculty and research staff with publications (mainly Scopus)
- Approximately 86K publications extracted (as @ Sep 2017)
- Metrics only for publications with DOIs
- Use of in-house author name disambiguation algorithm for identifying relevant publications
ARIA Prototype Dashboards

i) Researcher Dashboard
- A researcher account has a researcher dashboard
- Access to own artifacts, bibliometric and altmetric visualizations
- Cross-comparison of metrics as a time-series chart, for various time intervals

ii) Institution Dashboard
- An institution account has an institution dashboard
- Access to artifacts and metric visualizations at college/school/university level
- Cross-comparison of metrics as a time-series chart, for various time intervals at both researcher and admin level
ARIA Prototype

i) Researcher Dashboard

- Bibliometric visualizations
- Cross-metric visualizations
- Journal publications sorted by impact factor quartiles
- Altmetric visualizations
- Map view of sources of prestigious citations
ii) Institution Dashboard

- Aggregated citation counts - view of top 10 researchers.
- Aggregated visualisations for selected entities of an institution, e.g., a school or college.
- Cross-metric visualizations of aggregated metrics at school or college level.
- Aggregated altmetrics at school or college level, with drill down view of top 10 researchers.
ALTMETRICS: Rethinking and Exploring New Ways of Measuring Research Outputs

Award No.: NRF2014-NRF-SRIE001-019

PI: Professor Theng Yin Leng
Centre for HEalthy & Sustainable Cities (CHESS)
Wee Kim Wee School of Communication & Information
ARIA Usability Study

Objectives
i. To identify the design and data quality bugs in ARIA
ii. To get initial feedback from target users of ARIA

Data Collected (July – Sept 2017)
i. Eye gazing data
ii. Participant observation data
iii. Concurrent think-aloud data
iv. Post-study Interview responses data

Participant Count: 20 (PhD students, Postdocs, Research Staff and Faculty)

Some Salient Observations
i. Map view visualization of researcher’s citations was well-received.
ii. Cross-metric explorer was found to be useful for research administrators.
iii. Participants felt none of the publicly available tools provide similar visualization features.
iv. Participants wanted to view detailed data in addition to metrics for understanding the context.
We are conducting an international workshop at NTU:

Altmetrics for Research Outputs Measurement and Scholarly Information Management (AROSIM 2018) on January 26th 2018

Workshop Theme:
"The best of both worlds: cross-metric exploration and validation of Altmetrics and Bibliometrics"

Keynote Speakers:
- Dr. Mike Thelwall, University of Wolverhampton
- Stacy Konkiel, Altmetric.com

Registration has already started!
Thank You
Backup Slides
ALTMETRICS: Rethinking and Exploring New Ways of Measuring Research Outputs

- NRF SRIE Grant: NRF2014-NRF-SRIE001-019
- Lead Principal Investigator: Prof Theng Yin Leng
- Grant Period: Feb 2015 – Jan 2018

This is a project of the Centre for Healthy and Sustainable cities (CHESS), Wee Kim Wee School of Communication and Information (WKWSCI), Nanyang Technological University (NTU), Singapore

http://www.altmetrics.ntuchess.com
Project Outcomes and Novelty

Altmetrics for Research Impact Actuation (ARIA) prototype including cross-metric validation for 2 stakeholders:

(i) Individual researchers and (ii) Institutions
WP2: Understanding Twitter Usage by Academic Journals

Objective
- To understand the usage dynamics of academic journals in Twitter from a broader perspective

Methods
- 1.34 million tweets extracted from 1,327 journal titles from Master Journal List (MJL)
- Use of descriptive statistics, content analysis and social network analysis

Findings
- Twitter presence of journals not yet substantial.
- Sharing general web links is key activity.
- Inter-journal communication is apparent within the same citation index
- Web content from news portals and magazines are highly disseminated by journal accounts.
- Efforts are being made to broaden communication beyond research community to the general public
WP5: Company publications and university publications in AI/CS

Methodology:
• Identified 30 publishing venues in AI/CS areas
• Extracted papers published in these venues in 2015 and 2016
• Identified the top 10 companies and the top 10 universities in terms of the highest numbers of publications
• The top 10 universities in CS subject on the QS ranking were also identified
• Citation data was extracted from Scopus, and altmetric data was extracted from Altmetric.com and PlumX

Findings:
• No major difference was detected between company papers and university papers in terms of citation counts
• Company papers attracted more attention online than university papers, whereby they had considerably higher values in altmetric data such as Altmetric Attention Score and number of tweets