



ARTICLE-LEVEL METRICS

ALM Workshop Report

ALM Workshop 2012

Nov 1-3, 2012

Organized by PLOS (San Francisco, CA)

Workshop Planning Committee:

- Jennifer Lin
- Richard Cave
- Martin Fenner
- Cameron Neylon
- Donna Okubo

Details of the workshop, agenda and all documentation can be found here:
<http://article-level-metrics.plos.org/alm-workshop-2012/>

Contacts: Jennifer Lin (alm@plos.org) and Richard Cave (rcave@plos.org)

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Executive Summary

Background

The majority of research on evaluation and collaboration tools for scientific communication shows that the primary tool currently used to assess the quality of research at the journal level is ill-suited for determining the worth of individual articles, for calculating the quality or range of the research output of scientists, and for offering prompt measurement without undue time delay for citations to appear. This mode of evaluating research acts as a brake on innovation in research communication. Given such endemic problems, the research community has been calling for the development and the adoption of alternative means of gauging research value.

The digital environment of today's research enables the collection and analysis of many more data sources and types than ever before, which trace the dissemination and reach of the article itself. Article-level metrics (ALMs) measure these activities at the level of the article and provide a valuable service lacking in traditional metrics: a real-time indicator of impact for research. In addition to the conventional measure of citations, ALMs incorporate altmetrics, newer measures of scholarly interaction based on the social web. Overall, they can provide much-needed new checks and balances, greater speed of feedback, and superior relationship mapping and influence tracking, none of which can be replicated by the traditional impact factor. They can form the basis of recommendation and collaborative filtering systems able to power navigation and discovery of articles synchronized to the needs of the researcher, publisher, institutional decision-maker, or funder.

As a burgeoning technology, the current scope of ALM utility is limited by the awareness of the insight they bring to the research article, and likewise, adoption. The potential for ALMs to impact scholarly research will extend further as the research community continues to advance the agenda across multiple fronts: outreach & advocacy, governance, and technology. At this juncture, we need a shared strategic and operational framework aligning concepts, methodologies, and practices; the establishment of article-level measures across all scholarly publications; and supporting technologies that make use of the data. To this end, PLOS hosted the 2012 ALM Workshop on November 1-3, 2012 in San Francisco. We convened a cross-section of groups across the research ecosystem – researchers, institutions, and publishers, funders, as well as technology providers – for 3 days of collaborative breakout sessions amongst and between these groups to address the needs above and gather the input, support, and participation of leaders across the research landscape.

Problems Identified

As a first stage of the workshop, a series of problems were identified and clear problem statements defined. This was achieved through first defining broad classes of challenges and then defining the problem statements in breakout groups. A summary of the following nine problem statements developed are listed below:

1. Community structures	What would be the optimal structure of community to support coordination and collaboration? When would we need it and how would we tell?
2. Advocacy and promotion	There is a lack of inspiration and awareness outside this workshop. A new name is needed to bring people together.

3. Anti-gaming mechanisms, process interoperability	What is the difference between gaming and legitimate attention? How do we tell? How do we tell the people that care?
4. Sentiment analysis	Current metrics lack context, such as sentiment, source, intensity etc. Context is multi-dimensional but users of metrics need low-metrics (e.g., good/bad, for method).
5. Evidence, context, trust, and interpretation	How do you contextualize alms? What contexts matter to whom?
6. Personalization, use case targeting	Altmetrics should enable scholars and institutions to present themselves to funders, peers and the public.
7. Data Interoperability	In an ever more distributed and chaotic landscape our challenge is the reconciliation of that which is being counted and the counts themselves.
8. Aggregation and presentation	It is human nature to try to collapse complex data to a single number and given that oversimplification to one number is potentially dangerous. How do we have transparency of measures and indicators, have at least as many measures as there are interesting things to measure, and articulate what numbers represent?
9. Coverage and measurement	What is currently scalably measurable and immeasurable and how do we make the immeasurable measurable?

Actions from the Workshop

From the problem statements articulated by the workshop teams, we generated a set of potential solutions and focused on four from which we drafted action plans that can be executed in the immediate timeframe (6 months-1 year).

1. Target publishers, researchers and funders as ambassadors	<ul style="list-style-type: none"> a. Identify “ambassadors” in respective fields. b. Make and present them with use cases specific to their respective fields c. Capitalize on appropriate and effective relationships to best evangelize and advocate for altmetrics.
2. Measurability Map	<ul style="list-style-type: none"> a. Collect all metrics used now. Let people vote on and add to them. Include things identified, though not yet calculated. b. Quickly build something for people to respond in a simple manner. Make metrics manageable in number, grouped, and expandable for details. List outputs, trackable artifacts, and signals. c. Engage with all different stakeholders. Reach out to the funding community for their metrics. d. For immeasurable objects, create a place for people to submit examples. Collect and analyze them in order to make them measurable. e. Create a registry of metrics that is extensible across different communities. Create versionable profiles of metrics important to different communities to track the evolution of attitudes and usage.
3. Classifying science-related tweets for context	<ul style="list-style-type: none"> a. Assemble a list of scientists. b. Create a simple web form. c. Decide on classification (Profession, Field, Interest, etc.) d. Make data available as a file or via open API.

4. User stories: clusters, themes, and categories	<ol style="list-style-type: none"> a. Collect use cases. Seed with samples. Create awareness and communication. b. Determine criteria for prioritization and a model for ranking/sorting the collection. c. Pass “solved” use cases to the ambassador group. Expand remaining use cases into well-documented, solid user stories. d. Reverse engineer use cases from hackathon projects. e. Design an open challenge for the community to solve a use case. Share results via YouTube video.
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On the last day, we collaborated with developers and conducted research and development from a set of identified issues and challenges in the technical application of altmetrics data. Five projects emerged, which advanced the application of altmetrics either by improving the generation and reliability of the data (data collation and data integrity) or by creating novel new approaches to using the altmetrics data (data visualization, article navigation using altmetrics, and author contribution weights in an article with multiple authors).

Problem	Project Name	Type
Anti-gaming mechanisms	AltGaming	Data integrity
Coverage and measurability	Author Centrality Metric	Author contribution impact measurement
	Single Article, Many URLs	Data collation
Use case and personalization	ReRank It	Article navigation
	AltViz	Data visualization

Conclusion and Next Steps

Although the shift away from traditional research measurement is in its early stages, we have seen consistent and steady progress to date in ALM aggregation, display, usage, and application development. Through the work of altmetrics advocates and the existing implementations that have gained more visibility, awareness of ALMs is quickly spreading in the research community. The workshop has accelerated the overall endeavor by bringing a cross-section of the research ecosystem together to grapple with the challenges of adopting and applying ALMs. The workshop attendees generated initial plans for addressing governance and technical issues, all of which require collective input and action. We will move forward by building off of the workshop outputs – four action plans and five proof-of-concept projects – and developing them over the course of the next six months.

Beyond the areas addressed in the four workshop projects, we see a continued need to tackle the remaining problem statements articulated as a community early in the workshop:

- best practices (collection, display, and use) that will inform the development of cross-community accepted standards in the implementation of ALMs where appropriate
- establish a set of aggregate ALMs that simplify the ingestion, presentation, and communication of the metrics across its uses
- data integrity technologies to safeguard credibility in the reliability and validity of the data.

We also underscore the significance of establishing a framework for continued ALM community-building especially a communication mechanism for advocates, ambassadors, and coalitions to share the progress of individual efforts as well as support each other’s work.

Introduction

Sponsored by PLOS with generous support from the Sloan Foundation, the 2012 ALM Workshop convened a broad cross-section of the research ecosystem with 45 industry and thought leaders from Europe, Canada, and the United States. Participants spanned the following communities: researchers, publishers (OA and non-OA), funders, institutions, and technologists. It followed a series of meetings in 2012 that shared a strong focus on altmetrics, including: ScienceOnline, altmetrics12, and Occupy Impact.

The context for all of these gatherings is a shared set of questions that form the backdrop of each meeting. Firstly, how can we widen the diversity of measures we use to examine the impact and importance of traditional research outputs, primarily research papers? What can we do to enrich the information that we already have from citations to include proxies that are faster evolving, which reflect different types or use, or different communities of users? Secondly, how we can widen the range of research outputs that we can measure, and perhaps more importantly, do measure? While previous meetings emphasized a particular approach (i.e., research, technical, etc.), we aimed to incorporate a broad spectrum of research fields; methods; models; and relationships that have developed since the advent of altmetrics. We began forming the framework for an overarching community of practice over the course of the three days, through formal and informal interactions between participants as well as in plenary with the entire group.

We addressed the nascent state of the ALM and altmetrics community at-large with the following core questions: how do we think about this community and what parts of this overarching project should we do together, and what parts should we do separately? Where should we coordinate, and when should we leave things to the market? Over the course of the workshop, we advanced the broader altmetrics conversation across the following areas:

- awareness of social capital, mechanisms, and tools for using impact metrics that currently exist across target groups
- community-specific forms of measurable impact and convergence areas between audiences
- cross-pollination of ideas between groups to better inform community-specific uses
- coordination of efforts towards development of best-practices, tools, and outreach/advocacy.

The Workshop Process

Workshop Format

We employed an “unconference” approach within a traditional framework to optimize the wealth of diverse experiences and perspectives of the attendees, while progressively building on each group encounter and pushing discussions towards a concrete outcome. The workshop was comprised of three series of sessions. In the first set, we met as an entire group to establish the agenda, define terms, communicate the progress & milestones reached in the altmetrics work this year. During the evening reception, we held an expo to showcase existing product implementations of altmetrics and altmetrics tools and allow participants to engage with the owners behind them. Most notably, we set up the program of discussion areas through an open scheduling exercise, which allowed individuals to generate a list of issue topics based on their interest and background. The purpose of the exercise was to provide a single platform by which these thought-leaders can articulate their often-differing perspectives across communities and begin finding opportunities to advance adoption from a position of

understanding and commonality. As these proposals were clustered, similarities emerged, forming the backbone for the first breakout groups (S1).

The second series of sessions was comprised of three breakouts aimed at refining current altmetrics challenges, scoping solutions, and developing actionable plans. The aim of S1 was to articulate a well-framed question or concrete problem statement for each topic without concern for how, or even whether something is possible. The groups then generated an initial list of potential solutions in S2, which focused on scoping - identifying general things that could be done, types of approaches that may address the particular problem at hand. By plenary vote, the workshop attendees subsequently identified a smaller subset of the most promising and tractable to focus on given the breadth of ideas and possibilities. Participants spent the final session S3 creating action plans with concise recommendations that take their areas forward over the next 6-12 months. This exercise involved reaching a consensus on the most useful, feasible, and key steps to achieve for the defined problem at hand.

The workshop concluded with a “hackathon”: a day that joined the workshop attendees with developers to address the technical problems identified in the first two days of the workshop. A number of teams formed along interest areas and skill sets, and delivered their research findings or application prototypes at the end of the day.

Workshop Actions

Breakout Sessions

The following four figures chart the progression of the breakout sessions from initial problem statements to possible solutions and culminating in final action plans. We began by distilling and aggregating the individual proposals from the open scheduling exercise into nine initial issue topics. These problem statements were clustered into four groups that delivered a set of potential solutions to their corresponding problem. Of this set, the group then voted on a set of five of solutions to detail an action plan. While “Broaden network around a charter” was determined to be an action of immediate value to the altmetrics community, the group devoted their remaining time to delivering four final action plans.



6. Personalization, use case targeting:
Altmetrics should enable scholars and institutions to present themselves to funders, peers and the public. Within this problem we considered it was relevant and important to:

- Track the identity of who generates the metric (i.e. who tweets)
- Reconsider the name of these activities to capture the idea of context-
- Consider other research outputs (beyond articles)

7. Data Interoperability:

In an ever more distributed and chaotic landscape our challenge is the reconciliation of that which is being counted and the counts themselves.

- How do we identify and reconcile copies of that which is being counted?
- There is a need to create and foster standards and best practice which allow understanding, comparison, and aggregation across source data providers and altmetric providers.
- We need to provide further context for the counts through normalization and identification of sources.

8. Too many measures, how to present? Single Number?

It is human nature to try to collapse complex data to a single number and given that oversimplification to one number is potentially dangerous... How do we:

- Have transparency of measures & indicators
- Have at least as many measures as there are interesting things to measure
- Articulate what numbers represent

Use case and personalization

Create prioritized list of use cases in the following categories:

- Story telling informed by metrics
- Organizational intelligence for strategy
- Evaluation for a monetary decision

User stories: clusters, themes, & categories

1. Collect use cases (a wiki: more open than GoogleDocs, a home). Seed with samples, offer a basic structure. Create awareness and communication.
2. Determine criteria for prioritization or a voting mechanism and some sort of model for ranking/sorting the collection.
3. Pass 'solved' use cases to the advocacy/ambassador group for their use in communication and outreach. Apply ourselves further to expand remaining use cases into well-documented, solid user stories.

Aim for presenting at Force 11 in March.

4. Hackathon: show us the iteration of use case 1, 2, 3. Reverse engineer & ask what use case does this solve?

Ex: Make it easy to find stuff:
Add altmetrics for relevance in a discovery tool.
How to utilize in a search tool, which search tool, where would it make sense, what is the simplest thing that could be done in one day.
5. Open challenge to the community: solve a use case by 15 Feb that is not doable in an afternoon- a grand challenge. Solve and create a YouTube video to show this.

9. Coverage, what to measure, what matters, to who?

- What is currently scalably measurable and immeasurable and how do we make the immeasurable measurable?
- Create tools for publishing and citing
- Tools to crowdsource what can't be machine measured
- Focus on implicit data (footprints)

Coverage & Measurability

Create a measurability map based on difficulty and demand

Measurability Map

1. Collect all metrics used now (ImpactStory, altmetric.com, PLOS). Let people vote on and add to them. Include things identified, though not calculated:

- eLife editorial board (Ian)
- eScholarship journal editorial boards & paper series admins (Lisa)
- Latin American publishers and editors (Juan)

2. Quickly build something for people to respond in a simple manner. (Scope-planning is critical.)

- Make metrics manageable in number. Group metrics so they can be scanned. Make groups expandable for details:

- Data input
- Sources
- What items
- How important
- Other supporting data
- Way to point to provenance
- Demographic characteristics of responders

Ex: Measure diffusion of a paper's core idea

- List outputs, trackable artifacts, and signals

3. Engage with all different stakeholders. Reach out to the funding community for their metrics.

4. For immeasurable objects, create a place for people to submit examples. Collect & analyze them in order to make them measurable.

5. Create a registry of metrics: a central clearinghouse for openly describing all metrics being gathered. Make it extensible across different communities. Create versionable profiles of metrics important to different communities so that we can see whether attitudes & use of metrics evolve.

- Where does this registry live?

Altmetrics Hackathon

For the final segment of the workshop, PLOS & ImpactStory co-sponsored the Altmetrics Hackathon. The purpose of the day-long event was to collaborate with developers to begin developing solutions for existing technical challenges in the altmetrics community. With the 30 participants together, we reviewed the outputs of the prior days' work and discussed ideas, compiled in advance of the event (<http://tinyurl.com/covnyjv>). Attendees then organized around a subset of technical challenges that map back to the previous days' workshop outputs.

Problem	Project Name	Type
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Use case and personalization	ReRank It	Article navigation
	AltViz	Data visualization

After the five groups explored feasible approaches and methods, they launched into building proof of concepts that took the form of a variety of outputs, including data sets and prototypes. See Appendix 3 for more detailed descriptions and links to these outputs. The obvious need for expanded altmetrics development and concrete use cases for altmetrics tools became increasingly apparent in the amount of ideas generated, the work remaining for the prototypes, and the overall level of interest in addressing the technical needs discussed.

Project I: ReRank It*

ReRank It allows users to rank your PubMed search results based on the impact they have had. This application allows users to see which of the articles have produced the most discussion, been cited the most or have been recommended by academics. ReRank was voted winner of the Audience Award at the end of the hackathon.

Project II: AltViz

The AltViz (altmetrics visualization) group worked on better ways to visualize altmetrics data at various levels of aggregation (single article, few articles, many articles). The goal was to find ways to present the data in a meaningful way, that at the same time could easily be embedded into a variety of platforms. They discussed a variety of chart formats including sunburst plots, heat maps, dot charts, tree maps among several others and settled on two versions to implement during the hackathon.

For multiple articles, they decided to work on trying to improve bubble charts, and see if meaningful trends would emerge when visualizing large number of articles (> 100). Although interesting patterns arose, it was difficult to make sense of large datasets (in our case ~2000 articles). One version they implemented was using heat maps to look at article metrics across different PLOS journals (all from the same funder) on a scale of months.

For single articles, they decided that using sparklines might be a powerful yet minimalist representation to visualize metrics. When stacked for multiple articles, it provides a quick visual way to compare metrics across articles. They implemented spark lines using the Piety jQuery

plugin. In a short time, they also implemented a WordPress plugin for the Piety spark lines visualization for tweets and downloads.

Project III: Author Centrality Metric

Metrics to assess scientific output have traditionally focused on highly indirect metrics such as journal impact factors. While, article-level metrics are a critical step forward as they focus on a meaningful unit (i.e., the paper), they do not provide a solution to the problem of assessing a scientist's overall output. The purpose of this project was to develop such a metric.

Inspired by the WAR ("Wins above replacement") metric used in baseball and other sports to determine the impact of adding/removing a single player to/from a team, they framed the author credit problem as a measure of the impact of having a particular scientist on a paper. They constructed a linear model where authors and journals are binary variables that predict the number of citations a paper receives and derive coefficients for each term over the scientific corpus. The "weight" assigned to each scientist is the average number of citations added, which stands in as the impact metric of having "Charles Darwin" contribute to a paper. The proof-of-principle implementation pulled ALM data from the PLOS ALM API and showed that (and how) middle authors add value.

Project IV: One Article, Many URLs

The altmetrics effort to track the dissemination of research is currently impeded by the existence of multiple referral URLs for each single artifact. Additionally, no standard naming convention exists across publishers for those which they publish. This group followed example articles across journals via its article identifier (DOI) and recorded the proceeding referrer URLs across multiple dissemination channels. This dataset will support altmetrics providers' effort to more effectively capture these traces.

Project V: AltGaming – aka - BatSignal

Altmetrics activity changes express the changing levels of interest in a research artifact. The specific pattern of activity depends on the metric being considered (e.g., journal page views, Tweets, bookmark, etc.). Spikes in activity are of interest as they may indicate either sudden interest in a paper (e.g., mainstream news coverage, prize awarded to an author) or manipulation of metrics (i.e., gaming). The group sought to develop a tool to detect deviations from expected activity levels.

The group packaged the data to construct time sequence vectors for each of our sample articles, a subset of 2000 articles in the PLOS corpus. From a set of possible Bayesian approaches, they selected Kleinberg's burst detection algorithm to evaluate the data. They found an R library to implement this method. They hoped to find a sampling of bursts from which to visualize and study the spike train and its event arrival intervals. No bursts were identified in the proof of concept implementation, possibly due to the technical implementation of the algorithm; the data; or the suitability of the algorithm selected. Future iterations may include a simpler method that examines the variance of article activity change across the corpus. The longer term goal is to continue to build an open source, automatic ALM burst detection tool that can be used across altmetrics providers in their data monitoring efforts.

After the Workshop

From the set of community-generated action plans, we will organize a larger community of interested parties to put these plans in practice over the next 6-12 months. To do so, we will:

- Seed each project by establishing a framework for executing these plans, a detailed agenda, and a project timeframe
- Conduct a call for participation to recruit interested parties across the community
- Drive the groups to define a leadership structure to manage and oversee the implementation
- As a group, refine the problem-solution set, define the final set of outcomes/deliverables, and assign members to the individual tasks
- Identify the most effective communication channels to share the progress of the projects and solicit additional support as needed

As technical development for the hackathon projects continue beyond the workshop, we will:

- Solicit and collect video demos of available prototypes to showcase the work and encourage further development
- Promote each of the projects, especially to the community which will most benefit from the project
- Connect the project members to additional resources (organizations, user groups, funding, etc.) as needed
- Incorporate the projects as use cases in future outreach and advocacy efforts.
- Continue to seed concrete ideas and raise awareness amongst the user groups (funders, publishers, researchers, administrators) of the potential for tools to:
 - Advance adoption of altmetrics within each target group and across research ecosystem
 - Address specific pain/friction points which lower barriers to adoption of altmetrics use cases

Conclusion

The workshop demonstrated a number of important characteristics of this growing field. First, that there is a diverse community of stakeholders interested in a broad sense in widening the set of metrics applied to research outputs and at the same time, improving the use of both existing and new metrics. A thread that ran through the workshop was the importance of context and the importance of using these measures as data *to support* strategic decision making. Secondly the workshop showed that there was a significant space in which these stakeholders found it valuable to collaborate.

Finally, and possibly most importantly, the issue of expanding the community and the importance of it being inclusive for all potential stakeholders, was a common theme. A fundamental concern in driving adoption of both new measures and new community expectations around how those measures are used are inclusion of key stakeholders. The credibility of new measures is determined in large part by the credibility of users of those measures. The future for expanding the suite of available measures of research output therefore depends in equal parts on attracting users and stakeholder groups through attractive functionality and in effective marketing of both the possibilities and best practice in their realization.

The key result of the meeting was that there is a need for coordination and for the community to act together. Areas for common action include standardizing nomenclature, articulation of best practice, and communication. It was felt too early to create formal structures but that this was something to consider for the future. The most important thing for the

immediate future is build a coherent community that can meet and discuss the core issues raised.

Appendix 1: Workshop Participants

Workshop Participants

Alex Wade, Microsoft
Alicia Woodleight, F1000 Research
Andrea Michalek, Plum Analytics
Anna Daniel, Creative Commons
Aria Yow, UCSF Clinical and Translational Science Institute
Cameron Neylon, PLOS
Carl Boettiger, rOpenSci
Carly Strasser, California Digital Library
Chris Mentzel, Moore Foundation
Craig Jurney, HighWire Press
Dario Taraborelli, Wikimedia
David Baker, CASRAI
Donna Okubo, PLOS
Ethan Perlstein, Princeton University
Graeme Moffat, Frontiers
Heather Piwowar, Total Impact
Ian Mulvany, eLife
Jason Priem, Total Impact
Jason Young, Thomson Reuters
Jennifer Lin, PLOS
Jevin West, University of Washington
John Kunze, California Digital Library
Juan Alperin, OJS
Karthik Ram, rOpenSci
Kate Ahlport, Health Research Alliance
Kirk Hastings, California Digital Library
Kristi Holmes, Washington University, VIVO
Lisa Schiff, California Digital Library
Liz Allen, PLOS
Mark Hahnel, Figshare
Martin Fenner, PLOS
Maximilian Haeussler, UCSC Genocoding Project
Michael Habib, Scopus, Elsevier
Nettie Lagace, NISO
Nina Chang, Web of Knowledge, Thomson Reuters
Paul Groth, VU University Amsterdam
Pedro Beltrao, UCSF
Peter Binfield, PeerJ
Richard Cave, PLOS
Sam Arbesman, Kaufmann Foundation
Scott Chamberlain, rOpenSci
Stephen Abrams, California Digital Library
Tim McCormick, Consultant

Wim van der Stelt, Springer

* Due to Hurricane Sandy, the following registrants were not able to travel to the venue:
David Crotty, Oxford University Press
Josh Greenberg, Sloan Foundation
Michelle Liew, Cancer Immunity Journal, Cancer Research Institute

Participant Bios

Questions:

1. Educational background
2. Professional background
3. Technical skills (if applicable)
4. What is the area of most unrealized potential for ALMs (for science, scholarly communications, etc.)?
5. What do you hope we as a community can achieve by the end of the workshop?

Kate Ahlport

1. M.S.P.H. in health care administration
2. Executive Director, Health Research Alliance

Liz Allen

1. Business Studies (specialization in Global Market Research)
2. Publishing (Law; Science/Medicine) - on team PLOS for 8 years!
3. N/A
4. Improved content filtering for users - helping them to decide what to read through accurate measurement of reach and impact.
5. A better understanding of the needs of different parts of the community – publishers, funders, institutions, developers, authors and researchers

Sam Arbesman

1. PhD in computational biology and postdoc in quantitative social science
2. Senior scholar at the Kauffman Foundation
3. Coding, mathematical modeling
4. Recommendation engines for related and intriguing articles
5. Building more of a community

Pedro Beltrao

1. Degree in Biochemistry, PhD in Bioinformatics (Molecular Evolution)
2. Postdoc at UCSF, Starting Jan 2013 group leader at EMBL-EBI Cambridge, UK
3. N/A
4. Sorting/Ranking of articles, personalized recommendation engines, scientific merit
5. Learn other points of view on how altmetrics might be useful and how best to make use of this new source of information.

Peter Binfield

1. PhD in Underwater Holography

2. Career academic publisher
3. Excel. Finding broken functionality
4. Have it be used for tenure decisions
5. Something like the “Budapest Declaration” but for ALMs. Some clear idea about what items are still missing from all the offerings (e.g. news media coverage), and an idea of how to build it. A discussion about predictive metrics (on day of publication, what is the ALM that replaces Impact Factor). An advocacy plan that rocks

Carl Boettiger

1. BA Physics Princeton, PhD Population Biology UC Davis.
(<http://carlboettiger.info/vita.html>)
2. Postdoc at UC Santa Cruz
3. R, XML, HTML, RDFa, data analysis
4. Metrics for assessing reproducible research
5. Strengthen connections within the altmetrics community

Richard Cave

1. BS Cognitive Science, (currently enrolled) SFSU EMBA
2. I.T. Director at PLOS
3. Infrastructure, systems administration, database architecture, and a heaping of rusty coding skills that can be brought to bear when needed.
4. Demonstrating the "real impact" of altmetrics by tracking and visualizing the network of tweets made on a research article.
5. Build relationships to raise awareness of altmetrics.

Scott Chamberlain

1. Ph.D., Ecology & Evolutionary Biology
2. Postdoctoral Research Fellow at Simon Fraser University, rOpenSci
3. Programming: R, API consumption in R
4. As the semantic web becomes a reality, put altmetrics into context
5. Commit to use open source ALM data providers, and make ALM data open access

Anna Daniel

1. 4 degrees ranging from Psychology, media, Librarianship and a PhD in Business
2. Always research and digital content, but across business, government, academia. Including PricewaterhouseCoopers, Accenture, funds management, Monash University and Queensland University of Technology.
3. Are somewhat lacking.....
4. I'm trying to ascertain the total number of CC licensed materials (at highest granularity possible) in existence worldwide. Any help would be appreciated. Also digital literacy.
5. Greater awareness of metrics tools amongst the communities we represent - what they do, what the results mean and how individuals can use them. Ensure any best practices in ALMs include an easy way of counting CC licensed materials

Martin Fenner

1. M.D., Board certified in Internal Medicine and Hematology
2. Technical Lead for the PLOS Article-Level Metrics project
3. Experience in Ruby, Javascript, PHP and R

4. Aggregation and presentation of ALM data
5. Figure out what tools we need to build to make ALM more exciting and more widely adopted

Paul Groth

1. PhD Computer Science University of Southampton
2. I am an Assistant Professor at the VU University Amsterdam in the Knowledge Representation & Reasoning Group and am also a member of the Network Institute. I research approaches for dealing with large amounts of diverse contextualized knowledge with a particular focus on the web and e-Science applications. Specifically, my research covers data provenance, Web Science, knowledge integration and knowledge sharing. I am also co-chair of the W3C Provenance Working Group developing a standard for provenance on the Web.
3. Programming (java, python, JavaScript) and a bit of web stuff.
4. For filtering information to provide personalized targeted data to scholars.
5. I hope we can get an agreed on path to an open corpus of data that can be used for altmetrics.

Maximilian Haeussler

1. PhD in Biology / Bioinformatics
2. Bioinformatics / Text Mining research
3. Programming, data mining
4. Cross-publisher view counts?

Kristi Holmes

1. BS, Biology; PhD, Biochemistry
2. Bioinformaticist at Becker Medical Library at Washington University with interest in research impact (<https://becker.wustl.edu/impact-assessment>), Director of Outreach at VIVO (<http://vivoweb.org/>)
3. How impact metrics can be used and displayed within researcher representation platforms and how this information can be leveraged to enhance impact on the individual, local, and global level; using metrics to identify trends, identify high-impact investigators/initiatives
4. Build a more cohesive community, understand how specific tools and ideas might integrate, and understand what work can be done on the local level as well as in the immediate future.

Nettie Lagace

1. BA Wellesley, MLIS University of Michigan
2. currently Associate Director for Programs, NISO; previously product manager at Ex Libris for SFX link resolver, Verde electronic resource management system, bX recommender service
3. Unix? that's about it. But I like to talk to developers!
4. Further acceptance of validity of these measures.
5. Quite a bit of communication and cross-fertilization regarding the many efforts that are going on in this space. Better understanding of what capabilities the entire community can harness to move all efforts forward.

Jennifer Lin

1. PhD, Political Science
2. Product Director, PLOS
3. C, C++
4. Research discovery
5. Articulate adoption challenges across communities and build action plans to address them

Chris Mentzel

1. Bachelors in Mathematics, Current graduate studies in Management Science and Engineering
2. Information technology engineering and consulting, private philanthropy / science funding
3. system and network engineering, light programming / databases
4. providing academic credit (tenure, grants) based on metrics other than journal article citations (code, data, social media etc)
5. Alignment on a core set of thrusts to focus on in the near term.

Graeme Moffat

1. B.Sc. Physics, Ph.D. Neuroscience
2. Managing Editor, Product Development & Outreach, Frontiers
3. N/A
4. Momentum toward a standard and roadmap for broad ALM sharing between publishers, app developers and others.

Ian Mulvany

1. MPhys Edinburgh - 1999. Did a lot of computational physics, data modeling and coding in various flavors of FORTRAN for my sins. Managed to play around a little on a Cray T3d when that was the new cool.
<http://blogs.nature.com/soapboxscience/2012/04/03/transitions-ian-mulvany>.
2. In a nutshell, left academia, became involved in scientific publishing, moved into product development for researchers. In terms of ALMs, I was product manager for Connotea, I saw that the main problem with that service is we never got our head around a proper business model or a sustainability model. It's great to see the new services that are coming online all have that thought through to a much better extent. I later became head of product for Mendeley, where I was very involved in the product and commercial development of the Mendeley Institutional Edition, essentially an ALM product targeted at libraries. I am now head of technology for eLife and I am interested in building an extensible API for our articles that can be used to capture arbitrary ALM data about our articles, and on the back of this I will be building a notification system for our authors.
3. Python, learning JavaScript, like APIs, used to be able to use Google App engine and Yahoo Query Language, but I'm pretty rusty now.
4. Context, and interoperability.
5. A discussion around signaling. A provisional discussion around ranking of signals.

Cameron Neylon

1. BSc in Biochemistry, PhD in chemistry

2. Worked as a postdoc, then tenured academic in a UK University, then worked as a research scientist within a research funder and now working within a publisher. Have seen most ends of the research world at one time or another.
3. Don't know how many I have. A little programming, a little data management.
4. Tools to support discovery
5. A shared sense of purpose and an agreement on the route towards figuring out what community structures might be appropriate.

Karthik Ram

1. PhD in Ecology and Evolution
2. Postdoctoral fellow at UC Berkeley.
3. Seasoned R programmer with expertise in big data and high performance computing.
4. Fostering rapid collaboration and novel synthesis.
5. Find better approaches to convincing our [scientist] peers about the importance of ALMs and leverage existing/new tools to better science.

Lisa Schiff

1. PhD in Library and Information Studies, UC Berkeley
2. Currently a Technical Lead for Access & Publishing at the California Digital Library; Previously, an Information Engineer at Interwoven.
3. XML, Perl, some CSS, rusty other stuff
4. Clearly identifying the meaning and value of ALM in various contexts.

Carly Strasser

1. PhD Biological Oceanography, 2008 from MIT-WHOI Joint Program
2. I completed two postdocs in population models (Woods Hole Oceanographic and University of Alberta) and one postdoc with Data ONE organization (www.dataone.org), based at NCEAS/UCSB. Now I am a data curation specialist at California Digital Library, working on getting researchers excited about data management and sharing.
3. NA
4. Applying ALMs to tenure and credit for researchers in science
5. Raise awareness; build tools; begin professional relationships that will help advance acceptance and use of ALMs in research

Alex Wade

1. M Librarianship, University of Washington, BA, UC Berkeley (Philosophy)
2. Currently Director of Scholarly Communication for Microsoft Research, Working on Microsoft Academic Search (<http://academic.research.microsoft.com>)
3. Technical skills (if applicable): Very rusty
4. Use of ALM & other altmetrics to better rank/discover emergent trends & research topics

Jevin West

1. PhD in theoretical biology
2. Co-founded Eigenfactor.org; currently at the University of Washington
3. Quantitative skills in mathematical modeling of biological and social networks; also code extensively in my free time

4. Using ALM to help scholars better navigate the scholarly literature. Yes, we need them to rank and sort, but I think the most exciting areas are in developing ALMs to shorten the time in finding that key paper or researcher.
5. I would love to build something. With this many great people in one room for three days, I hope all our good discussions lead to something that researchers can start using within the next 6 months. It may be a bit ambitious, but given the progress PLoS has already made, I think it is possible.

Alicia Woodleigh

1. BA single Hons English Degree, NCTJ Magazine Journalism Postgraduate
2. I worked on National and Regional consumer and charity magazines before moving into Production Department at BioMed Central in online scientific publishing. I then worked at Pearson HE in project management before coming back to scientific publishing.
3. XML, some SQL, InDesign, Quark, Photoshop, Dreamweaver, JIRA, Prince, project management.

Appendix 2: Workshop Program

Day 1

7.30am – ALM 101 and breakfast (optional)

9:00am – Workshop welcome & opening plenary

11:00am – Open session scheduling: Generate & consolidate topics for breakout sessions

12:00pm – Lunch

1:00pm – Session Ia: Define & refine topics, assess needs

2:45pm – Break

3:00pm – Session Ib: Define & refine topics, assess needs

5:00pm – Reception & exhibition: Showcase altmetrics-related tools, services, and implementations

Day 2

8.30am – Breakfast & presentations from OSS I

10:00am – Session II: Design initial solutions, test hypothesis, develop strategy

11:30am – Plenary vote: Select final solution sets

12:00pm – Lunch

1.30pm – Session III: Refine solutions & design action plan

2:45pm – Break

3:00pm – Plenary presentation/Q&A of plans

4:00pm – Documentation sprint

4.30pm – Plenary closing messages

Day 3

9:00am – Altmetrics Hackathon (with ImpactStory): Collaboration between participants and developers to develop solutions to technical issues/challenges for the researcher, publisher, funder, research institution communities.

Appendix 3: Altmetrics Hackathon Documentation

Invitation and Registration Page

A full listing of application ideas board, development resources, attendee interests can be found here: <http://tinyurl.com/covnyjv>.

Project I: ReRank It*

Application: <http://rerank.it/>

Source code: <https://github.com/dweebit/rerankit>

ImpactStory Javascript API: <https://github.com/phayes/impactstory.js>

Team members included:

- Paul Groth
- Mark Hahnel
- Patrick Hayes
- Jack LaBarba
- Jason Priem

Project II: AltViz

Application: <http://karthikram.github.com/almviz/>

Source code: <https://github.com/karthikram/almviz>

Data sets are available in the git repository:

- single article.csv
- many articles.csv
- alm report 2012-10-10.

Team members included:

- Juan Alperin
- Carl Boettiger
- Martin Fenner
- Mahboob Imtiyaz
- Karthik Ram
- Matt Senate
- Nina Stoletzki

Project III: Author Centrality Measure

- Devin Scannell

Project IV: One Article, Many URLs

Data: <https://docs.google.com/spreadsheet/ccc?key=0Aqx2YcmBjqvbdE4xTFk4U05xRFBaSGZEZHpmOTZTZnc#gid=0>

Team members included:

- Anna Daniel
- Nettie Lagace
- Heather Piwowar

- Xenia can Edig
- Alicia Woodleigh
- With additional contributions from Tim McCormick, Patrick Hayes, and others.

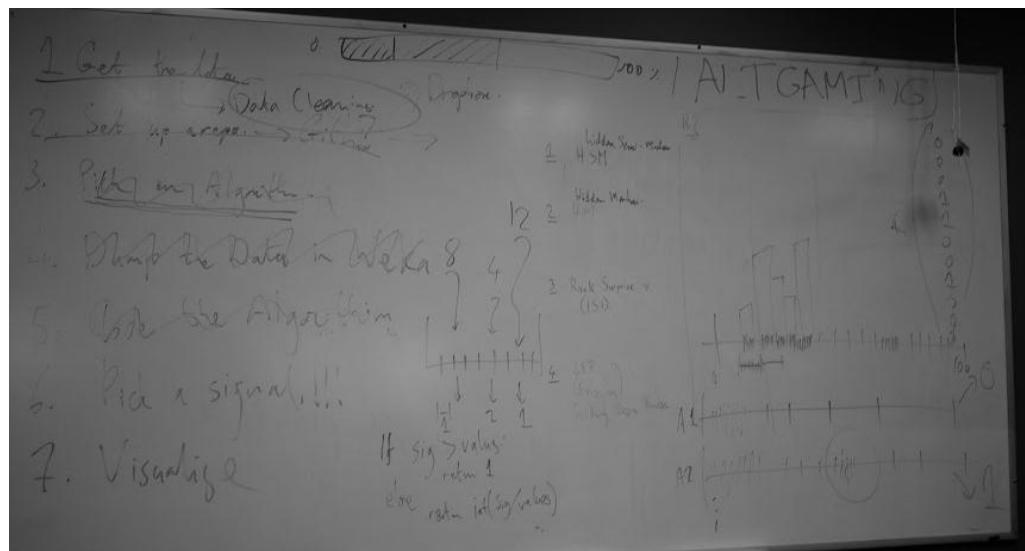
Project V: AltGaming – aka - BatSignal

Background to our hack.

One of the topics that got quite a bit of discussion at the workshop was the topic of gaming of ALMs. We are still in a domain with respect to ALMs that gaming has not become a serious issue. Over the course of the meeting only one specific example of gaming of PDF downloads, with respect to [SSRN](#) was alluded to. Nonetheless, as more people discuss ALMs the question on what to do about them comes up every now and again. In the session during the workshop we came up with 6 strong technical ideas for addressing this issue. Probably the biggest insight in the workshop was that for consumers of ALMs, such as funders, all they want to know is that the data you are providing is reliable. It's probably even better to not even mention gaming, one should simply be in a position to be able to give assurances around data quality.

The 6 technical ideas that came out of the workshop include:

1. UK - 3rd party (I have no idea what that means)
2. Provide provenance, and the ability for consumers to run the data themselves
3. Crowdsource detection of fraud
4. Have proprietary anti-gaming strategies, so cheaters don't know how to cheat.
5. Look for trend and event detection algorithms that could signal the possibility of something dodgy.
6. Create a shared blacklist amongst ALM providers.



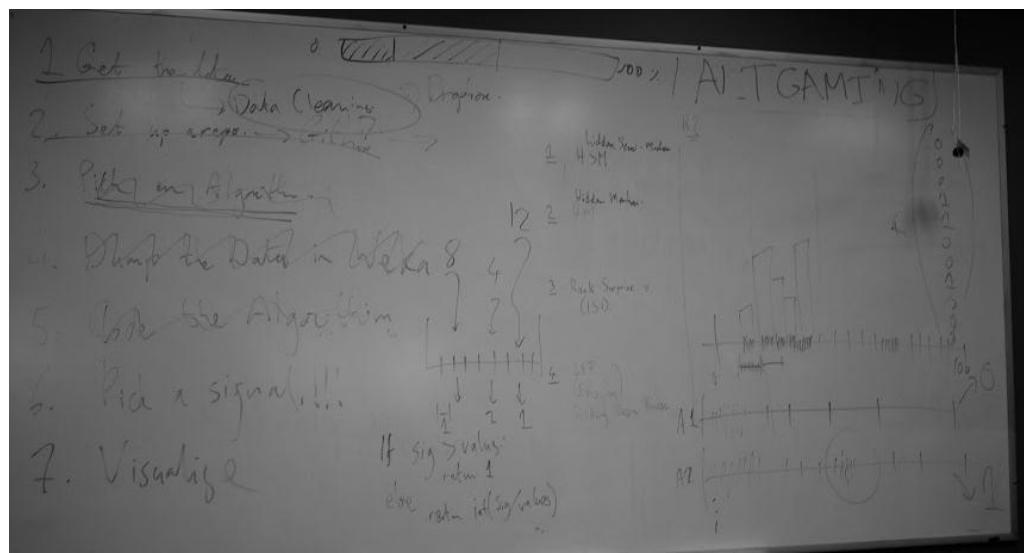
It was also suggested that in terms of strategies for looking for problems in the data, we should do the simplest dumbest thing first. We might also organize a hackathon specifically pitching one team against another, with one team out to break some metric, and the other team set to defend the metric, as a way of stress testing the system.

When it came to the day of the hackathon there were enough people interested in the general topic that we decided to have a go at something. We only had a few hours, so we decided to pick a simple atomic example of trying to find a signal in the data. There was a lot of discussion around whether this would be useful, if we didn't initially know what that signal would represent, and that is a fair point, however there was sufficient interest to give it a go.

The idea is that changes in altmetrics activity express the changing levels of interest in a research artifact. The specific pattern of activity depends on the metric being considered (e.g., journal page views, Tweets, bookmark, etc.). Spikes in activity are of interest as they may indicate either sudden interest in a paper (e.g., mainstream news coverage, prize awarded to an author) or manipulation of metrics (i.e., gaming). We wanted to get some data, apply a tool suitable for detecting a signal, and show that such a tool could be used with altmetrics data. We were then going to visualize the events. We felt that a working demo could be extended to a more generally applicable tool for the whole ALM community.

What we did.

To begin, we packaged the data to construct time sequence vectors for each of our sample articles, a subset of 2000 articles in the PLOS corpus. We then identified a set of possible approaches to evaluate the data: hidden or semi-hidden Markov models, switching Poisson (SP) process, Rank Surprise method, etc. The most recent applications are capable of adaptive event detection by incorporating Bayesian learning to Poisson models. We didn't have much time, and after identifying a set of algorithms that might do the job for us, we did a search for ready to hand implementations in R. We found a recently released [R package that applies Kleinberg's burst detection algorithm](#), and given that was available we decided to apply that. The data we had prepared was not in exactly the right format, so we wrote one more data processing step to wrangle the data a bit more, and we ran the algorithm on some real data.



Results

We hoped to find a sampling of bursts then to visualize in order to study the spike train and its event arrival intervals. No bursts were identified from our data set when we implemented the program. Whether this was due to the technical implementation of the algorithm; the data; or the suitability of the algorithm, we need to conduct further preliminary work such as testing this model with a simpler method that examines the variance of article

activity change across the corpus. We hope to continue to build an open source, automatic ALM burst detection tool that can be used across altmetrics providers.

Resources

The code we generated is on [Github](#). We used the literature in the [Mendeley burst detection group](#) to help focus on algorithms that might help. The data sets that we generated are in a [Dropbox folder](#). We generated one [large dataset](#) that can be used for testing algorithms against, however it will need to be converted into time series sub-data sets.

What's next?

We could see, in an infamous paper about bats, that there were a couple of clear spikes of attention, so we know, a-priori, that there are events that show up in the kind of data that we have access to. We know that it would be interesting to be able to automate both the retrospective discovery of these kinds of events, and the ability to analyze a live stream of signals to see upticks in activity. We know that there are a bunch of algorithms out there that are well tuned to this task, so there is good scope to iterate on this work and set up some nice clean stream data, and some data work-flows for generating this kind of data from available APIs, while at the same time finding a suite of algorithms to toss the data at. At the same time there was a lot of discussion around how to understand the context of ALM numbers, or events, and we need to keep an eye on what it all means, and whether the events we might be able to pick up can be related to things happening in the real world.

Team members included:

- Scott Chamberlain
- Jennifer Lin
- Ian Mulvany
- Brian Naughton
- Dario Taraborelli