# Computational Assessment of the Impact of Social Justice Documentaries

Jana Diesner[1], Susie Pak[2], Jinseok Kim[1], Kiumars Soltani[3] and Amirhossein Aleyasen[4]

[1] The iSchool, University of Illinois Urbana Champaign

[2] Department of History, St John's University

[3] Illinois Informatics Institute, University of Illinois Urbana Champaign

[4] Department of Computer Science, University of Illinois Urbana Champaign

**Abstract**

Documentaries are meant to tell a story, that is, to create memory, imagination and sharing (Rose, 2012). Moreover, documentaries aim to lead to change in people's knowledge and/ or behavior (Barrett & Leddy, 2008). How can we know if a documentary has achieved these goals? We report on a research project where we have been developing, applying and evaluating a theoretically-grounded, empirical and computational solution for assessing the impact of social justice documentaries in a scalable, robust and rigorous fashion. We leverage cutting-edge methods from socio-technical data analytics – namely natural language processing and network analysis - for this purpose and provide a publicly available technology (ConText) that supports these routines. In this paper, we focus on the theoretical foundations of this project, address our methodological and technical framework, and provide an illustrative example of the introduced solution.

**Keywords:** impact assessment, social network analysis, natural language processing, social justice documentaries

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**Contact**: jdiesner@illinois.edu, paks1@stjohns.edu, jkim362@illinois.edu, soltani2@illinois.edu, aleyase2@illinois.edu

## 1 Introduction

The need for the rigorous and scientific evaluation of the impact of social justice documentaries has been repeatedly pointed out by funding agencies, practitioners and researchers who are active in the field of documentaries in particular and media in general (Barrett & Leddy, 2008; Clark & Abrash, 2011; KnightFoundation, 2011). In these domains, impact assessment has high practical relevance: when a funding agency, e.g. the Sundance Documentary Fund, the JustFilms Division at the Ford Foundation or BritDoc, award a grant to a film maker, they want reliable and comprehensive information on the return of their investment, where the goal with these investments is to cause change in society. However, as explained in the background section, the amount and depth of prior reports and actual work on this topic is limited. In a nutshell, assessment in this domain has been typically done by using (a) traditional, scalable and quantitative metrics, such as the number of visitors of a screening or webpage, and/ or (b) conventional, qualitative methods for studying the perception of a topic or media product by few people in depth, such as interviews with focus groups. Overall, the quantitative metrics are typically used on the community or societal level (macro-level), while the qualitative methods are applied on the individual or small-group level (micro-level). We argue that these two layers have to be integrated to gain a comprehensive understanding of the impact of films.

Another major shortcoming with prior impact assessment work in this field is that while evaluation methods do consider the reaction of target audiences, they fail to take into account (a) relational information

about audience members and other stakeholders as well as (b) the information produced or shared by these groups. We have been addressing these limitation by developing a methodology and tool that help to map, monitor and analyze (a) the social network of stakeholders involved with the main topic of a movie – regardless of whether they have anything to do with a particular production or not, and (b) the content of the information produced and shared by these agents. We bring these types of behavioral information (social relationships and content) together by constructing and analyzing socio-semantic networks of social agents (stakeholders, audiences) and information. We argue that this approach provides a more comprehensive window into the structure, functioning and dynamics of the interplay of social agents and information than prior approaches used in this domain do (Diesner, 2012, 2013; Gloor & Zhao, 2006; Roth & Cointet, 2010).

This paper is structured as follows: Section two reviews prior work on documentary assessment and concludes with identifying missing pieces. Section three addresses these shortcomings by reporting on the development of a theoretically grounded, computational solution for mapping and assessing impact. We put the proposed solution into an application context by providing an illustrative example. Section four summarizes the results of this work, open questions and next steps.

## 2 Background

In this section, we synthesize prior work on assessing the impact of documentaries. Basically, there are three families of prior studies: case studies of individual movies, proposed frameworks, and academic research.

### 2.1 Individual Case Studies

One main approach to measuring the impact of documentaries are cases studies, i.e. collections of quantitative metrics and/or anecdotal reports on a single production. Two examples are the assessment of "Legacy" (Applied_Research_Consulting_LLC, 2002), and the Working Films' evaluation of "Blue Vinyl" (Barrett & Leddy, 2008). Such evaluations approximate the influence of a documentary by considering (a combination of) the following indicators:

- Cumulative counts of the number of screenings, video distributions, or people reached through campaign activities.
- Comments from individual viewers; analyzed qualitatively on a case by case basis.
- Lists of key organizations participating in the documentary-related campaign. Connections between these organizations are typically not considered.
- A few instances of policy adoption.

Overall, case studies can be useful in highlighting the outcomes of a specific documentary. However they do not generalize to other productions. In other words, this approach fails to ensure that the same methodology is applicable across productions and genres such that findings for multiple films could be compared.

### 2.2 Previously Proposed Frameworks

Various major media institutes and foundations, including the Center for Social Media, the Fledgling Fund, the Knight Foundation and the Rockefeller Foundation, have proposed systematic frameworks for impact assessment (Barrett & Leddy, 2008; Clark & Abrash, 2011; Figueroa, 2002; KnightFoundation, 2011). Each of these organizations has released their own framework, which typically measures impact along five to seven dimensions that entail the following: the aforementioned quantitative metrics plus influence on the individual, community, and societal level.

The main limitation with solutions from this category is that these frameworks are of normative and theoretical nature such that testing them in real-world settings might require adaptations and changes in order to obtain accurate and actionable results. Furthermore, the indicators recommended in prior frameworks are highly similar to the anecdotal evidence mentioned in the case studies section. In terms of

methodology, these frameworks typically combine simple cumulative frequency counts (number of screenings, viewers, website visitors and supportive organizations) with analyses of small samples of narrative descriptions from participants' self-reports.

Some framework proposals actually include indicators related to social networks: for example, "interorganizational collaboration" (Fledgling Fund), "network building" (Center for Social Media) and "network cohesion" (Rockefeller Foundation) are mentioned as key ingredients. However there are no further details on how to collect, analyze, interpret and leverage network data. Even where core network metrics, such as density and centrality, are mentioned (Rockefeller Foundation), these terms are simply introduced as possible metrics without providing information or practical guidance for how to use these metrics in an evaluation process.

### 2.3 Academic Research

The majority of scholarly work on this topic is confined to studying psychological effects of documentaries on individual viewers. Thus, most scholarly publications consider documentaries as a subcategory of mass media. A few exceptions exist: Whiteman (2004) uses a political science perspective to study several factors that affect a documentary's impact. However, since his framework heavily depends on qualitative analysis such as observations and content analysis, it is highly similar to the first two groups of approaches.

Summarizing the reviewed families of assessment approaches, we conclude that although various types of approaches have been suggested and applied, most of them are similar in that they jointly consider traditional frequency counts on a large scale and qualitative indicators on a small scale. Several proposals have emphasized the importance of taking social networks and the content of information associated with network members into consideration. At least in the domain of assessing the impact of documentaries, these strategies are waiting to be put into action. The work presented herein is a step into this direction.

## 3 Method

The overall process for this research project is shown in Table 1, and further explained in this section.

| Step | Description | Result |
|---|---|---|
| 1. Theory | Comprehensive review of prior literature on impact assessment of documentaries | CoMTI: Framework of relevant dimensions/indicators of media impact: (shown in Table 2) |
| 2. Operationalization | Translate relevant indicators into metrics and indices | |
| 3. Methods, metrics and algorithms | Map indices to methods, metrics and algorithms suitable for analyzing large-scale, empirical data | Combination of social network analysis and text mining, applied to data from social media, news coverage, interviews, and ground truth about documentaries |
| 4. Technology | Comprehensive review of existing technology to decide whether to reuse an existing tool or build a new one (shown in Appendix) | ConText –publicly available tool for extracting network data from text data, and jointly analyzing text data and network data |
| 5. Data Collection | Empirical: news coverage, social media data, focus groups data | |
| 6. Analysis and Interpretation | Apply ConText to data on various documentaries | Use ConText and additional tools for evaluation of various documentaries |

| | | |
|---|---|---|
| 7. Evaluation | Assess accuracy, performance and usability of methodology and tool | In cooperation with film makers, work in progress |

Table 1: Research and Development Process

Based on our literature review (step one in Table above and background section), we argue that measuring the impact of social justice documentaries requires the capturing, modeling and analysis of the map of the stakeholders and themes associated with (the theme of) a movie in a systemic, scalable and analytically rigorous fashion. Specifically, in order to understand the functioning and dynamics of the wider context surrounding a media production and its impact, we need to move beyond the level of individual and small-group studies by also identifying the connections between people, groups and information. Furthermore, we need to consider the content of the information associated with some campaign and discourse. These requirements have also been suggested by media production organizations, but have not been put to test as explained in the previous section.

### 3.1 Theoretical Framework

We have synthesized the indicators of impact as suggested by prior work into a framework that we named CoMTI (**co**ntent, **m**edium, **t**arget, and **i**mpact). This model is organized along the main dimensions of impact assessment and respective methods as explained below:

- Dimension: a component or process through which a documentary can achieve impact.
- Level: a set of sub-categories of evaluation criteria per dimension.
- Index: a set of evaluation factors per level.
- Analytics: suitable methods for discovering meaningful results per index category.
- Item: a set of specific features to be measured per index.

The framework is grounded in a set of theories and allows for large-scale, multi-level analysis:

- *Theoretical foundation*: framework based on empirically and rigorously tested theories from domains including diffusion of innovation and information, media effects, marketing, social and semantic networks, and collective action.
- *Domain expertise*: framework incorporates concepts specific to documentary evaluation that were suggested by experts from this domain.
- *Analytical* Comprehensiveness: considered analytical methods and metrics originating from statistics, network analysis and text analysis.
- *Multi-modal units of analysis*: considering the entity types people, organization and information.
- *Integrated approach*: combines traditional strategies for measuring documentary impact (frequency counts and qualitative analysis) with additional methods (network analysis, text analysis).

This framework entails a variety of stimuli that have been associated with cognitive, attitudinal and behavioral changes over time on the individual, communal, societal and global level. In this context, we consider a documentary as a special kind of media products. When it comes to identifying the impact of media content on people, prior work can be divided into three categories (Laughey, 2007):

- Direct impact: media content can have powerful influence on the knowledge and behavior of the audience.
- Indirect impact: media content is one of several factors that affect peoples' behavior and cognition.
- Null impact: media content does not have any significant influence on peoples' cognitive and behavior.

Little research has conclusively confirmed or negated media impact (Sparks, 2012). Even with advanced research designs, evidence for a causal relationship between media and impact remains vague. Several lab

experiments have successfully shown short-term impacts. However, the highly controlled lab study settings are a limitation to the generalization of any findings to real-world situations. More importantly, the small-scale and typically point-wise nature of such work prevents longitudinal insights. Despite many open questions about media impacts, scholars agree that media content affects our perception and behavior in certain, maybe latent, ways (Bryant & Oliver, 2008; Laughey, 2007). The proposed framework assumes that the impact of a documentary can be measured; and that this impact can be direct, indirect or not evoked. Also, we conceptualize the entire process of making and distributing a documentary as a communication process, where participants exchange information and knowledge via behavioral signals, including natural language (Griffin & McClish, 2003).

A large common denominator of media effects research is the belief that humans can be affected by media stimuli. The holistic process of how stimuli influence people has been dissected into five categories; all of which were originally suggested by Laswell in his model of communication (Johnson & Klare, 1961; Lasswell, 1948). Most theories of media effects fit into one or more of these categories (Laughey, 2007). We use the Laswell model as a backbone for the CoMTI framework by empirically identifying: *What has been said* (content) *on which channel* (medium) *to whom* (target) and *with what effects* (impact)? The *Who* dimension is partially entailed in the medium dimension, and will also be considered when we extract (groups of) stakeholders from network data, and by bringing text mining methods to the *medium* dimension. In the Lasswell formula, communication happens in order to influence a target audience. Thus, communication is conceptualized as a persuasive process (McQuail, 2010). This aligns with the goal of documentaries to lead to change in people's knowledge and/ or behavior.

Applying the provided definition of media use, we argue that a documentary is not some one-way communication where some agent (seeks to) transfer ideas or messages to others in order to achieve certain effects, but rather a two-way process in which senders and receivers interact with each other: receivers' responses and reactions to senders' input form dynamic feedback loops. This inherently reciprocal and iterative process is represented in our framework as shown in Figure 1, and is essential to overcome Lasswell's conceptualization which has been criticized for it's a linear, one-way direction of communication flow. Such feedback loops have high practical implications as film producers and engagement workers can leverage them to model the landscape of stakeholders and discourse associated with the theme of a documentary prior to and during release in order to identify relevant social agents and themes to link up to. This helps to strategically allocate scarce resources.

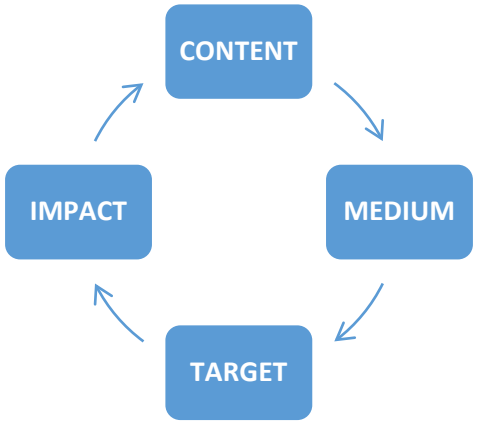



Figure 1: CoMTI framework with a Feedback Loops

The CoMTI framework borrows elements from verified outcomes of media studies, but is also unique in the following three ways:

- While most studies of media effects focus on one or two phases of the Lasswell's formula, our framework models the whole communication processes around a documentary.
- The proposed framework overcomes the linear, sender-driven, one-way flow of communication.
- The proposed framework is tailored towards measuring the impact of documentaries by integrating dependent variables into measurable indices.

In the next section, we briefly elaborate on every dimension of the CoMTI framework.

# CoMTI MODEL

## A Comprehensive Framework for Measuring the Impact of Documentaries

| DIMENSION | LEVEL | | INDEX | ANALYTICS | ITEM |
|---|---|---|---|---|---|
| CONTENT | MESSAGE | | Guiding Factor | Description<br>Ranking<br>weighing | Report by producers or funding agencies |
| | EXPECTED OUTCOME | | | | |
| | EVALUATION PRIORITY | | | | |
| | RESOURCE | | | | |
| MEDIUM | RELEASE MEDIUM | OFFLINE | Outreach | Stats | Number of movies, CDs distributed<br>Number of theatrical, Internet release<br>Duration of release; Sales of product |
| | | ONLINE | | | |
| | RESPONSIVE MEDIUM | MASS MEDIA | Mass Media Attention | Text Mining<br>Web Analytics | Frequency of news coverage weighted by influence (article, opinion/editorial)<br>Domestic, international broadcast |
| | | USER MEDIA | User Media Attention | Text Mining<br>Web Analytics<br>Survey, Interview | Twitter, Facebook, Blogs, webpages<br>Frequency of talking about, links included, user-created contents |
| | | PROFESSIONAL MEDIA | Prestige | | Number of festival acceptance<br>Number of awards<br>Number of professional reviews |
| | | INTERPERSONAL INTERACTION | Intimate Attention | | Conversation, talking on the phone or email, lectures, exchange of letters, etc. |
| TARGET | AUDIENCE SIZE | | Reachability | Text Mining<br>Web Analytics<br>Archived Data<br>Survey, Interview | Number of viewers or visitors |
| | HOMOGENEITY | | Diversity | | Geography & demography: location, age, gender, education, income |
| | AUDIENCE TYPE | SINKER | Passiveness | Text Mining<br>Web Analytics<br>Network Analysis | Number of inactive viewers |
| | | TRANSMITTER | Leadership | | Number of opinion leaders |
| | COLLECTIVE ENTITY | | Advocacy | Text Mining<br>Web Analytics<br>Survey, Interview | Number of advocacy communities, colleges, schools, or NGOs |
| IMPACT | INDIVIDUAL<br>COMMUNAL<br>SOCIETAL<br>GLOBAL | COGNITIVE | Awareness | Stats, Text Mining<br>Web Analytics,<br>Network Analysis | Frequency of names, ideas, thoughts, or concepts appeared in corpus<br>Report of increased awareness |
| | | ATTITUDINAL | Sentiment | Sentiment Analysis | Frequency of positive, negative, neutral sentiments of comments<br>Personal, critics, mass media, and organizational responses<br>Reaction to calls for action |
| | | BEHAVIORAL | Engagement<br>Enactment<br>Connectedness<br>Capacity<br>Expansiveness<br>Centralization | Text Mining<br>Web Analytics<br>Network Analysis | How well connected<br>How much & far disseminated<br>How centralized is the impact<br>The route of diffusion<br>Number of action pledges<br>alliance and allied action of organization<br>Discussion or decision by organizational, governmental, international policy/legislation makers<br>sponsorship of bills, adoption, donation, funding, implementation, social movement or intervention |
| | | TEMPORAL | Impact Dynamics | Longitudinal analysis | Comparison b/w multiple time points<br>Duration of impact<br>Increase vs. decrease<br>Change vs. stability vs. reinforcement<br>Introduction or shifts of topics<br>Detection of social norm change |

Table 2: CoMTI Framework for Impact Assessment

#### 3.1.1 Content

Studies of media impact start from the presence or absence of certain kinds of content before measuring impact (Sparks, 2012). Taking the explicit and implicit content of a film and the communication related to (the theme of) the movie into account is essential for impact assessment and related strategic communication and interventions. The *Content* dimension of the CoMTI framework consists of the following levels of measurement:

- Message: the main message that a film wants to convey. This can be elicited from filmmakers or in a more empirical fashion from the film transcripts.
- Expected Outcome: goals set by film makers for the scope of reach and intended changes.
- Evaluation Priority: a ranked list of priorities with respect to intended outcomes, which can be elicited from producers. These rankings can be used to weight impact categories.
- Resource: investment needed for a production, e.g. money, personnel, engagement work and follow-up activities. This information can be used to assess the effectiveness of a production – how much input is needed to move the needle how much?

The outlined levels of content are not limited to documentaries, but also applicable to other types of media data, and are related to each other throughout the data collection and evaluation process.

#### 3.1.2 Medium

Some scholars argue that the medium or channel, which nowadays are often information and communication technologies, determine the characteristics of media products, content, and their political, economic, social and cultural usage (Innis, 2007; McLuhan, 1994). Acknowledging the importance of the medium, previous assessments of documentary impact typically report media statistics, such as the frequency of screenings, theatrical release and broadcasts; considering higher numbers as (proxies for) greater impact (Barrett & Leddy, 2008; Clark & Abrash, 2011; John & James, 2011). One limitation with this strategy is that exposure does not have uniform impact cross recipients. Prior studies on the diffusion of innovation have shown that different types of adopters perceive information at different points in the life cycle of a production and with varying degrees of depth of impact (Rogers, 2003). Moreover, social networking effects, e.g. word of mouth, strongly impact this process (E. Katz & Lazarsfeld, 2006; M. L. Katz & Shapiro, 1986). Thus, the choice of media for a documentary is likely to shape the breadth and depth of potential impact on the public.

Another problem is that prior studies do not differentiate between first-hand (seeing the actual film) versus secondary ((social) media reactions, public discourse) media exposure. We argue that this distinction matters because a) first-hand exposure is easier to track for distributors and b) secondary exposure has the potential for greater networking effects. This separation goes hand in hand with the distinction between push versus pull models for media: mass media (push) implies that communicator transmit information to large and scattered audiences (Dominick, 2007; Luhmann & Cross, 2000), while social media (pull) is based on interactions between users, and has been found to be more influential than mass media in terms of credibility, speed of message transfer, and potential to change behavior (Bessière, Kiesler, Kraut, & Boneva, 2008; Jenkins, 2006; Keen, 2007). Corresponding data can be collected from news archives and the participatory web, respectively.

Finally, face-to-face interaction between individuals is another important channel. Interpersonal contact has been identified as the most powerful channel of cognitive, attitudinal and behavioral change (Bass, 2004; Rogers, 2003). These data are more difficult to collect than (social) media data; with (partial) mappings being possible via surveys and interviews.

#### 3.1.3 Target

In marketing, the size of the reachable target audience matters; it determines for instance the cost-per-person of an advertisement. However for documentaries, this rationale does not apply, mainly because

producers have no tangible metric for assessing effectiveness other than the number of pairs of eyes that have watched a film. Thus, the size of the audience can translate into impact, but needs to be complemented with additional factors (Barrett & Leddy, 2008; Clark & Abrash, 2011; Figueroa, 2002; John & James, 2011).

Another issue related to the target dimension is audience diversity: the more heterogeneous the audience, the broader the reach. Studies in risk communication, marketing, social influence and diffusion have shown that audiences who are homogeneous in terms of age, sex, income, education or physical proximity can limit the ripple effect of communication (Page, 2007; Prell, 2012; Rogers, 2003).

A classical finding from media effect studies is that ideas flow from media to opinion leaders to the rest of the world (E. Katz & Lazarsfeld, 2006; Lundgren & McMakin, 2011). In the CoMTI framework, formal opinion leaders, e.g. media editors and professional critics, are distinguished from informal opinion leaders, such as popular bloggers and grass-root organizations. The latter type of influencers can be identified from social media data via social network analysis (Hansen, Shneiderman, & Smith, 2010; Watts, 2007).

One common feature of previous efforts to measure documentary impact is the focus on advocacy (Barrett & Leddy, 2008; Clark & Abrash, 2011; John & James, 2011). Established communities of practice can be a powerful change agents because members of tight knit groups are subject to group norms (Drazin & Schoonhoven, 1996; Rogers, 2003). The importance of communities as change agents justifies their inclusion as a separate indicator in CoMTI.

Data for measuring the indices for the *Target* dimension mainly come from statistical reports by documentary producers, web analytics, surveys and archival records. For identifying informal opinion leaders, social network analysis is used.

#### 3.1.4 Impact

In the ComTI framework, impact is measured as a weighted function over four stimulus dimensions that are associated with cognitive, attitudinal and behavioral changes over time on the individual, communal, societal, and global level. Sometimes, a change might be clearly associated with a stimulus, e.g. the creation of a new piece of legislature or the adoption of a policy (Barrett & Leddy, 2008).

Studies in diffusion, risk communication and social contagion generally list four levels of the range of impact: individual, communal, societal and global (Kasperson et al., 1988; Lundgren & McMakin, 2011; Marsden, 1998; Rogers, 2003). In prior conceptualization of range, impact is assumed to start on the individual level and branch out to the next larger level; implying a linear diffusion mechanism from small to large. We do not make this assumption, but acknowledge the fact that impact might diffuse between any of these layers, maybe in an iterative or reverse fashion.

Research on human perception and behavior has identified the following sequential process through which individuals experience change: knowledge, persuasion and decision (Rogers, 2003; Slovic, Finucane, Peters, & MacGregor, 2004). Knowledge is generated when an individual is exposed to new stimuli or information and develops an understanding of them. Persuasion means that an individual forms a positive or negative opinion towards stimuli or information. Decision follows if an individual becomes engaged in activities that lead to accepting or rejecting the given inputs. There is no common agreement on how to collect data corresponding to each these stages. KAP surveys have been used for several decades to provide information on the knowledge, attitudes and practices of health behavior and innovation adoption (Launiala, 2009).

The CoMTI framework conceptualizes the phase of potential documentary impact as consisting of cognitive, attitudinal and behavioral factors and suggests corresponding indices. We choose the term *cognitive* because the mental activities related to knowledge acquisition are mainly of cognitive nature. Persuasion denotes the intent of communicators to induce attitudinal change in a direction desired by the senders. *Attitudinal* is neutral in that it does not imply any directionality of change. *Behavior* can be

distinguished from cognition and attitude in that it represents tangible changes expressed in words or activities. We do not assume a strictly sequential order of these stages and allow for interaction effects.

In explaining changes in cognition, attitude and behavior, the network concept is vital. Numerous studies have shown that perceptions, feelings and behavior initiated by one member of a network can influence other network participants (Christakis & Fowler, 2007; De Nooy, Mrvar, & Batagelj, 2011; Marsden & Friedkin, 1993; Scherer & Cho, 2003). As discussed for the Medium dimension, social media and other forms of interpersonal interaction can be more influential for cognitive and behavioral changes than mass media exposure. Furthermore, empirical reports on measuring the impact of documentaries have listed the network of viewers or alliances of advocacy organizations as a sign of increased capacity (Barrett & Leddy, 2008; Clark & Abrash, 2011; John & James, 2011). For example, the degree of connectedness of the audience can be used to gauge the degree of cohesion of members for collective action. The sheer act of forming connections to others can be part of a behavioral change.

The temporal aspect of impact is an understudied issue. Many impact studies have relied on surveys and experiments from a single point in time, or use a survey with a before/ after (watching and documentary) design (Bryant & Oliver, 2008; Sparks, 2012). The CoMTI framework incorporates the temporal aspect of impact by measuring indices at multiple points in time. In summary, the CoMTI framework considers spatial, temporal and phase-related aspects of change.

Data for measuring the Impact indices can be obtained through intensive mining of unstructured and semi-structured natural language text data, e.g. from the social web. Text mining and network analysis technique will be used to extract entities (including people, organization and information) and detecting patterned relationship between them.

In summary, the CoMTI framework bridges the gap between theory and practice by offering a mapping from clearly defined, practically relevant and theoretically grounded indicators of impact to (a) crucial dependent variables, i.e. relevant dimensions of impact and (b) cutting-edge method for capturing, representing and analyzing these signals based on real-world data.

## 3.2 From Theory to Practical Solutions: Analysis Techniques, Technology and Methodology

Based on the presented review of prior work and the proposed theoretical framework we conclude that enabling a reliable, efficient, broad and deep understanding of documentary impact requires the capturing and analysis of the web of stakeholders and content associated with (the theme of) a movie. This implies the combination of two types of techniques:

- Social network analysis, which helps to map and assess the structure, functioning and dynamics of the web of stakeholders (Wasserman & Faust, 1994).
- Natural Language Processing (NLP), which help to identify (the valence of) salient concepts and themes originating from or shared by stakeholders (McCallum, 2005; Mihalcea & Radev, 2011).

### 3.2.1 Technology

Conducting such analyses in a scalable and robust fashion requires automated solutions. To avoid reinventing the wheel, two independent experts from our team evaluated existing tools along the dimensions of impact defined in the CoMTI framework and additional relevant features such as pricing and license (Table 3). The list of tools, though by no means exhaustive, contains products currently used for documentary assessment and alternative solutions. The results (Table 3) show that each tool satisfies only a subset of the measurements laid out in CoMTI. Moreover, while some tools offer language analysis capabilities and other support network analysis, no single tool combines both methods. However, to measure impact the way we defined it, the integrated analysis of text mining and network analysis is indispensable. This justifies the need for a new tool that supports both techniques. Based on the outlined assessment of

capabilities needed we have been building a new, publicly available tool named ConText (http://context.lis.illinois.edu/) that covers the following routines:

- Data import: social media data collection from Twitter and Facebook.
- Preparing unstructured and structured natural language text data for analysis:
  - Support the generation of curated corpora of news wire data by splitting up and disambiguating downloaded batches from LexisNexis.
  - Organizing the respective meta-data in a database.
- Analysis of unstructured, natural language text data:
  - Summarization techniques:
    - Corpus statistics, e.g. (weighted) term frequencies
    - Topic modeling
    - Sentiment Analysis
    - Visualization of topic modeling and sentiment analysis
  - Pre-processing techniques:
    - Creation and application of stop word lists
    - Stemming
    - Parts of speech tagging
  - Entity and Relation extraction techniques:
    - Entity Detection (for the entity classes people, places, organizations so far)
    - Codebook/ dictionary construction and application
    - Relation extraction based on co-occurrence, syntax or meta-data
    - Construction of one mode networks (association networks) and multi-mode networks

The resulting software integrates a variety of open source libraries, e.g. the Stanford parsers, as well as routines that we built from scratch. The software is written in Java plus D3 for visualization. The relation extraction part is particularly crucial for integrating text analysis and network analysis. ConText has a graphical user interface to ease adoption by non-technical people. We also provide a handbook and training material.

We have designed and built ConText as a general applicability tool for conducting text and network analysis on data from other domains, even though the evaluation criteria from the CoMTI framework might not apply in such cases.

### 3.2.2 Methodology

We have developed the following methodology for assessing documentary impact:

1. Baseline model: Understand the problem space: (Where) is impact possible?
   - Mapping the public discourse and key players related to the main theme(s) of film prior to release. Main themes can be identified in a data driven way, e.g. by conducting topic modeling on the film transcript, or from film makers or funders (based on our experience throughout this project, the outcomes from both strategies do not necessarily align).
   - Data and analysis: collect, analyze and combine text data and network data based on news coverage, social media, and focus groups; using the analysis techniques that we implemented in ConText for this purpose.
   - Outcomes:
     i. Analytical: Baseline model
     ii. Practical: Understand opportunity space for connecting campaign work to relevant stakeholders and themes, which helps to strategically allocate scarce resource and mobilize social capital.

2. Ground truth model: Understand the message of the documentary: Aiming to achieve impact with respect to what?
   - Applying the same text analysis techniques as used or building the baseline model, but this time to the film transcript.
   - Outcome:
     i. Analytical: ground truth model, i.e. the message that the film can communicate.
3. Model of reality: Understand the film's impact: Has the needle moved?
   - Mapping the public discourse and key players related to the main theme(s) of film during and after release.
   - Outcomes:
     i. Analytical: The difference between the baseline model and the model of reality, i.e. the offset, indicates change with respect to the main issues addressed in the film. The intersection of this offset with the ground truth model indicates change due to the content of the film. Occurrences or mentions of the coverage of the film from social media and media in the same offset indicate change due to the public discourse related to the film.

### 3.3 Illustrative Example

We provide a brief illustrative example of the proposed methodology and technology. We recently presented our impact assessment of "The House I Live In", a documentary by Eugene Jarecki first screened at Sundance in 2012, at the 2013 Sundance Creative Producing Summit, where we got plenty of valuable feedback on our work that we are currently incorporating into our framework and implementation (addressed in the limitations section).

For this assessment, the funder of the film informed us that the main issue that the movie aims to have an impact on is "mandatory minimum sentence" (MMS). We collected the international press coverage on this topic from LexisNexis (downloading N=167 articles), and used the LexisNexis routines in ConText to parse, deduplicate and preprocess these data; transforming raw download data into to a curated corpus and metadata database.

Figure 2 shows a semantic network generated from the meta-data of the media coverage of MMS. This network was generated in ConText by linking any two index terms per article that occur within and across user-selected entity classes – in this case "subject" – and that meet or exceed the user-specified relevance score that LexisNexis provides.

Figure 3 provides a summarizing visualization of the themes emerging from the bodies of the news articles. This was generated by applying topic modeling to the data and visualizing the main words for the main topics as a word cloud. These outcomes suggest that the media frame MMS as (a) a social issue centered on people and (b) a legal issued centered on drug abuse and sentencing.

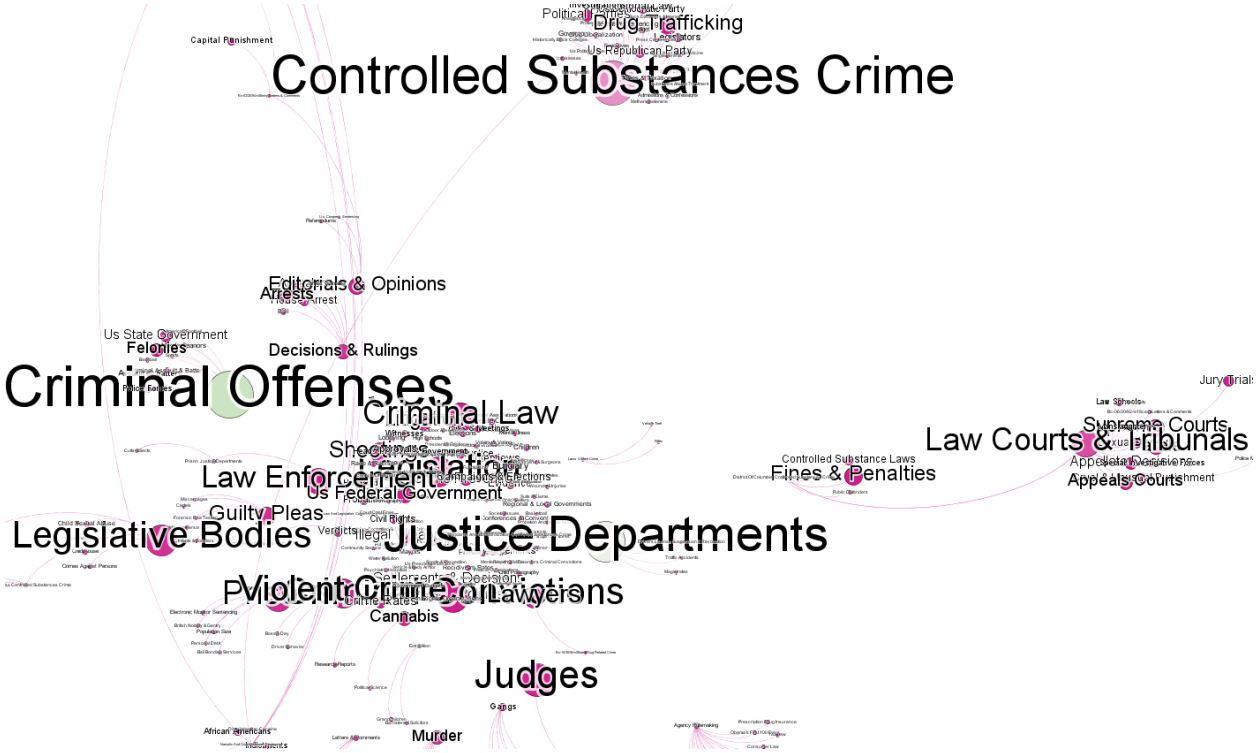



Figure 2: Media discourse on mandatory minimum sentencing prior to movie release (semantic networks of meta-data)


Figure 3: Media discourse on mandatory minimum sentencing prior to movie release (visualization of topic modeling of text bodies of media coverage)

Comparing the themes entailed in the media coverage (Figure 3) to the same technique applied to the transcript of the documentary (Figure 4) shows a large common denominator: both text (sets) portray MMS as a social issue. However, while media is more focused on prisons and violence, the film itself is more about politics related to drugs.

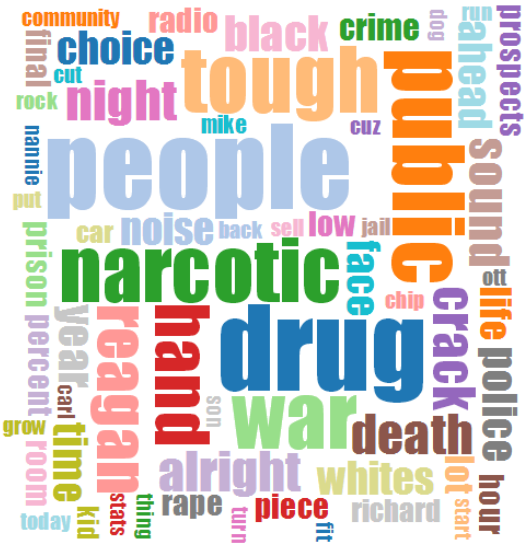



Figure 4: Message that the Documentary can convey (visualization of topic modeling of film transcript)

We assessed the media discourse on the actual movie after its release – again based on articles from LexisNexis (N = 167, chose to select same number of articles for comparability) that we converted into semantic networks based on the meta-data (Figure 5) and text bodies. Our results indicate that the press coverage is mainly about announcements of screenings and centered around the director, but hardly addresses MMS – the main issue that the movie aims to have an impact on. While we as academics might consider this as a limitations, we were informed at the Sundance summit that producers may aim to position a movie as a piece of art first and a communication vehicle for some issue second. This calls for a more long-term cycle of evaluation, which is supported by our methodology and technology.

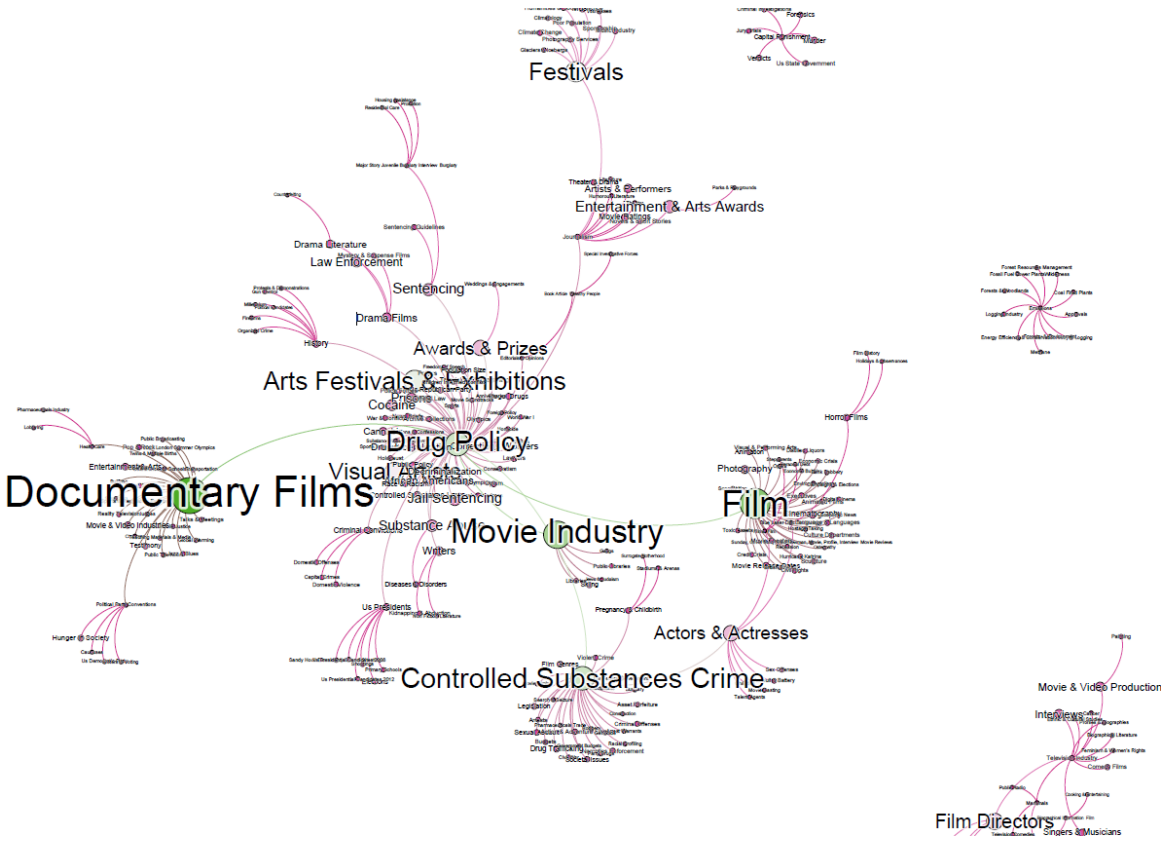



Figure 5: Media discourse on "House I Live In" after movie release (semantic networks of meta-data)

To capture the public reaction to the movie, we also conducted social media analysis using ConText. In addition to that, we also used NodeXL because ConText was not yet ready for this part (Hansen et al., 2010). In the following images, accounts are displayed as nodes if they have more than 200 followers, and node size and hue increase with the number of followers. Mapping followers and followees of @DrugWarMovie – the handle for "The House I live in" - shows that even though the film was successful in attracting a substantial number of followers (N = 2,804), many of them are not that important or influential themselves on Twitter (small number of accounts displayed, small node size) (Figure 6). In fact, the visually represented accounts are less and smaller in size than the accounts which the film account is following, even though the film is following less accounts (1,735) than it has followers. This indicates an asymmetry between following key players (successful) and attracting key players (less successful).

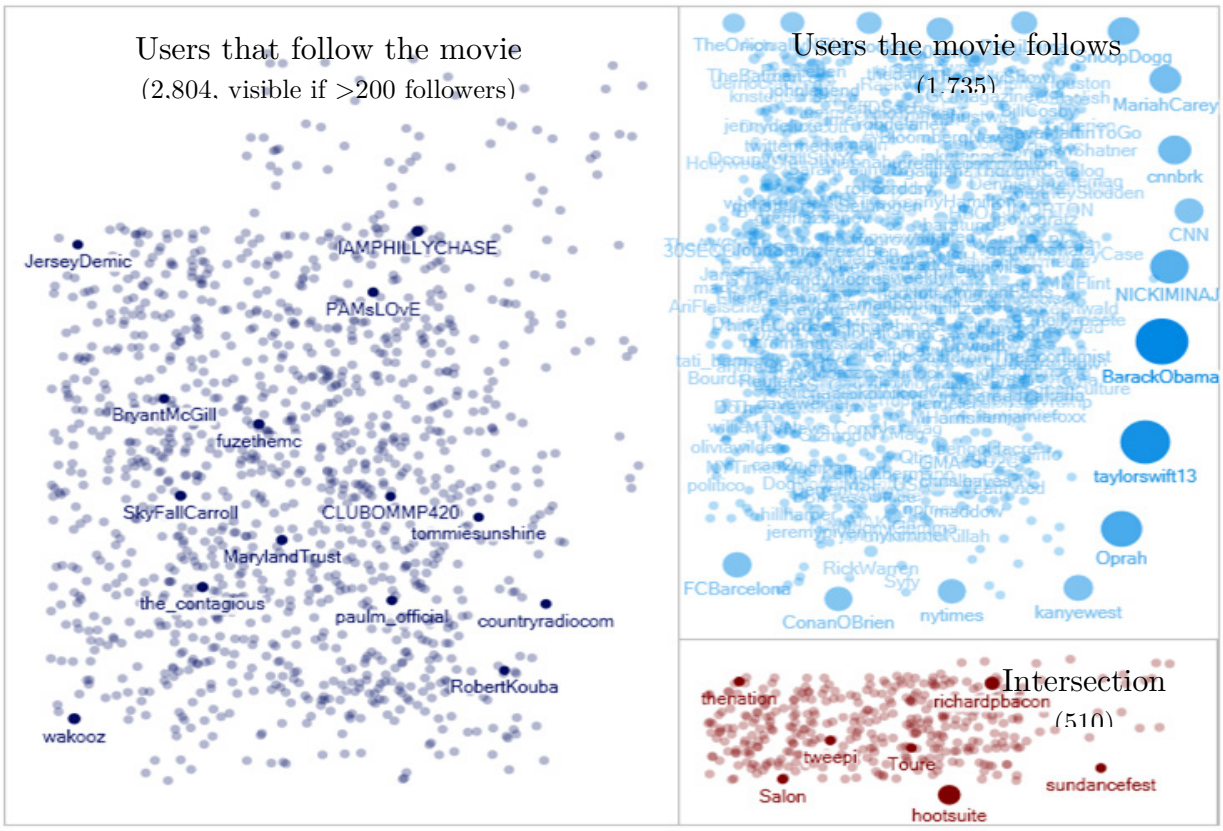



Figure 6: Twitter-sphere for @DrugWarMovie

Zooming closer into the intersection of followers and followees (Figure 7) shows that most of these accounts are organizations involved with legalizing certain drugs. Only a few types of stakeholders that we consider as relevant in this content domain are involved in the public discourse on Twitter – more precisely one retired politician, two government workers, 12 small media companies and 33 NGOs.

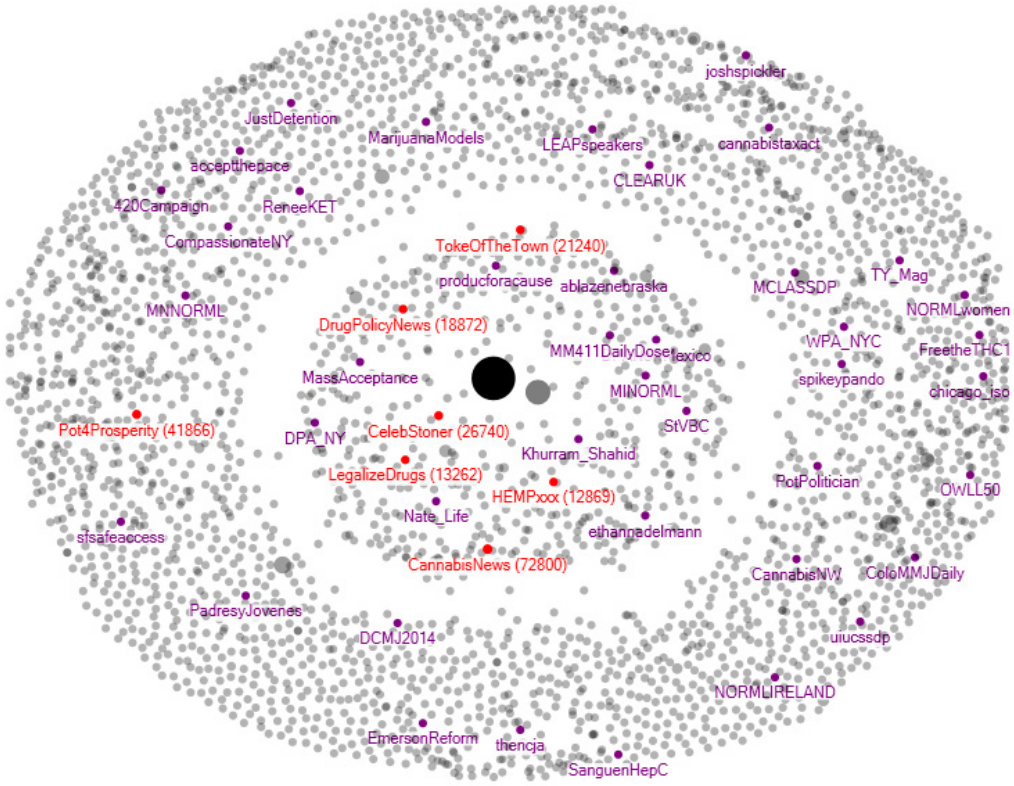
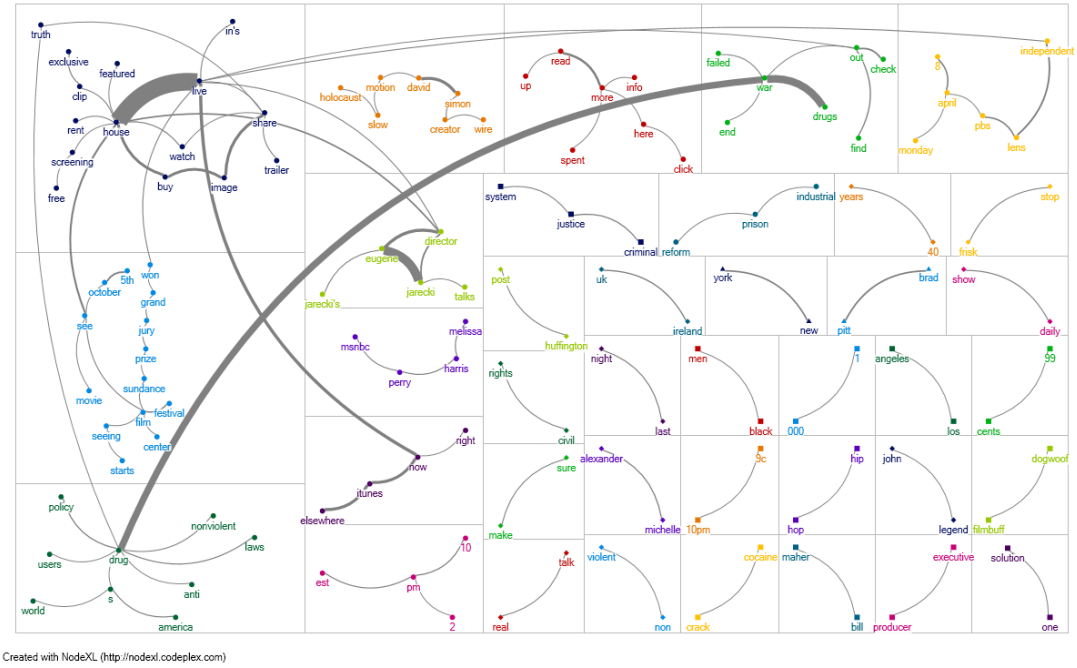


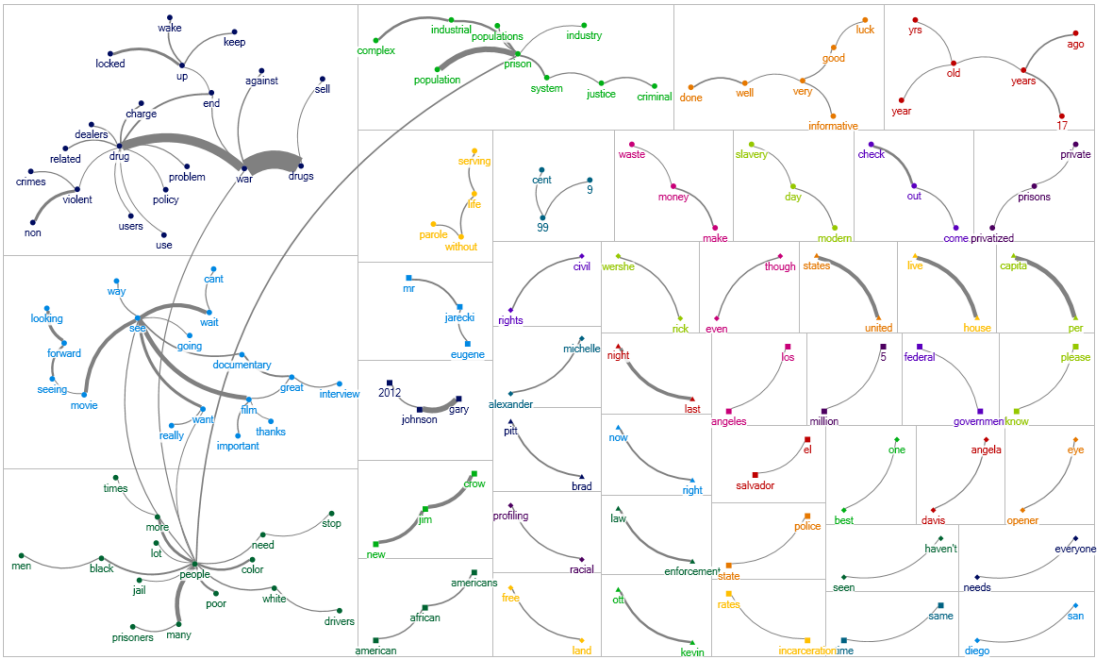

Figure 7: Intersection of followers and followees (red = relevant types of account, purple = any other account)

We do not assume that all social media platforms lead to the same (impression of) impact of a documentary. Thus, we are looking at another social networking service – Facebook: the semantic networks built from co-occurring and highly salient terms (defined as TFIDF) that appear in the posts of the film's fanpage suggests that the person posting those notes mainly addresses "watching the movie", "release of the movie" and "war on drugs" (Figure 8). This represents classic campaign work. However, the user base (comments and replies to posts) not only picks up on these topics, but brings new ones to the table, mainly related to the prison system and people of color. This finding suggests that it takes an engaged campaign worker to get a discussion started (missing on Twitter for this particular movie). Once this has been achieved, one possible form of impact is the public engaging with this topic and taking it into new directions. Note that looking at only one social media platform would not have allowed for gaining this differentiated view.




Created with NodeXL (http://nodexl.codeplex.com)

Figure 8: Co-occurrence of salient terms from posts on Facebook Fanpage for "House I Live in"




Created with NodeXL (http://nodexl.codeplex.com)

Figure 9: Co-occurrence of salient terms from comments on Facebook Fanpage for "House I Live in"

## 4 Conclusions, Discussion and Next Steps

Films are produced, screened and perceived as part of larger and continuously changing ecosystems that involves multiple stakeholders and themes. We have presented a novel, theoretically grounded, and practically employed and evaluated solution for mapping and assessing the impact of (social justice) documentaries by analyzing the web of stakeholders and information related to (the main topic of) a film in a systematic, empirical and scalable fashion. This solution overcomes the main shortcomings of prior

approaches used or proposed for this purpose. The tool we built to facilitate this process is also applicable for conducting text mining and network analysis on data from other domains.

Several limitations apply to our current conceptualization and implementation: First, our ground truth model about a film considers only one dimension of a documentary, i.e. content as represented in the film script, while other key elements like visuals and sounds are neglected. While we do not incorporate these elements into the ground truth, reaction to it are being tracked. Second, we focus on public awareness as reflected in social media data, news coverage and interviews with focus groups. However, an additional or alternative goal with impact might be political and/ or corporate change. In the near future, we plan to expand our framework and data sources to cover these dimensions as well. Currently, we are enhancing our entity extractor to cover additional entity classes and instances that are referred to by a name or not. Finally, as we are conducting a range of case studies, we will synthesize our findings into empirical insights and try to identify patterns from these results.

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## 8 Appendix

| **Tool** | **Main Functionalities supported** | **Access** | **Scalability** | **Cost** | **ComTI Category** | **Interface** |
|---|---|---|---|---|---|---|
| **SAS Social Media Analytics** | Data, Sentiment, Demographics, Historic, and Influence | API integrated with web-analytics | | $5000 /month | Cognitive Direction Attitude Behavior | Graphical Interface |
| **Social Mention** | Data, Influence, Sentiment, "Passion", and "Strength" | Stream API managed through GET request | 1000 queries/day | Free | Cognitive Attitude Behavior | |
| **Beevolve** | Crawler, Data, Sentiment, Very basic analysis | Crawler API queries | 10 terms | $100/m | Cognitive Attitude | Graphical Interface |
| **Trendrr** | TV program assessment, Data, | API, but not publicly | | $500/m | Cognitive Direction | Nice Graphical |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Historic, Sentiment, Geo-tagging, and Link Analysis | viewable | | | Attitude | Interface |
| **Viral Heat** | Data, Sentiment, Influence, and Stream based | HTTP Managed API | | $10/m | Cognitive Attitude Behavior | Graphical Widget |
| **Hoot Suite** | Data, Sentiment, Link Analysis, Geo-tagging, Influence, Historic, and Sentiment | HTTP managed API for streams | 300 queries per hour. | $10 /month | Cognitive Direction Attitude Behavior | Graphical Report Builder |
| **Gnip** | Data, Influence, URL Resolution, Geo-tagging, Historic, and Language Detection | APIs for stream management | | $2000/month | Cognitive Direction Behavior | Web based interface |
| **Topsy** | Data, Sentiment, Influence, URL Resolution, Geo-tagging, Historic, and Related Topic Discovery | API managed through GET request | | $60 /month? | Cognitive Direction Attitude Behavior | Web Viewer. API returns JSON |
| **DataSift** | Data and Sentiment | APIs for stream management | Limited by cost | Pay by use | Cognitive Attitude | Graphical Interface |
| **Meltwater Buzz** | Data, Sentiment, & Influence | No available APIs | | $10,000 /year | Cognitive Attitude Behavior | Graphical viewing platform |
| **Sysomos** | Data, Sentiment, Historic, Influence, Language Tagging, and Geo/Demo-tagging | API available, but not publicly posted | | | Cognitive Direction Attitude Behavior | Widgets for digesting data |
| **Alexa** | Basic Web Analytics. Noted for inaccuracies | Parse from Web | | Free | Temporal | |
| **Google Analytics** | Basic Web Analytics. Decent Accuracy | API with docs | | Free | Temporal | |

Table 3: Mapping of Existing Tools to CoMTI Categories*

* Legend: green = feature/ strength, yellow = limitation, red = serious issue, empty = no information available