Watching, creating, and archiving: Observations on the quantity and temporality of fannish productivity in online fan fiction archives

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Abstract

In the Fan Data project, we collected data from online databases that archive media fan production (specifically, fictional fan texts). We developed software and visualization tools to analyze these archives. Digital analysis focused on counting and graphing the rate of the fan fiction production

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over time in three Hollywood blockbuster movie fandoms: *The Avengers*, the *Batman* trilogy, and *Inception*. We found that audiences grant a great deal of 'mindshare' to media texts and create fan works in response to those texts immediately after viewing a film but that what sustains fan productivity are the attractiveness of specific online archiving platforms and the liveliness of activity in a given fandom. Internet archives have a decisive function in offering the creative and conserving infrastructure for 'unofficial' communication, art, and knowledge. Today, they are trendsetting organs and their impact verifies the assumption that the Hollywood studios' market strategies are not the sole, or most crucial, predictors or determinants of audience engagement.

Keywords
Batman, data visualization, fandom, fan fiction, Inception, mass culture, mindshare, online archives, The Avengers

Introduction

Fan Data is a project that investigates the quantity and temporality of fan production on two online fan fiction archives. By 'fan production', we mean the activity of fans producing creative works in response to a certain cultural product. While fans create a wide variety of fan works, this study focuses on the production of fan fiction. Fan fiction is an umbrella term that describes a multiplicity of genres of literary production authored by media fans, including short prose pieces (drabbles), poems, short stories, multi-chapter novels, and series of works comprising several volumes. Fan writers use the narrative of a television show, book, movie, or computer game as a starting point for original stories, incorporating characters, story lines, settings, and other elements of the 'source' texts into their fan fiction works. The branch of media studies scholarship known as fan studies (see Bacon-Smith, 1994; Derecho, 2006; Fiske, 1987; Jenkins, 1992; Russ, 1985; Winter, 2010) points to the practice of fan fiction as evidence that fans do not passively consume cultural products; rather, fans discuss and reflect on the media content they consume and also produce original content through which they subvert, alter, and customize this received content.

We focused on evaluating the two largest archives of fan fiction, namely FanFiction.net [FF.net], launched in 1998, and Archive of Our Own (AO3), launched publicly in 2009. To do so, we developed a set of data scrapers, which refer to computer programs designed to crawl through the network of Web pages in the Web-based archives and to save the data, mostly the publication dates and authors, to a local database. A 'scrape' refers to the execution of this computer program over some specified set of Web pages. In contrast to the traditional and closed single-user archive model, both of these digital platforms provide an open and collaborative multiuser environment. As we will show in more detail, Derrida's (1995–1996) observation that the archive itself does not only record but also produce content is especially true for these new digital archiving environments with their rather democratic possibilities of participation and generating new items.

Our comprehensive scrapes of both online archives revealed that FF.net contains over 5 million stories written by more than 1 million authors, and AO3 contains over 800,000 works written by more than 70,000 authors.[1] The quantitative size of the archives lead us to surmise that a great deal – perhaps most – fan fiction posted online today appears in one or both of these platforms. The fan authors themselves have full control over the content that they upload to each particular platform. However, platform owners and moderators can opt to delete or censor stories. We surmised that, by

analyzing FF.net and AO3, we would be able to discern patterns and trends in online fan behavior, fan production, and archival practices of fans, at least in the subcategory of Internet fan fiction production.

Questions that we were seeking to answer through the fan data project included the following: What is the temporal relationship between mass media distribution and fan production? In other words, how soon after a mass media text is released are the first fan productions created and posted online, and for how long after the release of a media text does fan production continue? What factors contribute to high-volume fan production? What archival practices can be detected and what is the role of online text archives in the process of meaning making through fan texts? What archive infrastructures, marketing strategies, and fan activities increase or decrease fan production? In other words, what contributes to a media text having a 'long tail' as opposed to a 'short tail' (Anderson, 2004)? Primarily, our goal in asking these questions about the quantity and timing of fan production was to determine whether we could ascertain when and how fans award what we are calling 'mindshare' to specific media texts.

Mindshare

Madden (1991: 9) published one of the seminal articles on 'mindshare', explaining the term as 'the part of a person's short-term memory' that a given brand holds. He summarizes the theory of marketing and advertising for mindshare as follows, 'The more mind share that a product holds in a potential buyer, the better the chance that he or she will buy the product. Conversely, the less mind share held, the less chance for the product's sale' (Madden, 1991: 9). Marketers thus strive to stay at the forefront of consumers' minds – to hold on to mindshare over time – through frequent contact, usually in the forms of advertising and promotion, '[A] marketer must interact regularly and at an intense enough level of communication with consumers to capture a solid share of their [. . .] mind share in a particular product or brand category' (Madden, 1991: 9). Over time, and due to the frequency of competing inputs, a consumer will tend to 'forget' about brands and products, and thus 'a marketer must interact regularly and at an intense enough level of communication with consumers to capture a solid share' of their conscious memory and attention.

We are using the term mindshare to refer to (a) how strongly a media text holds on to media audiences' imaginations and (b) how the functionality of organized archives as conservers of information has switched with the evolution of the Internet toward a role as decentralized gathering points for collective creativity and memory. Consumers do not only *think* about certain cultural products at the time they go to the cinema or when they purchase the film on home media. Consumers think about media long after they have seen a film at the movie theater or in their living rooms. Our study aimed to discern how long media audiences remain mentally engaged with the media texts that they consume (and whether audiences can become engaged with media products *in advance of* consumption, on the basis of movie trailers, advertisements, familiarity with 'well-branded' stars, directors, or franchises, or other factors).

We want to know how long a certain text *lives* in the imaginations of viewers. How long does it *hold on to* the audiences' thoughts and emotions? How much mindshare do people grant to different media products that they consume? By defining mindshare as the amount of mental energy or affective interest that people dedicate to specific media texts, we approach Kurt Lewin's theory of 'life space', which initially gave rise to the mindshare theory (Madden, 1991). Lewin's theory, according to Madden, is that 'because an individual is able to retain only a limited number of thoughts at any one time, when additional thoughts come along, previous thoughts are apt to be

squeezed out of one's life space' (Madden, 1991: 8). Inspired by Lewin and Madden, we argue that people can only attend to a certain number of media texts at any given time, and that new media texts are constantly competing for their attention, so the media texts that people think about the most and the longest have a great deal of mindshare and the ones that quickly fade away from people's thoughts have the least amount of mindshare.

One observable indicator of mindshare is fan production. It designates a large and diverse category of cultural production that includes genres such as fan fiction, fan videos, fan art, machinima, game mods, and costume play. Whereas we think that all modes of fan production are manifestations of mindshare because an individual has to be actively thinking about a media text in order to create a fan work about that text's characters, stories, and settings, we chose to focus on fan fiction because, as stated above, we felt that we could easily identify and design tools to scrape the two largest online fan fiction archives in operation. Since these are archives of textual content, we would be able to develop scrapers for text-only Web sites more easily than we could for fan sites (such as tumblr.com) that incorporate text, image, animation, and video.

When we think about fan fiction production as a manifestation of mindshare, we are assuming that the more fan fiction is written about a given media text at a specific point in time, the more mindshare fans are awarding to that text at that time. This brings us to a deeper inquiry about how media audiences interrelate to mass media texts. As Abercrombie and Longhurst (1998) point out in *Audiences*, a large number of media theorists publishing from the 1970s through the 1990s worked within the 'incorporation/resistance paradigm' (IRP), which 'defines the *problem* of audience research as whether audience members are incorporated into the dominant ideology by their participation in media activity or whether, to the contrary, they are resistant to that incorporation' (p. 15). The IRP researchers' primary questions had to do with the extent to which audiences acquiesce to, or resist, power relations. An exemplary IRP study is Radway's *Reading the Romance* (1984), in which Radway argues that women who regularly read romance novels are reacting to, and resisting, oppressive patriarchal power through their reading; every time they read a romance, they 'escape' from patriarchy through 'denying the present' (momentarily setting aside all real-world demands on their time), and through identifying with heroines whose lives are very different from their own (Radway, 1984: 90).

The opposite of audiences resisting dominant power relations through their media use is audiences being incorporated into dominant power relations through their media use. Many IRP theorists regarded resistance more favorably than incorporation, reasoning that if many people are 'incorporated' by a media text into the existing power structure, then they can be thought of as 'cultural dupes' (see Hall, 1981), that is, as uncritical thinkers heavily influenced by the dominant ideologies encoded in mass media texts.

We are aware that, by conceptualizing fan production as indicative of 'mindshare', we run the risk of depicting media viewers as being incorporated by media texts. We understand that when we state that fans grant mindshare to media texts, it might initially seem that we are assuming that fans' minds are colonized or overtaken by the media that they consume. On the contrary, our view of media fans is that they are active audiences of media texts who demonstrate thoughtfulness, critical thinking, and creativity by using mass media as the basis for original works. However, we do think that a modified version of the IRP might be useful for studying fan production and audience mindshare. We propose that our research takes place within a new research paradigm, which we will call the engagement-production paradigm (EPP). While the IRP asks, 'Are media audiences incorporated by, or do they resist, dominant power relations through their consumption or uses of a media text?', the EPP (exemplified by our study) asks, 'How long, and how deeply, are

active participants in media fandoms ("interactive audiences" [see Jenkins, 2002]) mentally and/ or emotionally engaged by a media text, as evidenced by the quantity of their fan production over time in response to that text?'

The culture industries exercise enormous influence over audiences' choices between media productions. Gray (2010: 7) points out that 'the industry pumps millions of dollars and labor hours into carefully crafting its paratexts' – movie trailers, television series promos, video game commercials, posters, online banner ads, webisodes, and other materials that advertise the 'main' media products, which are the films, series, and games themselves – 'and then saturates our lived environments with them' (p. 7). As a result, no audience member's decision about what texts to consume can be said to be entirely personal and independent of the massive marketing campaigns routinely launched by media corporations (Gray states that major studios dedicate a 'full third of the average film budget' to the film's marketing, and the percentage is even greater for anticipated blockbusters; meanwhile, television networks air 'over 30,000 promos a year', amounting to approximately an estimated '$4 billion worth of ad time' [p. 7]). This study does not dispute that media corporations deploy immense resources to lead audiences to specific texts. But we set out to discern how different financially successful media texts garner different degrees and durations of audience *attention* and *interest*. An individual may spend the same amount on tickets for various summer superhero movies, for instance, but may think about, fantasize about, question, and speculate about some movies much more than others. Films that achieve box office success, in other words, do not automatically or necessarily generate equal amounts of short- or long-term emotional or intellectual investment in viewers. Media fans, who by definition have higher amounts of interest in media texts in general than average consumers, may be frequently interpellated by big-budget marketing campaigns, but even after they spend money on various products, they still have a measure of autonomy in selecting which texts they will maintain an interest in after they view them and which texts they will use as the bases for their own paratexts, such as fan fiction stories.

Gray (2010: 20) interprets fans' production of media-based paratexts as 'less working against the industry's version of the text than cutting a personalized path through it' and that these personalizations, which fans publish to other fans via platforms such as fan fiction archives, allow 'communities to construct a more intimate relationship to what may otherwise seem a "mass" text' (Gray, 2010: 161). Gray's view allows us to recognize that fan productions do not either strictly 'resist' corporate power or represent wholesale incorporation by the culture industries; instead, we can perceive fan production as the manifestation of many consumers' desires to customize mass media to suit their own needs – to reclaim the commodities that are so persistently sold to them as the source texts for their own creative interpretations and elaborations.

The EPP is interested in investigating the interaction of audiences with media texts as consisting of varying degrees of audience engagement, with high engagement resulting in fan production. We do not think of media content as 'seizing hold' of fans' imaginations; instead, we think of fans as awarding mindshare to different texts at different times, and we presume that when fans have granted a large amount of mindshare to a given media text, that is the point at which they feel motivated to produce a new fan work. We think that the amount of fan engagement and fan production that occurs with respect to a media text is determined partly by media companies' marketing strategies, partly by the relative attractiveness of the media texts themselves, partly by the infrastructure of online archives, and partly by fans' activities; that is, what fans do to sustain their own and one another's interest in a given fandom.

Why we chose the *The Avengers*, *Batman*, and *Inception* fandoms

The Fan Data team chose to study fan production in three media universes: *Inception* (dir. Christopher Nolan, 2010), *The Avengers* (dir. Joss Whedon, 2012), and the *Batman* trilogy (dir. Christopher Nolan, 2005–2012). We chose these three fandoms because the five films are comparable as Hollywood summer blockbusters and are all among the top 40 highest grossing films of all time as well as among the 200 highest-grossing films when taking ticket price inflation into account (Box Office Mojo, 2014). *The Avengers* is part of the so-called Marvel Cinematic Universe (MCU), the coordinated effort by Marvel Studios to produce an integrated series of action movies featuring Marvel Comics superhero characters. *The Avengers* was a key film for the MCU, as it united superheroes who had separately been introduced in earlier films. Nolan's *Batman* films have been the most successful of all of Hollywood's attempts to translate DC characters to cinema screens, and we thought that analyzing the MCU's highest grossing production alongside DC's top-performing movies might be a good case of comparing like to like. Since *The Avengers* and the *Batman* movies revolve around well-known superheroes from the genre of comic book adaptation and both franchises consistently generate high box office revenues, we surmised that fans would have similar degrees of familiarity with the core characters and similar long-term exposure to the overarching narrative worlds of both franchises.

We chose *Inception* because we hoped that it would provide a useful contrast to *The Avengers* and Nolan's *Batman* films. *Inception*, like *The Avengers* and the *Batman* trilogy, was a huge summer hit and was helmed by a director with enormous popularity among media fans (Nolan himself), but *Inception* was a stand-alone film, with an original story line that did not draw on comic book antecedents, did not have a preexisting fanbase, and did not inaugurate a film franchise. We wanted to investigate one case of a 'one-off' blockbuster next to the two cases of series-based blockbusters. Taken together, these three properties trace the ambit of recent summer movie fandoms and fan production.

Data collection

We collected data from AO3 and FanFiction.net with computer scripts called 'scrapers', written in the programming language Python 2.7. The scripts load every content page ad hoc within a specified fandom on a Web-based archive and save records of the fan fiction entries to a local SQLite database. For each fan fiction entry, the scripts save the title, author, content summary, and the publication date. Dates are represented as Unix time stamps, which count the number of seconds since the epoch (meaning January 01, 1970, 00:00 coordinated universal time (UTC)). For example, as of this writing, the Unix time is approximately 1377969792, indicating that nearly 1.4 billion s have elapsed since the epoch. Times before January 01, 1970 are represented as negative numbers. Web pages are loaded with the Python library urllib2 and saved in a variable named html below:

$$html = urllib2.urlopen(url).read()$$

HTML content is processed using the Python library Beautiful Soup. Rules to extract metadata for all works in a fandom were written individually for AO3 and FF.net to accommodate the unique Web formatting of each archive.

Archive of our own

The *Avengers* fandom data were collected on July 08, 2013, and include 25,047 works written by 6670 distinct authors. The data were gathered from the set of works listed at http://archiveofourown.org/tags/The%20Avengers%20(2012)/works.

The *Batman* fandom data were collected on July 22, 2013, and include 1445 works written by 640 distinct authors. The data were gathered from the set of works listed at http://archiveofourown.org/tags/Batman%20(Movies%20-%20Nolan)/works.

The *Inception* fandom data were collected on July 08, 2013, and include 5085 works written by 1253 distinct authors. The data were gathered from the set of works listed at http://archiveofourown.org/tags/Inception%20(2010)/works.

FanFiction.net

The *Avengers* fandom data were collected on June 18, 2013, and include 17,675 works written by 8447 distinct authors. The data were gathered from the set of works listed at http://www.fanfiction.net/movie/Avengers/.

The *Batman* fandom data were collected on July 22, 2013, and include 6270 works written by 3687 distinct authors. The data were gathered from the set of works listed at http://www.fanfiction.net/movie/Batman-Begins-Dark-Knight/.

The *Inception* fandom data were collected on June 18, 2013, and include 3735 works written by 1705 distinct authors. The data were gathered from the set of works listed at http://www.fanfiction.net/movie/Inception/.

Graphing

Each work saved in the database is annotated with a time stamp. For purposes of graphing, it makes sense to count the number of works published within a given time interval in order to get a sense of the volume of works being generated over time. Weeks are assumed to begin on Sundays. We plot this time series data with the Python library 'matplotlib'.

When comparing fan production between the two archives, one finds the average volume may differ greatly between the two. To compare the shape of the time series, in the case of *The Avengers* and *Batman*, we normalize the time series with respect to the maximum value. That is, if time series $a(t)$ has a maximum value of 543 works/week, we plot a new time series $b(t) = a(t)/543$. This scales the time series to values between 0.0 and 1.0, allowing comparison of the shape and trends of two time series previously on different scales.

Ethical considerations

This study adheres to the 'ethical guidelines for research online' formulated by Bruckman (2002). We analyzed online information, without seeking consent from its authors, which was officially, publicly archived, from archives that do not require passwords for access and that do not prohibit data collection or academic study of their data. While the topics written about in fan fiction may be considered highly sensitive by some fan authors and readers, we do not quote from any stories and do not mention or cite any individual authors or readers. In the future, fan works archives may establish policies banning data collection by researchers or other parties, but the two archives that we studied do not currently have such policies in place.

We acknowledge that this article quantifies, describes, and frames the activities of an online subculture, media fandom, many of whose members may think of fandom and fan productivity as 'private' (i.e. limited to consumption and interpretation by members) rather than 'public'. Although fan stories published in freely accessible fan fiction archives do not meet the definitions of private online communities given by Milner (2011: 22) or Bruckman (2002), fans may resist scholars observing these sites, drawing conclusions about fans' proclivities and tendencies, and publishing their findings. Potential harm might be done to fans if, for example, media corporations use the information or hypotheses presented by studies such as ours to antagonize or exploit fans. Our goal is to characterize fan fiction writing as a legitimate and important form of cultural production that is practiced by a large number of people, not to draw any negative attention to fan communities or practices. Three of the authors (De Kosnik, Cuntz-Leng, and Horbinski) have participated in fan fiction communities and archives for over 10 years each, and the entire research group worked on this article from a position of deep respect for media fans. At the same time, we recognize that, as Gajjala (2002: 182) argues, 'ideas of private/public, closed and open spaces are blurred and reconfigured' in online research methodologies, and those uncertainties apply to big data analyses as well as to qualitative, ethnographic analyses. Definitions of what constitute ethical data collection and data-oriented studies of the Internet fandoms will likely shift with future debates around projects such as ours.

Analysis of *The Avengers* fan production

The Marvel superhero film *The Avengers* unites, for the first time in a single film, several superhero characters that had been the central protagonists of their own Marvel films as well as several other supporting characters that had appeared in these earlier single-hero films (Loki, Black Widow, Hawkeye, Agent Phil Coulson, and Nick Fury). Marvel's hope was that, because most of the individual hero films (*Iron Man*, *Iron Man 2* [dir. Jon Favreau, 2008 and 2010]*, Thor* [dir. Kenneth Branagh, 2011], and *Captain America* [dir. Joe Johnston, 2011]) had each achieved box office success (although *Hulk* [dir. Ang Lee, 2003] and *The Incredible Hulk* [dir. Louis Leterrier, 2008] were less successful, critically and financially, than the other MCU outings), that audiences would be excited about seeing many protagonists with whom they were already familiar joining forces in *The Avengers*, and that anticipation would build well in advance of the film's release. Marvel has consistently been a leader in exploring the potentiality of narrative- and character continuity across their properties: Hadas (2014: 6) states that in 'the 1960s, Marvel Comics were the first to place their superheroes in the framework of a shared world, and invite their audiences to engage with a *universe* rather than a character, a series or even a franchise'. The MCU films have adopted the comics' networked structure, and *The Avengers* was marketed as the fullest realization, to that point, of the entertainment possibilities of popular protagonists co-existing in a 'shared world'.

We graphed *Avengers* fan production on FF.net (Figure 1) and AO3 (Figure 2) separately, looking at the time frame of January 2011 to July 2013. These graphs show that Marvel's strategy worked incredibly well. In both the AO3 and the FF.net graphs of *Avengers* fan production, we see that works were being posted in advance of the film's premiere on May 4, 2012. Although only very few works were published on FF.net prior to *The Avengers*' cinematic release, there is a clear buildup of *Avengers*-related production on the platform from February through April 2012. The buildup of fans' pre-premiere interest in *The Avengers* is much clearer on AO3; between August 2011 and January 2012, fan production leaps from 4 to 115 works/week, then slows down to
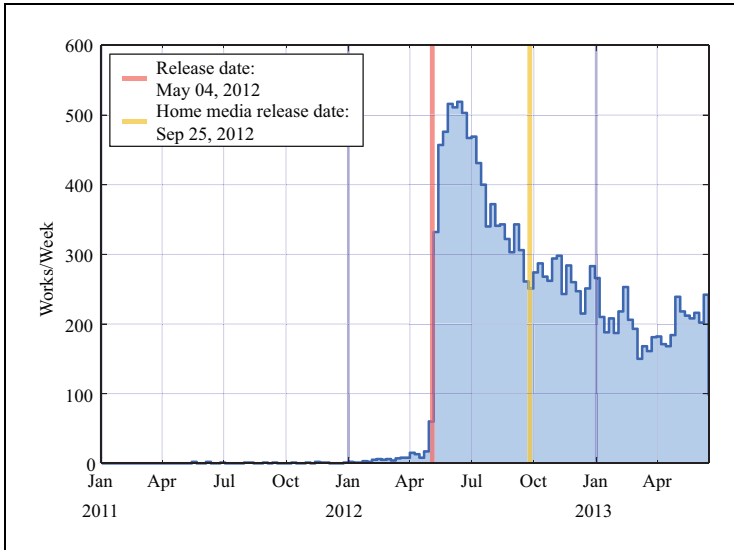
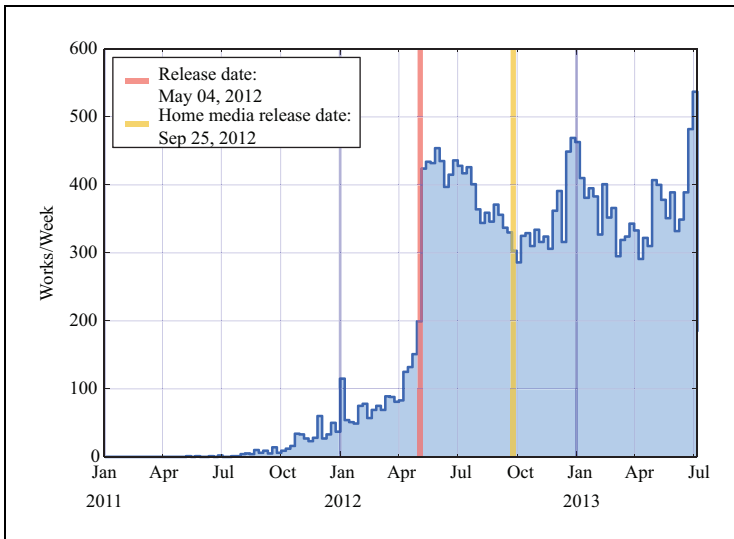**Figure 1.** *The Avengers* fan production on FF.net.

Figure 2. *The Avengers* fan production on AO3.

49 works/week on January 22, and climbs again between February 2012 and the eve of the May premiere to 199 works/week.

The impact of the movie's theatrical release on fan production is evident in both the AO3 and the FF.net graphs. An enormous spike in production occurs as soon as the film premieres in early May 2012, jumping to more than 300 works/week on FF.net and to over 400 works/week on AO3.

Table 1. *The Avengers* fan production showing number of works, number of authors, and average number of works per author.

Avengers fandom	FF.net	AO3	Totals
Last date scraped	June 18, 2013	July 8, 2013	–
Number of works	17,675	25,047	42,722
Number of authors	8447	6670	15,117
Average number of works per author	2.09	3.76	2.83

One conclusion we can draw from this 'premiere spike' is that fans do not wait a certain period of time after watching a film before they begin producing. Instead, it appears that production starts almost as soon as fans leave the cinema. The infrastructure, accessibility, and temporal independence of online archives allows fans to easily and immediately generate their individual interpretations of, and elaborations on, the film they just watched, share their fantasies with other users, store them, and add them to the greater Marvel knowledge universe. Before we visualized this data, we might have hypothesized that fans would need to ponder a media text they viewed, mull over the story lines, and dwell on the characters for a week or two before jumping into that text's fictional universe and authoring their own texts, but we found no latency period between media consumption and fan production.

The premiere spike is not short-lived on either FF.net or AO3. In fact, fan production increases in the weeks immediately after *The Avengers*' release. This increase is more dramatic on FF.net (where production jumps from 332 to 519 works/week) than on AO3 (where production jumps from 424 to 454 works/week), but there is a definite increase in weekly production on both archives. Perhaps this indicates that while *many* fans are ready to begin writing their own texts right after they view a media text, *some* fans do need to 'digest' the text for a week or two before writing fan fiction. Or, the post-premiere increase might indicate that many of the same fans who produced works right after the movie's premiere *continue* to create fresh works in the weeks after the premiere (and that their numbers are augmented, at this later date, by the fans who needed to digest the text). It may also indicate the completion of longer fan works begun immediately after the film's release. Table 1 shows that the average number of works per author in the *Avengers* fandom on FF.net is 2.09, and the average number of works per author in the *Avengers* fandom on AO3 is 3.76, so there is certainly repeat authorship on both sites, though much more on AO3.

As for the tail of *Avengers* fan production on FF.net and AO3, we see interesting differences between the sites. FF.net shows a steady drop-off in production after the production peak is reached 1 month after the movie's premiere. The peak of production on FF.net is 519 works/week, but by March 2013, production falls to 150 works/week. Production does rebound between March and June 2013 to 242 works/week, but this figure is still far below the production peak. On AO3, however, *Avengers* production stays steady overall, even reaching new peaks in the months after the movie's launch. Between the film premiere in May 2012 and June 2013, production has dipped below 300 works/week (between 286 and 295 works/week) three times, but each time, it has climbed back up, reaching a new height of 463 works/week in January 2013 and spiking to 537 works/week in July 2013 – exceeding the premiere and post-premiere spikes by 83 and 74 works/week, respectively. While the May 3, 2013, release of *Iron Man 3* (dir. Shane Black), another installation in the Marvel film franchise, probably led to the rebound of production on FF.net and the new height of production on AO3, AO3 was consistently more productive in

Avengers fandom than FF.net after the *Avengers*' theatrical release, and any impact that *Iron Man 3* may have had on fan production on both sites was far greater on AO3.

To explain why AO3 does not see the same drop-off in *Avengers* production that FF.net does, we look to the fact that AO3 was (and still is) a new fan archive, having launched in closed beta in October 2008 and in open beta on November 15, 2009. FF.net is a far older archive, which has alienated some fan writers and readers by periodically 'purging' or deleting fan fiction that 'contains detailed descriptions of physical interaction of sexual or violent nature', with the latest purge taking place in late May 2012 (Ellison, 2012). AO3, by contrast, does not regulate the content as long as it does not violate US law, regardless of the rating or topic of the material (OTW, n.d.).

When AO3 went into open beta, it had 347 users; approximately 5 weeks after the start of open beta, the archive had 3974 users (AO3, 2009). By the end of 2011, the site had grown to over 31,000 users and more than 275,000 works in over 8100 fandoms (AO3, 2011). This growth was dwarfed, however, by the massive increase in traffic to the platform that began in May 2012, precisely the month that *The Avengers* premiered. In the 2 months after *The Avengers*' theatrical release, AO3 saw a 25% jump in user accounts, and May 2012 alone saw an increase in traffic to the site (566 GB) that almost matched the traffic growth it experienced over the entirety of 2011 (595.63 GB) (AO3, 2012b, 2012c).

AO3's rise as a fan fiction archive and *The Avengers*' rise as a blockbuster movie coincided. We speculate that this coincidence in the building popularity of fan platform and media text is one reason that AO3 served as an attractor for *Avengers* fans and why *Avengers* has remained a highly productive fandom on that site. *Avengers* fans may have felt that AO3 was the 'place to be' to engage with one another, and AO3 may have taken on the aura of a 'hot scene', an exciting new space where many new *Avengers* works were being posted at a fast clip without strict regulating mechanisms. This sense of AO3 as a fresh and vibrant scene may have led *Avengers* fans to *keep* writing new works in that fandom, even long after the movie's premiere. In contrast, FF.net, which was regarded as neither new nor particularly fan friendly at the time of the *Avengers* premiere, did not generate the same consistent long-term productivity.

If we are correct in hypothesizing that AO3's status as a hot scene contributed to its having a higher and more sustained rate of productivity than FF.net in the *Avengers* fandom, then we can postulate that it is not just a movie studio's strategy (i.e. Marvel's releasing several successful films that all interrelate in order to generate interest for each new film in the series) that determines the volume and duration of fan production. The attractiveness of fan platforms and different platforms' degrees of popularity also factors into how much, and for how long, fans produce.
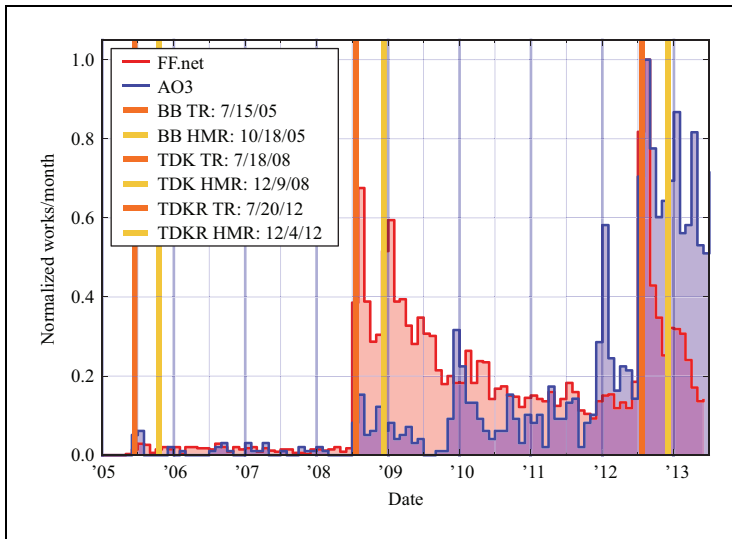
Analysis of *Batman* fan production

Batman has been an icon of popular culture for decades, and director Christopher Nolan's three additions to the franchise (*Batman Begins*, *The Dark Knight*, and *The Dark Knight Rises*) have attracted new audiences and inspired new forms of reception for the superhero. Our count shows that there are far fewer *Batman* fan works than *Avengers* fan works on both FF.net and AO3 (Tables 1 and 2 show that we counted over 42,000 *Avengers* works on FF.net and AO3 combined, but just under 8000 *Batman* works on the two platforms combined).

That *Batman* fan production should lag so far behind *Avengers* fan production, despite the fact that both achieved massive success at the box office, might be attributable to the fact that the *Batman* films tell the story of one superhero and a few supporting characters, while *The Avengers* is

Table 2. *Batman* fan production showing number of works, number of authors, and average number of works per author.

Batman fandom	FF.net	AO3	Totals
Last date scraped	July 22, 2013	July 22, 2013	–
Number of works	6270	1445	7715
Number of authors	3687	640	4327
Average number of works per author	1.70	2.26	1.78

Figure 3. *Batman* fan production on FF.net and AO3 (normalized).

about a fairly large team of superheroes with numerous supporting characters. More characters might mean more possibilities for fan fiction scenarios and more potential romances and friendships for fan writers to explore; hence *The Avengers* may facilitate more fan production than *Batman*. There may be other in-text differences that contributed to the greater fiction productivity of *Avengers* fans compared to the productivity of *Batman* fans, such as the tone of the films; while earlier depictions of Batman (the 1966–68 ABC television series, for instance) have been comedic and even 'campy' (see Brooker, 2001), Nolan's *Batman* films present grim conflicts unfolding in a dark atmosphere and are far more somber in mood than *The Avengers* or any of the Marvel adaptations. Films in the serious drama genre yield less fan fiction, in general, than films in the sci-fi/fantasy or superhero/action genres, and Nolan's *Batman* trilogy may fall more into the former than the latter in the perception of media fans.

Figure 3 indicates a slow beginning of fan fiction activity on both platforms after the theatrical release of *Batman Begins* on June 15, 2005. There is a low but constant level of productivity, with fewer than 10 new works/week published to FF.net until the summer of 2008. Although some *Batman* works appear on AO3 with dates from this period, we presume that this phenomenon is due to AO3's permitting users to backdate their posts, that is, to assign creation dates

to works that are earlier than the upload dates. Thus, we are disregarding the AO3 *Batman* works that date from 2008 and earlier, given that AO3 had not launched until after the release of *The Dark Knight*.

Following the theatrical release of *The Dark Knight* on July 18, 2008, we see an abrupt increase in fan fiction activity on FF.net of more than 100 new works/week. Although a small peak of (backdated) fan fiction productivity can be detected on AO3 as well, the graph documents a relatively constant level of activity compared with the short-lived peak on FF.net. While a correlation of production with *The Dark Knight* home media release on December 9, 2008 can be seen on FF.net, the home media release seems to have had no influence on AO3, which was then still in development in closed beta.

The Dark Knight Rises premiered in cinemas on July 20, 2012. The large spike in fan fiction activity on both platforms coincides with this event. With a peak of 345 works per month on FF.net and a peak of 98 works per month on AO3, the spike following *The Dark Knight Rises*' release significantly outstrips the peak following *The Dark Knight*'s theatrical release on both platforms. After the premiere date, a dramatic drop-off can be seen for FF.net, while the distance between peak and baseline appears less prominent on AO3. That adult content is permitted on AO3 leads to divergent target audiences for both platforms and might contribute to the maintenance of levels of fan production on AO3. At the moment, roughly 33% of the content on AO3 is explicit or mature in comparison to 18% mature content on FF.net.

All in all, Figure 3 shows that *Batman* fan fiction production has grown with each release, the third movie inspired the most fan production, the second less, and the first very little. The theatrical releases have a significant short-term influence on fan fiction activity, whereas other events like home media releases or the release of trailers (July 2004, 2007, and 2011, respectively) have little or no evident impact on the rate of fan fiction production. Exceptions to this occur during the year-end holiday seasons of 2009, 2011, and 2012 (in the weeks just prior to and following the New Year), which show an increase in fan activity on both platforms. We note too that there was no home media release of a *Batman* movie in these years. It is possible that either fan fiction writing events (i.e. challenges), common in this time of the year, or possibly TV broadcasts of the movies during the holiday season provoked the higher number of fan submissions.

Analysis of *Inception* fan production

The 2010 release of *Inception* presents an interesting case in terms of fan production because it had no built-in fandom anticipating its release, apart from the fandom constructed around its director, Nolan, and several of its stars, particularly Leonardo DiCaprio. However, DiCaprio had not been popular to fan fiction authors prior to the release of *Inception*. Although movies like *Titanic* (dir. James Cameron, 1997) and *The Departed* (dir. Martin Scorsese, 2006) had been effective at the box office, they were not very generative in terms of fan fiction production. The same is true for movies directed by Christopher Nolan other than the *Batman* films, such as *The Prestige* (2006) or *Memento* (2000). *Inception* was not based on a prepublished comic book series or earlier film franchise but had an original script and characters with whom fans had no familiarity prior to seeing the movie. Yet despite these facts, *Inception* has a higher quantity of fan production than all three *Batman* films combined (Tables 2 and 3 show a combined total of 7715 *Batman* works and 8820 *Inception* works on both these fan platforms). This may be partly due to the fact that *Inception*, like *The Avengers*, is an ensemble film. That *Inception* managed to trump *Batman* in terms of fan production seems to lend weight to our supposition that *Batman* fan production is lower in part due to the relatively small number of central characters in the *Batman* movie universe. Also, unlike

Table 3. Inception fan production showing number of works, number of authors, and average number of works per author.

Inception fandom	FF.net	AO3	Totals
Last date scraped	June 18, 2013	July 8, 2013	–
Number of works	3735	5085	8820
Number of authors	1705	1253	2958
Average number of works per author	2.19	4.06	2.98
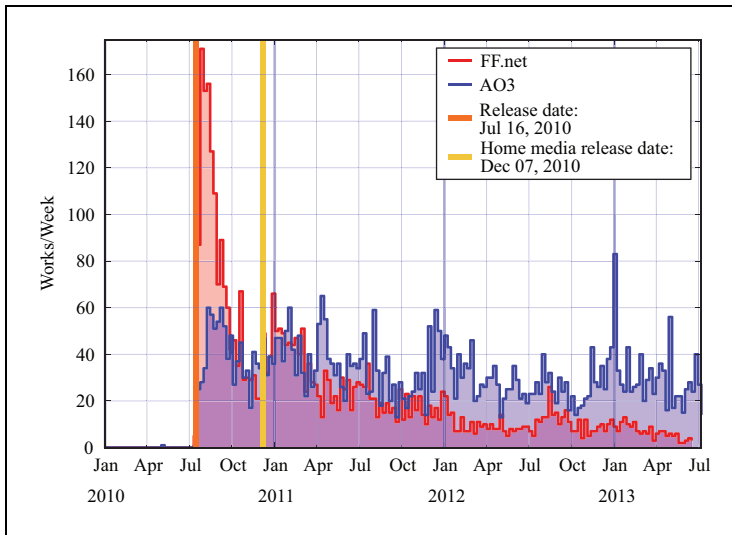
Figure 4. *Inception* fan production on FF.net and AO3.

either *Avengers* or the *Batman* trilogy, *Inception* is a 'puzzle film' (Thompson, 2010) whose plot twists, holes, and gaps may work as 'a cultural activator, setting into motion [audiences'] decipherment, speculation, and elaboration' (Jenkins, 2006: 95).

Almost as soon as *Inception* premiered, fan interest grew profoundly. The essentially instantaneous start of fan production based on *Inception* can be seen on both fan fiction archives, with works posted on FF.net and AO3 in the weeks after the film's release reaching an all-time high of 171 works/week on the former and production on the AO3 reaching a volume (60 works/week) only exceeded twice since (Figure 4). Production on the two archives, however, diverges dramatically thereafter. Works for *Inception* on FF.net show a more or less exponential drop-off from the heights of summer 2010, while levels of production on AO3 have essentially held steady since the film's release, dipping below 20 works/week only a few times and actually reaching an all-time high of 83 works posted per week in January 2013, 2.5 years later (Figure 5). Some of this difference in graph behavior is most likely related to the May 2012 purge of explicit works on FF.net; in June 2012, one fan estimated that perhaps 0.4% of the former total works on FF.net, amounting to approximately 145,000 stories, had been deleted (Ellison, 2012). But the difference in *Inception* production levels between FF.net and AO3 is too significant for the FF.net purge to be the primary
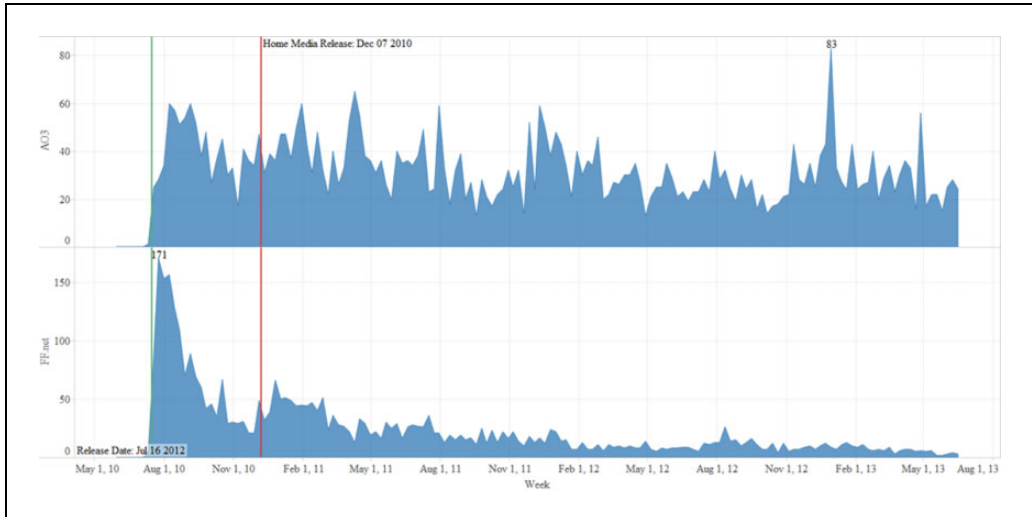
Figure 5. *Inception* fan production on FF.net and AO3 in separate graphs (to emphasize the drop-off in production on FF.net compared to the sustained levels of fan production on AO3).

cause, particularly in light of the fact that the release of *Inception* predates the massive rise in AO3 popularity (driven by the FF.net purge) by nearly 2 years.

What, then, makes AO3 a site of persistent fan interest in *Inception* when fan productivity falls off so sharply on FF.net? One point of interest is that fans in the *Inception* fandom on AO3 are more productive than those on FF.net (Table 3), with an average of 4.06 works per author as opposed to 2.19 on FF.net. It may well be that this high number of works-per-author accounts for the sustained levels of fan production of *Inception* on AO3, for a few fans who are very active in a fandom – reading and commenting on one another's works, responding to each other's works with new works and generally contributing to lively online interaction among the members of the fandom – can essentially drive the creation of new fan texts, even in the absence of any new source material. Since *Inception* was a stand-alone film, it was clear to fans that they could not anticipate any sequels – they had to create these themselves.

In other words, we posit that continued fan engagement and production can be fueled by fan activity as much as or more than by consumption of the media text that gives rise to a fandom. Internet fan activity is spontaneous and constantly generative of new content – not just new fan fiction stories, but reviews, commentary, debates and dialogues, screen caps, animations, gossip, paparazzi photos of actors, and other media that circulate swiftly through online fan communities – from which participants take pleasure. In contrast, most media texts that serve as the sources or foundations of fandoms, such as films and television shows and novels, are fundamentally fixed. We therefore surmise that the high works-per-author average among *Inception* fans on AO3 indicates that the *Inception* fandom on that site has been an intensely active community since the movie's premiere, which has kept the members in that fandom engaged with the *Inception* universe and has motivated them to keep creating new works long after the film's departure from cinemas, despite the fact that no sequels will be forthcoming. The online archives are used both to expand and conserve the fictional story world that *Inception* could only have grown into due to these archival platforms that enforce user participation and follow-up narrating.

Hypotheses and implications

Based on the data collected and analyzed through our fan data project, we propose the following hypotheses and implications: Fan fiction production is a large-scale activity. Fan fiction production based on Hollywood blockbuster movies, taking place on the two largest fan fiction archives over the past 5 years, has constantly been growing and shows no signs of slowing. Following what Derrida (1995/96: 10) has called the 'archontic principle', both platforms show a drive 'that seeks to always produce more archive, to enlarge itself. The archontic principle never allows the archive to remain stable or still, but wills it to add to its own stores' (Derecho, 2006: 64). Fan production has reached peaks of over 537 works/week on AO3 in the *Avengers* fandom, and a productivity rate of over 100 works/week is not uncommon. We have counted the total number of works for both FF.net and AO3 to be approximately 5.3 million for the former and 830,000 for the latter. These numbers only pertain to fan fiction production; there are numerous other types of fan works being regularly produced and posted online that are not included in this study and that can be associated with other archiving instruments on the Internet. Therefore, it must be acknowledged that fan production, as a realm of online activity, is large and increasing and will therefore be a rich site of data analysis for years to come.

Fans award mindshare to blockbuster Hollywood movies based on a number of factors, for example, the marketing strategy used by the studios, properties inherent to the films themselves (especially the number of characters and potential relationship dynamics between the characters), the type of fan activity occurring within a fandom on a given platform, and the attractiveness of a platform (as measured against other platforms and in tandem with the attractiveness of the text itself).

A serial text strategy, such as the MCU, can be very effective, but seriality in itself is not a predictor of fan production (as evinced by the fact that the *Batman* fandom is far less productive than *The Avengers* fandom). The greater the number of major characters and the greater the number of potential romantic/sexual relationships and friendships (and enemy-ships) between the characters, the greater the fan production. We can see this in the relative paucity of fan fiction for *Batman* films, which usually has only four or five main characters, relative to the quantity of fan fiction written for *Inception* and *The Avengers*, which both had large ensemble casts (Tables 1 to 3).

We see a post-premiere drop-off of production in the *Batman* fandom on FF.net and in AO3, a post-premiere drop-off in the *Inception* fandom and in the *Avengers* fandom on FF.net and sustained production levels in *Inception* and *Avengers* on AO3. We cannot be sure of the reasons for drop-offs or level maintenance in any given fandom on any given site, but the data suggest that a high number of works per author may have something to do with levels holding steady: in the sustained-level fandoms, *Inception* and *The Avengers* on AO3, the average works per author is 4.06 and 3.76, respectively, while the average works per author in all of the drop-off fandoms ranges between 1.7 and 2.19 (Tables 1 to 3). We propose that a high production rate *per* fan may indicate a fan community in which fans are more enthusiastic about the source text and about other fans' works and use the archive platforms as sites of meaningful communication and exchange. When a fan platform is rising in popularity at the same time that a media text is rising in popularity, this co-occurrence can create a hot scene for fan activity that contributes to high fan productivity and also to sustained fan productivity. We think that the sustained levels of *Avengers* and *Inception* production on AO3 are due in part to AO3's being a new and exciting online archive at the same time as the theatrical releases of *Inception* and *The Avengers*.

Fan production seems to spike immediately following a movie's premiere. Also, there is consistently a New Year's spike on AO3 across all three fandoms that we studied, but this spike did not occur on FF.net. We speculate that this may have to do with AO3 being the site for fan challenges that take place during the year-end holidays, incentivizing fans to write and post fan fiction during the last week of the year. Several 'fic challenges' use AO3 as their primary archive, while FF.net is not generally associated with fan-organized writing challenges. One interesting lack of correlation we noted is that the home media release of these blockbuster films did not produce any noticeable spikes in production. However, the home media versions of all three films were released in the third or fourth quarters of the year, and so fans may have had DVDs or Blu-rays in hand (perhaps received them as holiday presents and re-watched the films with family members) at the time that they created works over the holidays – that is, the home media may have fueled or informed fan production without itself leading to visible spikes immediately following their release dates. We feel that this shows that studios' marketing strategies (studios devote millions of dollars to advertising home media editions of their biggest box-office hits, as home media sales have eclipsed movie theater revenues for the past decade; see Gray, 2010: 7) do not always directly win fan mindshare or prompt fan production. The possibilities of participation provided by Internet fan fiction archives and fic challenges taking place on AO3, as well as the simple fact that fans may have more time to re-watch, think, and write about media texts by year's end seem to be feeding peaks in fan production more than any marketing strategies around home media.

Avenues for future research

Our hypotheses are not conclusions. We plan on culling more data from more fandoms on AO3 and FF.net and adding a qualitative research component (consisting of interviews with individual fans who have contributed works to these fan sites), in order to further test our theories about fan production and the crucial role of online archiving platforms. What the fan data project has demonstrated with certainty so far is that sites of the Internet fan production contain a wealth of information about when, and to what extent, media consumers grant mindshare to media texts and that data scraping and data analysis of these sites can yield a range of insights about consumers' mindshare as measured through their creative activities. There are many potential applications of our research but we are most interested in continuing our project in ways that will lead to potentially significant contributions to media studies and communication studies research, for example, by deepening our understanding of what we are calling the EPP. We hope to build out the EPP into a more complete model for representing the many interrelated factors that cause media consumers to be engaged with media texts and to produce fan works in response to the media they consume. We feel that the EPP could become an influential model for understanding consumers' interactions with media texts that is grounded in data rather than in purely qualitative research (although we acknowledge that this method would be complementary to data analysis) and is not concerned with what consumers spend on media, but rather with why consumers dedicate their attention, interest, and creative energies to different media texts at different times.

Acknowledgment

Note

1. It should be noted that AO3 has allowed users to post multimedia fan works including art, audio recordings of fan fiction (podfic), and fan videos since at least March 2012, although the AO3 cannot currently host these files itself (AO3, 2012a). These fan works are included in our AO3 results. However, we estimate that more than 95% of works on AO3 are primarily text based, that is, fan fiction.

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Laurent El Ghaoui graduated from Ecole Polytechnique (Palaiseau, France) in 1985 and obtained his doctor of philosophy in aeronautics and astronautics at Stanford University in March 1990. He was a faculty member of the Ecole Nationale Supérieure de Techniques Avancées (Paris, France) from 1992 until 1999 and held part-time teaching appointments at Ecole Polytechnique within the Applied Mathematics department and Université de Paris-I (La Sorbonne) in mathematics in economy program. He joined the Berkeley faculty in April 1999 as an acting associate professor and obtained his tenure in May 2001. He went on leave from UC from July 2003 until September 2006 to work for SAC Capital Management, a hedge fund based in New York and Connecticut. Since then he is back full time at UC Berkeley in the Electrical Engineering and Computer Science department. He teaches optimization in that department and a class on optimization models within the masters in financial engineering at the Haas School of Business. He is the recipient of a Bronze Medal for Engineering Sciences from the Centre National de la Recherche Scientifique (France), a CAREER award, an Okawa research grant, and a Google research grant. He is also the corecipient of an SIAM optimization prize.

Vera Cuntz-Leng was a visiting researcher at the Berkeley Center for New Media of the University of California, Berkeley in 2013–14, and is currently a postdoctoral researcher in the Department of Media Studies at Philipps University in Marburg, Germany. She studied film and theater science in Mainz, Marburg, and Vienna. She received her doctor of philosophy from the Department of Media Studies at the Eberhard Karls Universität Tübingen, with a thesis about the intersecting relations between queer reading, slash fandom, and the fantasy genre in *Harry Potter*. She has published on *Harry Potter*, transmediality, science fiction and fantasy film, fandom and subculture, color aesthetics, Indian cinema, Japanese cinema, and Peter Weir. She is the editor of a forthcoming anthology about fan culture and fan practices in Germany.

Andrew Godbehere is a PhD candidate in electrical engineering and computer science at UC Berkeley. Advised by Laurent El Ghaoui, his research focuses on novel combinations of statistical modeling and numerical optimization to achieve efficient insight into very large databases. Applying his research to large text corpuses including Twitter, fan fiction, and news archives, he is developing a software library to bring advanced computational tools to humanities scholars. He graduated summa cum laude with a bachelor of science from Cornell University and has publications in controls and computer vision. He was the lead developer on the interactive audio installation 'Are We There Yet?' at the Contemporary Jewish Museum in 2011.

Andrea Horbinski is a PhD candidate in modern Japanese history with a designated emphasis in New Media at the University of California, Berkeley. Her work focuses on the history of manga and the role fan production has played in it from a transnational perspective, and she has discussed fandom, anime, manga, and Japanese history and folklore at conventions and conferences on three continents, including WisCon, AnimeExpo, and HASTAC. She currently serves on the Board of Directors of the Organization for Transformative Works and on the Advisory Board of the Ada Initiative, and her articles and reviews have appeared in *The WisCon Chronicles*, *Transformative Works and Cultures*, and *Mechademia*.

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Vu Pham is a PhD student in electrical engineering and computer science at UC Berkeley. His research interests focus on text mining, optimization, and machine learning. At Berkeley, he works with Prof El Ghaoui and publishes research articles on the applications of sparse machine learning in text analytic problems. His work had brought him the most prestigious Golden Globe award from Vietnam for young scientists (out of 10 winners). With his research, he focuses on the study of a computational model to understand the academia, including the fields of data mining and humanities via machine learning and convex optimization methods.