Abstract
The Internet has become the new battle ground between authoritarian regimes and ordinary individuals who want unimpeded access to information. The immense popularity of online activism and citizen journalism enabled by social media has instigated state level players to partially or completely block access to the Internet. In return, individuals and organizations have been employing various anti-censorship tools to circumvent these restrictions. In this paper, we claim that censorship is futile as not only has it been ineffective in restricting access, it has also had the side-effect of popularising blocked content. Using data from Alexa Web Rankings, Google Trends, and YouTube Statistics, we quantify the ineffectiveness of state level censorship in Pakistan and Turkey and highlight the emergence of the Streisand Effect. We hope that our findings will, a) prove to governments and other players the futility of their actions, and b) aid citizens around the world in using legal measures to counteract censorship by showing its ineffectiveness.

1 Introduction
The popularity of the Internet is a double-edged sword: it opens up a world of information and promotes free speech but at the same time, this popularity incites authoritarian regimes and other actors to repress access to it. As a result, at present more than 60 countries around the world censor the Internet in one form or another [7]. These forms include all-out blocking [15], partial blocking at different levels [38, 46, 2], performance degradation/throttling [1], and content manipulation [3, 47]. To stem this suppression tide, researchers and activists are actively developing an arsenal of various anti-censorship tools [27, 50, 16, 21, 8, 12, 29]. Cognizant of this, censors are trying to stay ahead of the curve [48, 40, 22]. This has led to a cat and mouse game between censors and anti-censorship practitioners, with no end in sight, similar to the struggle between encryption-decryption [31].

Fortunately, this tug of war has not dampened the desire of users around the world to gain unimpeded access to the Internet. On the one hand, they are readily using various methods to circumvent restrictions [38] and on the other they are helping others to do the same through ingenious mechanisms, such as putting up addresses of open DNS servers as wall graffiti [51]. In a similar vein, in spite of restrictions and the risk associated with bypassing them, the usage of social media and blogs has been escalating [10]. At the other end of the spectrum, all of this online activism has induced some governments to pass “Internet Constitutions” to enshrine freedom of expression, net neutrality, and online privacy [36].
Essentially, at the very core, the goal of a censor is to restrict access to content that is deemed detrimental to a certain vested interest. This blackout often backfires and causes the content to go viral following the Streisand Effect [25]. The Streisand Effect can be defined as the inadvertent popularity of any material as a result of its suppression (Details in §2.1). In recent years a number of instances of this phenomenon have been recorded. These include the swell in the number of Twitter users after the website was blocked in Turkey [49], the popularity of the online activism portal Avaaz’s posters to ban South Africa’s lion bone trade [42], and the re-posting of the “Station hertzienne militaire de Pierre-sur-Haute” entry on Wikipedia after the latter was forced by French Intelligence to delete it [23]. While the Internet is replete with examples of this phenomenon, the evidence is mostly anecdotal and not in the context of state-level censorship.

To remedy this, we present, to the best of our knowledge, the first formal study of the Streisand Effect in state-level censorship. With Pakistan and Turkey as a case study, using data from Google Trends, YouTube Video Statistics, and Alexa Web Rankings, we show that censorship has, a) not affected the ranking of websites
such as YouTube, and b) it has had the side-effect of causing restricted content to go viral. The goal of this paper is two-fold: to dissect the Streisand Effect in the context of state-level censorship and also, possibly more importantly, to aid citizens around the world in using legal measures to counteract censorship. For instance, for the past two years activists have been fighting a case in a provincial High Court in Pakistan to unblock YouTube. The ineffectiveness of the ban has even prodded the lead judge to remark at one point: “What the government is saying is a joke. Every child is accessing YouTube. It’s a fraud against the people of Pakistan” \[41\]. Unfortunately, most of the information about censorship circumvention and the Streisand Effect is circumstantial and anecdotal, to which the law is blind. Therefore, a formal study with concrete numbers can fortify the case for the futility of Internet censorship around the world. It has already proven effective in countries like Turkey where the ban on Twitter was lifted recently after the constitutional court ruled it as illegal \[39\].

The rest of the paper is organized as follows. In §2 we give background information about the Streisand Effect and the various data sources used in the paper. §3 presents our findings. We discuss the implications of the findings in §4 §5 concludes the paper and also discusses future directions.

2 Setting The Stage

In this section, we give the reader background information about the Streisand Effect, Alexa Web Rankings, Google Trends, and YouTube Video Statistics. In addition, we give details of Internet censorship in our two target countries: Pakistan and Turkey.

### 2.1 Streisand Effect

The Streisand Effect is named after the singer Barbara Streisand who in 2003 unsuccessfully tried to have an aerial picture of her Malibu beach house taken down from the website of an environmental activist \[25\]. She subsequently lost the $50 million lawsuit but the ensuing media coverage brought more than a million visitors to the said website. Since then, the Streisand Effect has become synonymous with the unintentional virality of any information, online or otherwise, as a consequence of any attempt to censor, suppress, and/or conceal it. This phenomenon has manifested itself in a diverse array of settings. Examples include unsuccessful lawsuits and injunctions \[43 §20\], personal liberty \[9\], and even scientific research \[26\]. Over the years, the effect has been leveraged by individuals and organizations alike to repel censorship. For instance, the American Library Association and others have been organizing a Banned Books week since 1982 to raise awareness about banned and restricted books \[17\]. Similarly, attorneys frequently advise their clients not to pursue libel cases that can potentially raise interest in the issue rather than subdue it \[33\]. Above all, the Streisand Effect has been successfully used by numerous individuals around the world to take the fight to government mandated censorship \[18 §49 §25\]. It is important to highlight that while the positive effects of the effect are an effective tool against censorship, it is by no means a panacea. To counteract online censorship around the world, we still require an ecosystem of activists and tools. We discuss this in detail in §4.2.

| Date           | Event ID | Description                                                                 |
|----------------|----------|------------------------------------------------------------------------------|
| February 22, 2008 | PK1      | YouTube censored in retaliation to the movie “Fitna”                         |
| May 19, 2010    | PK2      | Facebook, YouTube, Flickr, and Wikipedia blocked due to “Everybody Draw Muhammad Day” |
| September 17, 2012 | PK3      | YouTube blocked in reaction to another controversial movie “Innocence of Muslims” |

Table 1: Censorship Events in Pakistan

| Date           | Event ID | Description                                                                 |
|----------------|----------|------------------------------------------------------------------------------|
| May 08, 2008   | TR1      | YouTube blocked due to videos offensive to Mustafa Kemal Ataturk             |
| January 27, 2014 | TR2     | SoundCloud blocked to stop access to leaked audio tapes of the Turkish Prime Minister and his main political rival in a possible graft case |
| March 20, 2014 | TR3      | Twitter blocked to suppress access to leaked recordings allegedly implicating the Turkish Prime Minister and his inner circle in various corruption scandals |
| March 27, 2014 | TR4      | YouTube censored to block access to audio recordings of government officials discussing a possible military strike inside Syria |

Table 2: Censorship Events in Turkey
2.2 Pakistan

With a population size almost half of South America and an almost comparable number of absolute Internet users [38, 28], Pakistan has experienced Internet censorship in many forms over the years. Popular websites such as Google, Facebook, Flickr, Wikipedia, and YouTube have borne the brunt of restrictions in recent years. At times, the side-effects of this censorship have affected connectivity outside the country as well [6]. From a technical perspective, websites are blocked at both the DNS level as well as the HTTP level [38]. These restrictions are imposed through technology from Netsweeper at the IXP level [44]. In addition, citizens are also spied upon through FinSpy [37]. Fortunately, Pakistan also has an extremely vibrant social activism community which has legally challenged Internet censorship and surveillance within the country [41, 35]. Table 1 shows three major censorship events from the country under consideration in this paper.

2.3 Turkey

An Internet penetration of close to 49% makes Turkey one of the most connected countries in the world [19]. It also has the highest Twitter penetration in the world [4]. In addition, 72% of the Internet users access newspapers and magazines online [45] enabling them to be politically informed. Unfortunately in the last few years, Turkey has gone from relatively benign online censorship to “one of the world’s most determined Internet censors” [32]. In fact, the Turkish parliament recently passed legislation that allows the authorities to block any website while bypassing the courts [5]. In addition, Internet service providers are bound to keep tabs on a user’s online activity for two years for use by the authorities. Similar to Pakistan, Turkey also has a very active online community whose activism recently prompted its top court to deem the ban on Twitter as illegal [39]. Four main censorship events from Turkey are listed in Table 2.

2.4 Alexa Web Rankings

Alexa [9] is a web analytics company that provides traffic analysis and rankings for top level domains. Traffic rankings—which are updated daily—are calculated by using crowd-sourced data from its browser toolbar. A website’s rank is a function of the number of unique visitors and page views. Alexa’s web portal displays rankings via three views: 1) global, 2) country-wise, and 3) category-wise. In addition, Alexa also exposes a Web Information Service API that allows the user to query historical data through Amazon Web Services.

2.5 Google Trends

Google Trends [11] is a time series index of search term volume entered into Google in a geographic region. The index is calculated by normalizing the total query volume for a specific term by the total number of queries in that region. The maximum value is 100 and indexes can be searched back till January 1, 2004. Google Trends have found wide traction for trend prediction, from economic indicators [11] to disease epidemics [24]. Similar to Alexa, Google Trends has both a web-based portal as well as a back-end API.

2.6 YouTube Video Statistics

Statistics for a YouTube video can be enabled by the uploader for public consumption. These statistics can include a time series of views, duration of views, and shares. Instead of sharing raw numbers, the portal only exposes generated charts of regular time series or CDFs. In addition, no external API is available to access this information.

3 Results

This section presents the results of our analysis. We first analyze the ranking of YouTube (§3.1), followed by the popularity of individual topics (§3.2). We then drill down into individual pieces of restricted content (§3.3) and also examine the popularity of anti-censorship tools (§3.4).

3.1 Website Ranking

YouTube has primarily borne the brunt of censorship in Pakistan. Most notably, it was first briefly banned in 2008 and since September, 2012 has experienced an indefinite blockage [38]. To gauge whether this censorship has had any effect on the usage of the website in the

| Date       | Ranking |
|------------|---------|
| April, 2009| 5       |
| February, 2010| 5     |
| March, 2010 | 4       |
| July, 2011  | 4       |
| August, 2011| 4       |
| September, 2011 | 4   |
| May, 2013   | 9       |
| August, 2013| 10      |
| May, 2014   | 10      |
| June, 2014  | 10      |
| July, 2014  | 11      |

Table 3: Alexa Ranking for YouTube in Pakistan

http://www.alexa.com/

http://www.google.com/trends/
Table 4: Alexa Ranking for YouTube in Turkey

| Date          | Ranking |
|---------------|---------|
| April, 2009   | 8       |
| June, 2009    | 8       |
| February, 2010| 5       |
| September, 2011| 3     |
| October, 2011 | 3       |
| April, 2012   | 3       |
| May, 2012     | 3       |
| May, 2013     | 3       |
| November, 2013| 3       |
| March, 2014   | 4       |
| June, 2014    | 4       |
| July, 2014    | 4       |

country (or more specifically its ranking), we make use of data from Alexa Web Rankings. Unfortunately, Alexa no longer allows the user to query historical data for a specific country and only displays the current ranking on its website. To work around this, we use the Wayback Machine from Internet Archive—which caches previous versions of websites—to access previous rankings. Table 3 presents the ranking of YouTube in Pakistan for all Alexa snapshots from the Wayback Machine. It is clear that the ban on YouTube in Pakistan has not affected its rankings or indirectly its usage in the country. Specifically, in spite of the indefinite ban since 2012, the website has been consistently amongst the top 11 websites in the country.

Similar to Pakistan, Turkey has also blocked YouTube multiple times in the last few years. The longest ban lasted 30 months, from May, 2008 till October, 2010. It also remained blocked between March, 2014 and June, 2014. In spite of this, Alexa Rankings data in Table 4 shows that YouTube remained amongst the top 10 most visited websites in Turkey during both censorship periods.

Limitations: While the data we collected clearly shows a censorship ineffectiveness trend, the wide gaps in the data do not permit us to claim that the behaviour holds throughout. Nonetheless, it shows that at least for certain months users were not deterred from accessing YouTube during the various blackout periods in both countries. To examine whether there is a correlation between content popularity and censorship, we next analyze data for specific events.

3.2 Topic Trends

Having shown that censorship has not affected the ranking of YouTube in Pakistan and Turkey, we now dissect individual censorship events to study the manifestation of the Streisand Effect. To this end, we use data from Google Trends as a metric to gauge the popularity of restricted content. We first examine data from Pakistan followed by Turkey. As listed in Table 1, YouTube was blocked in Pakistan in February 2008 (PK1) for a few days in retaliation to the controversial movie “Fitna”; the trailer for which was uploaded to YouTube in January of the same year. In addition to Pakistan, several other countries, including Indonesia, also blocked YouTube in response. Somewhat amusingly, Pakistan restricted access to the website via BGP misconfiguration. This made the website globally inaccessible for a large part of the Internet for nearly 2 hours [38]. Figure 1 shows the Google search volume for the term “Fitna” for users within Pakistan in 2007 and 2008. The dotted green line represents the month in which the video was uploaded while the red dashed line marks the month when YouTube was blocked in Pakistan. The blue line represents the actual search volume data. The data shows that the popularity of the video spiked after it was restricted in Pakistan.

We also see a similar trend in Turkey. Since December 2013 a Twitter user with ID “Haramzadeler” has been using the website to share audio clips and documents implicating the ruling Turkish government in massive corruption scandals. The collection also includes recordings of the Turkish Prime Minister and his friends and family. In reaction to these exposés, the Turkish government blocked access to SoundCloud, YouTube, and Twitter. In particular, SoundCloud was blocked in January 2014 (TR2 in Table 2). Figure 2 shows the Google search volume for “Haramzadeler” in Turkey. The results show that searches for the term peaked as a result of the blockage of SoundCloud in January even though

![Figure 1: Search Volume for “Fitna” in Pakistan. The green dotted line marks the upload date on YouTube and the red dashed line marks its censorship.](https://archive.org/web/)
Haramzadeler started uploading content months before that.

Limitations: From the two examples above, it is fairly straight-forward to conclude that there is a strong correlation between censorship and the popularity of the censored content. It also suggests that this is not merely a case of the classic “correlation implies causation” fallacy. Nonetheless, in other cases this is harder to claim. For instance, Figure 3 shows Google Trends data for Pakistan from May 2010 for “Everybody Draw Muhammad Day” (PK2 in Table 1). This event resulted in the blockage of YouTube for a year. The finest granularity at which Google Trends data is available is on a weekly scale, therefore it is hard to tell if the content went viral after YouTube was blocked due to the fact that the content upload and censorship took place during the same week and hence the overlap between the green and red vertical lines. We see a similar trend in 2012, when YouTube was banned again due to another controversial movie “Innocence of Muslims” (PK3 in Table 1). As before, the green dotted line marks the time when the video was uploaded, the red dashed line marks the point at which the censorship was enforced, and the blue line shows the search volume from within Pakistan in Figure 4. Again, from this data it is hard to conclude if the censorship caused the popularity or vice versa.

3.3 Affected Content

So far we have been able to show that, a) censorship has not affected website rankings in Pakistan and Turkey, and b) topics spiked in popularity after they were censored. The latter only applies to Google search popularity of the content, not the content itself. Therefore, we now analyze YouTube statistics to gauge whether we can pin-point the Streisand Effect at play for the actual content. This task is complicated by two factors: a) YouTube only serves graphs for statistics, not the underlying data, and b) most of the contentious videos have now been taken down. As a result, we only focus on one particular clip which was uploaded to YouTube in February 2014, wherein the Turkish Prime Minister allegedly discusses construction permits for an area earmarked for a forest with his friend who is a business tycoon and a real estate developer. This video is amongst the set of content which resulted in the censorship of both YouTube and Twitter (TR3 and TR4 in Table 2) in Turkey in March 2014. Figure 5 plots the daily views of the said video. It is clear from the graph that even though the video was uploaded in February, its popularity spiked in March, after YouTube was censored.

Limitations: While the example under consideration looks promising, it is the only one for which we were able to obtain data. Therefore, a single video is insufficient to extrapolate to other events.

3.4 Circumvention

Our analysis thus far shows that censorship has not deterred users from accessing restricted content. In fact, in certain cases the censorship has had the side-effect of popularising the content. Bearing this in mind, the next natural question is to ask how users are accessing the restricted content. In case of Pakistan, in prior work we learned that users were actively making use of anti-censorship tools, such as VPNs and Tor to circumvent
censorship. To determine whether there is a correlation between censorship and the use of anti-censorship tools, we again rely on data from Google Trends. Specifically, we note the search volume for “Spotflux”, “Tor”, “Ultra-surf”, and “Hotspot Shield”. We also add two generic circumvention terms viz “Unblock” and “Proxy”. The data is visualized in Figure 6, the two red dashed lines mark PK2 and PK3, respectively. We see that the popularity of these tools spiked as a result of the two censorship events. Note that Spotflux was not available before PK2, that is why there is no spike in its search volume. We also conducted a similar study for Turkey, with the results presented in Figure 7. In this case, the four red lines represent TR1, TR2, TR3, and TR4, respectively. Again, we see that the popularity of these tools is positively correlated with the four censorship events. Unlike Pakistan, where Tor is popular in the entire time series, in Turkey its usage seems to have started only after TR3 and TR4.

4 Discussion

Using limited and sparse data from multiple sources we have been able to show that not only does censorship not work but it also inadvertently causes restricted content to become popular. This is a promising line of work but before Internet activists around the world can claim a convincing victory against the spectre of censorship, we need to analyze more comprehensive data. Towards this end, we now discuss how additional data might be useful and we also call upon organizations, such as Alexa and Google, who might hold this data to share it with the research community so that they can comb through it.

4.1 Open Data Against Censorship

In §3.1 using data from Alexa Web Rankings, we argued that website level censorship has not diminished the usage of YouTube in Pakistan and Turkey for certain months. But the lack of monthly data throughout the events deters us from claiming the consistency of the trend. Similarity, in §4.2 using Google Trends data, we showed that certain pieces of content went viral after being censored, arguing for a cause and effect relationship between the latter and the former. While this trend was clear for PK1 and TR2, the weekly granularity of the data prevents us from verifying this for PK2 and PK3. Fine-grained daily data would be sufficient for teasing out the presence of the Streisand Effect. In the same vein, data about the usage of other videos on YouTube would be effective in inspecting the effect for individual pieces of content. In addition, data from ISPs and Content Distribution Networks would be useful in examining access patterns during periods of censorship at a finer granularity. We hope that all of these organizations that are sitting on top of these silos of data will make it publicly available, similar to the filtering data from the OpenNet Initiative.

4.2 The Streisand Effect as a means to an end

The Streisand Effect in a large number of instances showcases the futility of online censorship. Primarily, it shows that banning content on the Internet generates more interest in the content and increases its circulation. Cognizance of this phenomenon is slowly driving public policy and discourse. A recent example of this is the after-

https://opennet.net/research/data
math of the May, 2014 European Court of Justice ruling in the Google vs González case. Under this “right to be forgotten” ruling, individuals have the right to request search engines to remove personal data from search results [20]. In the ensuing debate, EU countries have been weighing the implications and practicality of the EU-wide “General Data Protection Regulation”. Italy for instance in one of its proposals assumed that individuals want an umbrella removal of their personal information, which potentially requires a search engine such as Google to reach out to third parties, e.g. individual social network users or people with personal webpages, to cascade information deletion. In reaction, Poland opined that the assumption is ill-founded and the required multimodal removal effort will most likely trigger the Streisand Effect as it will draw more attention to the content [14]. Under Poland’s proposition, users should be able to choose which information to remove and from where. For example, a user might want a certain piece of information to be removed from Google search results but still be available on a blog. Therefore, awareness of the effect will be influential in defining digital rights policy in the EU. In a similar vein, we believe that governments that directly censor information on the Internet need to be mindful of inadvertent consequences of their actions. For example, countries like Pakistan and Turkey, regularly ban online content to safeguard the religious and social sensibilities of their citizens. Our examination of this category of censorship in this paper has shown that it has largely been ineffective. Knowledge of this observation should prompt state-level censors to rethink their position and explore alternative mechanisms to deal with such issues—for example, by directly engaging with their citizens and considering their points of view.

While the Streisand Effect is a handy instrument to keep censorship in check, it is only one of the many means to an end, not an end in itself. The end being an open, universally accessible Internet. To begin with, the effect does not manifest in all instances of censorship. The rampant presence of censorship around the world is a testament to this [21]. Secondly, the goal of this paper is not to argue that online activists need to
become complacent and actually embrace online censorship as it, due to the Streisand Effect, achieves the goal of proving its own ineffectiveness. On the contrary, anti-censorship efforts need to be beefed up in terms of political activism and campaigning, design of appropriate tools, and identification and measurement of Internet restrictions to keep up with the increase in country-level censorship [34]. Specifically, once content has been blocked, anti-censorship tools such as VPNs and proxies need to be employed. Without these tools the category of the Streisand Effect presented in this paper would not originate in the first place. Furthermore, the initial study and measurement of Internet censorship enables the design of tools to counteract it. For instance, ignoring TCP RST packets as a method to bypass the Great Firewall of China came about as a result of studying its modus operandi [13]. Finally, the efforts of Internet freedom activists in recent years have been effective in raising awareness. In some cases—for instance, in Turkey [39]—they have even succeeded in getting content unblocked through legal recourses. Overall, the Streisand Effect would not exist if all of the above efforts were abandoned. In essence, the aim of this paper is to raise awareness about the Streisand Effect in the context of state-level censorship rather than to argue for it as an all-encompassing anti-censorship mechanism.

5 Conclusion and Future Work

By making use of data from Google Trends, YouTube Statistics, and Alexa Web Rankings, we were able to not only show that censorship is ineffective but rather that it also has the inadvertent effect of making restricted content go viral. Specifically, we show that the national ranking of YouTube in Pakistan and Turkey has remained largely the same in spite of multiple censorship events. In addition, Google Trends and YouTube Statistics numbers show that blocked videos spiked in popularity after they were censored. This paper was just an initial window into the interplay of the Streisand Effect and state-level censorship. In the future, we aim to extend our study...
to other countries. In addition, we hope to make use of other datasets to augment our current findings. Finally, Google Trends data also breaks down search volume by region. It would interesting to work out say if censorship circumvention is an urban or rural phenomenon in Pakistan and Turkey.

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