

Assignment M2

CS6750 Summer 2021

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Abstract—In the “M” assignments, we examine the free video streaming service Pluto TV, with the goal of determining how “drop-in” users (who do not have accounts) can easily search for “On Demand” content to watch; this functionality currently does not exist on Pluto TV. We approach this problem through an HCI (human-computer interface) design lifecycle.

1 NEEDFINDING PLAN #1: PRODUCT REVIEWS & WORKAROUNDS

Product reviews and workarounds were taken from Cord Cutters News, Cordcutting.com, TechRadar, *PC Magazine*, *Business Insider*, SiteJabber, and Reviews.com. Further observations were taken from the comments on a “how to search Pluto TV” YouTube video and a post on the /r/cordcutters subreddit.

1.1 Results

Raw data for reviews is given in Appendix 7.1; for workarounds, Appendix 7.2.

Pluto TV reviewers included: (a) “cord cutters” (users without cable TV), (b) users of multiple streaming services, (c) first-time users of video streaming services, (d) mobile device users, (e) users of hardware-based streaming devices (Roku, Google Chromecast, Amazon Fire Stick), (f) college-educated (bachelor’s through PhD) white males 25-55+ years old, (g) tech industry professionals, (h) parents of young children, and (i) politically-polarized audiences.

Primary goals of users were to watch live TV and on demand video, without fees. A secondary goal was to play background noise/music. Entertainment and news were the most-sought after content.

Favorable observations included: (a) the interface being similar regardless of platform/device, and could be controlled with mouse, finger, or remote control, (b) content being divided into (niche) categories, (c) ability to configure closed captioning in terms of font, color, size, and opacity, (d) ability to hide channels/categories one is not interested in (but only if signed in), (e) ability to

pick up where one left off watching, and (f) being easy enough to use by novices (such as a user's parents).

Common complaints included: (a) inability to find content due to the lack of a search feature, (b) ambiguity in category/channel names due to a lack of descriptions, (c) no means to filter/sort videos, (d) content listed randomly, (d) scrolling endlessly (one user mentioned 10 minutes!) to the point of abandoning the goal of watching, (e) inability to stop video playback, (f) inability to pick up where one leaves off scrolling, (g) inability to look ahead in the TV schedule, and (h) being repeatedly presented with content objectionable to the user's tastes.

Another common theme was a comparison of the interface to a "TV guide". One user suggested that it would be helpful to print the guide, and another thought it would be an improvement if the streaming video was separated from the guide.

The comments section of a "how-to" YouTube video contained insights into user expectations for search features. Commenters' expectations included: (a) a bar or box, (b) a magnifying glass icon, and (c) typing what one wants into the bar/box. From searching YouTube itself, it became apparent (from auto-suggested searches) that users also look for: (d) a search button.

Because this video did not *actually* provide a workaround, commenters supplied their own. One method, also found on Reddit, used the [JustWatch](#) service to determine if a given title was *available* to watch on Pluto TV (though this did not help to actually locate the title *within* Pluto TV). Others mentioned using search engines like Google and DuckDuckGo, but these results were not reproducible; an exception was the search "Pluto TV James Bond" returning a link to: <http://pluto.tv/live-tv/pluto-tv-007>

An alternate, surprising opinion was that a search feature was *not* needed because the Pluto TV service did not offer enough "random" (new) content. Instead, it was suggested that adding favorite channels would suffice, and that browsing these made "more sense" than performing a direct search.

1.2 Takeaways

User reviews can yield useful expectations about search interfaces, along with goals, pain points, wish lists, and novel ideas. Demographic information is limited to that of content creators, and is not always available from users of

YouTube, Reddit, or SiteJabber. An advantage is that there is no interaction between the researcher and the reviewers/users.

1.3 Controlling for biases

We controlled for voluntary response bias by collecting data from reviews across the spectrum of opinion: very positive (4+ out of 5, or “the best free service”), “good” (3 out of 5), “generally dissatisfied” (1.9 out of 5), to very negative (1 out of 5). Social desirability bias could have been mitigated slightly by using a review that was not attributed to any specific author; SiteJabber contributors seemed to be unconcerned about the reception of their opinions. We could not control for recall bias in the written reviews, as these were submitted after the fact, but we tried to offset this with YouTube videos of “live” demonstrations.

2 NEEDFINDING PLAN #2: EVALUATING EXISTING USER INTERFACES

We qualitatively evaluated the search interfaces of three websites that provide ways to search for free streaming video content: [Crackle](#), [JustWatch](#), and [Kanopy](#). A student survey comparing Crackle and JustWatch gathered additional data, including a few quantitative measurements.

2.1 Results

Capability and complexity of the three interfaces varied, but certain flows of user tasks, and impediments to these tasks, were common to all. See Appendix 7.3 for evaluation data, Appendix 7.4 for screenshots, and Appendix 7.5 for survey data.

2.1.1 *Identify how to start the search*

The user must first **see** the contents of the webpage, and **identify where to start** their search. To do this, the user either must **read one or more words** and/or **recognize a symbol**. The user can be distracted from this by video playback and advertisements of other available content which are presented by the webpage. Because the task occurs in a web browser, it may be only one process of many running on the device, any of which may generate audio or visual notifications to command the user’s attention; the user may elect to change windows/browser tabs at a moment’s notice.¹

¹ Such “task switches” can impact any of the subsequent task flows as well.

2.1.2 Engage with the search and make a request

Next, the user must “engage with” the place where the search can be started. The user takes steps to **exert influence**, by **maneuvering** to and **manipulating** the starting area for the search. This is typically accomplished by moving a pointer to the place input should be entered, optionally **entering input** (letters and/or words determined by the user), and **confirming** that input is complete, **requesting** a search. The user may need to know the **spelling** of the search term(s) or the **category** containing their item. During this process, the interface can supply new (unsolicited) information, which the user can **read** and incorporate/reject in **deciding** on their search term(s). A user can also **cancel** the current request before it is made.

2.1.3 Search the search results

Once the request is made, the user will be presented with an array of items to **see** and **interpret** (in text and images). Often the user will be tasked with **scanning** the output. The user winds up **searching** the result of their search request to **evaluate** whether the result set contains the desired item(s). This is accomplished by **manipulating** various buttons or menus, **rearranging**, **showing**, or **hiding** certain pieces of what they see. This portion of the overall process can be the most demanding on the user.

2.2 Takeaways

Putting multiple interfaces “under a microscope” is a time-consuming and resource-intensive process, but this needfinding was able to identify types and patterns of user tasks, yielding **verbs** describing the tasks being performed.

2.3 Controlling for biases

Recall bias was mitigated by collecting data in real time, while the interface was actively being used. Confirmation bias was less controlled: only the author performed in-depth qualitative evaluations of all three interfaces, and while additional feedback was collected (for Crackle and JustWatch) via student surveys, the surveys were not aligned well with the author’s evaluation procedures. Some questions did not yield descriptive or relevant enough responses, indicating that the questions asked were not specific enough.

In the spirit of allowing survey participants to withdraw at any time, none of the questions required a response. It was illuminating to see students choosing to submit surveys without answering a single question.

3 NEEDFINDING PLAN #3: THINK-ALOUD PROTOCOL & PARTICIPANT OBSERVATION

To observe user thought processes, tasks, and behaviors on Pluto TV and Netflix, we recruited two individuals for a think-aloud protocol (one of whom was the author). Scripts followed the template in Appendix 7.6. Acquisition and disposition of audio data is described in Appendix 7.7.

3.1 Results

Full transcriptions of recorded sessions are given in Appendix 7.8.

Participants were asked to search for a movie of their choice, but interpreted this differently: one looked for a movie they did not know anything about, but might be interested in watching, while the other looked for a specific series of movies that was already known to the user. When looking for an unknown, the participant looked for certain categories by name, and samples (clips) of each video; a still image or one-line description was insufficient for making an informed decision. When looking for something specific, movie titles and category names were said to be necessary, actor names were also tried; trailers for *other* movies or TV shows were described as a distraction.

In all cases, participants described looking at and choosing categories, reading descriptions, looking through (and rejecting) the choices presented by the interfaces. Participants voiced a desire for more control over what the interface displayed.

Labels on various menus and buttons were read aloud, indicating they were being looked at. Participants discovered which button(s) needed to be clicked by reading labels on the buttons. They moused over pictures and buttons to see if this action caused something else to be displayed. There was a great deal of vertical scrolling performed using the mouse wheel, sometimes by dragging the scroll bar in the browser. “X” was mentioned for getting rid of things.

Participants expressed annoyance when encountering parts of the interface perceived as irrelevant to the task at hand, or which prevented them from taking

actions related to their goals, or which incurred more effort than desired or expected during a given task. Surprise and (dis)satisfaction were also voiced when unexpected events or results occurred.

3.2 Takeaways

Think-aloud protocols and participant observation accessed “stream of consciousness” thinking to a high degree. The recordings were invaluable for learning what users are actually thinking and doing.

Manual transcription of audio recordings is an extremely time-intensive process: it took over 3 hours to transcribe 56m of recordings. (We are aware this can be automated, but did not wish to submit our data to systems beyond our control, nor send the files across networks.)

3.3 Controlling for biases

By involving a family member, we must control for social desirability and observer biases. We removed the author from the room and used prepared scripts to conduct the session. These biases, and confirmation bias, would have been better controlled if more participants were recruited, offsetting the small sample size (especially because participant observation is a sample of one). To further control for confirmation bias, the author selected a movie title without any advance knowledge of whether it would be found on either service.

4 DATA INVENTORY

4.1 Who are the users?

People who search streaming video services include (from Plan #1): (a) “cord cutters”, (b) cable subscribers, (c) users of multiple streaming services, including Netflix, (d) first-time streaming users, (e) mobile device users, (f) AT&T subscribers, (g) Android and/or iOS users, (h) hardware streaming device users, (i) college-educated white males in their 30s, (j) parents of young children, (k) bilingual users, (l) politically-polarized audiences; from Plan #2, (m) library card holders and (n) college/university students.

4.2 Where are the users?

Users may be at home, near an LG Smart TV, using other streaming services, using Google Play Store, accessing Pluto TV through web browsers and Roku

devices (Plan #1). They can be found in large metropolitan areas (Plan #1), and sitting at a desk (Plans #2, #3). Our needfinding was less successful at answering this question; we did not get a good enough “feel” for the wider user base. We would need to collect more information through user surveys and interviews.

4.3 What is the context of the task?

(Plan #1) The context is one of leisure: entertaining oneself and/or others, and providing background noise for some other activity. Plans #2 and #3 demonstrated the task in context of a first-time user’s exploration, and in a residential setting with ambient household noise. Competing demands include video and audio stimuli (including from the interface itself) that distract one’s attention and otherwise hinder the task.

4.4 What are the users’ goals?

The main goal is to “find” something to watch, in accordance with one’s own preferences, while preventing exposure to content that one wishes to avoid (Plans #1, #3). This includes not only locating something already known, but also identifying something unknown of possible interest to the user (Plans #2, #3). Another goal is to do this without having to pay a subscription fee (Plan #1).

4.5 What do the users need?

At minimum, users need to know: (a) how to use a mouse, (b) how to use a web browser, (c) what a magnifying glass symbolizes, and (d) how to interpret text. Additionally: (e) how to type, (f) a movie or TV show title, (g) names of actors/actresses, (h) year of release, (i) familiarity with genres (what categories contain), (j) an actual sample of the video. These needs were primarily identified in Plan #3.

4.6 What are the users’ tasks?

From Plan #2, tasks include identifying how to start the search, making a request (exerting influence), and searching the search results.

4.7 What are the users’ subtasks?

From Plan #2, reading, recognizing a symbol, moving a pointer, entering input, confirming input is complete, evaluating suggestions, deciding on search term(s), requesting search, canceling search. From Plans #1 and #3, we add: scrolling,

scanning/browsing, sorting, filtering, viewing pictures, viewing clips, listening to sound.

5 REQUIREMENTS

We focus on novice users. For the interface to be successful, a user should be able to find what they want on the *very first* attempt (or be immediately informed that the content is not available) An obvious “launch point” is needed so the user can start searching immediately. Categories and individual items should be accompanied by brief descriptions of what they contain. Options for searching, sorting, or filtering (including parental controls) should be simple, clearly labeled, and placed in close proximity to what they modify. Any action taken by the user should be cancellable or reversible with very little effort. The interface should not interrupt or undo the user’s actions without the user’s consent.

Metrics should include (a) how many distinct searches are performed before a target is found, (b) how many mouse clicks it takes to get to the target item, (c) how much scrolling is performed before the target is found, and in which direction, (d) how many search terms are used, (e) how many sort/filter options were used, and (f) how many times each sort/filter option was used or disabled.

To help visually-impaired viewers, and help comply with the Americans With Disabilities Act (ADA), the interface should provide a means to “read aloud” what is on the screen and accept voice commands. The interface should also be localized in multiple languages.

6 CONTINUED NEEDFINDING

Based on our experiences in this assignment, we believe it would be useful to continue with Plan #1 and Plan #3. We would want to research additional websites containing actual user reviews, and recruit additional participants for think-aloud sessions. Questions arose about what “searching” means to different people, and how users understand the ways TV shows and movies are categorized (or how the users themselves would categorize them). Creating additional, better-designed surveys would help to collect these additional details.

7 APPENDICES

7.1 Raw data: Product reviews

Table 1—Observations from Pluto TV product review #1.

Question / Aspect	Answers / Remarks
Reviewer	Nick Pino, TechRadar
URL	https://www.techradar.com/reviews/pluto-tv https://www.linkedin.com/in/nickpino
Review date	2020, April 6
Positive or negative?	4.5/5 stars
User background	Entertainment editor (games/technology) Writes articles that "generate some 9 million pageviews for TechRadar each month" B.S. Computer Science, Cum Laude San Francisco Bay Area ~30yo white male
User expectations	Commercials are expected "You get what you pay for" "...you probably shouldn't go in expecting world-class cinema here - what's on offer is more or less the schlock that either went straight-to-DVD or didn't do super well at the box office" with a few notable exceptions
How the service is being used, to what end, and where	For bingeing on "brainless shows", "throwing on in the background of your home office" As a supplement to Netflix, Amazon Prime, or Hulu
Pros	Free service with no signup necessary Works on a number of devices 250+ channels Platform agnostic Lots of entertainment content for niche audiences
Cons	Ads No local channels Periodic performance issues
Functionality the reviewer liked	"The one benefit to signing up for the service is that it allows you to save your favorite channels at the top - which is great if you plan on using the service daily and know you want to see ABC News and don't want to scroll through 50 channels to get to it."
Common issues, complaints Desired functionality that was lacking or missing	"...[news and sports] networks aren't always live - in fact every time we've tuned into them they've been showing content from earlier in the day. That's all well and good if you're just trying to get a general idea of what's happening in the world, but it probably won't suffice if you need up-to-the-minute information about a situation."
Preferred or desired video content the interface?	"...a straight-up Naruto channel that only shows episodes of Naruto... which is actually pretty cool."

Popular content (on Pluto TV)	(no data)
Other notable comments, experiences	(no data)

Table 2—Observations from Pluto TV product review #2.

Question / Aspect	Answers / Remarks
Reviewer	Ben Moore, PC Magazine
URL	https://www.pcmag.com/reviews/pluto-tv
Review date	2019, November 18
Positive or negative?	"Good" (3.0/5)
User background	Analyst for PCMag covering video streaming, security software, GNU/Linux, PC games Bachelor's degree in New Media & Digital Design ~25yo white male
User expectations	Omission of DVR is not surprising since the service is free
How the service is being used, to what end, and where	"It won't compete with the free version of Spotify or other music streaming services, but some may find it suitable for a bit of background noise."
Pros	Free. Wide variety of content. Does not require an account. "Given the dizzying number of categories and channels, I recommend signing up for an account and hiding all the channels you don't care about."
Cons	Very few traditional cable channels. Lots of ads. Unpolished interface and channel schedule guide. Bare-bones features.
Functionality the reviewer liked	"Pluto TV's interface is easy to understand but cumbersome to navigate." "Launching a channel though; just click on any the entry [sic] in the guide to watch it." "One advantage of the mobile app is that you can actually jump to specific categories in the guide, which is much easier than having to scroll to select them."
Common issues, complaints Desired functionality that was lacking or missing	Can't sort channels by category or search for a particular channel. Channel guide only extends a few hours into the future, so you can't see future programming schedules. "I would also prefer it if Pluto TV provided descriptions for each channel it offers, as I often didn't know what to expect from each one." "Pluto TV behaves similarly to YouTube TV's in that the channel guide is always available underneath the streaming video if you scroll down a bit. A clearer separation of content would improve the design." Parental controls are missing.

Preferred or desired video content (no data) the interface?	
Popular content (on Pluto TV)	"Entertainment content is where Pluto TV shines the brightest, specifically with its Comedy, Entertainment, and Movies subcategories."
Other notable comments, experiences	<p>"Cats 24/7 and Slow TV (this channel features livestream marathons of Norwegian train rides, wood-chopping, knitting, and similar low-intensity content) incorporate several sources, but may be too unconventional to offer long-term value."</p> <p>"The best way to describe Pluto TV's web interface is as a web-based TV guide."</p> <p>"The My Profile section gives you the same options as the website. You can edit the channel list, set up your phone as a remote for Roku devices, and update your account information."</p>

Table 3—Observations from Pluto TV product review #3.

Question / Aspect	Answers / Remarks
Reviewer	SiteJabber (Aggregate)
URL	https://www.sitejabber.com/reviews/pluto.tv
Review date	2018-2021
Positive or negative?	Generally dissatisfied (1.9/5 stars)
User background	First-time video streaming users Politically-polarized viewers Roku users Both genders People who do not like condoms Cord cutters Mobile phone users AT&T subscriber(s)/Google Play Store users No demographic information
User expectations	Fewer ads Less political ads Less-sensitive subject matter ads "Stay out of politics. I JUST WANT TO WATCH TV!"
How the service is being used, to what end, and where	To replace cable TV "...millions of homes buy cable and over the air TV an [sic] do nothing but sit on social media, youtube and other sites all day."
Pros	"it's easy enough to use my parents replaced their cable with it."
Cons	""Can't search up anything" "Format is terrible not user friendly at all" "Not able to find categories easily. While scanning will jump back to main page with current show being shown." Too many commercials Too much perceived propaganda

Functionality the reviewer liked	Could fast forward the movie but not the commercials.
Common issues, complaints Desired functionality that was lacking or missing	<p>"TV Guide would be nice. The web site is worthless. No search, No scanning time, shows the hour you look only. No scrolling to see what is on at 9 unless you look at 9."</p> <p>"It is great to have a free TV channel if you had a better guide. Maybe one we can print."</p> <p>Accusations of left wing or right wing bias</p> <p>"Objectionable" commercials</p> <p>How to change the language</p> <p>LG smart TV app</p> <p>Day of the week does not match today</p> <p>"pick a TV series you want to watch and it either shunts you to a guide page or some program you never chose"</p> <p>"I made the stupid mistake of pressing the wrong button & Pluto did not let me resume where I left off."</p>
Preferred or desired video content(no data) the interface?	
Popular content (on Pluto TV)	(no data)
Other notable comments, experiences	"The movies and series are good, and are there for people that cannot access streaming services that cost money. I'm the type of person to get irritated easily, so maybe I'm overreacting about the ads, but it is annoying. But anyways, I'm going to watch the second movie despite how crappy the first one was, because I'm curious about what happens next."

Table 4—Observations from Pluto TV product review #4.

Question / Aspect	Answers / Remarks
Reviewer	Rob Latham
URL	https://www.reviews.com/entertainment/streaming/pluto-tv-review/
Review date	2020, October 18
Positive or negative?	"a great option for anyone looking for free TV streaming"
User background	Writer focused on technology, music, entertainment and sports. White male
User expectations	Not given
How the service is being used, to what end, and where	To watch free movies and TV shows without even having to create an account
Pros	<p>"Excellent user experience"</p> <p>Apps and web player come with useful 10-second fast-forward and rewind buttons, playback features that enable viewers to skip through on-demand content.</p> <p>Allows users to turn closed-captioning on and off and to customize font options as well as the color and size of the text and background.</p>

Cons	"Live sports action viewing is restricted by the lack of local network channels, which typically carry big games."
Functionality the reviewer liked	"Pluto TV's live streaming service will feel familiar to the majority of viewers as it takes the form of an online TV guide. It begins by playing the last channel that the viewer watched, then lets them scroll through and play the desired channel in full-screen or standard-sized web modes. Upon closing the full-screen mode, content continues to play in a small pop-up screen as viewers navigate the site and look for things to watch."
Common issues, complaints Desired functionality that was lacking or missing	(no data)
Preferred or desired video content the interface?	(no data)
Popular content (on Pluto TV)	(no data)
Other notable comments, experiences	(no data)

7.2 Raw data: Product workarounds

Table 5—Observations from Pluto TV workaround #1.

Question / Aspect	Answers / Remarks
Reviewer	Dave Johnson for <i>Business Insider</i>
URL	https://www.msn.com/en-us/news/technology/how-to-search-for-shows-or-movies-on-pluto-tv-using-the-web-mobile-or-smart-tv-apps/ar-BB17ET21 https://www.businessinsider.com/how-to-search-on-pluto-tv?op=1 https://www.linkedin.com/in/dave-r-johnson
Review date	2020, October 21
User background	Technology journalist who writes about consumer tech Air Force veteran (satellite/space operations) Content lead on Windows team at Microsoft BS Mechanical & Aerospace Engineering, MS Administration 57yo white male
User expectations	Pluto is designed to look and work like a traditional channel guide for a cable TV or satellite system, and relies entirely on browsing to find the shows you want to watch.
How the service is being used, to what end, and where	"When you search on Pluto TV, you can choose whether you want to look for live television or "On Demand" titles. "No matter which platform you're using to view Pluto TV — the web, a mobile device, or your smart TV — the interface is essentially identical; the only difference is whether you control it using a mouse, your finger, or a remote control."

Workaround(s) given	Browse and scroll
Pros	Although Pluto TV is available on a variety of different devices, the method you use to search for shows is almost exactly the same between all of them.
Cons	(no data)
Common issues, complaints Desired functionality that was lacking or missing	You can search for shows on Pluto TV by browsing the catalog by genre, channel, and time of day the show airs — but you can't search for a specific show by name.
Preferred or desired video content	(no data)

Table 5—Observations from Pluto TV workaround #2.

Question / Aspect	Answers / Remarks
Reviewer	/r/cordcutters subreddit
URL	https://www.reddit.com/r/cordcutters/comments/d139ja/is_there_a_way_to_search_pluto_tv_on_demand/
Review date	2020, June?
User background	Reddit users who already use Pluto TV
User expectations	Favorites list should work
How the service is being used, to what end, and where	With Roku
Workaround(s) given	https://www.justwatch.com/us/provider/pluto-tv Search in Roku
Pros	(no data)
Cons	(no data)
Common issues, complaints Desired functionality that was lacking or missing	Search should be added
Preferred or desired video content	(no data)

Table 6—Observations from Pluto TV workaround #3.

Question / Aspect	Answers / Remarks
Reviewer	How To Tech (YouTube)
URL	https://www.youtube.com/watch?v=CSHEVT8bwH8
Review date	2020, June 11 (+ comments)

User background	YouTube content creator - How To, Reviews, Guides, and Tutorials Amazon Fire TV, Roku, Android Streaming Nvidia Shield, Hulu, Netflix, Airpods, iPad, Google TV Chromecast, Xbox Series X S, Nintendo Switch, Streaming Apps, Google Home, Amazon Alexa, Technology, Software, and Hardware
User expectations	"a search function you know type in what you want" Search bar (mentioned multiple times) Magnifying glass icon "Search is when you pull up a search box and type in what you want to search for."
How the service is being used, to what end, and where	Mobile phone, iOS "I use JustWatch to find out what streaming service offers specific titles I'd like to watch"
Workaround(s) given	Browsing (not searching) "I searched on Google for a specific show I want to watch and a platform I could use. I found Pluto, and low and behold... The box art of the show, a yellow play button and a drop box to select the season. This means, they wrote an algorithm to search for a show and display it for people who don't have an account, but are too lazy to apply that very same algorithm to a search bar for current viewers." "I successfully 'searched' through Pluto TV by going through DuckDuckGo. I typed the title of the movie + "Pluto tv" in DuckDuckGo and was able to find it. I don't know how successful this will be with other movie titles and shows but it's worked for me so far." "There's also no reason to have a search on Pluto. There's not enough random content. You could search for hours and probably find nothing. Just go threw [sic] the guide and add channels to your favorites. And then you can just go threw [sic] it and see the episodes of your favorite channels. It makes way more sense then them having a Search."
Pros	(no data)
Cons	"Nothing is in alphabetical order so if searching for a specific title you'd have to scroll through the lot before finding out it is not available."
Common issues, complaints Desired functionality that was lacking or missing	"10 minutes looking, couldn't find it." "can't find a search box, bar, etc to use to find this movie" "by the time I'd trawled thru the options, I'd no time left and I gained a wretched thumping headache for my trouble."
Preferred or desired video content	<i>Johnny Mnemonic, Transference, Spongebob Squarepants, Fear Factor, Star War: The Clone Wars, Doctor Who, Snowpiercer</i>

Table 7—Observations from Pluto TV workaround #4.

Question / Aspect	Answers / Remarks
Reviewer	The Streaming Advisor (YouTube)
URL	https://www.youtube.com/watch?v=483CqRcUqc0

Review date	2021, June 1
User background	YouTube content creator, Roku user
User expectations	(no data)
How the service is being used, to what end, and where	With Roku
Workaround(s) given	"A new update allows users to search Pluto TV [on Roku] for movies and TV shows by name."
Pros	(no data)
Cons	(no data)
Common issues, complaints Desired functionality that was lacking or missing	(no data)
Preferred or desired video content	(no data)

7.3 Raw data: Evaluation of existing interfaces

Websites were viewed in Mozilla Firefox on Windows 10 at 1920x1080 resolution, in a maximized browser window at 120% zoom; [Privacy Badger](#) was enabled in Firefox in an effort to minimize the impact of user tracking on the search results. "Sky Captain" was the search term used on Crackle and JustWatch; it was later discovered that Kanopy does not carry popular entertainment.

Table 8—Observations from Crackle evaluation.

Question / Aspect	Answers / Remarks
URL	https://www.crackle.com/
Access method (browser, app, etc.)	Firefox web browser on Windows 10 1920x1080, maximized window
Can the search interface(s) be accessed without signing in?	Yes
Position of interface elements	Top center-left Occupies banner at the top of the screen, after the site logo, "TV", and "MOVIES" Search results occupy their own page
Size of interface relative to overall "real estate" of the display	Very small, until results are returned (whole page)
Components of search interface	Hyperlink Magnifying glass icon, popup box with underline, animated ellipsis, X

	Scroll bar
Simplicity of interface	Very simple
If labeled with additional text, what text is Hyperlink: SEARCH supplied?	Mouseover hyperlink: SEARCH Popup: Search for titles, people, genre... X
Ease of identification	Very easy. Off-white on black and at the end of the banner Overall page is not cluttered. It contains the banner, a rotating series of still images from movies (with title and one-line description), "watch now" and "watch later" button, and cookie preference selection at the bottom.
How can the user interact with the interface?	Mouse over; it lights up Click on SEARCH or the icon to bring up a popup box, which dims the rest of the screen (it takes focus, is a modal dialog) Click on the "form line" in the popup Fill in the "form line" in the popup by typing Clicking on the "X" at the right of the popup returns the user to the previous view (and wipes out all search results) Clicking anywhere else does nothing
Does the interface make suggestions before providing output? If so, what type(s)?	No
How is the output displayed (all on one page, divided between pages, etc.)?	All on one page
Does the output require scrolling?	Yes, vertical only
Does the output contain one or more of the search terms?	First results do, later results do not Unclear how some of the results correspond to the search
How is the output ordered?	Titles that match search terms are shown first, then seemingly at random No order is apparent
Can the output be sorted?	Cannot be sorted
Can the output be filtered?	Cannot be filtered
What makes the interface easy to use?	Visually distinct search button Very large font makes the guidance easy to read Underline resembles a line on a form (reinforcing the idea of filling in the blank, typing in words) The search itself lets you do only two things: enter search terms or press X to close -- so less decision-making and discovery is required by the user
What makes the interface difficult to use?	Can only go back to the top of the page with a click, must mouse scroll (or click/drag the browser's scrollbar) all the way back up Does not necessarily remember previous searches in a session so one has to always "start from scratch" (this might be seen as a positive w.r.t. cookies, etc.)

Hacks or workarounds?	Can use browser search (Control-F and F3) to look for/jump to words/phrases in the result set
Other notes	(none)

Table 9—Observations from JustWatch evaluation.

Question / Aspect	Answers / Remarks
URL	https://www.justwatch.com/
Access method (browser, app, etc.)	Firefox web browser on Windows 10 1920x1080, maximized window
Can the search interface(s) be accessed without signing in?	Yes
Position of interface elements	<p>Below: 1 - Search bar, 2 - Discover button, 3 - Box art browse, 4 - Sort menu, 5 - Filters</p> <p>1) Occupies banner at top right screen, between "New", "Popular", and a "Sign In" button</p> <p>2) Left center</p> <p>3) Center right (more for browsing than searching, but also allows the user to look for something)</p> <p>4) Upper left, under "Search results for: <search terms>"</p> <p>5) Upper right</p>
Size of interface relative to overall "real estate" of the display	<p>1) Very small (changes to half of the banner after clicking the "Discover" button)</p> <p>2) The Discover button is small, but larger than the other buttons on the page</p> <p>3) 25-33% of the screen</p> <p>4) Very small, almost the smallest text on the screen</p> <p>5) Very small but set apart</p>
Components of search interface	<p>1) Medium gray magnifying glass icon on dark gray text box, which expands horizontally* when clicked and collapses when the user clicks anywhere outside the box</p> <p>"Trending searches" represented as buttons containing individual video titles (in white text), each with a gray magnifying glass**</p> <p>Short list of top search results in two columns (videos and... people?)</p> <p>A text hyperlink to all results followed by a tiny double-right-arrow ">>" icon</p> <p>*Until "Discover" button is pressed, which causes the box to become wider and no longer expand horizontally</p> <p>**Until a search is performed, then "Recent searches" are shown but "Trending" are not. "Clear all" is added</p> <p>2) Bright yellow button</p> <p>3) At first this looks like an image of movies that are offered, but mousing over reveals ""arrows"" for browsing</p> <p>4) Drop-down menu with downward-pointing chevron "arrow"</p> <p>5) Black/dark blue button (with gray outline) on dark background; contains label and what looks like a "funnel" icon, both in off-white</p>

Simplicity of interface	Complex
If labeled with additional text, what text is supplied?	<p>1) Search for movies or tv shows No recent searches (on first use) Trending searches (only while "Recent searches" is not shown) Recent searches</p> <p>2) Discover movies & TV shows 3) Box art/titles of movies & TV shows 4) sorted by Popularity* 5) "Filters" and "Remove filters"</p> <p><i>*changes to currently-selected sort order</i></p>
Ease of identification	<p>1) Easy, stands out less due to text being medium gray 2) Slightly less easy than 1) as it may not immediately register that it is for searching rather than ""discovering""</p> <p>The initial page is slightly cluttered with "All your streaming services in one app." in a huge font which dominates the screen, the bright yellow "Discover" button, a pictorial list of streaming services accessible via JustWatch, box art of movies/TV shows. At the bottom of the page is shown: "Under the new EU law on data protection, we inform you that we save your history of pages you visited on JustWatch."</p> <p>Overall page is not cluttered. It contains the banner, a rotating series of still images from movies (with title and one-line description), "watch now" and "watch later" button, and cookie preference selection at the bottom.</p>
How can the user interact with the interface?	<p>Clicking the "Discover" button changes the website appearance for all future visits. (Cannot get back to the first page unless using Firefox "Private Browsing" mode.) The resulting change in the width of the search bar is unexpected but makes it easier to see.</p> <p>Once on the "full results" view, to leave the "full results", the user must click navigation buttons in the banner. Clicking the browser "Back" button can go through a long list of URLs encoding various filters selected by the user.</p> <p>Sort menu and filter button can be clicked/toggled to reveal additional options.</p>
Does the interface make suggestions before providing output? If so, what type(s)?	Yes. "Trending searches" (titles others have searched for, not necessarily search terms used; "Trending videos" might be more accurate)
How is the output displayed (all on one page, divided between pages, etc.)?	<p>Divided between pages</p> <p>The search bar itself expands into a large "drop-down" box that overlays the main page, taking almost half of the available screen real estate. Only four titles are shown, along with a link to "See all results for <search terms>". Clicking this link takes the user to a new page showing how many titles are in the result set and each record in the result, one below the next</p>
Does the output require scrolling?	No, if only using the top results If using "all results", vertical only
Does the output contain one or more of	First results do, later results do not

the search terms?	Unclear how some of the results correspond to the search
How is the output ordered?	Titles that match search terms are shown first, then seemingly at random
Can the output be sorted?	Can sort by Popularity, Random, Alphabetical, Release year, TMDB Popularity, IMDb score
Can the output be filtered?	Can filter by All, Movies, TV Shows, Release year (sliding cutoff, this year, and last year), Genres uses toggle buttons that cycle through: - grayed-out checkmarks - white checkmarks and light gray "box" highlights - white "do not enter" icons and black "box" highlights Rating: IMDb, slider bar Price: slider bar, 0\$ to 50\$, with binary toggles like ""up to \$1"" -- this filter also contains Types (Free, Ads, Subscription, Buy, Rent) and [video] Quality (SD, HD, 4K) Age rating (MPAA): checkmark toggles for G, PG, PG-13, R, NC-17 All individual filters have "X Reset" in the upper right Can remove all filters with one button press
What makes the interface easy to use?	Preserves search results (note: in the resulting URL) Ex: https://www.justwatch.com/us/search?q=Sky%20Captain
What makes the interface difficult to use?	Assumes user is familiar with TMDB and IMDB Lots of options for filtering
Hacks or workarounds?	Can use browser search (Control-F and F3) to look for/jump to words/phrases in the result set
Other notes	(none)

Table 10—Observations from Kanopy evaluation.

Question / Aspect	Answers / Remarks
URL	https://www.kanopy.com/ https://gatech.kanopy.com/
Access method (browser, app, etc.)	Firefox web browser on Windows 10 1920x1080, maximized window
Can the search interface(s) be accessed without signing in?	No. Requires public library card w/PIN or university SSO login, then can skip signup for Kanopy account
Position of interface elements	Below: 1 - Search bar, 2 - Browse button 1) Top center 2) Top right (next to 1)
Size of interface relative to overall "real estate" of the display	1) Narrow band occupying half of top banner space 2) Very small
Components of search interface	1) White text box on black background, containing barely-visible light gray text, and high-contrast black magnifying glass icon on the rightmost side 2) White all-capital letters on black background and small

	downward-pointing triangle "arrow" (also white); pop-up drop-down with genres/categories and right-pointing triangle arrows
Simplicity of interface	Not as simple as Crackle but much less complex than JustWatch
If labeled with additional text, what text is supplied?	1) Search videos, subjects... 2) BROWSE
Ease of identification	1) Easy: white box on black background, prominently positioned at top. The magnifying glass stands out very well on the white box. At the same time, the text inside is very light-coloured making it harder to perceive/uncomfortable to read 2) "Browse" button could be identified later due to size, but is nevertheless visually-distinct (white on black) and is right next to the search box
How can the user interact with the interface?	Clicking on the white search box causes the "Search videos, subjects..." tip to become a less-light shade of gray (but still very light in colour), and adds a blinking cursor that signifies text entry. Typing in a search term causes a clickable pop-up box showing a short list of videos, subjects, or sometimes "suppliers"; the box only appears if there are results. The box does not force the user to interact with it, and can be dismissed by clicking outside the box and outside the search bar. Dismissing the box does not erase the user's input. Clicking on the magnifying icon performs the "full search" and loads a new page which allows for sorting and filtering. This can also be done without any search terms being entered. The BROWSE button can be either moused-over or clicked. The end result is different for each: Mousing over BROWSE displays a list of categories that can be further moused over, popping up subcategories. Clicking on the category names does nothing. Clicking on a subcategory loads a new page dedicated to the selected subcategory. Clicking BROWSE loads a new page with a text-only list of all categories and subcategories, all of which are clickable.
Does the interface make suggestions before providing output? If so, what type(s)?	Search: Only after typing in a search term (popping up a short list and "View all results" with magnifying glass icon) Browse: Yes, categories
How is the output displayed (all on one page, divided between pages, etc.)?	When there are few results, the interface implies that the output is divided between pages; a label box reading "Page 1" (not clickable) appears at the top of the result set, and a page number appears at the bottom. But when there are many results, there is still only one page containing all results.
Does the output require scrolling?	Yes, vertically
Does the output contain one or more of the search terms?	First result(s) typically contain(s) the search term; the rest are deemed "related" by subject matter, supplier name, or other categories
How is the output ordered?	Default is "Most Relevant", then by search term, then more randomly

Can the output be sorted?	Can sort by Most Relevant, Most Popular, Most Recently Added, Title: A-Z, Title: Z-A
Can the output be filtered?	Can filter by any of the categories listed on the results page. These categories can be different depending on the results of the search. Examples are (in order): Subjects, Suppliers, Filmmakers, Features, Languages, Captions, Year of production
What makes the interface easy to use?	Webpages are clean and not very cluttered Everything can be clicked on
What makes the interface difficult to use?	Access is gated Content may not align with user expectations
Hacks or workarounds?	Can use browser search (Control-F and F3) to look for/jump to words/phrases in the result set
Other notes	<p>"FAQ: What is Kanopy? "Kanopy is the best video streaming service for quality, thoughtful entertainment. Find movies, documentaries, foreign films, classic cinema, independent films and educational videos that inspire, enrich and entertain. We partner with public libraries and universities to bring you an ad-free experience that can be enjoyed on your TV, mobile phone, tablets and online." "Kanopy is only available through libraries, so you need to be a member of a participating library to start watching Kanopy. If you are a member of a participating public library, you can start watching by signing up with a valid public library card number and PIN/password. If you are a currently registered student or faculty member of a participating college university, you can start watching by signing up with a valid university login."</p>

7.4 Screenshots of existing user interfaces

We include screenshots to show what the different interfaces looked like at various points of the evaluations. See Figures 1 & 2 for examples of Crackle, Figures 3 through 6 for JustWatch, and Figures 7 through 10 for Kanopy.

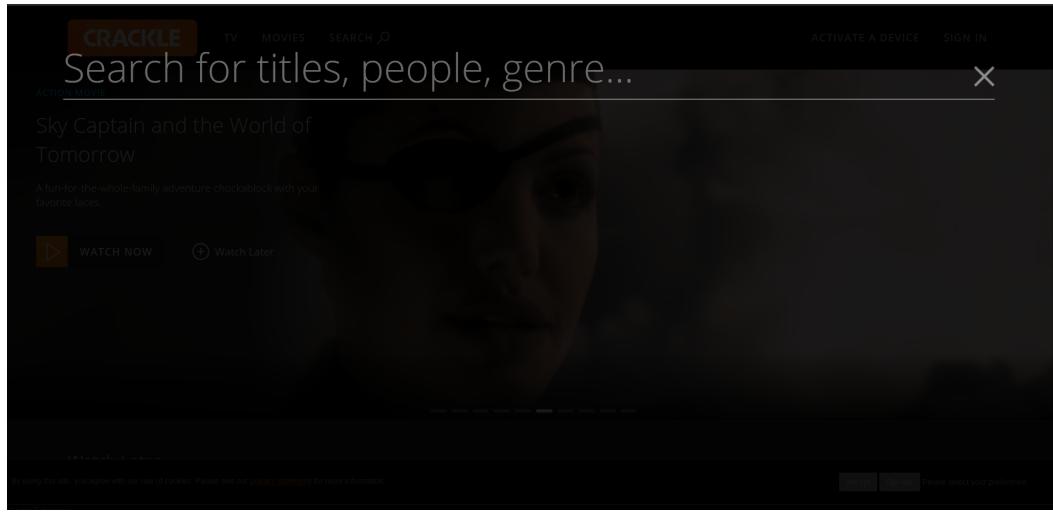


Figure 1—Crackle search bar, after clicking the SEARCH button.

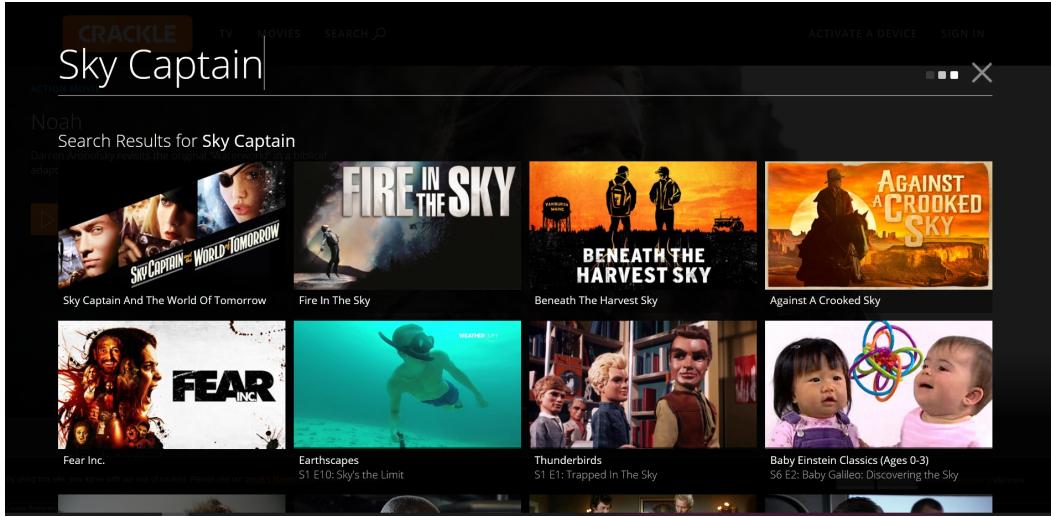
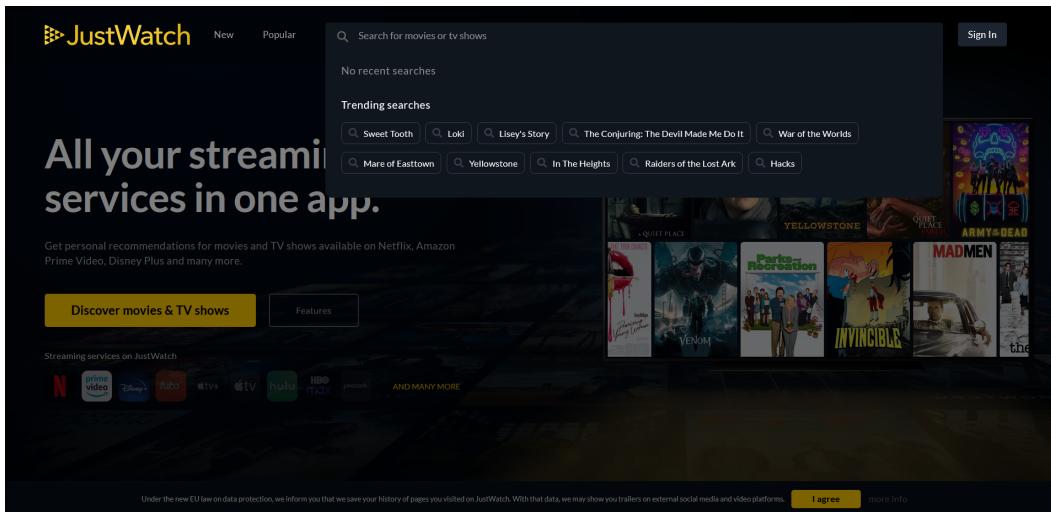
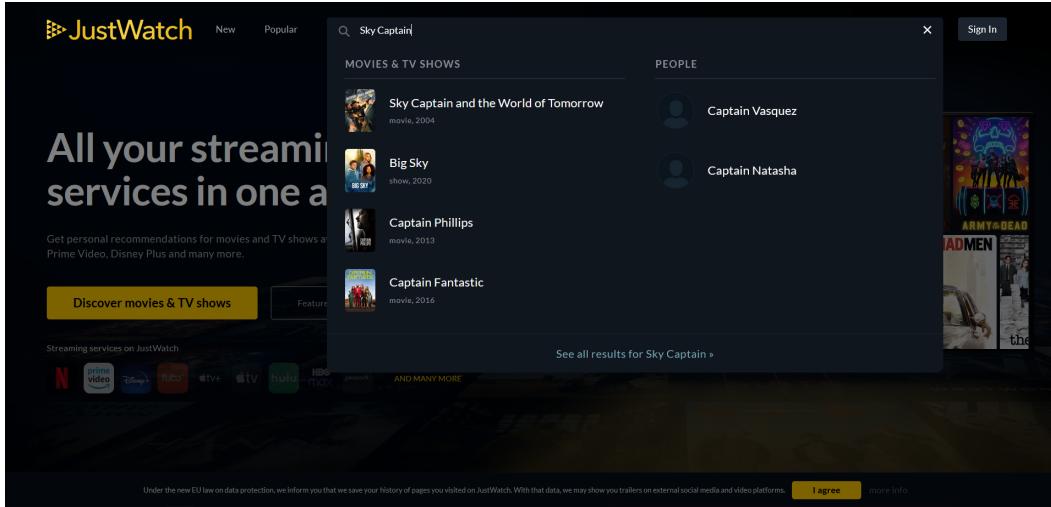


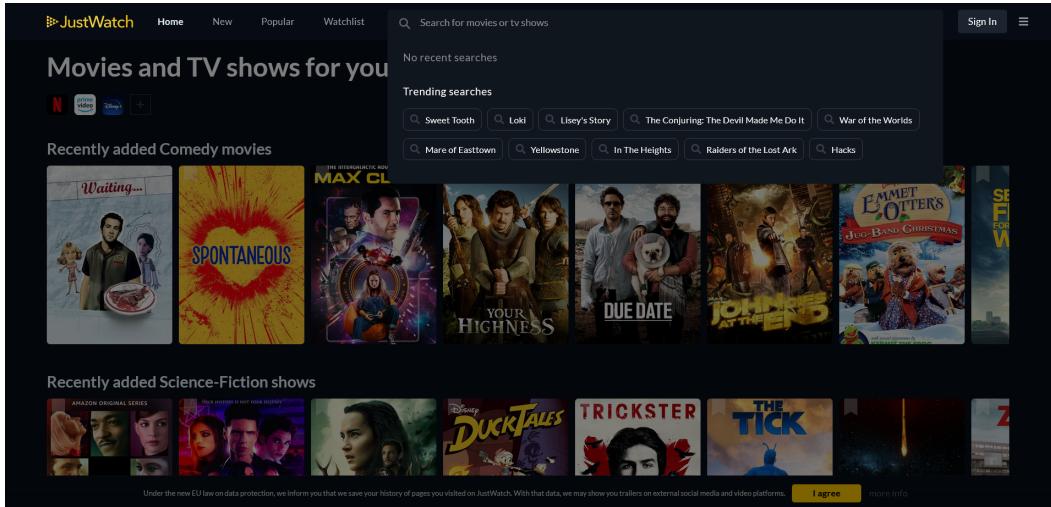
Figure 2—Example Crackle search results. “Working” or “busy” status is shown with an animated ellipsis in the upper-right hand corner.



*Figure 3—JustWatch search bar, after being clicked. This is how the page appears *before* clicking the yellow “Discover movies & TV shows” button on the left-hand side.*



*Figure 4—JustWatch search bar, after a search is performed. This is how the page appears *before* clicking the yellow “Discover movies & TV shows” button on the left-hand side.*



*Figure 5—JustWatch search bar upon clicking, before a search is performed. This is how the page appears *after* clicking the yellow “Discover movies & TV shows” button. Compare with Figure 3.*

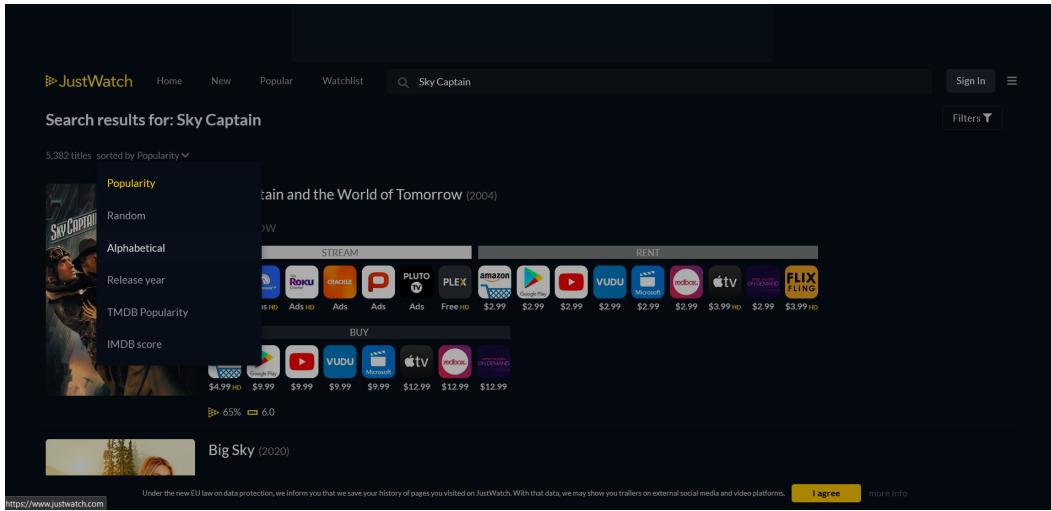


Figure 6—JustWatch “full results” view showing sorting options (left) and filters button (right). This is how the page appears regardless of whether the yellow “Discover movies & TV shows” button is clicked.

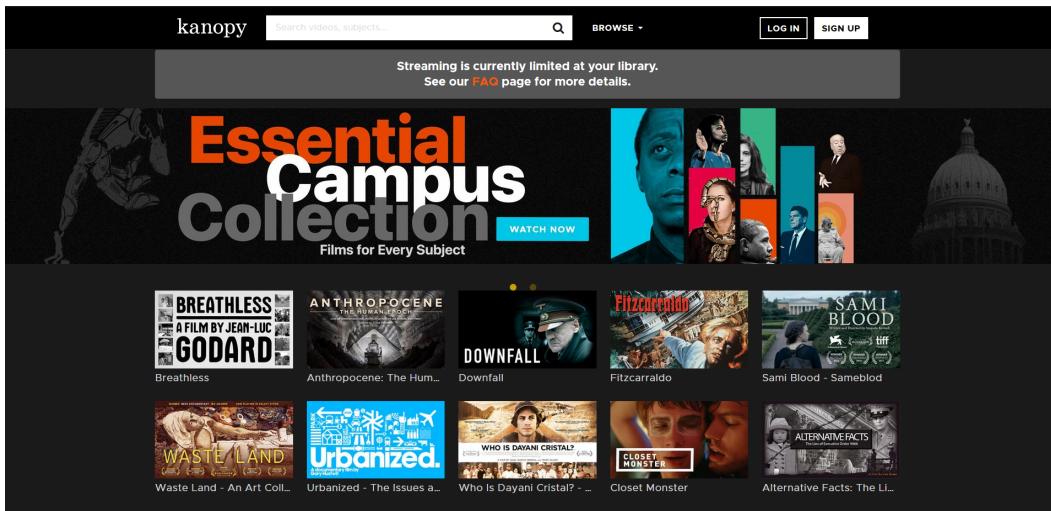


Figure 7—Kanopy landing page, after signing into Georgia Tech SSO and skipping Kanopy signup.

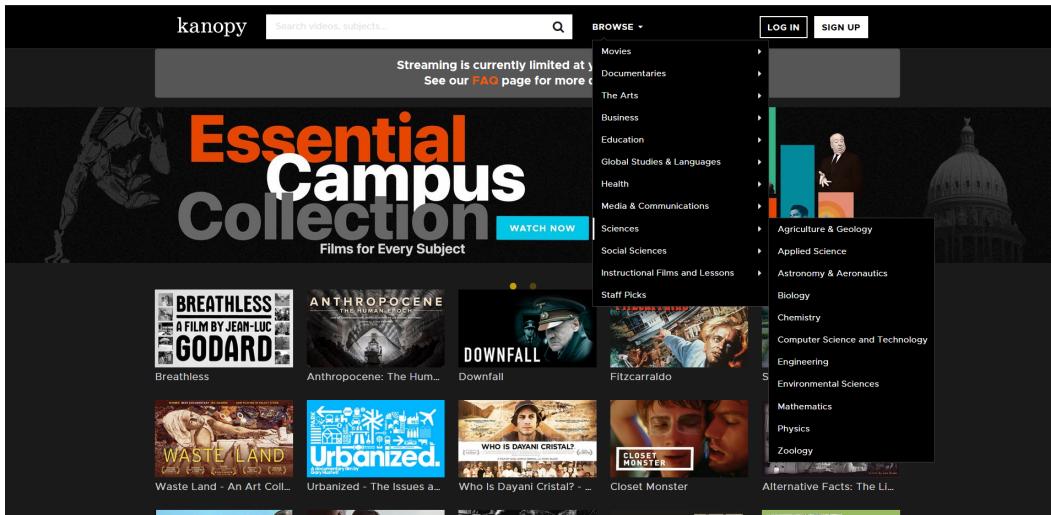


Figure 8—Kanopy while mousing over BROWSE.

This screenshot shows the 'Browse by Subjects' section after clicking the 'BROWSE' button. It's organized into four columns: 'Movies', 'Documentaries', 'The Arts', and 'Business'. Each column lists specific categories. For example, 'Movies' includes 'Independent Cinema', 'World Cinema', 'Classic Cinema', 'Drama', 'Comedy', 'War & Action', 'Romance', 'Horror & Thriller', 'Science Fiction & Fantasy', 'LGBTQ Cinema', 'Early Film', 'Short Film', and 'TV Series'. The 'Documentaries' column lists 'Ethnicity & Identity', 'Politics & Current Affairs', 'Media & Popular Culture', 'Women & Society', 'LGBTQ Stories', 'Art & Artists', 'Science, Nature & Technology', 'Health & Wellness', and 'Historical Perspectives'. The 'The Arts' column includes 'Architecture', 'Dance', 'Design', 'Experimental/Alternative Media', 'Fashion', 'Film Studies', 'Literature', 'Music', 'Performing Arts', 'Photography', and 'Visual Art'. The 'Business' column lists 'Career Development', 'Business Case Studies', 'Business Skills', 'Economics & Globalization', and 'Leadership Training'. Below these are 'Education', 'Global Studies & Languages', 'Health', and 'Media & Communications' sections, each with their own sub-categories.

Figure 9—Kanopy after clicking BROWSE.

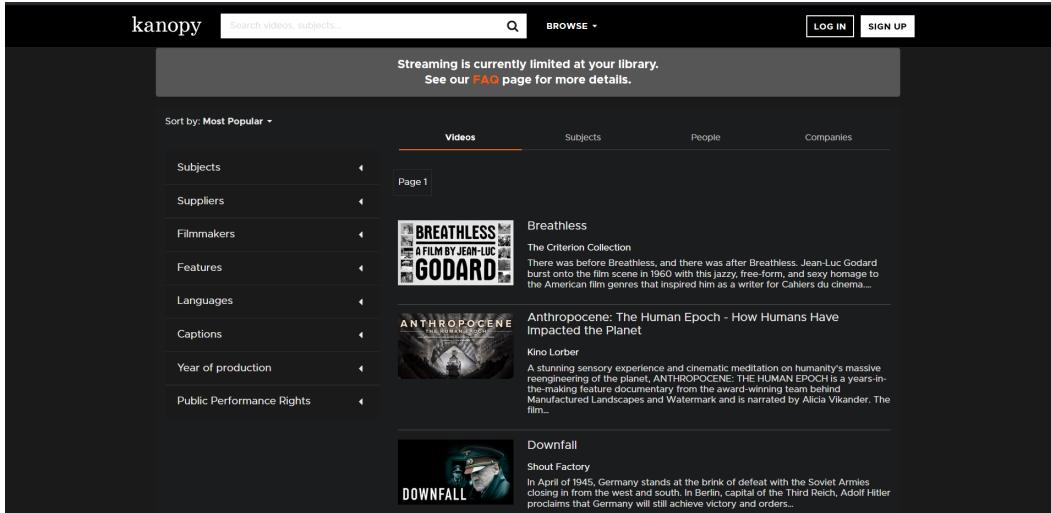


Figure 10—Kanopy search results after clicking the magnifying glass, without any search terms entered.

7.5 Survey data

Table 11—JSON format of survey questions and responses.

```
[{"id": "1623288370469", "text": "Please open the Crackle website and try to search for a movie or TV show. Was the search easy to locate / identify? Why or why not?", "answers": ["search of movies resulted in right one being searched ; also Genre /A-Z works well ", "No. Searching for a show (Mad Men) showed any result with 'Mad' or 'Men' in it, which was irrelevant for what I was trying to find.", "wow. so much work . no crackle stinks ", "", "Cast a wide net, didn't find my show, just shows with that keyword", "", "yes"]}, {"id": "1623287900193", "text": "If the Crackle search made suggestions, how helpful were they?", "answers": ["Did not help / confusing", "Did not help / confusing", "N/A (no suggestions)", "", "N/A (no suggestions)", "", "Not very helpful"]}], {"id": "1623288017654", "text": "How much effort was it to search for a movie or TV show on Crackle?", "answers": ["A comfortable amount of effort", "Could not find what I was looking for", "A lot of effort", "", "Very little effort", "", "A comfortable amount of effort"]}], {"id": "1623289274413", "text": "What was the worst or best part of searching on Crackle?", "answers": ["No unwanted details ( best)", "The search is too broad", "Crackle", "", "Worst: it didn't find my show ", "", "no way to select movies from a certain alphabetical letter"]}], {"id": "1623288261257", "text": "What could make the Crackle search easier to use?", "answers": ["suggestion while searching ", "If a show is not on Crackle, it should say so at the top", "Not being Crackle", "", "pop up potential results as I type like Netflix", "", "make searching for specific movies easier"]}], {"id": "1623290646064", "text": "Please open the JustWatch website and try to search for a movie or TV show. Was the search easy to locate / identify? Why or why not?", "answers": ["yes, it was easy and quick ", "Yes", "Ugh no. ", "", "Easy", "", "yes"]}], {"id": "1623290800696", "text": "If the JustWatch search made suggestions, how helpful were they?", "answers": ["Not very helpful", "Right amount of helpful", "N/A (no suggestions)", "", "Right amount of helpful"]}], {"id": "1623290884071", "text": "How much effort was it to search for a movie or TV show on JustWatch?", "answers": ["A comfortable amount of effort", "Very little effort", "", "", "A comfortable amount of effort", "", "A comfortable amount of effort"]}], {"id": "1623291062728", "text": "What was the worst or best part of searching on JustWatch?", "answers": ["sometimes not providing right suggestions ", "The search is more"]}]
```

accurate and it clearly shows where movies/shows are streaming", "", "", "It aggregates a bunch of services together so feels like I can find anything ", "", "easy search interface, easy to figure out"]}, {"id": "1623291079412", "text": "What could make the JustWatch search easier to use?", "answers": ["none except better algorithm for search ", "", "", "", "Have more advanced filter options ", "", ""]}, {"id": "1623291110256", "text": "Which service provided the better overall experience?", "answers": ["JustWatch", "JustWatch", "", "", "JustWatch", "", "JustWatch"]}]

7.6 Think-aloud protocol script

The template below was used for both Pluto TV (Exercise #1) and Netflix (Exercise #2). One page was printed on both sides for each.

Think-Aloud Exercise #1

Please complete the following steps. You can stop for any reason, at any time.

- 1) Open the Windows Voice Recorder app. (To do this, click the Windows search bar, type “voice”, then click on “Voice Recorder”.)
 - 2) When you are ready, press the “microphone” button to begin recording. Please answer (aloud) the questions below.
Recording can be stopped by pressing the “stop” (square) button.
*You can change your mind about recording, or stop for any reason, at any time.
If you prefer, you can fill in the blanks below. (This is also optional.)*
 - 3) Start Mozilla Firefox. Open this link: <https://pluto.tv/> Allow the page to load.
 - 4) What do you see on this page?
-

- 5) What are your thoughts or feelings about this page?
-

- 6) What do you like or dislike about it?

(Please turn the page over.)

- 7) Imagine you will now watch a movie of your choice, using Pluto TV.

What things on the page do you find yourself looking for?

What does it seem like you need to do on this page?

What do you need to know in order to find your movie?

Describe how you look for your movie on Pluto TV.

- 8) Were you able to find what you wanted? _____

- 9) If not, what stopped you?
-

- 10) What changes would you make to Pluto TV to make this easier, or more pleasant?
-

- 11) If recording is in process, please stop recording. Let the researcher know you are done.

Thank you very much for your participation.

7.7 Handling of audio recordings

Verbal consent and permission to record audio was obtained prior, and an alternate means to take notes was provided if one needed or wished to terminate recording. Audio recordings were transcribed on the same device that recorded them, so the recordings never traversed a network, and were destroyed after being manually transcribed. Personal names were not included in the recordings or the transcriptions.

7.8 Transcriptions of think-aloud protocol recordings

7.8.1 Participant 1, Pluto TV

OK, this is Pluto.

It starts with a requirement for accepting their privacy policy and terms of use.

<clicking sounds>

<silence>

"Watch For Free Now."

<clicking sounds>

Clicking on Movies.

OK, scrolling down to, say, Comedies.

<clicking sounds>

<mouse movement sounds>

<clicking sounds>

Now I got this... trailer blocking everything. Go away. <clicks (Back?) button>

Start again. <click> Watch Free. <click> Movies. <click>

Oh. I have to click "On Demand". All right. <click>

There are no trailers when you mouse over anything particular.

Now I have a popup to try one month free. Go away. No thanks.

And then there's an annoying little box or trailer that's got nothing to do with what I'm interested in in the bottom right corner.

So if I click on something, there's a small blurb about it. There's... it could really use a trailer to get a feel for what you're going to be watching. Because if you have no idea what it is, and you'd like to check it out, something other than a still picture would be better.

So I clicked on something, and... I hit X to get rid of it. Move on to another one.

Not very informative.

It seems to have moved my selection to Science Fiction when I was looking at Comedy...

Oh, I see what it is. Comedy is a single line, as opposed to them displaying all their comedies. It's just a single line and you have to scroll sideways. How tedious. And then you have to click "all" to see all of them.

Clicking on randomly and "Watch Now". <clicking sounds>

I would add trailers to every one of their offerings.

They've got 569+ titles, no way to sort. <clicking sounds>

If you knew the title, I don't see where you could just simply plug in the name and see if they have it on there, in their catalog. <clicking sounds>

It's annoying when you pick a type, a genre, and you literally have to scroll to the far right before you can click "Show All".

It would be better if they allowed that selection right at the top, so for instance, Comedy, to the right of it, Show All.

7.8.2 Participant 1, Netflix

I see the Netflix homepage. Signing in.

The sign-in button is off to the right instead of probably being in the middle.

<sounds of video play, then stop>

I am looking for... My List. <sounds keep playing> Or, some suggestions.

Or to continue watching something I've been watching.

I want to find a new movie. I have to click "Movies", followed by "Genre".
<sounds play briefly>

It's not always easy to find what you want because of the way they categorize things.

And even if you say "Science Fiction", for instance, and you click "Explore All", you generally have to get rid of the "Suggestions For Me" because it tries to pigeonhole you in terms of what it thinks you want to watch.

So if I go by "Latest Release" <sound plays>... If I'm unable to find something, it's usually because I don't have any interest in what they seem to have on offer.

It would be nice if they didn't suggest you watch something you've already seen. I would like to have an option to say do not list anything that I've already seen, unless I expressly ask to see something again.

It would be helpful if you could filter, like for instance you might say "Science Fiction", "International" (as opposed to "Hollywood") or specify specific countries, or certain types of science fiction, to have subcategories. And to simultaneously filter by date released, to have multiple filters active at the same time, not just one.

7.8.3 Participant 2, Pluto TV

I am starting Mozilla Firefox and I am opening Pluto TV. <typing sounds>

The page has loaded. I currently am looking at a TV screen with a muted video button and... terms of use and privacy policy agreement that pops right up and asks to be accepted. I guess it says I can read it if I want to. There is a big yellow button that says "Accept" and then a little three-line hamburger thing at the top left, and the logo, and then some other buttons on the top right, like on some other websites, "Careers", "Partners", "About Us", "Where to Watch", "Support", and -- I can scroll! this page, and it says "Drop In, Watch Free". And there's buttons for downloading on the App Store and Google Play, and then a "Watch Free Now" button, had to scroll to see it, and then you can scroll some more and it shows you lots of different things that it can talk to like Google TV, and Fire TV, and Roku, etc.

Now you can keep scrolling, some advertising where it says it's got hundreds of channels and another "Watch Free" button, and then a picture of what it looks

like on your TV, I guess, and then you keep scrolling and it says it has thousands of movies and ANOTHER "Watch Free" button, and you can KEEP scrolling, and it's kind of the same information as before, just -- flipped, like the stuff that was on the right is on the left, and vice versa. And yet another "Watch Free" button. They're showing all the places you can stream it, like Android TV, again, Roku, Playstation, etc., and scroll some more and some really flashy graphics saying "Watch Free TV", "Start Watching Now". And then you finally hit the bottom of the page. It's a bunch of hyperlinks at the bottom, like About Us, Careers, like the top and then more, like Leadership, News, Smart TV, Watch on the Web, Where to Watch, Streaming Devices, Mobile App, Desktop App, and then links to their partners, like advertisers.

It's a really long page, there's a lot of scrolling. <mouse wheel scrolling sounds> And oh, there's another button in the middle of the beginning, if you mouse over this box in the middle of the page, which looks like a TV screen, if you mouse over it it gets a little bigger and there's a button which says "Launch Pluto TV". It's... <mouse scrolling> OK, I guess I need to -- well, let's take a look at the Terms of Use real quickly. Some privacy policies, they say they've updated them, "Your privacy is important to us". Three links there <scrolling>, there's a button to Accept and Continue, there's no button NOT to accept, so... I guess I don't have much of a choice. So we'll go ahead and click this "Accept and Continue". Now we're taken back to the same page as before, with the Launch... with the TV screen view in the middle and then this "Launch Pluto TV" button.

And so now, what do I like or dislike? Well, I like that it's muted right away, you know, because autoplay videos -- well, it's autoplaying, the video is playing, I'm guessing that's because it's Live TV or whatever is playing right now, or an example. But it's nice that it's not making any noise. Because if I'm someplace where I don't want to disturb anybody, I don't want to hear the noise, or maybe you don't like being startled or surprised by noise. So that's nice.

The buttons to watch it are really bright and stick out, so they really want you to watch.

Oh! The middle screen has suddenly changed. The TV screen, it says "Want more? Watch hundreds of channels for free. Open web app." This is now all in the middle of the screen. When you mouse over it, it's not clear if it's a button or

just an overlay, but everything is taking us to the "Launch Pluto TV" button, so I guess I have to hit that to watch something. OK.

So now I want to watch something, and I've clicked this "Watch", er, "Launch Pluto TV" button, and now I have something that looks... I've got half the screen looks like another TV screen, it's still muted. And the bottom half of the screen looks like a TV guide. And on the left here, there are... it's like a menu, lower left. All the navigation seems to be at the bottom of the screen except for - oh, at the very top, there are two buttons "Live TV" and "On Demand". And then there's a little icon in the upper right corner, kind of looks like a person, kind of looks like when you're not signed into Google, because we haven't had to sign in ever at this point. So the bottom half of the screen is like a TV Guide and I want to watch a movie. Well, this screen looks like it's live TV. So you mouse over the bottom half and it tells you a channel name like a TV channel, and it tells you what's playing. I don't necessarily want to watch this movie, so I'm going to... I'm kind of curious to see what's on -- *Hunger Games: Mockingjay*, that's cool. It's channel 54. And then some other movies that I'm not necessarily interested in.

So this part of the screen doesn't -- the actual TV part is like two-thirds of the screen, and the TV guide is like really squished at the bottom, it's hard to... I mean, you can see one or two rows of the TV guide by scrolling through it, so... IGN Summer of Gaming, hmm. OK, and there's a button here in the lower right, it's a white button on all this dark stuff, and it says "Show Guide". I click that, and all of a sudden I can -- the guide expands and takes over the WHOLE screen, and the picture, what was playing, the live TV, goes to Picture-in-Picture mode, and it's still muted, and you can mouse over it to see what it, you, can do. You can expand it, there's like a little fullscreen button which is the little square in the lower right-hand corner, I think it looks just like the YouTube one. The fullscreen button, I've seen that before on YouTube. And it's still muted. But I can't seem to make it go away. Like it's in the lower-right hand, and it covers up part of the screen and I don't think I can do anything about it.

So there's this TV guide thing and I can see what's playing... there's quite a few... you can use the browser scroll bar too (?) to scroll, and holy cow, there are tons of channels here. Wow. Okay. So there's a lot of stuff. There is NO scroll bar on the bottom to let you go left or right. You can only scroll down. So you can't look ahead, you can only see what looks like the next hour or so of what's on.

So on the left side of the screen, there's a bunch of buttons, looks like they're buttons, kind of like a menu, and they say things like "Featured", "Movies", "Entertainment", "News and Opinion", "Reality". They look like categories or genres... I can click on one, and I'm going to click on Movies because I want to watch a movie.

OK, so now this changes the TV guide and the... assumption is, is that it's now just showing movies? That would make sense. There's no way to -- oh, they're in order of channel number. That's kind of meaningless to me just because they seem arbitrary. They don't look like real TV channels, and it's not like this has anything to do with cable, so there's no connection with, like, the channel numbers I already know. So that doesn't help. So these channel numbers are just, seem just kind of there. So they're sorted, but it doesn't help. It seems kind of random. I would just have to look through all of these things to see if I would want to watch something that they're already playing right now. But that's just what's playing right now.

What do I like about this page? I've used TV Guide a long time ago, like the actual printed one, and it looks like that, so it was the first thing I thought of when I saw it was it looks like a TV guide. That was actually kind of cool, makes me think of relatives, older relatives, who might like it for that reason too.

So there's another button at the right hand top that says On Demand, so based on my experience with cable, then I'm assuming that I will be able to watch what I want to watch. I can mouse over it, so I know I can go, so I'm going to click that and now it's taking its time... wow, it's a bunch of gray boxes... oh, finally everything shows up and -- OK, so the TV that was playing before is STILL playing, muted, in the lower right hand corner in the little window, so no matter what you do, that looks like it just keeps going. I think I saw some ads in it, while I was looking at the other -- just out of the corner of my eye, and maybe that's why you can't stop it, I don't know. But regardless, it's still there.

So now we're looking at the On Demand, and the stuff on the left of the screen, the menu buttons, have changed. They're not the same groups or categories or genres, some of the look the same <mouse wheel scrolling noises>, they're things like "Top TV Series" -- OK, this is annoying, an ad JUST showed up obscuring everything else in the middle. This is like those free-to-play video phone games that force you to watch ads before you get to do the next thing. So that's what's

happening right now, and it's for Paramount+. I don't know the connection. And it says 17 seconds remaining -- well, it said it was 30-something seconds before; it's counting down. So I'm trying to click anywhere else on the screen, and I can't click off, so it forces you to sit through this thing if you haven't started watching yet? Boy. OK. All right, it's gone.

So now it's gone and I was looking at the, um... I was looking at the things on the left. Right. And these categories, so like "New Movies This Month", "Recently-Added Series", "Trending Now", and then some "Cine Premiere", "Last Chance to Watch", "LGBTQ Cinema", "Sitcoms", some things in other languages? Mostly Spanish? And Staff Picks, Romance, TLC. So there's some groups and stuff, and so, what... I still can't scroll to the right. Everything scrolls up and down. And there's no search bar anywhere on this page, so I can't type anything in anywhere.

So what do I find myself looking for when I want to find a movie of my choice? OK, let's say that I want to watch... a Star Trek movie. OK, so I want to watch a Star Trek movie, and I was looking for a search bar but there isn't one of those, like you know with a microphone-- magnifying glass, not here. So if I'm going to find Star Trek, I'm... now I know I can probably -- there's NO text under the box art! What we're looking at here is a whole bunch of box art pic-- like, you know, images, like of the actual box of the DVD or something, right? And they're all... you can't scroll with the browser to the right, but now I see -- I didn't see it before because it's kind of -- it doesn't stick out really well, but now I see there's a little gray circle with a right, white right-pointing chevron like an angle bracket in it, so that tells me that I can click on this, and it will scroll that row of stuff to the right and then there's more to the left. And there's a View All thing too.

So I'm in the Most Popular movies, I'm still not looking for Star Trek, I'm getting sidetracked here. But I was curious to see... so I'll click -- the View All has a little eyeball on it! That's kind of cool... I don't know why, well, why they would put that there, but now I am back on a screen that says Most Popular Movies, "120 titles plus" and there's a whole bunch of things and... OK, if I wanted to find Star Trek <sounds of typing and computer beeps> -- there's no actual text anywhere. It's just the pictures. So I can't even use the browser to look for it, like by doing Control-F to find it, because there's no words, there's no text. Just pictures. So I

would have to actually have to sit here and just look at all these pictures to see if they had Star Trek.

And that's... if I... oh look, there's a Star Trek! OK, I had to scroll, I was just scrolling one, two, three -- I'm using the mouse to scroll; I could use the scrollbar because there is a scrollbar. But I was just kind of scrolling kind of idly, because you know, I feel kind of helpless, this is all I can do, and lo and behold... oh, where did it go? It's all the way down here. There doesn't -- this isn't even in alphabetical order. So, like, this is in the Most Popular Movies section, we've got these Hunger Games movies, and then... looks like a bunch of random stuff, just whatever people are watching, and... scroll scroll scroll again, and here, so now we've got some Star Trek movies. There's Star Trek: First Contact, and Star Trek: The Voyage Home, StarGATE... and that's it. Well, for Star Trek, there's just the two. So I guess I'm stuck with whatever's here.

So the stuff I found myself looking for was -- the words "Star Trek". I didn't see any text, but we saw the pictures of all the movie boxes or the posters or whatever, so I was looking, literally just looking for Star Trek on here <mouse scrolling noises>, since we already know that there's no search bar or anything. I just have to look -- and so, on this screen there are 1,2,3,4,5,6,7,8,9, there are 9 things in a row, and 1,2,3,4,5,6,7,8,9,10,11,12,13-odd rows. It's like having a bunch of cards spread out at random and you have to pick one out from all them. So what do I need to do? I just have to hunt for it, and I would have to know what I was looking for.

So I'm going to go back really quickly -- can I go back? Oh, there's an X in the upper right hand corner. Everything is black and the text is white, so it stands out. There's not much ON the screen. It's just like the logo, and Live TV, On Demand, the X, the movies, and then all the pictures. And then the picture-in-picture that's STILL playing. That's it. So there's not much else to do except hit close -- hit the X and go back. Curious to see if it shows up...

I'm back at that other screen that had the list of the categories. So I'm going to, and you can mouse scroll through these, apparently, 'cause there's no scrollbar for it -- there's no scrollbar anywhere on this page before, so you have to scroll with your mouse. I imagine if you were on a mobile, you would like, drag it, but you have to use the mouse. There's no click and drag, no scrollbar to help.

So the last thing I want to see if there's, I want to see if I click on -- OK, is there a Sci-Fi category? Um... <mouse scrolling> Oh, Cult Movies, Science Docs (that sounds like documentaries)... Sci-Fi and Fantasy TV, OK. The categories are not in any order than I can tell, so I literally had to scan and scan and manually find the thing? Click Sci-Fi and Fantasy TV, except that's, no, these aren't movies. Those are <scrolling> -- oh, I see what's happening here. When you click on something, these categories, it just skips to the section of this giant view. So, you know, I don't know if I can find Star Trek using the categories, because I can't find a category to help me find my Star Trek. Classic Movies -- it's probably not under Classic Movies.

I'm going to try one more time. It's not going to be under Adventure TV, maybe? No, that looks like... wow. So the categories aren't defined. You can read into things, like TV Westerns is pretty straightforward, and Game Shows is straightforward, and British TV... Food TV... Military Movies? Adventures? OK, I'm going to click Adventures. And then, there's SOME science fiction in here. The Star Trek's in there so I actually guessed right. Wow. So you would have to know what these categories were, but they don't tell you, so that's kind of hard.

I did find, well, I kind of found what I wanted. I might not have wanted to watch one of those two Star Trek movies, because there's, you know, more than that, but at least I found something.

So to make this easier, putting the actual text of, like, text that the browser will see when you search the browser window, would be really helpful, because if you knew how to search with the browser, you could do that. Obviously a search -- any kind of search bar would be an improvement. Having some guide to the categories would also be good too, I don't know where they would show that to you. Maybe two lines under each, each category, like Adventures, I don't know. It all seems kind of arbitrary, and if they don't tell you what characterizes these groups, then you just have to guess. And that's... taking some of the guesswork out would help.

So that's, I guess, my experience with Pluto TV.

7.8.4 Participant 2, Netflix

Ok, we are looking at Netflix. And I've signed into my account. And I'm going to go... and I want to watch a movie.

Well, actually, we're going to look at -- what do I see here? It's the list of who's watching, I'm going to pick me. And here we go. <click>

<loud noise from video> OK, OK, stop the sound! It autoplays sound. That is definitely something I don't like about Netflix is, and I wonder if there's a way that you can change that, but anyway... it's playing video, so I'm kind of -- it's distracting me from what I wanted to do. Anyway, and then, like a trailer, or whatever, and I see a button for Play, if you actually want to play what's here, and then at the top we've got the banner. There's a banner at the top, and there's some links for Home, TV Shows, Movies, New & Popular, My List (this is all at the top) -- oh, and the video stopped. Thank goodness. Whatever they were showing the trailer for, now it's a still image. So now I can, now it's not as distracting.

And at the top right of the screen there's a magnifying glass, in white. This background they're showing is kind of teal, light teal blue right now, but you can still see this thing. And then Kids, DVD, and some notifications, and then profile/stuff related to your account. That's at the top. At the bottom we have My List, which is stuff I like to watch, and then Continue Watching, and you have to scroll down (and there is a scroll bar on the right, in the browser window, so you can, I can drag it with my mouse, because I'm using the mouse, or I can use the mouse wheel to scroll).

And if you mouse over -- oh! that's kind of cool, if you mouse over the categories here, it pops up another thing, says "Explore All" with little arrows. So you can mouse over the categories, or if you mouse over the row of pictures... you can, there's a little arrow so you can scroll to the right in each category. When you mouse over any of these, any of the shows, it pops up like a little mini-view -- thankfully it's muted -- everything is showing a clip of everything. I actually kind of wish it wouldn't do that, because it's kind of distracting. It may give something away, like how trailers give things away. But it's showing, like, a clip from whatever it is. But I don't think you can turn that off.

Anyway, so you can scroll down this page to see all these different categories and stuff. <scrolling noises>

So how do I feel about this? I didn't like that it was playing, autoplaying. But it's colorful! It's colorful... The groups of things are kind of separate from each other, so... it's... there's a lot of stuff, but it feels like there's more space in between the

stuff. So it's easier to kind of visually see these different groups because they're separate from each other.

What else do I like about this? Top 10 in the US today, huh... that might be interesting for some people, not so much for me. It's just there, just another thing to scroll by. Because apparently that's the way of it. You just have to scroll. Or drag the scroll bar.

Now there's some new thing... "Geeked". Geeked category. TV Sci-Fi and Fantasy. And then the Netflix-only things, which are bigger than everything else -- I guess they really want people to watch their stuff -- and then yet more categories, yet more categories. You could just keep on scrolling. Gosh, it feels like a news feed. You can just keep on scrolling and never know when you're done. OK, there is a bottom. If I use the mouse scrollbar, I can get there right away, but -- there's a lot of stuff!

OK. Now I want to watch... all right, I want to watch Star Trek. <laughing> I really want to watch Star Trek. So, I find myself looking for the -- I keep looking at the magnifying glass because I want to search for it. I don't want to scroll through things. I don't want to have to hunt and peck, and hunt and -- you know -- have to find a needle in a haystack. So I look for the magnifying glass. I just have to click on it. Well, I have to find it, but it's up there, and now I click on it. That's great. Oh, now I get a little bar, a little box, it says "Titles, people, genres"... so I guess if I didn't know the title of it, I guess that means I can search for an actor. Or "sci-fi" and actually SEARCH for the category. Oh, that's kind of neat.

So let's say I want to see if it has something with Leonard Nimoy, 'cause I know he's in Star Trek. So let's look for it that way for kicks. Leonard Nimoy. So I type in "leonard nimoy" and I didn't even have to hit Return. I'm going to backspace a bit to see what happens if I just say "leonard". It's making suggestions, not in the little text box, but it's actually presenting the same types of rows of shows, of movies, like before -- except they change when you type in the box. So it's just "leonard", it says "Explore titles related to Leonardo di Caprio, Leonardo da Vinci, and then we actually have shows like "Hap and Leonard"... "The Departed" (I don't even know why that's there)... so these things all theoretically have some connection to the word or name "leonard".

All right, let's go back to Leonard Nimoy. So I'm typing "nimoy" back into the top again. I can -- I don't have to mouse -- once I clicked on the text box, I don't have to mouse any more. Now I see "Explore titles related to: Leonard Nimoy", and -- Star Trek! It's the very first thing. It looks like the original Star Trek... is it the series or the movie? I'm picking up the mouse again, so I can go mouse over the thing, so it can blow itself up and show the little clip. I don't know why you would want to listen to it from here, but they have, like, the little mute thing, so you could if you wanted to, for whatever reason.

So this, OK, looks like the actual original series Star Trek. Cool. TV show, not a movie. And then it tells me I can play it from here, or I can add it to my list, thumbs up, or thumbs down, and there's a little downward arrow -- oh this is nice, it gives little pop-ups that tell you what all these buttons do, right away. Like, "Add to my list", or "I like this", or "Not for me" <laugh>, and then "Episodes and info".

And it actually for some reason tells you how strongly it matched your search. And... OK. I searched for Leonard Nimoy and it said this is an 84% match. Now that doesn't make any sense, because I would expect this to be a 100% match, because it's Star Trek, and Leonard Nimoy was Spock. So -- it's like it's interesting, but it also, kind of doesn't really jive with my expectation of what I would see there. Not that it really matters, I don't think? But it's interesting.

It gives a rating, how many seasons, what video quality (like HD), and then some things like "Exciting", "Suspenseful", "Alien Sci-Fi". <laughs> OK, they're how other people have described it, I guess. Maybe, I'm guessing, this is how they categorize it -- oh, they must be tags, like they're tags, I guess.

OK, and then next to that there's "For the Love of Spock", which is, I believe it's a documentary. I don't see any Star Trek movies... so maybe they don't have any Star Trek movies. Well, they have Star Trek: The Next Generation. And then there's... John Malkovich! <laughs> That's not a Star Trek movie.

So now I want to, I'm going to go back to the search box and I'm going to take out, I'm going to remove "leonard nimoy" -- wow, it took me right back to the beginning where, with that first trailer that was playing. Ugh... see, I don't really want to watch stuff while I'm doing this. Anyway. So I'm going to type "Star Trek" in again, and... OK! When I type "Star Trek", now I get, OK, the same TV

show -- and then more, it looks like, lots of different Star Trek series, but no Star Trek movies. None of them. So I guess they're just not on Netflix right now.

Since all the Star Trek stuff showed up at the beginning, I'm guessing I don't really have to bother scrolling. If they don't show up at the beginning, then they're not there. So, well. At least it was easy to -- I'm making that assumption. Right, I mean, <scrolling> you COULD scroll down to see if Star Trek was buried there like on... but this is pretty clear. What you see is what you get, I guess. OK.

So was I able to -- oh, how I looked for it? I just typed into the box and found there's a couple different ways I could look for things, like by people or name, I just typed it in and I didn't even have to hit Return. I could go back and tweak it if I wanted, in the box. And it would just automatically change [results] without having to press Enter or anything like that. So it just "does". And so that was it. Didn't find exactly what I wanted, but I found something related, which you know, I could settle for. And I also found something that I forgot was there, so I did learn something, which I kind of like.

OK. If I didn't find what I wanted, what stopped me? Well, the fact that it just wasn't there. It's -- I don't feel like I can't find it, like I'm not capable of finding it, because the little search box was really clear. And they show things that -- they do show some Star Trek at the top, so I'm assuming, again the conclusion is, is this is what they have with the words "Star Trek" in it, and since there's no movies, then I'm going just going to say, oh OK I guess, it's just not there. No movies.

So changes to make this easier, or more pleasant? Well, it's pretty easy, because I can just type in the box and watch what happens. Like I can play with it. I like that I can play with it. I know what I'm looking for, at least what I want to see... there's no, there's no... OK, so there's just pictures of all the shows, like, if I try to do a browser search for "Star Trek" <typing noises> and use Ctrl-F and F3 <clicking> it's not going to show me anything about the shows that it came back with. That might help, I don't know.

To be more pleasant... I mean, it would be kind of nice if it said "Sorry, we don't have Star Trek movies." I don't know how it would communicate that without making itself [Netflix] look bad, right? But I do wish that when I reset my search, I really wish it wouldn't go back to playing [a] full-screen trailer of something.

It's like I've already seen it, I really don't want to see it again. I'd like to have it not autoplay anything. It'd be nice if it didn't play video like all the time. OK!