Lab 1 - Flixpicks Product Description

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1. Introduction

In July 2022, a study by Nielsen Holdings on total television consumption in the United States showed that streaming services represented 34.8 percent of viewership which surpassed cable television for the first time (Fischer, 2022). Streaming services have surpassed cable television due to cable's limitations, such as only being able to view the scheduled shows each day as opposed to the on-demand viewing that streaming provides. The study also predicts continued growth in the streaming market. A study by Learndipity Data Insights that took place in 2016 investigated the changes in viewing selection processes resulting from the expanded available inventory. In 2016 Netflix users spent, on average, 17.8 minutes browsing for engaging media to watch (Moscarlitolo, 2016). A study released in 2020 reported that users spent up to 187 hours a year searching for engaging media to watch. That amount of time divided by 365 days translates to roughly half an hour of wasted time spent searching for media to watch each day (Ward, 2020). This is equivalent to one streamed, ad-free television episode that an average person is not able to watch each day due to indecision. This indecision is caused by too many options and is also referred to as Choice Overload.

Not only are streaming services imperfect because of the time that people waste looking for engaging media to watch but there is also less social experience with streaming services when a person watches something by themselves. When people go to a movie at a theater, watching along with an audience allows everyone in the theater to experience and interact with the movie together, from clapping to laughing or crying. This ability to interact with others during a movie is a part of the movie-watching experience that current streaming services do not provide unless a group is watching together.

Streaming services growing popularity has led to an increase in both the number of streaming services and the number of shows and movies provided by each service. As of April 2022, Netflix alone had over 4000 media titles and Amazon Prime had over 7000 (Clark, 2022). While this increase could be viewed as a positive change for people who know what they want to watch, the additional media correspondingly increases search time to find engaging media.

The solution to the indecision problem is a cross-platform app called FlixPicks that facilitates a quick decision by filtering through every movie and television show on the user's subscribed platforms based on customizable preferences. The app also allows users to leave comments during the movie which lets the user engage with the media further as well as adding to the accuracy of FlixPicks' recommendations. The app streamlines the search process, offering all the same options, and enables users to dedicate more time to watching their media rather than searching for desirable media.

2. FlixPicks Description

FlixPicks' objective is to provide personalized management of the content available to users across all streaming services to which they subscribe. FlixPicks also provides analytics for streaming service representatives to view. FlixPicks tracks the user's media viewing habits and generates recommendations for new media that the user might enjoy from their Linked Subscriptions. These recommendations are generated based on user watch history, user Reactions, and data from other users who share similar viewing habits. Reactions are tags that users attach to comments to display positive or negative emotions to the recommendation algorithm about that media. The user has the ability to submit these Reactions and comments from the overlay CineMap while they watch their media. The recommendation algorithm's

confidence in the user's media preferences increases with each positive Reaction, shaping subsequent recommendations.

FlixPicks also allows users to toggle between viewing only recommendations based on the user's Linked Subscriptions, and also allowing content that is exclusively available on other subscription services. This provides users with the opportunity to discover content available on streaming services they are not subscribed to. After locating a movie or television show, users are presented with a Quick Click link that directs them to the respective streaming service offering the media for viewing.

2.1 Key Features and Capabilities

Flixpicks is an application/website that is built for individuals with more than one streaming service. FlixPicks creates a customized experience for users with diverse subscriptions to help reduce Choice Overload. Table 1 defines the user roles and their level of access.

Table 1

FlixPicks User Access Feature Table

Category	FlixPicks Feature	Guest	Registered User	Admin	Representative
Subscription Service Management	User Account Registration	Access	N/A	Access	N/A
	Account/Subscription Service Management	Unavailable	Access	Access	Access
	User Subscription Integration	Unavailable	Access	Access	Access
	User Tier Level Feature Access	Unavailable	Access	Access	Access
Taste Profile	Taste Profile	Unavailable	Access	N/A	N/A
	Taste Profile Survey	Unavailable	Access	N/A	N/A
	Taste Profile Content-Based Filtering	Unavailable	Access	N/A	N/A
	Taste Profile Collaborative Filtering	Unavailable	Access	N/A	N/A
Recommendations	Recommendations	Unavailable	Access	N/A	N/A
	Filtered Recommendations (Criteria based)	Unavailable	Access	Access	N/A
Movie Library	Browse/Search Filtering	Access	Access	Access	N/A
	HotPicks	Access	Access	Access	N/A
CineRoll	CineRoll	Unavailable	Access	Access	N/A
CineWheel	CineWheel	Access	Access	Access	N/A
CineMap	CineMap Overlay	Unavailable	Access	Access	N/A
	CineMap Commenting	Unavailable	Access	Access	N/A
	CineMap Export Data	Unavailable	Unavailable	N/A	N/A
	CineMap Data Analyzing	Unavailable	Unavailable	N/A	N/A
Analytics	Data analytics testing	Unavailable	Unavailable	Access	Access
	Analytics	Unavailable	Unavailable	Access	Access
	Summary reporting for user/stakeholders	Unavailable	Unavailable	Access	Access
Simulation	Simulation	Unavailable	Unavailable	Access	Unavailable
Movie Info	Create/edit Movie Info	Unavailable	Unavailable	Access	Unavailable
Feedback	Feedback	Access	Access	Access	Access

The Taste Profile is a major feature with the ability to customize recommendations. Upon creating an account, the user is prompted to complete the Survey to establish the initial interests of the user for the Recommendation Algorithm. Users are able to access or reset the Survey at any time. In addition to the explicit data collection with the Survey, the Taste Profile is updated with three forms of implicit data. Reactions are captured when the user comments on media, the user's watch history is recorded, and users with similar viewing habits also affect the Taste Profile through the Apriori Algorithm. For example, if John Doe watches media A, B, and C, and Jane Smith watches media A and B, media C could be recommended to Jane.

Media recommendations are displayed to the user on the home page. The "recommended" category always appears at the top of a user's home page and displays the top ten results from the Recommendation Algorithm for a user. The HotPicks recommendation feature displays the ten most viewed media each day.

CineWheel allows users to input at most ten television or movie choices on a wheel and spin to receive a random selection out of the input. This helps increase the user's decision-making speed by selecting content through a random selection algorithm.

CineRoll is a feature that directly combats Choice Overload. Upon selecting the CineRoll feature from the home page, a single recommendation based on the user's Taste Profile is displayed. The user is able to "re-roll" for another recommendation. When a user accepts or declines a recommendation, FlixPicks updates their Taste Profile to reflect alignment with their preferences.

Descriptive information about the media selection is displayed such as title, date of publication, lead actors and actresses, rating, and genre(s). In addition to this information, Quick Clicks are provided for each of the services that allow that media to be streamed.

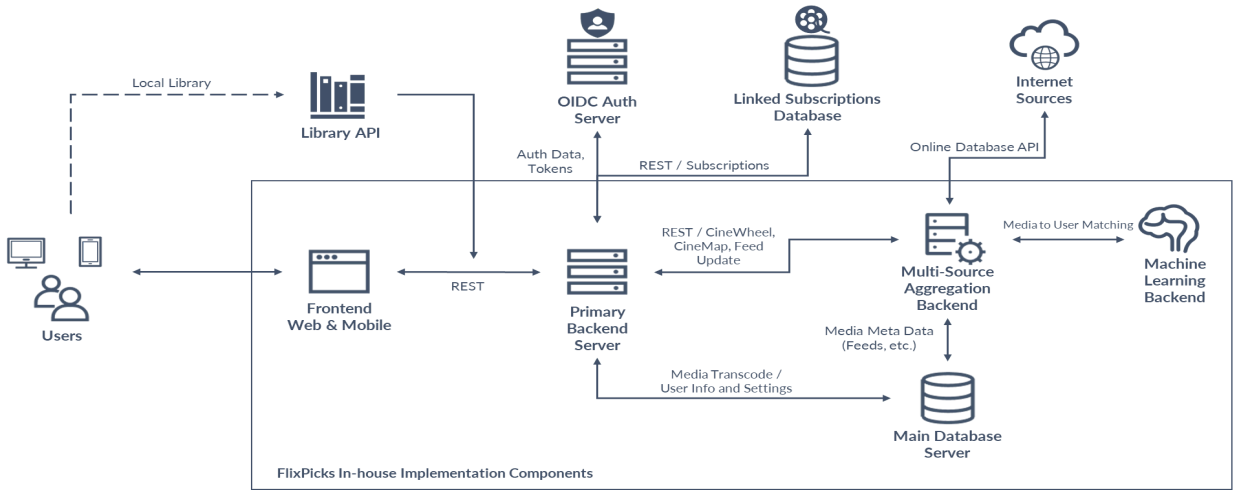
CineMap is an overlay that appears on top of the media after a Quick Click is pressed if the feature is turned on. CineMap allows users to leave Reactions with a comment attached to them to display their feelings at that specific timestamp in the movie. They are able to view other users' comments and Reactions throughout the media as they watch. The frequency and type of Reaction is recorded in the Taste Profile and affects future recommendations.

2.2 Major Components

FlixPicks contains a front-end web application, a back-end database, and an overlay. The front-end houses most of the major features like CineWheel, CineRoll, categories, and searching which also communicate with the back-end. Similarly, CineMap is an overlay that sends and receives data from the backend. The major functional components and their relationships are shown in Figure 1.

Figure 1

FlixPicks MFCD



The hardware that is required to run FlixPicks is a computer with internet access and a modern Chromium-based browser such as Chrome or Firefox that supports FlixPicks' CineMap extension. FlixPicks also works on iOS and Android cellular devices with internet access and

Smart TV devices with internet access. The software behind FlixPicks is an HTML, CSS, and Javascript web portal, a JavaScript browser extension for the PC version, Swift for iOS and Apple TVs, and Java for Android devices.

The external data sources are YouTube Data API, 3rd Party Netflix API, and Amazon Personalize. The application server is Apache Tomcat and the database server is a MySQL server. AWS is used for machine learning and artificial intelligence. For version control, FlixPicks uses Git, for the repository GitHub is used and lastly, the project management and issue trackers are VSCode and Eclipse IDEs.

3. Identification of Case Study

The case study for FlixPicks' proof of concept includes a group of a few people with varied levels of user roles, streaming subscriptions, media tastes, viewing habits, and group size. Table 2 defines five fake users with these varied characteristics to show FlixPicks' tailorability and uniqueness for each user, and to show its ability to reduce indecision.

Table 2

FlixPicks Prototype Case Study

Name & Information	Description
John Doe, Registered User	- John is subscribed to Hulu, Netflix, and Amazon Prime Video. - He constantly finds himself annoyed switching from different streaming platforms while browsing for content to watch. - Because of work, he only has a few hours left to consume entertainment at the end of the day. - He watches with his family.
Jane Plain, Registered User	- Jane is subscribed to Hulu and Netflix. - She regularly hangs out with groups of friends and one of their regular activities is watching a movie as a group. - She and her friends constantly find themselves disagreeing over which movie to watch together.

Tim Brown, Guest User	- Tim is not subscribed to any streaming services. - He regularly finds himself unsure what content he wants to watch. - He wants to find good shows to watch but doesn't know where to start without being subscribed to anything.
Jack Smith, Registered User	- Jack is subscribed to Hulu, Netflix, and Amazon Prime Video. - He regularly watches movies and shows at home by himself. - After watching something he typically searches YouTube reviews to see what others thought about specific parts of the movies he watches.
Nick White, Representative	- Nick is an advertising representative for Netflix. - He is looking for user data about the most interacted with parts of movies and shows. - Netflix does not provide interactions during the viewing of media so he needs to outsource this data.

The users defined in Table 2 differ in what features of FlixPicks they have access to, their party size when they watch media, the number of services they are subscribed to, which streaming services they are subscribed to, frequency of media consumption, and experience with streaming services and yet there is at minimum one feature that is beneficial to each of the users. FlixPicks is beneficial to anyone who already subscribes or wants to subscribe to a streaming service for media viewing. The main goal of FlixPicks is to reduce the time it takes to find a movie or show appealing to the user through features such as CineWheel and CineRoll, but there are also features such as CineMap that allow for interaction with the media and its viewers. The user role titled Representative is reserved for representatives of streaming services who would like to use the application to view the analytics that FlixPicks collects. This allows for not only media watchers but also streaming service representatives to benefit from FlixPicks.

4. FlixPicks Prototype Product Description

The FlixPicks prototype showcases FlixPick's important and innovative features to demonstrate feasibility on a larger scale. The prototype has a limited number of movies that it is

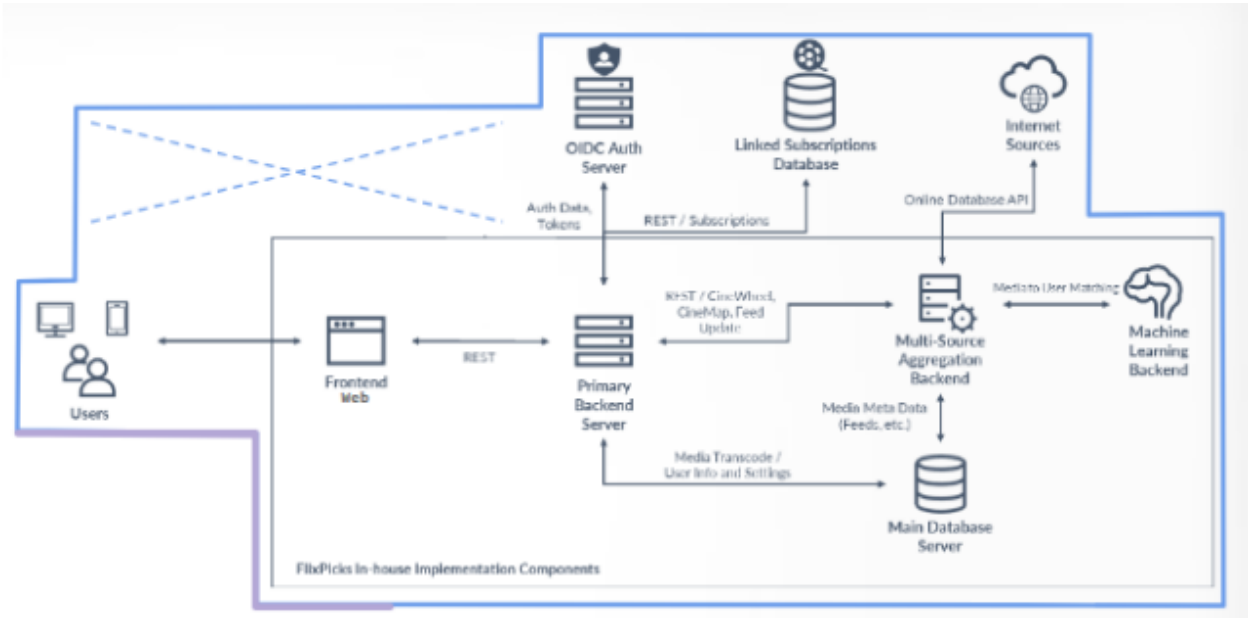
capable of accessing and it models fake users with simulated inputs for testing and risk mitigation strategy demonstrations. The ability to manipulate these fake users and view how these changes affect their data proves that the product is capable of accurately tracking user data, and generating recommendations based on patterns in multiple users' watch histories.

4.1. Prototype Architecture

Figure 2 depicts the reduced functionality of the prototype, and only includes a web application. These reductions are due to the smaller scope of the prototype to fit within the resource and time restrictions to allow for the creation of user data and media simulation in the absence of real users. The remainder of the prototype retains the same architecture of the frontend using the backend as a gateway to the 3rd party APIs and FlixPicks' internal databases.

Figure 2

FlixPicks Prototype Major Functional Components Diagram



The hardware necessary to run the prototype is any computer with a browser-based web interface. The browser's web interface interacts with the prototype's web servers and databases.

The virtual machine provided by the Computer Science Department of Old Dominion University is used to run the prototype application.

The software used in this prototype is Docker-LAMP, Linux operating system, Apache HTTP server, SQLite, PHP programming language, and Python. For the web programming, HTML, CSS, and JS are used. VS Code and Eclipse are the IDEs and version control is done through GitHub along with the project management board that is also in GitHub. VS Code is also used for issue tracking and testing.

4.2. Prototype Features and Capabilities

Table 3 depicts all the features that are available in the real-world product and compares them to the features that are partially implemented in the prototype. The user subscription integration and monetized user tier were excluded to focus less on the finances and more on the capability of the prototype. The prototype focuses on FlixPick's core function of generating and updating the user's Taste Profile and creating media recommendations. CineRoll and CineWheel are fully functional but the CineMap has only a partially implemented data export and data analysis feature because it does not use real people as users or full libraries of real media. Because much of the data used in the prototype is fake or simulated, the generated recommendations are not accurate to that of the real-world product, which uses opinions and feedback of real users to make recommendations. The prototype accurately detects patterns of watch history displayed by fake users and recommends media accordingly. The threshold for defining a pattern (support and confidence values) is adjustable within the prototype.

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Table 3

FlixPicks Real World Product vs Prototype Feature Table

Category	FlixPicks Feature	RWP	Prototype
Subscription Service Management	User Account Registration	Fully Implemented	Fully Implemented
	Account/Subscription Service Management	Fully Implemented	Fully Implemented
	User Subscription Integration	Fully Implemented	Partially Implemented
	User Tier Level Feature Access	Fully Implemented	Partially Implemented
Taste Profile	Taste Profile	Fully Implemented	Fully Implemented
	Taste Profile Survey	Fully Implemented	Fully Implemented
	Taste Profile Content-Based Filtering	Fully Implemented	Fully Implemented
	Taste Profile Collaborative Filtering	Fully Implemented	Fully Implemented
Recommendations	Recommendations	Fully Implemented	Fully Implemented
	Filtered Recommendations (Criteria based)	Fully Implemented	Fully Implemented
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	HotPicks	Fully Implemented	Fully Implemented
CineRoll	CineRoll	Fully Implemented	Fully Implemented
CineWheel	CineWheel	Fully Implemented	Fully Implemented
CineMap	CineMap Overlay	Fully Implemented	Fully Implemented
	CineMap Commenting	Fully Implemented	Partially Implemented
	CineMap Export Data	Fully Implemented	Partially Implemented
	CineMap Data Analyzing	Fully Implemented	Partially Implemented
Analytics	Data analytics testing	Fully Implemented	Partially Implemented
	Analytics	Eliminated	Fully Implemented
	Summary reporting for user/stakeholders	Eliminated	Fully Implemented
Simulation	Simulation	Eliminated	Fully Implemented
Movie Info	Create/edit Movie Info	Fully Implemented	Partially Implemented
Feedback	Feedback	Fully Implemented	Partially Implemented

4.3 Prototype Development Challenges

The challenges of developing the prototype are mostly due to inexperience. Not all of the team knew how to configure a database in a way that could communicate with the front end of the program when development started or what third-party API sources were best suited for the project. Similarly, the team did not have experience with collaborative filtering and other machine-learning aspects associated with this assignment because of the team's inexperience in the field.

5. Glossary

Administrator: A user who, beyond having access to the full slate of features a Registered user has and the data available to a Representative, can manipulate FlixPicks data.

Android: An operating system for mobile devices manufactured by Google, Samsung, and other companies.

Apache Tomcat: An open-source implementation of the Java Servlet, Java Server Pages, Java Expression Language, and WebSocket technologies. Tomcat provides a “pure java” HTTP web server environment in which Java code can run.

API: An Application Programming Interface is an interface that allows for interactions between multiple software applications or mixed hardware-software intermediaries.

Apriori Algorithm: Association mining that allows for common patterns in a users watch history to be used to help suggest content for other users.

Choice Overload: The phenomenon that choosing between a large variety of options can be detrimental to the decision-making process.

CineFeatures: CineFeatures is the collective name of the three features in FlixPicks: CineRoll, CineWheel, and CineMap.

CineMap: FlixPicks extension that is enabled when a user is watching media. It overlays their media and allows the user to see and make their own time-stamped comments and reactions that are stored on the FlixPicks DB.

CineRoll: FlixPicks feature that generates random selections based on a user’s interests. CineRoll uses the Taste Profile to generate selections for a user based on their recommendations and chooses one for the user. The user has the option to reroll if they aren’t satisfied with the selection.

CineWheel: FlixPicks feature that randomly selects from a set of user-inputted choices. The user provides the feature with media options and the feature randomly selects from a maximum of ten options.

CSS: Cascading Style Sheets is a style sheet language used for customizing the appearance of a document written in a markup language such as HTML. CSS is a cornerstone technology of the World Wide Web, alongside HTML and JavaScript.

Decision Fatigue: The fatigue from deciding what to watch can take the joy out of watching anything.

Git: Software for tracking changes in any set of files, usually used for coordinating work among programmers collaboratively developing source code during software development.

Guest: An unregistered user who has limited access to features offered by FlixPicks.

HotPicks: A micro-experience tile for showing popular and trending media. Dynamically creates the list upon page refresh. Available for registered users and guests.

HTML: Hyper Text Markup Language. HTML is the standard markup language for creating web pages. HTML elements tell the browser how to display the content and define the structure of web pages.

IDE: An integrated development environment is a software application that provides comprehensive facilities to computer programmers for software development.

iOS: An operating system used for mobile devices manufactured by Apple Inc.

JavaScript: A scripting or programming language that allows you to implement complex features and interactivity on web pages.

Library: Aggregated content that is shown to users. Guest users only have access to HotPicks but registered users can see aggregated content from HotPicks and their personalized recommendations.

Linked Subscriptions: User's subscription data that will be used to filter what media is shown in the Library, users can change this in settings if they want to only view their subscriptions.

MySQL: An open-source relational database management system.

Netflix: A subscription-based streaming service that allows members to watch TV shows and movies on internet-connected devices.

Quick Click: A link from FlixPicks that redirects the user to the selected streaming media.

Reactions: Small images that the user attaches to their comment to describe a variety of emotions that the user feels about the media.

Recommendation Algorithm: An algorithm that uses a dynamically built input library and information filtering system based upon the Taste Profile that provides suggestions for media content that is most relevant to a particular user.

Registered User: A user who completed registration and Taste Profile Survey, having full access to features offered by FlixPicks.

Representative: A user who is an affiliate of a particular streaming service who has access to non-account-specific data analytics of Registered Users.

Stakeholder: A person with interest or concern in something, especially a business.

Streaming: A method of transmitting or receiving data over a computer network as a steady, continuous flow, allowing playback to start while the rest of the data is being processed.

Streaming Service: A streaming service is a digital platform that delivers multimedia content over the internet, allowing users to watch or listen to it in real-time without downloading. Examples include Netflix, Spotify, and Disney+.

Subscription: A user's enrollment with a Streaming Service provider, providing them access to media available through the service.

Survey: A questionnaire to establish the initial information for recommendations in the Taste Profile.

Taste Profile: A user profile on FlixPicks that stores data about user streaming subscriptions, recommended media, and user preference information. As a user makes selections the Taste Profile recommendations become more refined to the users' preferences.

User Roles: Guest, Registered User, Representative, and Administrator are the user roles for FlixPicks.

Watch History: A comprehensive list of past content viewed by a user.

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