Predictive ESRB Assessment Tool

# Requirements Specification

## Abstract

Given the consistently increasing complexity of interactive entertainment and the sheer volume of titles released yearly, ensuring that video games are efficiently and appropriately rated is a critical endeavor for both developers and publishers. The process traditionally involves manual assessment by industry experts, which can be time-consuming and resource intensive. By harnessing the power of advanced machine learning algorithms, the Predictive ESRB Assessment Tool streamlines the rating prediction process, providing accurate and expedited preliminary ratings for video games. This more contemporary solution not only reduces the time required for developers and publishers to receive crucial ratings but also empowers them to make informed release plans with confidence.

## Glossary

### Entertainment Software Rating Board (ESRB)

A non-profit organization that assigns age and content ratings to video games and apps, indicating their suitability for different audiences.

### Content Descriptors

Specific elements or themes within a video game, such as violence, language, or sexual content that are used by the ESRB to provide additional information about the content of a game.

### Classifier

A machine learning algorithm or model that is trained to classify or categorize data into specific groups or categories.

### Cross-Validation

A technique used in machine learning to assess the performance of a model by splitting the data into multiple subsets for training and testing.

# User Requirements

## Functional: Feedback Submission

“As a user, I want to be able to provide feedback to the system administrators to report issues, offer suggestions, or comment on my experience.”

Users should have the ability to submit feedback through a designated form within the application. Providing a feedback mechanism allows users to communicate their experiences, report issues, and suggest improvements, contributing to the system's overall quality and user satisfaction.

### Acceptance Criteria:

1. The application should include a feedback submission form accessible from the user interface.
2. The feedback form should capture the following information:
   1. User’s name
   2. User’s email address
   3. Feedback category (e.g., bug report, suggestions, general comments)
   4. Detailed feedback or description
   5. Optional file attachment

### Verification:

To ensure that a user has successfully submitted their form, the user will receive a confirmation receipt.

Non-Functional: Transparency & Compliance with User Expectation.

#### Description:

*Transparency should be a key pillar stone in any application and our system will provide clear and understandable explanations as a rubric for what factors may influence ratings. Our goal is to serve information that users will consider useful in understanding rating prediction. The user will also be notified of any content that may be flagged of interest or falls under a high interest category.*

“As a user, I want to have access to clear and understandable explanations regarding the factors that influence the ratings of video games in the system. Additionally, I want the system to flag any content of interest or that falls under high-interest categories and notify me about it. This will help me make informed decisions about the games I engage with.”

Acceptance Criteria:

1. Clear access to explanations
2. Flagging of Content
3. User notification of flagged content
4. User Response
5. Verification of rubric and links for verification

# Verification:

The rubric will match exactly what is documented by the official ratings guide of ESRB. The User will be provided with two links. One link that is reflective of the rubric in our application and another link to the ESRB search, where a game in question can be freely searched to see if the categories of the selected game match with the previously categorized games in the same category.

## Functional: Recommending Games with Similar and Dissimilar Content.

## Description:

*Users will have the ability to receive recommendations for games that have similar content to a selected game and games that do not share similar content. This feature enhances user engagement by suggesting games that align with the user's preferences or offer new experiences.*

“As a user, I want the system to recommend games to me based on content similarity. I want to discover games that share similar themes or characteristics with a selected game, as well as games that offer entirely different content for a varied gaming experience.”

Acceptance Criteria:

1. User is presented with a list of games that share similar/dissimilar content/themes in a user-friendly manner, including game titles and their associated categories.
2. Our system will highlight what features were most important in making the decision.

# Verification:

The user can go to the feedback form and submit a discrepancy, detailing the specifics of their issue which can be later reviewed by the team internally. This relevancy of each game can also be verified on ESRB’s official website, which will be linked, where an end user can filter their game by relevant categories to see if the recommended games are also in that category.

# System Requirements

## Functional: Classify an Arbitrary Game.

## Description:

*The system should be capable of accurately classifying and providing an ESRB rating prediction for any game, including those not present in the system's data set.*

Acceptance Criteria:

1. The system should be able to classify a game with an accuracy greater than 90%. The spec will further clarify how this accuracy is to be achieved, further in the document
2. The system should be able to classify a game within a reasonable amount of time < 5 seconds.
3. The system should be able to make this prediction with high confidence by comparing it to titles already in the system that have similar themes.

Verification:

*To fulfill the acceptance criteria, the system must keep track of relevant fields and their associated categories, highlighting overlap. This can be checked by keeping track of the arbitrary game’s features and finding if the majority of these fields are a subset of a similar game within the system to suggest high confidence. Confidence can be measured by checking the arbitrary game against games with similar themes having an overlap of over 75%. If the overlap is above 75% then it is considered a success.*

*\*Please note that accuracy of prediction does not equal the percentage of overlap. Accuracy can be higher than the amount of overlap given that features in a similar category can lead to the same conclusion, without the need for both to be in the games content descriptors.\**

## Non-Functional: High Accuracy of Game Prediction

## Description:

*The system must achieve a minimum accuracy rate of 90% when predicting ESRB ratings for arbitrary games based on its training data and algorithm. High prediction accuracy is crucial to provide users with reliable information and recommendations for video games, enhancing user satisfaction and trust in the system.*

# Acceptance Criteria:

1. *The system must achieve a game prediction accuracy rate of at least 90% on a representative dataset of diverse games*
2. *The system’s prediction accuracy should remain consistent over time, with minimal fluctuations or degradation.*

# Validation:

Our model will use the longstanding machine learning techniques to ensure that accuracy is up to standard. The model will use cross-validation which will act as a safety check to make sure our predictions are reliable. Imagine you are taking a test and want to know how well you will do. Instead of studying once and hoping for the best, you will take multiple practice tests, each time using different questions. Our model is very much the same. We will split our information into several parts like chapters in a book, then switch out the chapters. As we repeat this process, each time we will evaluate a score of how each performs.

## Functional: Handle Missing Data Fields

## Description:

The system must be able to handle situations where certain data fields are incomplete or missing, ensuring that it can accurately classify games and provide meaningful recommendations, even with limited information.

# Acceptance Criteria:

1. The system will keep a record of what categories are most important in making a decision, determined by how much information gain is acquired from each field during a split.
2. The table must provide the information in a digestible manner to avoid confusion when trying to draw valid conclusions and can be referenced later if needed.
3. The number of missing data fields must be enough to maintain our target accuracy of above 90%.

## Verification:

Given that the data fields for determining a game will be selectable via a dropdown list that is pre-determined by our team, the system will run test cases keeping track of the minimum number of fields required to maintain above our threshold of 90% accuracy via an object table.

## Non-Functional: Scalability

## Description:

The system's scalability ensures that it can handle an increasing volume of game data and user interactions while maintaining optimal performance and responsiveness, thereby accommodating future growth and user demands. Scalability is essential for meeting the growing needs of our user base and game database. It ensures that our system remains efficient and reliable as we expand our services.

# Acceptance Criteria:

1. The system should well under subsequent requests
2. The system’s response time of no more than 5 seconds.
3. As the data set grows the system should continue to maintain fast response time.

# Verification:

We will begin testing the system with a small load and gradually increase over time keeping track of the results. If there are any significant increases in response time we will take note and output this to a form that will allow the team, to analyze and then optimize for retest. Identifying key metrics such as CPU response time and memory utilization will allow our team to identify any bottlenecks.

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Description automatically generated

# A diagram of a company Description automatically generatedFunctional & Non-Functional Mapping