Lab 2 - AskMissy Product Specification Outline

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1. Introduction

The results of COVID-19 have caused a decrease in student test scores as schools transition from face-to-face to remote learning. In the United States, about 55 million students in grades K-12 were forced to transition to online learning (Garcia, 2020). With in-person learning, schools were able to provide the classroom with the necessary resources—such as textbooks—in order to complete their assignments; however, school resources are not as accessible to online learners.

During the pandemic, school systems failed to give online teachers and students daily access to resources normally provided in the classroom. The lack of available resources prevent at-home students from completing their assignments. As a result, testing performance has decreased due to a lack of study materials.

AskMissy is a software application that is programmed to recommend users resources tailored to their needs. This application allows users to efficiently search for resources and displays further recommended resources that could interest the users.

1.1 Purpose

AskMissy is a software application that searches and displays resources based on the user's preferences. Users are able to search for resources pulled from two databases—the AskMissy Library and the local school library. AskMissy can also recommend resources based on the user's preferences using machine learning.

A key feature of AskMissy is the recommendation system— implemented through machine learning. This actively filters through the user's interests and preferences, then displays a selection of resources that the user might be interested in— depending on the ratings of their previously used resources.

AskMissy will not act as a social media platform. The implementation of user and class profiles are intended to create a place where the instructor can group students based on their resource preferences. The group communication aspect is implemented to allow students to communicate with their teacher if they have questions or if they have resources they would like included in their school library. The teacher can then message the librarian for any resource requests or other queries. The AskMissy software application is not intended to be a marketing application. Users are not able to make purchases through AskMissy, but are able to see information about each resource.

1.2 Scope

The AskMissy prototype application will benefit K-12 school systems by showcasing the main objective of the software application—creating an efficient way to find resources online. Users are able to search for resources based on their preferences using the AskMissy search engine, then have the application display the results. This allows users to efficiently search for resources pertaining to what they are looking for without having to look through a list of unrefined resources.

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1.3 Definitions, Acronyms, and Abbreviations

Administrator: A user who is responsible for managing a majority of AskMissy's working data.

Agile: A set of frameworks and practices where solutions evolve through collaboration between self-organizing cross-functional teams.

Acknowledgement: A message delivered to an authenticated user in response to their submitted bug report.

Activity: Any action undertaken by a user in relation to the AskMissy application.

Announcement: A message delivered to lower level users from a higher level user, usually in the case of a Librarian or Teacher to a student.

AskMissy: A software application that will help users find more relevant resources.

AskMissy Library: The total collection of metadata from which other libraries and functions Extract data from.

Application Programming Interface (API): A software intermediary that allows two applications to talk to each other.

Apriori Algorithm: An algorithm designed to find Itemsets in a dataset for boolean association rules. Itemsets are groups of books found to be read together with a high frequency, implying similar future association.

Authenticated User: A user who possesses an account in AskMissy, i.e. not a guest.

Association Rule (Algorithm): A statement that a book or group of books implies the presence of another item with some probability.

Basic Search: A search function that lists the highest rated books based on the search criteria, including genre, author, title, and publication date. This search does not utilize the Apriori Algorithm or any specific school library.

Book Data: Data about a book entry in either a School Library or the AskMissy Library, describing the book's title, author, isbn number, genres, average rating, number of ratings, publication date, original title (if any), and language.

Bug: An error in the AskMissy application that causes it to produce an incorrect result or behave in unintended ways.

Bug Report: A Message from an AskMissy user describing an error they encountered which is delivered to the Administrator.

Bug Report Database: The central repository containing all the bug reports.

Categorize: A feature of the bug reporting system which lets a user assign greater specificity to the nature of a bug.

Classes: The sections of a course that are scheduled for a specific academic year, assigned to Teachers, and include a roster of Students.

Confidence (Algorithm): The ratio of transactions that contain book A and B to transactions that contain book A.

Conviction (Algorithm): The ratio of expected support of book A occurring without book B assuming that books A and B are independent, to the observed support of A occurring without Y.

Courses: The programs of study which the Authenticated Users of AskMissy are enrolled in.

Cascading Style Sheet Revision 5 (CSS5): A style sheet language used for the presentation of documents written in a markup language such as HTML, CSS5 is the fifth version of the original CSS version.

Comma-Separated Values (.CSV): A delimited text file that utilizes commas to separate values.

Current Books: The list of books that an Authenticated User has declared they are actively reading.

Data Retention: The continued storage of an organization's data for compliance or business reasons.

Database: An organized collection of structured information, data, typically stored in a computer system.

Economically Disadvantaged: A student eligible for Free/Reduced Meals who receives Temporary Assistance for Needy Families (TANF) or is eligible for Medicaid.

Exact Match Search: A search for a single specific type of resource.

Extract: To receive or collect data from a data source, usually one of the library databases associated with AskMissy.

Federal School Code: A six digit character code to identify a specific school or educational institute.

Feed Database: The central repository containing group interactions.

Flask: A micro web framework primarily written in Python.

File Server: A device that controls access to separately stored files.

Filter: To specify the results to view from an inquiry.

Goodreads: A subsidiary database of Amazon that stores books, annotations, quotes, and reviews.

Group: A collection of users organized into two possible levels - Classroom or School. Students and Teachers will be part of a classroom group and a school group, Librarians will be part of a school group.

Guest: A user who is not a student, teacher, librarian, or administrator; who has limited access to the AskMissy application.

Hypertext Markup Language Revision 5 (HTML5): A type of markup language primarily used for implementing content in the World Wide Web, this is the fifth version of its original version.

Input: Supplying data to the AskMissy application, or the data being supplied.

Interaction: The means by which one user may share information or otherwise communicate with another user. This may be done predominantly through the use of Messages, unless otherwise specified.

Interests: Aspect of the User Profile based on the user's liked books.

Itemsets (Algorithm): a grouping of books found to be associated with each other across multiple user's past reading.

Lesson Plan: Input supplied by Teachers to the AskMissy application to provide a template set of search parameters which other Authenticated Users may use to perform an AskMissy Search, usually relating to one or more Courses.

Librarian: A user responsible for managing the library's inventory/database, communicating with teachers and students.

Lift (Algorithm): The ratio of observed support of book A and B to the expected support of book A and B.

List (Algorithm): a comma delimited file (.csv) consisting of one or more columns containing one or more entries in the format of rows, with each data form separated by a comma.

JavaScript: A programming language that is used for implementing websites on the World Wide Web.

Machine Learning Training: Training data that shall be used to teach the machine learning model to predict a user's recommended resources.

Message: A communication in the form of a string data type between one or more users.

Metadata: Data that provides information about other data.

Personal Learning: An educational approach that aims to customize learning for each user's strengths, needs, skills, and interests.

Profile: The displayed data for an authenticated user. This data describes the user's type,

Private (Data): Authenticated User Activity which cannot be viewed by other Authenticated Users.

Public (Data): Authenticated User Activity which can be viewed by other Authenticated Users.

Python: A high-level programming language.

Query: An action functions perform to obtain data corresponding to one or more Activities the user is performing.

Rate: A numeric measure of the quality of any given book on a scale from 1 (lowest quality) to 5 (highest quality).

Recommendation: A specific book that a Teacher or Librarian may submit for Students to view.

Request: A Message from a Student to a Teacher or Librarian specifically to bring attention to the Student's desire for a book to be included in the School Library. Individual Requests can also be sent from the Teacher to the Librarian to emphasize the importance of that Request.

Real World Product (RWP): Refers to the physical version of any digital abstraction described within the AskMissy documentation.

Register: The process that a guest user takes to create an account verified by their school's database.

Resolved (Bug Report): Any Bug Report which is marked inactive in the Bug report Database.

Review (Communication): A text assessment submitted by an Authenticated User regarding a particular book.

Review (Administrator): An activity the Administrator User can perform to access the AskMissy data in any form, and make minor modifications according to the context of the documentation.

School Library: The database of books registered in the Real World school.

Standards of Learning (SOL): An examination conducted by Virginia Public Schools that tests the minimum required expectations for every student enrolled in the state of Virginia.

Student: A user studying at a K-12 education institution.

Student Feed: A portion of the user interface that allows student users to view the most recent books read and/or reviewed by their fellow students, and view books specifically recommended by the Teacher assigned to their class.

Support (Algorithm): The ratio of transactions that contain an itemset to all transactions.

Shelves: Term used in the Test Library for attributes that describe a book's subject matter and metadata. Synonymous with Tags.

Short Message: A Message specifically no longer than 200 characters, spaces included.

Submit: The process of Inputting a required data type for the intended process.

Tags: Term used for attributes that describe a book's subject matter and metadata. Synonymous with Shelves.

Teacher: A user who helps K-12 students acquire knowledge. They are responsible for making plans and managing students' groups/communication.

Teacher Feed: A portion of the user interface that allows teachers to view the most recent books read by that teacher's students, and view recommendations by other Teachers and Librarians.

Temporary Assistance for Needy Families (TANF): A program that provides eligible families with a monthly cash payment to meet their basic needs.

Test Library: Database of books, users, shelves/tags, and ratings drawn from the goodbooks-10k GitHub repository.

Tester: A user responsible for designing and conducting testing suites for usability testing.

Unresolved (Bug Report): Any Bug Report which is marked active in the Bug Report Database.

User: An individual using the AskMissy Interface.

User Interface/User Experience (UI/UX): The visual representation of the data AskMissy provides to the user on the user's computer.

View: The current information being displayed in the UI/UX to the user, or the Activity of interacting with the UI/UX.

Web Scraping: The process of extracting content and data from a website.

Web Server: A computer program that distributes web pages as they are requisitioned.

Windows: A series of operating systems developed by Microsoft.

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1.5 Overview

The product specification elucidates the functional requirements to implement the AskMissy software application prototype. The latter sections will provide an overview of each application feature and their individual requirements.

2. General Description

The AskMissy prototype shall be implemented as a web application. The application's prototype shall sufficiently demonstrate its main core features: machine learning training; basic and AskMissy searches; user registration, and source tag development. The live product for recommendations using machine learning—AskMissy's key aspect— shall be partially implemented due to a limited number of reference data required to fully demonstrate this feature. The differences in implementation status should not affect the effectiveness of the prototype demonstration.

2.1 Prototype Architecture Description

The AskMissy prototype shall be implemented using Flask, integrated with PyCharm. The prototype has two developments—the front-end development shall interact with the back-end development. The front-end shall be implemented with HTML5 and CSS5, while python is utilized on the back-end to implement the prototype's functionalities. MySQL is utilized to integrate the databases to the prototype. The major functional components of the prototype are shown in Figure 1.

Figure 1

Prototype Major Functional Component Diagram
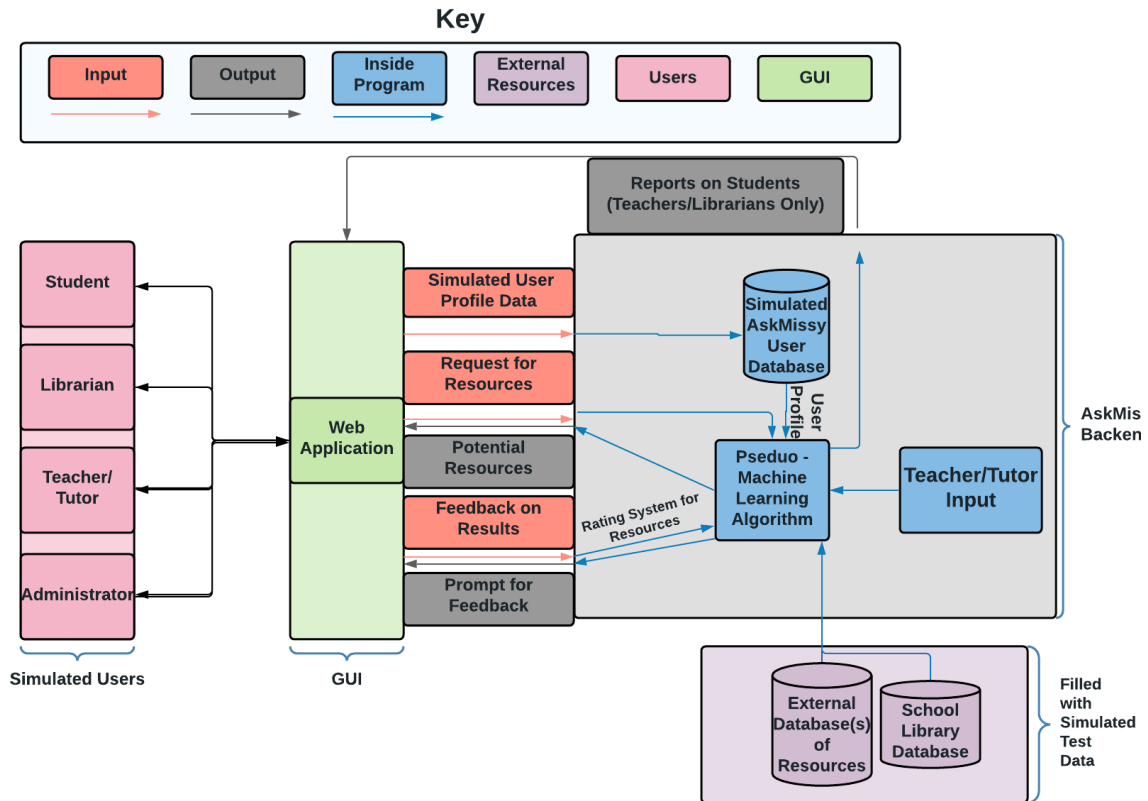
2.2 Prototype Functional Description

The key aspect of the AskMissy prototype shall be fully implemented in the real world product, but partially implemented in the prototype,—due to a lack of user test data. Table 1 explains the features that are partially and fully implemented in the real-world product and the prototype.

Table 1

AskMissy RWP vs. Prototype Feature Description and Implementation

Category	Feature	RWP	Prototype	Reasoning
Data Retrieval	Metadata Report	Full	Partial	Limited test data as a proof of concept
	Basic Search	Full	Full	
	AskMissy Search	Full	Full	
Data Management - Live Product	Machine Learning	Full	Partial	Limited test data as a proof of concept
	Source Tag Creation	Full	Full	
	Source Tag Management	Full	Full	
	Lesson Plans	Full	Partial	Limited test data as a proof of concept
	Internal Database Manipulation	Full	Full	
	External Database Manipulation	Full	Full	
Data Management - Development	Source Tag Development	None	Full	Use to develop default tags
	Machine Learning Training	None	Full	Use to develop algorithm defaults
	Simulated Data	None	Full	Use to fill database with simulated data for testing
	User testing reports	None	Full	Use to develop user interface
Security	Login/Authentication	Full	Partial	Limited test data as a proof of concept
	Data Encryption, moving	Full	None	Best practices will be put in place
	Data Encryption, resting	Full	None	Best practices will be put in place
Account Management	User Profile	Full	Partial	Limited test data as a proof of concept
	Feedback	Full	Full	
	Group Management	Full	Partial	Limited test data as a proof of concept
	Login/registration	Full	Full	

UI	Group Interaction	Full	Partial	Limited test data as a proof of concept
	Bug Report	Full	Partial	Limited test data as a proof of concept
	Basic Search	Full	Full	
	AskMissy Search	Full	Full	
	Communication	Full	Partial	Limited test data as a proof of concept
	Personal Data Report	Full	Partial	Limited test data as a proof of concept

The entirety of the data management development aspect shall be fully implemented—which incorporates the source tag development, machine learning training, simulated data, and user testing reports. Basic and AskMissy searches shall also be fully implemented, as well as the school and AskMissy library databases.

The AskMissy search algorithm relies on the databases in order to filter and display the search results to the user. The machine learning algorithm relies on user interaction to recommend resources back to the user. Due to a lack of user data, the prototype will have partially implemented features; however, it is not required that these features be fully implemented—the prototype can still demonstrate its effectiveness without the use of full implementations.

2.3 External Interfaces

The AskMissy prototype shall utilize specific hardware, software, and user interface requirements for user functionality. The Apriori algorithm is utilized to ensure machine learning functionality. MySQL is used to ensure relational management with the resource and user profile databases.

2.3.1 Hardware Interfaces

The prototype is accessed through any computer running on WindowsOS, macOS, or Linux. The device would need to be able to install different software applications, as well as connect to the internet and access a stable web browser.

2.3.2 Software Interfaces

The software application utilizes multiple software interfaces for the prototype functionality. The prototype needs to run on any computer that runs on Windows, Mac, or Linux operating systems. Flask shall be used to attach the code to a web browser on the front-end of the application as opposed to the command line. PyCharm is utilized on the back-end application to implement the prototype code. AskMissy can eventually be implemented onto a virtual machine to make the prototype accessible to the developers and testers.

2.3.3 User Interfaces

The AskMissy prototype is accessed on a modern web browser. The web browser application shall have the navigation on the top of the page. The application displays the home page, browse, login, and register screens. Each registered user—student, teacher, or librarian— shall have separate user interfaces. Appendix A below shows the site map of the AskMissy Prototype.

Appendix A - Site Map