

Lab 1 - AskMissy Product Description

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1. Introduction

A student's ability to find resources suitable for them is essential to not only their individual growth academically but contributes to the success of their school. The Standards of Learning exams, or SOLs, mark the performance of middle and high school students in subject areas like reading, math, and science for that given year of school. SOL scores will contribute to whether a school maintains a certain level of accreditation that passes educational standards and the student pass rates determine their academic needs are being fulfilled in the classroom. In light of the impact of the pandemic, the inequities between the students are made more apparent as educators and the Virginia Department of Education work to close the gaps (VDOE, 2021).

Without a proper way to search for resources needed for the SOL exams, students with a lack of learning materials that are not well suited to their academic needs are held back as they underperform on these SOLs. Their interest for learning wanes as students struggle to find resources that fit their specific learning preferences, whether that student lacks the resources provided to start with or the student lacks the knowledge on how to properly search for specific resources for their course/classes.

A solution is needed where students can easily find the resources necessary to bridge the gap between conventional learning and digital learning. Students can address their lack of a personalized learning experience in the form of an application that offers a more personalized experience for students in finding resources called AskMissy. AskMissy is a software application that will apply machine learning tactics towards the association of the user's input in personalized searches that are specific to the user and the tags assigned to each resource. This will aid in helping users of the application achieve more precise results with each iterative use as

the software learns to provide appropriate recommendations of resources, which can help students gain useful searching habits. With this software being integrated into the school, teachers and librarians play a role as they use the application to post lesson plans, make recommendations and create groups that apply the best fit to what the student is currently learning. AskMissy will be offered to students in grades 6-12 to help them boost their preparedness for SOLs.

2. AskMissy Product Description

AskMissy is a web based software application created to help users search for useful and well founded resources. With a device that has internet access, a user who is registered through the school can make a user profile capable of operating searches. The searches are backed by a resource tagging system that uses machine learning to pair that user with recommendations tailored to what the user searched for.

The overall goal of this software solution is to improve a student, teacher, or librarian's approach to finding resources they need; since the software will also inherently build and grow one's searching skills as they find success in their searches. Academically, this solution works to indirectly improve the student's reading comprehension when they build a habit of reading every time they use this application. Having students build healthier reading habits leads to the end goal of having positive effects on future SOL preparedness by those students acquiring the lesson specific academic materials needed.

2.1 Key Product Features and Capabilities

Any guests of the AskMissy application who have not made an account have the option to create one, given they have a working school ID; otherwise, they find out that guest users without a profile will only be able to use basic searches for resources found in the database. As a web based application, AskMissy users will have the ability to access the application inside and outside of the school system through their school login information.

The authentication process of non-registered users will be straightforward as they are referred to as guests in the system but will oftentimes have limited features that they can use. Guest users could also be first time users that are able to but have not yet made a profile. Reducing the number of anonymous users and restricting their access around the AskMissy search feature will make it so unregistered users cannot hamper the machine learning search algorithms.

Once registered, that registered user can authenticate their account through the school system and have access to the AskMissy searching algorithms. The system will have three different school users being students, teachers and librarians.

For students, they will have access to the application's built in search algorithms, the ability to share resources they have found helpful with other users, and the ability to private message their teachers and librarian users. Students will also be able to view any publicized reviews on a resource made within their respective class/course groups.

For teachers, they will have all the previous features, in addition to the ability to create and manage class/course groups, and create and manage their own lesson plans. Teachers will be able to request resources for students and request resources from the school librarians. The last

feature for teachers is their access to their own students' resource reviews within their own respective class/course groups.

For librarians, they will have all previous student and teacher features. Librarians will have the ability to maintain and update their current school library inventory within AskMissy, as they also receive lists of requests for resources by students and teachers which can be managed through the application. Librarians can contact administrators for any technical issues with the AskMissy application's functions or data.

Administrators will also be included as users but not within the school system. Administrators will have the highest access in the AskMissy application as they secure all data and maintain external databases—and the access to them. They will be given access to all user profiles and any metadata linked to the profiles in the case something goes wrong and must be updated or wiped. Administrators will authorize librarians to create their own school groups. Administrators of the application are separate from school administrators but can contact the school administrators for any data requests.

AskMissy offers a feedback and ratings system for the resources recommendations. After each resource recommendation, a prompt regarding the feedback on that resource will become available to the user. The feedback given on a successful or unsuccessful result will be fed into the machine learning algorithm to associate an experience between a user and a resource they searched for. The overall rating of a specific resource will not affect a user's personal profile recommendations, as it is intended to keep the user's search specific and personalized to them.

The internal database of AskMissy applies to any data stored by the school, whether that be the school library inventory and resources—which is managed by the librarians—or any user

information, which is managed by the administrators. Administrators manage an external database that keeps track of the appropriate external resources. Resources are collected with identifiers such as their ISBNs for books. Any synopsis or metadata are also collected through working web scraping APIs and language recognition.

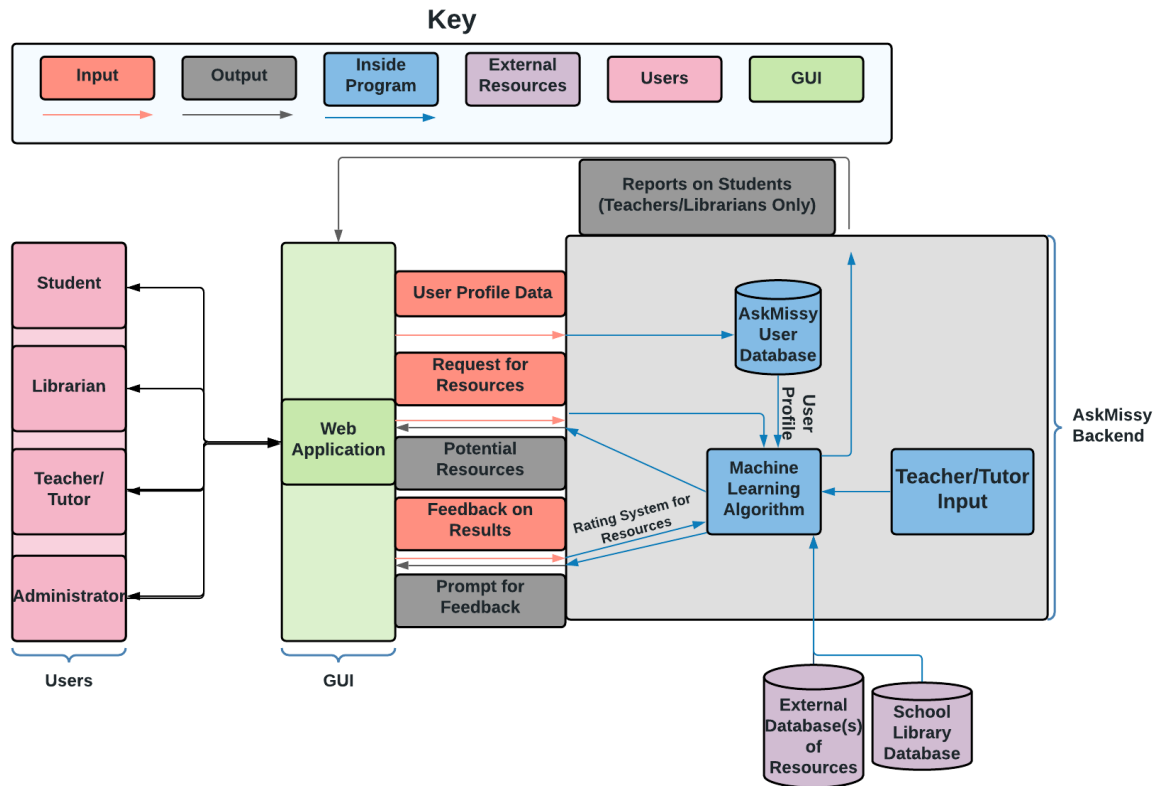
There are two current machine learning algorithms in AskMissy that will dictate how the personalized search results are linked to previous recommendations to the user by the tags listed and the feedback and rating algorithm. As a learning system, the more the software is used and fed data, then the system can approach accurate resource results.

2.2 Major Components (Hardware/Software)

The hardware required by the user will be a device capable of supporting modern internet access and a browser. Five servers are needed to provide for the AskMissy application to function. Those five servers will be the frontend server, a main backend server, a web scraping backend server, a machine learning backend server, and a main database backend server. Figure 1 shows the major function component diagram and all the interactions between the components making up the AskMissy application.

Figure 1

AskMissy Major Functional Component Diagram



The software and languages required for AskMissy will be the use of HTML5, CSS3 and JavaScript for the frontend, since the application will be web based. The backend will be established in Python. The IDE chosen for a group wide coding environment will be PyCharm with a GitLab repository. Databases will be stored in a mySQL database. The machine learning and natural language processing algorithms will be written in Python.

3 Identification of Case Study

AskMissy is targeted towards users who are students in grades 6-12, as the intent for the application is to target SOL based learning by providing students with a personalized resource finding tool. The resources found through the AskMissy search feature will help students prepare for upcoming SOL exams. Teacher and librarian users are also integrated into the application,

working alongside students, while also looking for resources that are best suited for their own lesson plans and library catalogs respectively.

The machine learning algorithms nested in the AskMissy application will be trained enough to accurately learn a student's personal resource preferences, as well as appropriately match resources to their current profiles. Enabling teachers and librarians to have access to the application will also give them insight on which resources are helpful in improving academic performance. These resources are suggested directly to students or ordered for the library.

AskMissy will ultimately extend its usefulness to resource publishers who want attention to their resources and any new editions. Student's parents could also find the AskMissy effective for their kids and explore the benefits of personalized resources at home.

4 Product Prototype Description

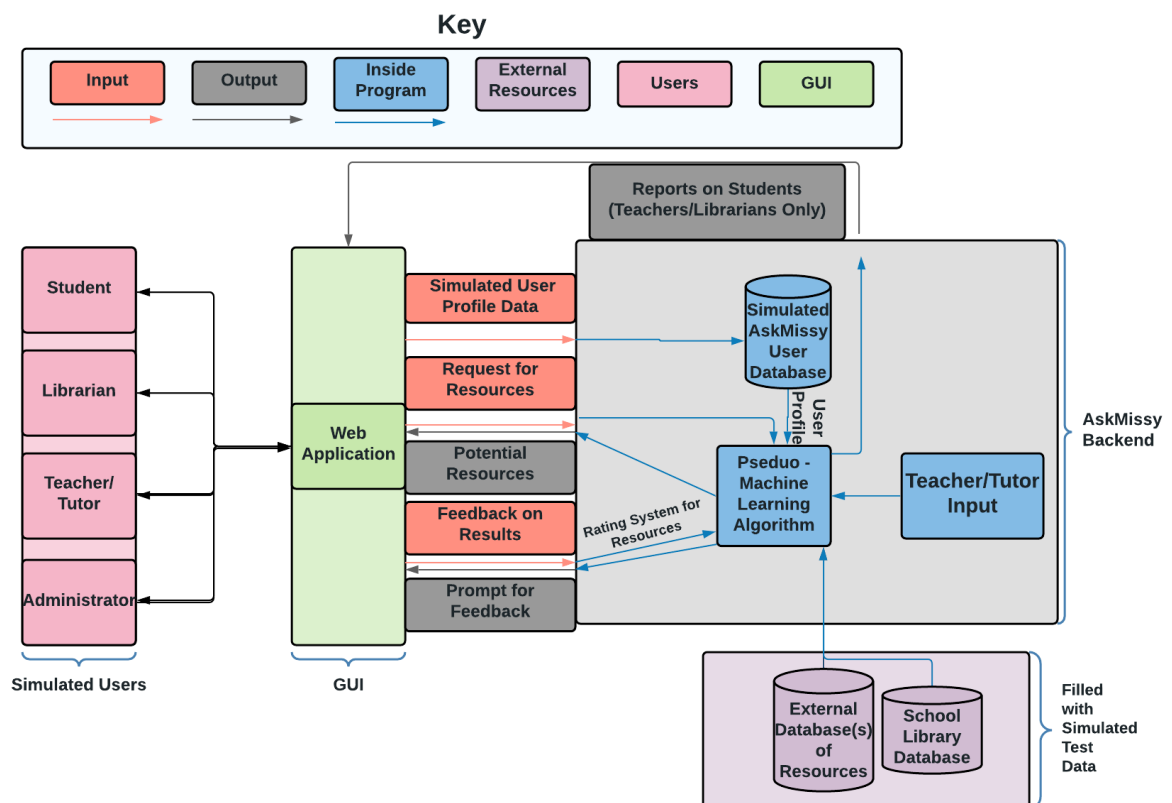
AskMissy supports users—guests, students, teachers, librarians, admins, and testers—through the application's strong, working search functionality and associative machine learning techniques. The AskMissy prototype will demonstrate its features on a reduced scale of fabricated user data and a reduced book library, while still implementing how the aforementioned user types will communicate and access the app and how the inner systems—like the front end, back end, algorithm logic, and testing suite—interact with one another. The prototype will show little to no implementation of security features due to best practices brought forth in the real world product.

4.1 Prototype Architecture

The AskMissy prototype will use no specialized hardware other than access to the internet and computer. The prototype will be loaded into a provided ODU Computer Science Department virtual machine. The software for the prototype will use Git for the version control, GitLab for the repository, and PyCharm Community Edition for the coding environment. Front end software used are still HTML5, CSS3, and JavaScript. The machine learning algorithms will be implemented with the tools known as Pandas, NumPy, SciPy, Matplotlib and Jupyter Notebook.

Figure 2

AskMissy Prototype Major Functional Component Diagram



The major functional component diagram for the prototype remains the same except for the databases filled with simulated test data to represent real live data and switching to pseudo-machine learning algorithms in the back end. While the prototype isn't using real machine learning, it will still be able to demonstrate the real-world features on the limited test data set in the MySQL libraries as a proof of concept.

4.2 Prototype Features and Capabilities

The AskMissy prototype will retain its core functionality of personalizing recommendations to the user, enabling inter-user resource sharing, and utilizing the default source tag-creation algorithms not implemented in the full product.

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Table 1*AskMissy Real World Product (RWP) vs. Prototype - Key Features*

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

Although the AskMissy prototype won't implement full machine learning found in the real world product, the source tag development and a large supply of test data should supplement and display what the features are meant to demonstrate.

4.3 Prototype Development Challenges

A challenge to the AskMissy application is the knowledge that comes behind learning the skills towards implementing the machine learning algorithms correctly. Another challenge is ensuring the data for the prototype can be manipulated and parsed through. Populating a large data set with mock test data will be valuable as the prototype will not have access to real student data but will work to closely simulate it.

5 Glossary

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.

Algorithm: A finite sequence of defined instructions, mainly used to solve a class of problems or perform a computation.

Amazon Relational Database (RDS): A database web-service run by Amazon on a cloud, designed to simplify the setup, operation, and scaling of relational databases in applications.

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

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

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.

Flask: A web framework written in Python to allow for prototyping.

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

GitLab: A single application platform that allows for collaborative development.

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

Graphical User Interface (GUI): A graphics-based operating system interface that utilizes icons, menus, and a mouse to interact with the program.

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

Machine Learning: The study of computer algorithms that improve automatically through the use of data provided.

MySQL: An open-source relational database management system.

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

PyAutoGUI: A cross-platform automation module written in Python.

PyCharm: An integrated development environment (IDE) written in Python that is used for computer programming.

Python: A high-level programming language used for programming and developing software applications.

Real World Product (RWP): The fully implemented, final product for AskMissy.

Student: A user studying at grades 6-12 in need of reliable resources.

Teacher: A user who helps students in grades 6-12 acquire knowledge. They are responsible for making plans and managing students' groups/communication.

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

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

User: An individual using the AskMissy Interface.

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.

6 References

- Albanese, A. (2021, May 6). *Report urges library leaders to address decline in public library usage stats*. PublishersWeekly. Retrieved December 15, 2021, from <https://www.publishersweekly.com/pw/by-topic/industry-news/libraries/article/86256-report-urges-library-leaders-to-address-decline-in-public-library-usage.html>
- “Allreaders.com features detailed book and movie reviews from many different genres of books!,” *Detailed Book review summaries*. Retrieved September 22, 2021, from <http://allreaders.com/>.
- “Amazon.com: Kindle eBooks: Kindle Store: Nonfiction, Literature & Fiction, Foreign Languages, Business & Money & More,” *Amazon*, Retrieved October 01, 2021, from <https://www.amazon.com/Kindle-eBooks/>
- Coates, T. (2021). *Freckle report 2021: Digital or diverse?- the future for public libraries*. Tim Coates Books.
- Crain, C., & Waldman, K. (2018, June 14). *Why we don't read, revisited*. The New Yorker. Retrieved September 22, 2021, from <https://www.newyorker.com/culture/cultural-comment/why-we-dont-read-revisited>.
- Ellard, C. (2020). *Covid-19 impact on Sol Assessments, verified credits, and graduation requirements for Spring/Summer 2020*. Newport News Public Schools. Retrieved December 14, 2021, from <http://sbo.nn.k12.va.us/sol/covidimpact.html>

Fuglei, M. (2019, July 22). *Why students who read for pleasure are stronger academically.*

ResilientEducator. Retrieved October 1, 2021, from

<https://resilienteducator.com/classroom-resources/how-reading-for-pleasure-helps-students-develop-academically/>.

Garcia, E., Weiss, E., & Welshans, I. (2020, October 7). *What teaching is like during the pandemic-and a reminder that listening to teachers is critical to solving the challenges the coronavirus has brought to public education.* Economic Policy Institute. Retrieved October 7, 2021, from

<https://www.epi.org/blog/what-teaching-is-like-during-the-pandemic-and-a-reminder-that-listening-to-teachers-is-critical-to-solving-the-challenges-the-coronavirus-has-brought-to-public-education/>.

GeeksforGeeks. (2020, August 29). *5 most-recommended career fields in computer science.* GeeksforGeeks. Retrieved January 25, 2022, from

<https://www.geeksforgeeks.org/5-most-recommended-career-fields-in-computer-science/>.

Gelles-Watnick, R., & Perrin, A. (2021, September 21). *Who doesn't read books in*

America? Pew Research Center. Retrieved September 22, 2021, from

<https://www.pewresearch.org/fact-tank/2021/09/21/who-doesnt-read-books-in-america/>.

Gioia, D. (n.d.). Reading at Risk. Washington D.C., Virginia ; National Endowment for the Arts. https://www.arts.gov/sites/default/files/RaRExec_0.pdf

Henry. (2021, May 27). *The importance of Reading* Retrieved September 22, 2021, from

<https://www.uopeople.edu/blog/why-its-important-to-read/>

Ingraham, C. (2018, June 29). *Leisure reading in the U.S. is at an all-time low*. The

Washington Post. Retrieved September 22, 2021, from

<https://www.washingtonpost.com/news/wonk/wp/2018/06/29/leisure-reading-in-the-u-s-is-at-an-all-time-low/>

“Meet your next favorite book,” *Goodreads*. Retrieved October 01, 2021, from

<https://www.goodreads.com/>

Frequently asked questions about Sol testing. Virginia Department of Education. (2015,

October). Retrieved October 7, 2021, from

https://www.doe.virginia.gov/testing/sol_faq.pdf.

Rosalina, E. N. (2018, November 30). *The correlation between self-esteem and student's reading comprehension*. English Language Teaching Educational Journal. Retrieved

October 1, 2021, from

<https://eric.ed.gov/?id=EJ1283078>

What should I read next? book recommendations from readers like you. What Should I

Read Next? (n.d.). Retrieved January 25, 2022, from

<https://www.whatshouldireadnext.com/>

Virginia Department of Education. (n.d.). *Sol Test Pass Rates & other results*.

Retrieved October 7, 2021, from

https://www.doe.virginia.gov/statistics_reports/sol-pass-rates/index.shtml.