Instrument Recognition Software

CSULB 491B Computer Science Senior Project II

Product Requirements Document

Target Release	1.0
Document Status	Finalized
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1. Objective:

Vision	*The Instrument Recognition Software aims to be a two-dimensional product aimed at both sorting mass amounts and precisely labeling audio data.*
Goals	*Our product is expected to recognize specified instruments at a minimum 90% accuracy threshold for commercial interests by the completion of the senior design course.*
Initiatives	*High accuracy for trained labels.* *Reasonable processing time for identification.* *Can be repurposed for various audio types.*
Persona(s)	*Enterprises: Organizations looking for precise, customizable audio recognition for professional use.*

2. Release

Release	*Instrument Recognition Software v1.0*
Date	*5/8/2020*
Initiative	*High accuracy for trained labels* *Reasonable processing time for identification*
Milestones	*91-96% accuracy with <10 second response time for single entry evaluation.*
Features	*Desktop client runnable with a single click.* *Server connected with client that hosts the machine learning model and allows for the upload of user files.* *User Interface capable of displaying audio, graphs, and labels.* *Six pretrained labels for monophonic sound recognition.* *Login system capable of encrypting user passwords.*
Dependencies	*JDK 8* *Python 3*

3. Features

Feature	*Easy use Desktop Application*
Description	*A desktop application accessible by using a single click.*
Purpose	*To simplify and streamline the product for professional distribution.*
User problem	*Employees using the product in a work environment may not have an understanding of computer science or training with the product.*
User value	*Removes the need for employee training and reduced the possibility of user error.*
Assumptions	*The necessary dependencies have been installed.*
Not doing	*N/A*
Acceptance criteria	*A fully function desktop application runnable with a single click.*

Feature	*Server-Client Interaction*
Description	*The software client should be able to upload files to and receive data from a dedicated server that hosts the machine learning model.*
Purpose	*Audio recognition of personal files through predefined labels. Computed on a different machine than the client.*
User problem	*The customer's computer should not be responsible for handling the intense computation required for label assignments and should be able to do it on their own data.*

User value	*Offloading of computational burden means that the software can be run on machines with lower hardware requirements on their own data.*
Assumptions	*The customer does not want to have the computation done on their machine and has their own data to evaluate.*
Not doing	*Permanent server availability.*
Acceptance criteria	*A server capable of labeling uploaded files is available upon release.*

Feature	*User Interface Display*
Description	*A user interface that can play the audio from a clip, display the PSD graph generated, and provide the correct label for it.*
Purpose	*To display information to the user that is associated with the audio they are processing.*
User problem	*The user should have descriptive data available to them about the desired file besides the name and the label.*
User value	*The user can appreciate the evaluation strategy by observing the process as well as check their files easily when evaluating large datasets.*
Assumptions	*The user wants to see more data then just the label for the file.*
Not doing	*Anything other than the tasks specified in the description.*
Acceptance criteria	*The correct sound byte, PSD graph, and label can be displayed for each uploaded file.*

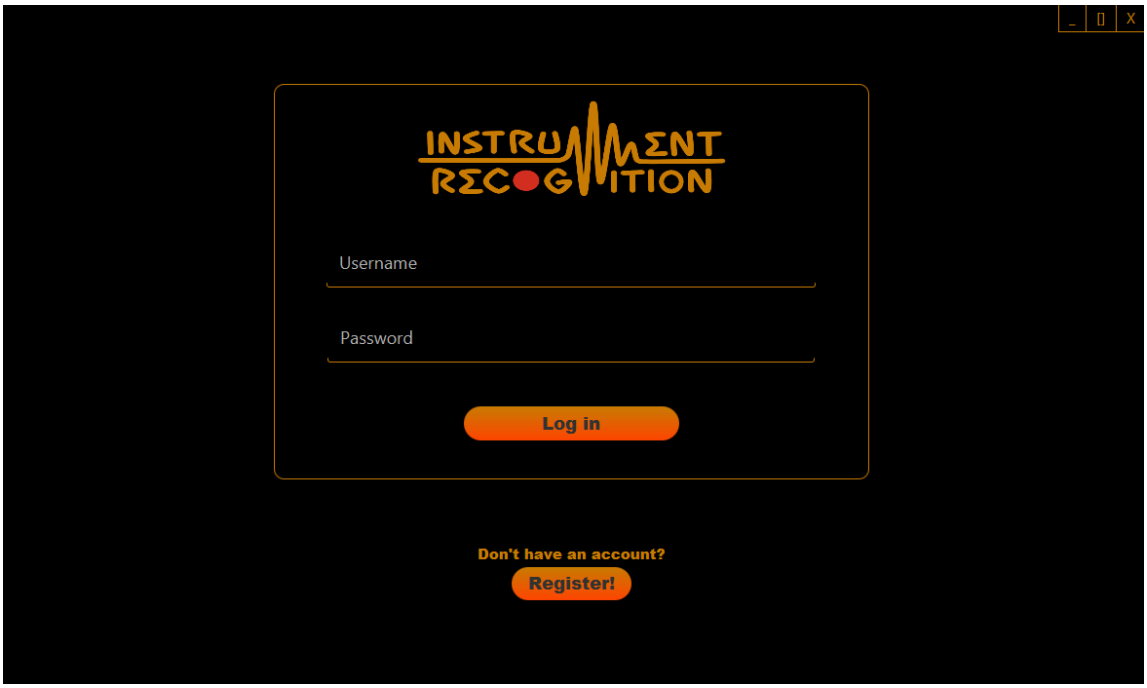
Feature	*Audio Recognition Accuracy*
Description	*As an enterprise, we would like to consistently identify complex audio signals in a large set of data using an algorithm to avoid human evaluation.*
Purpose	*Audio recognition through predefined labels.*
User problem	*The current level of technology has not caught up to the enterprises' need and human evaluation is either not efficient or possible.*
User value	*Automates evaluation of data to alleviate human workload or identify patterns undetectable by humans.*
Assumptions	*The enterprise will be requiring this service frequently and the data is at least of .wav quality.*
Not doing	*The feature only pertains to audio that can generate a unique Power Spectral Density graph.*
Acceptance criteria	*A minimum of 90% accuracy on a testing set of at least 100 samples.*

Feature	*Login System*
Description	*A fully functional login system using encrypted passwords stored on a database.*
Purpose	*To add individuality to user accounts and protect their security.*
User problem	*Different users may wish to interact with only their own data and need a way to be associated with their uploaded files*
User value	*Allows the client to tailor the displayed data to a specific user.*

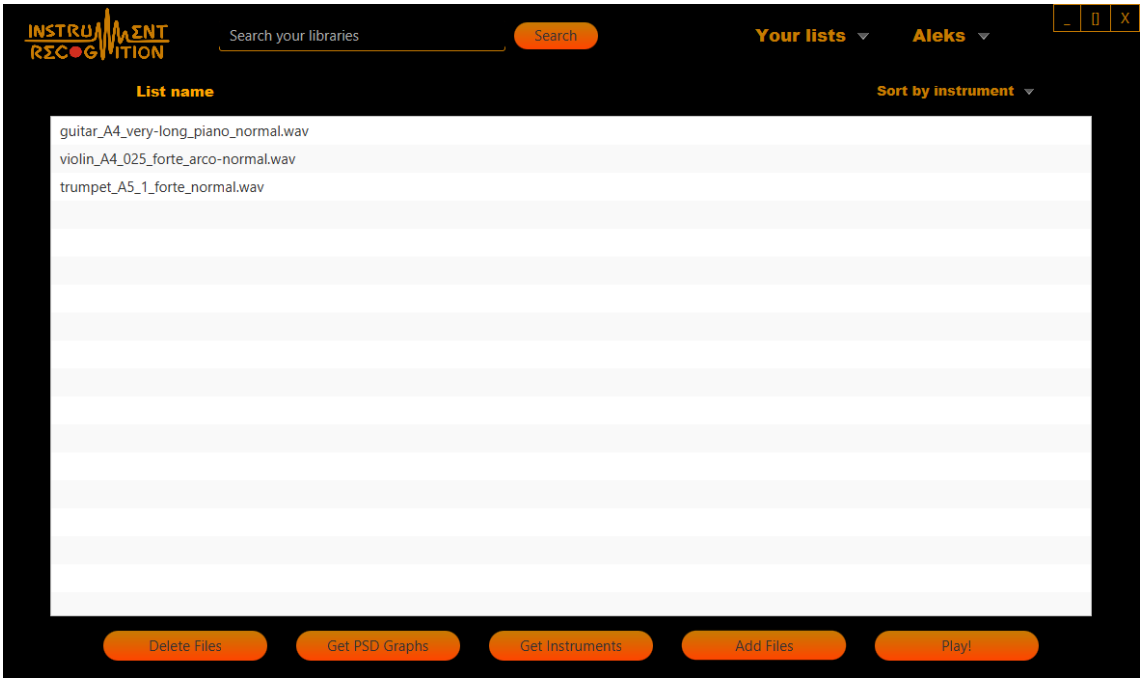
Assumptions	*All uploaded data is not intended to be shared with everyone using the product.*
Not doing	*Providing server space to "remember" users after logging off and retaining their uploaded data.*
Acceptance criteria	*An application that only displays data to the user who uploads it if multiple sessions are running at once.*

4. User Flow and Design

Login Page



Home Page



5. Analytics

Key performance indicator	Baseline	Target	Timeframe
We believe validation set accuracy will guarantee a standard level of accuracy in the product.	70%	90%	Achievable by 5-8-20
We believe an elegant CNN model will achieve a fast computational speed for a trained model.	<15 seconds	10 seconds	Achievable by 5-8-20
We believe a solid theoretical foundation that unique PSD graphs can be used to identify unique sound sources is applicable to other mediums besides instruments	1 additional medium	3 additional mediums	TBD

6. Future Work

Future features	Purpose	Priority	Timeframe
Polyphonic music labeling	Allows for more practical application of the software due to accepting a wider variety of inputs.	Medium	8/1/2020
Fault tolerance recognition	Showcases a valuable application of the product not associated with instruments.	Medium	6/1/2020
Additional, more complex instrument options	Increase the application of the project.	Low	6/1/2020