

# **American Sign Language Practice Website**

## **UCS 503 Software Engineering Project Report**

### **END-Semester Evaluation**

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# **ASL Practice Website Using OpenCV And Django**

## **Background/ Problem Statement**

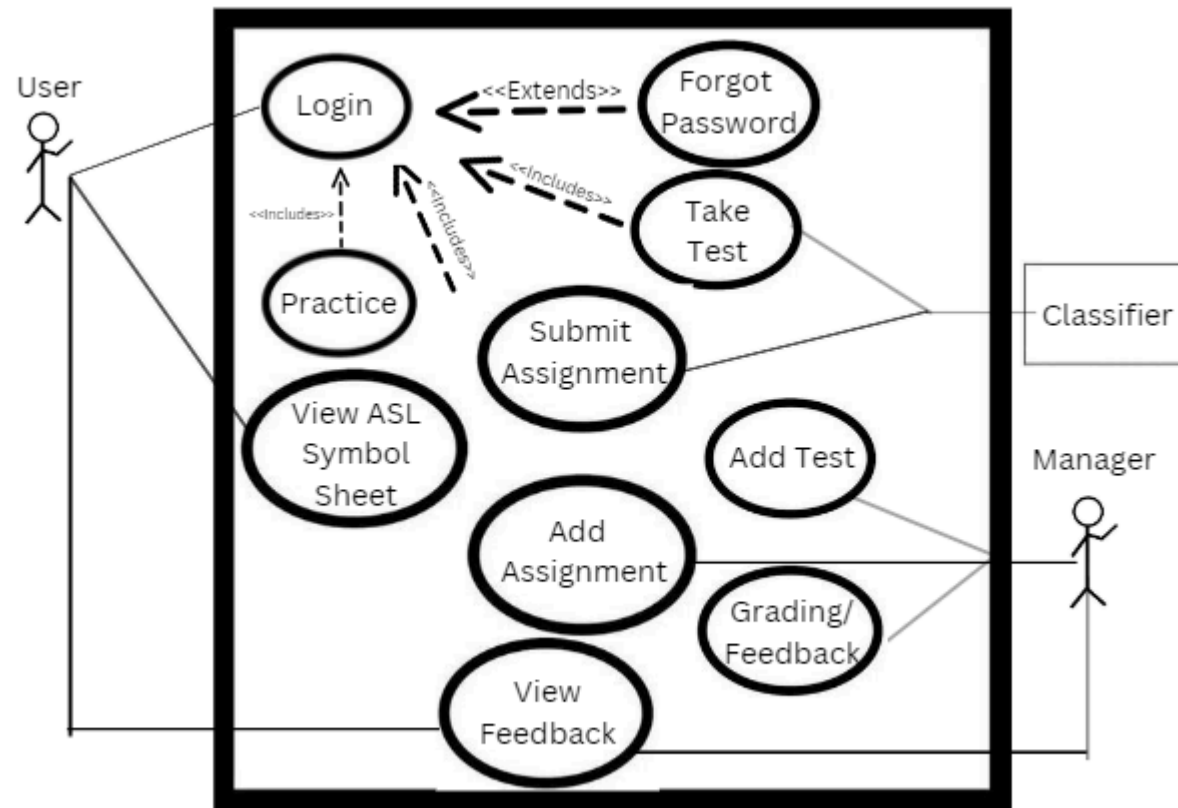
The system of American Sign Language has been around since the 1800s and has been a versatile medium of communication for the deaf and people with hearing impairments. Its main advantages are that it has been improved and optimized over the 300+ years it has been used as well as the fact that it can be performed with one hand.

This project intends to increase the awareness about ASL and to provide a platform for users to learn & practice basic ASL symbols. It aims to make sign language a widespread and commonly known way of communication.

The project employs a classification mode that would be trained on ASL symbols of both hands. It identifies the symbol performed by capturing the spatial position of landmarks on a person's hand/palm and displays an output.

The implementation of the project would feature a website where the users can practice by logging in after signing up and allow the website to access their camera. Certain tests and assignments would also be provided for users to test their knowledge to improve their future performance.

## Use-case Diagram



### Use-case Templates:

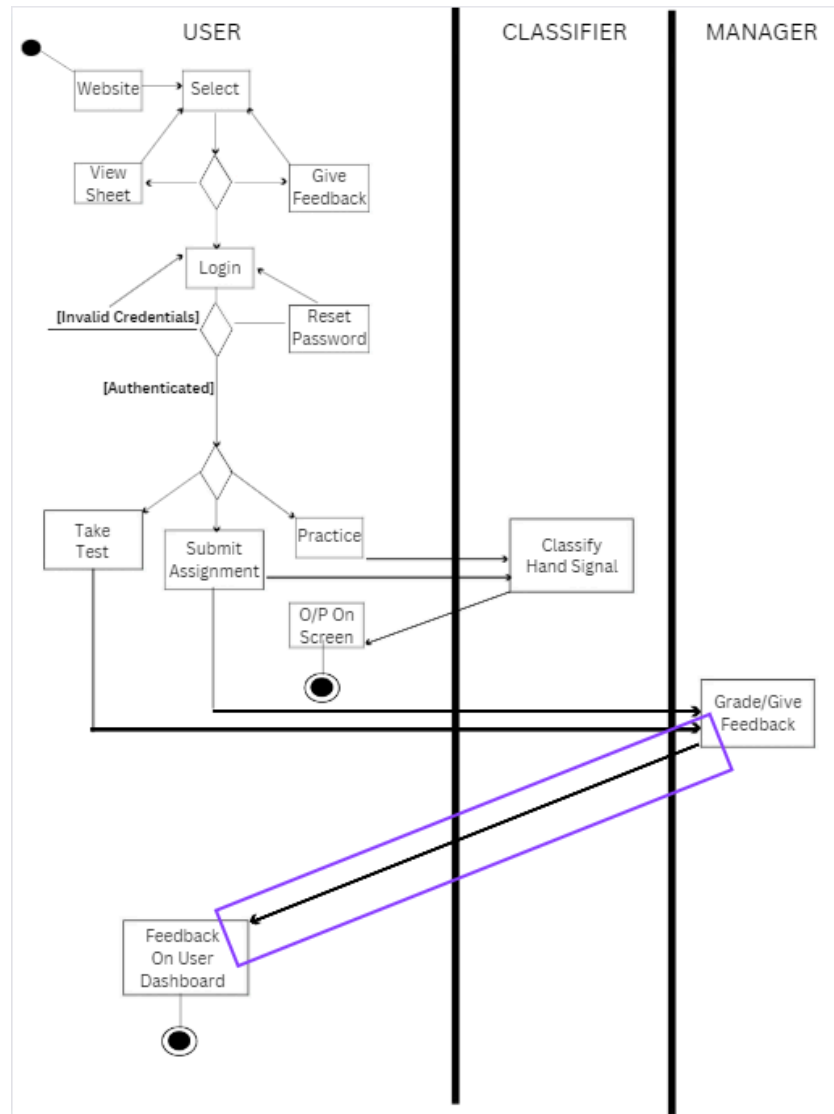
1. Use Case Title	Practice of ASL Hand Symbols
2. Abbreviated Title	Prac ASL
3. Use Case Id	1
4. Actors	Users
<b>5. Description</b> Users will be able to see a window with their camera feed and perform any hand signal which the classifier will classify and output on the screen	
<b>5.1. Pre Conditions:</b> Logged-in + Camera Access	
<b>5.2. Task Sequence</b> User will allow camera access and hold up the hand symbol they want to practice.	
<b>5.3. Post Conditions:</b> Real-time output from the classifier will be shown on their screen	
<b>6. Modification History:</b> N/A	
<b>7. Author:</b> Avirat Sharma	

1. Use Case Title	Submit Assignment
2. Abbreviated Title	Sub_Assn
3. Use Case Id	2
4. Actors	Users,Maintainer
<b>5. Description</b> Users can submit a screenshot of them holding up the hand symbol corresponding to the question by placing their hand in a pre-defined area.	
<b>5.1. Pre Conditions:</b> Logged-in + Camera Access	
<b>5.2. Task Sequence</b> A user can hold up a symbol in a pre-defined box and then click submit and the screenshot will be sent to the backend.	
<b>5.3. Post Conditions:</b> Classifier verifies the output and added feedback from the manager is uploaded to user dashboard	
6. Modification History:	N/A
7. Author:	Avirat Sharma

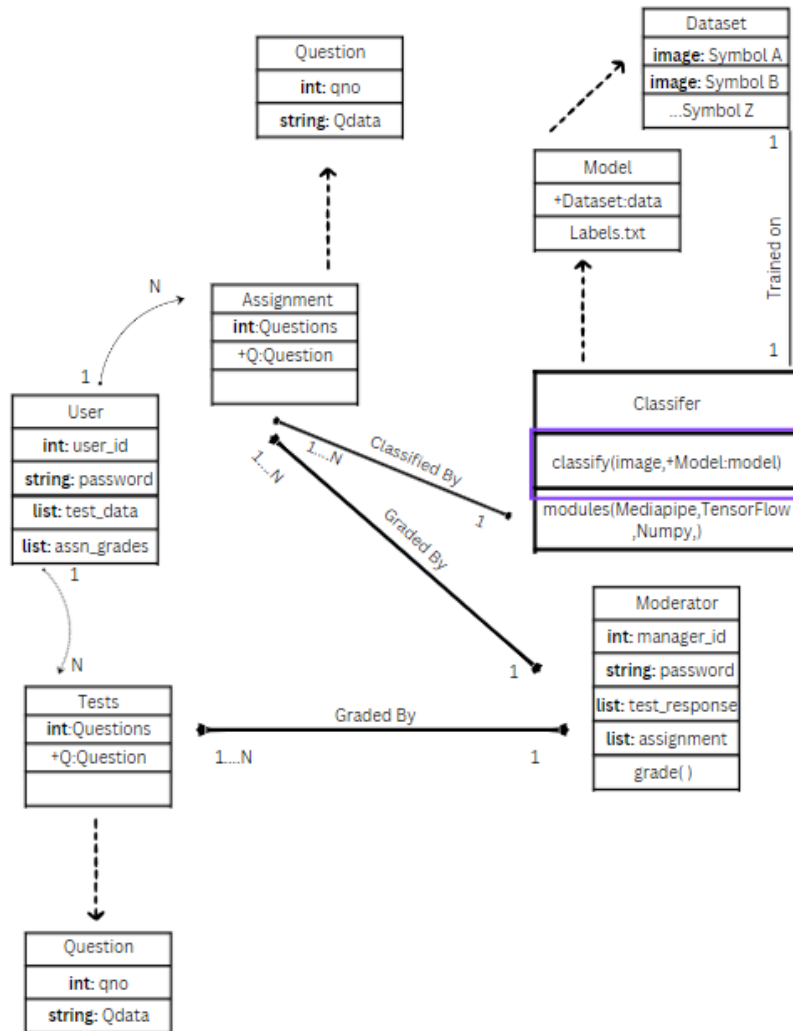
1. Use Case Title	Submit Assignment
2. Abbreviated Title	Sub_Assn
3. Use Case Id	2
4. Actors	Users,Maintainer
<b>5. Description</b> Users can submit a screenshot of them holding up the hand symbol corresponding to the question by placing their hand in a pre-defined area.	
<b>5.1. Pre Conditions:</b> Logged-in + Camera Access	
<b>5.2. Task Sequence</b> A user can hold up a symbol in a pre-defined box and then click submit and the screenshot will be sent to the backend.	
<b>5.3. Post Conditions:</b> Classifier verifies the output and added feedback from the manager is uploaded to user dashboard	
6. Modification History:	N/A
7. Author:	Avirat Sharma



## Activity Diagram

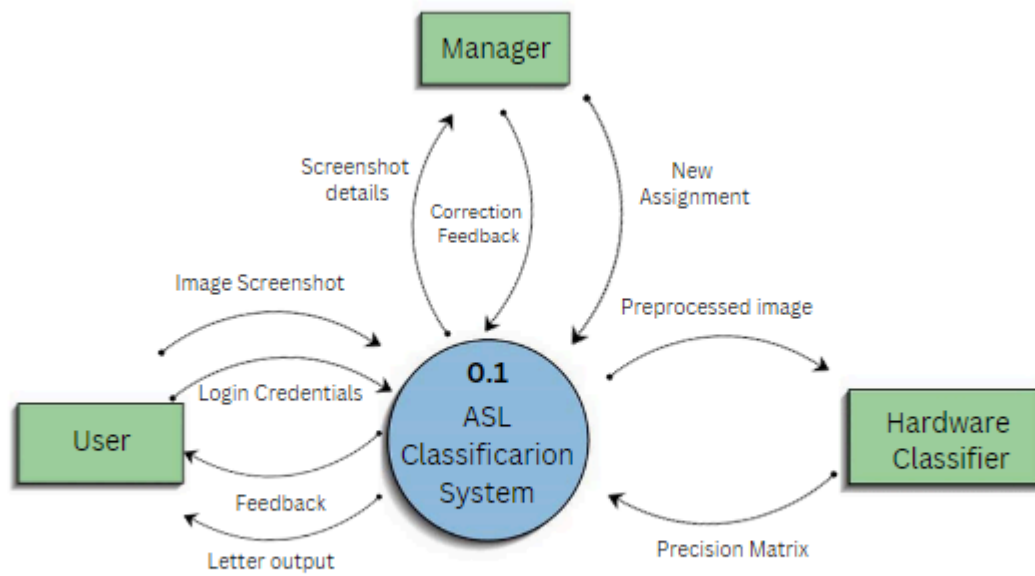


## Class Diagram

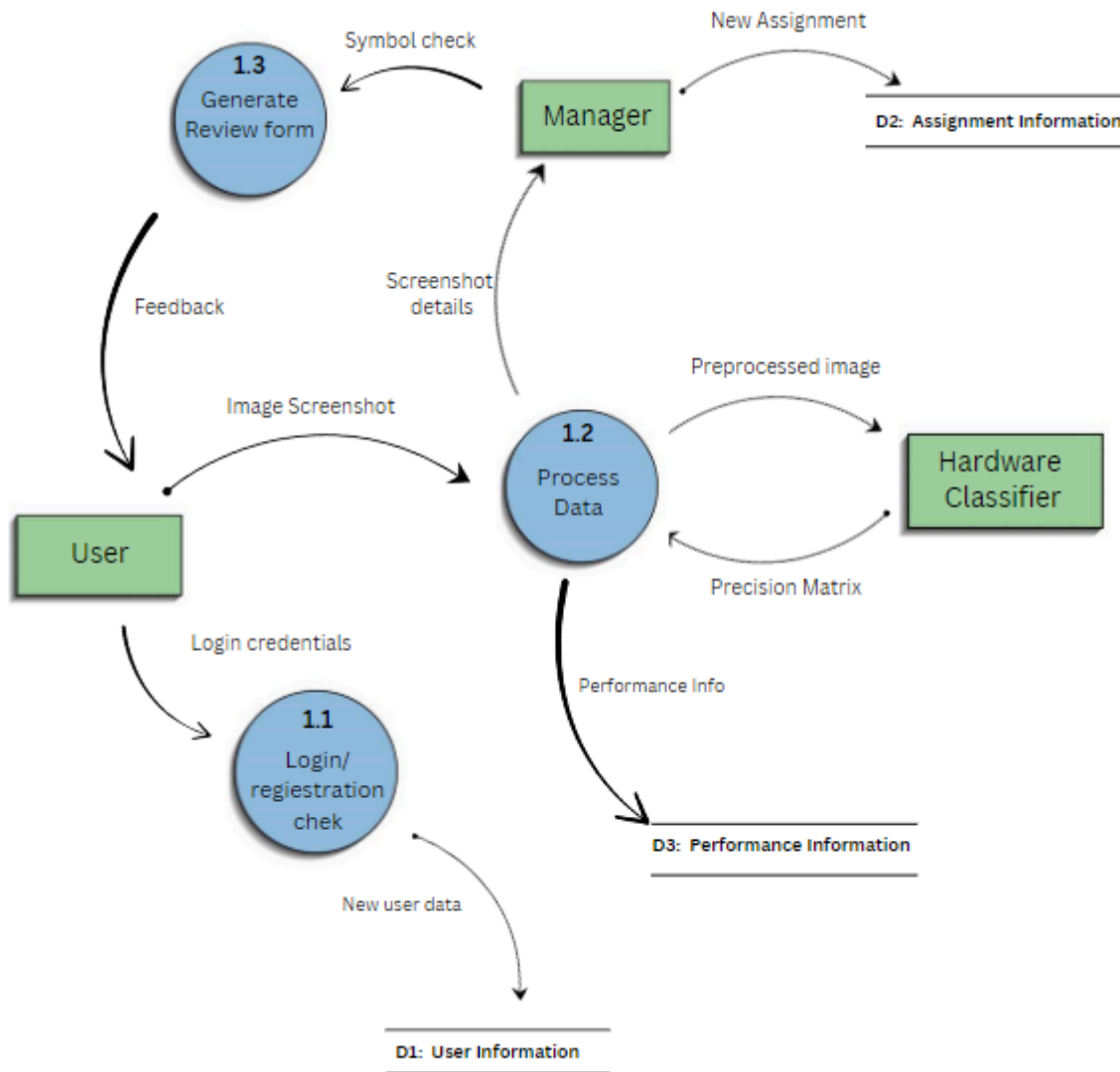


## Data Flow Diagram

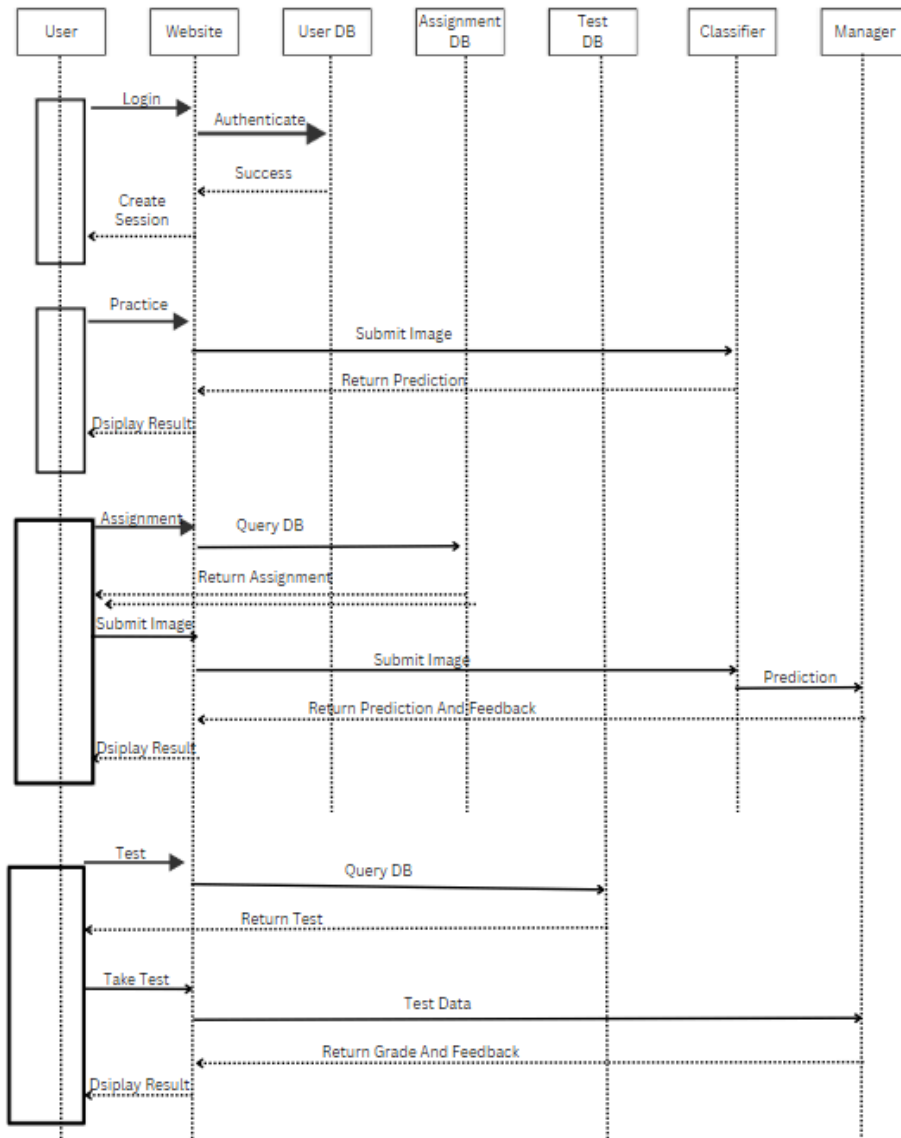
### Level 0:



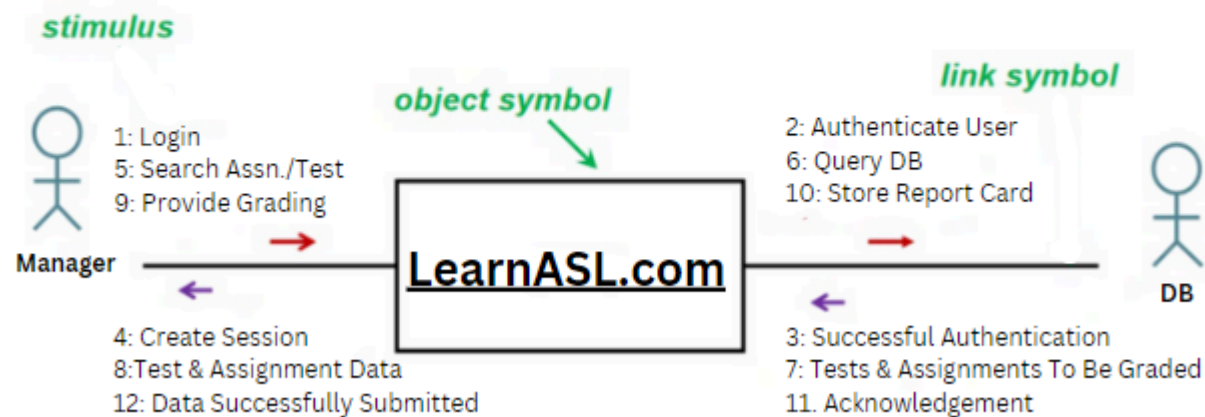
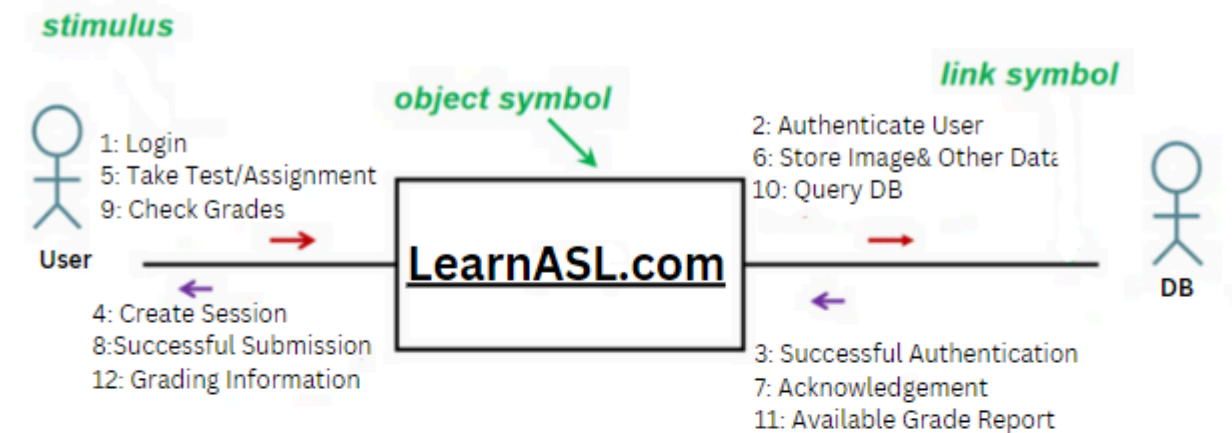
## Level 1:



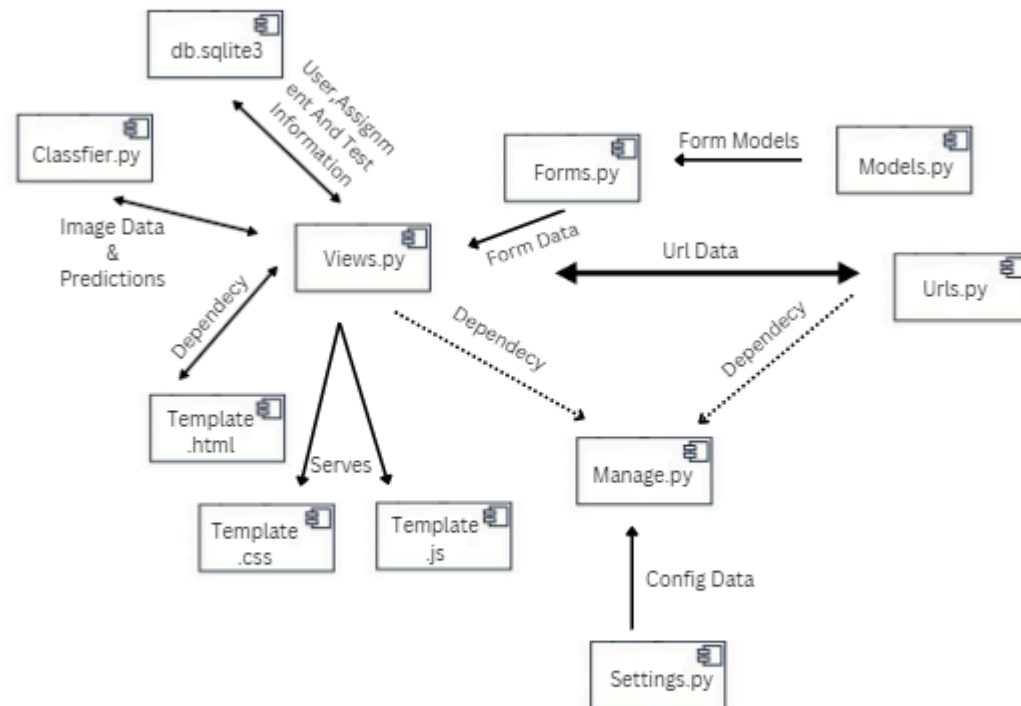
## Sequence Diagram



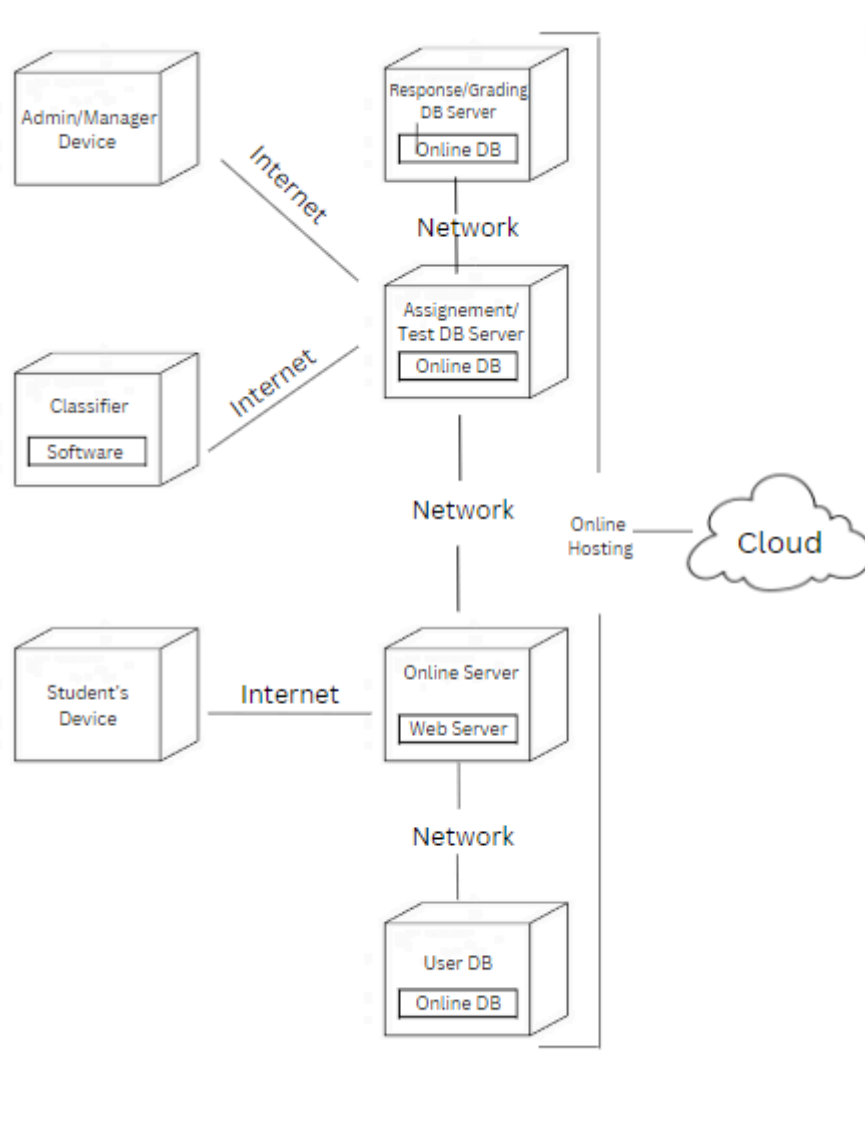
## Collaboration Diagram



## Component Diagram



## Deployment Diagram





## Testcases

### Test Case 1:

<b>Test Case #:</b> 1	<b>Test Case Name:</b> Logging In	<b>Page:</b> 1
<b>System:</b> User DB Server	<b>Subsystem:</b>	
<b>Designed by:</b> Avirat Sharma	<b>Design Date:</b> 26-10-2023	
<b>Executed by:</b>	<b>Execution Date:</b>	
<b>Short Description:</b> Login Credential Verification		

<b>Pre-Conditions:</b> <ol style="list-style-type: none"> <li>1. User has an account on LearnASL.com</li> <li>2. User enters correct email and password</li> </ol>
--

Step	Action	Expected System Response	Pass/ Fail	Comment
1	User is shown the login form	Website loads login form		
2	User enters correct pwd and email	Website displays information filled in the form		
3	Click Login Button	Login credentials are verified with user DB		
4	Verification is received	User is logged in		

<b>Post-conditions</b> <ol style="list-style-type: none"> <li>1. User is assigned a token and a session is created</li> <li>2. User is redirected to home page</li> </ol>
---

## Test Case 2:

**Test Case #:** 2

**Test Case Name:** Incorrect Credentials

**Page:** 1

**System:** User DB Server

**Subsystem:**

**Designed by:** Avirat Sharma

**Design Date:** 26-10-2023

**Executed by:**

**Execution Date:**

**Short Description:** Login Credential Verification

**Pre-Conditions:**

1. User enters incorrect email and password

Step	Action	Expected System Response	Pass/ Fail	Comment
1	User is shown the login form	Website loads login form		
2	User enters wrong pwd and email	Website displays information filled in the form		
3	Click Login Button	Login credentials are verified with user DB		
4	Erroneous response is received	Alert is displayed for incorrect details above Login form		

**Post-conditions**

1. User is assigned a token and a session is created

## Test Case 3:

**Test Case #:** 3

**Test Case Name:** Forgot Password

**Page:** 1

**System:** User DB Server

**Subsystem:**

**Designed by:** Avirat Sharma

**Design Date:** 26-10-2023

**Executed by:**

**Execution Date:**

**Short Description:** Resetting Password

### Pre-Conditions:

1. User has an account on LearnASL.com
2. User wants to change the password of their account.

Step	Action	Expected System Response	Pass/ Fail	Comment
1	User is shown the login form	Website loads login form		
2	User clicks forgot password	Website loads forgot password form		
3	User enters their email	Email is verified with User DB		
4	Verification is received	Password reset email is sent to the user's email		
5	User enters reset code in the form	New password form is loaded		
6	User enters a new password	Password has been updated in the DB		

### Post-conditions

1. User's password has been reset.

## Test Case 4:

**Test Case #:** 4

**Test Case Name:** Sign Up

**Page:** 1

**System:** User DB Server

**Subsystem:**

**Designed by:** Avirat Sharma

**Design Date:** 26-10-2023

**Executed by:**

**Execution Date:**

**Short Description:** Signing Up

**Pre-Conditions:**

1. User does not have an account on LearnASL.com
2. User enters valid email

Step	Action	Expected System Response	Pass/ Fail	Comment
1	User is shown the sign-up form	Website loads sign-up form		
2	User enters a valid email and pwd	Website displays information filled in the form		
3	Click Sign-Up Button	DB checks if email does not belong to another account		
4	Acknowledgement is received	A new account is created		

**Post-conditions**

1. A new account is created with the credentials that the user entered

## Test Case 5:

<b>Test Case #:</b> 5	<b>Test Case Name:</b> Invalid Credentials	<b>Page:</b> 1
<b>System:</b> User DB Server	<b>Subsystem:</b>	
<b>Designed by:</b> Avirat Sharma	<b>Design Date:</b> 26-10-2023	
<b>Executed by:</b>	<b>Execution Date:</b>	
<b>Short Description:</b> Invalid Credentials		

<b>Pre-Conditions:</b>
1. User does not have an account on LearnASL.com
2. User enters wrong email or password

Step	Action	Expected System Response	Pass/Fail	Comment
1	User is shown the login form	Website loads login form		
2	User enters invalid credentials	Website displays information filled in the form		
3	Click Login Button	Login credentials are verified with user DB		
4	Erroneous response is received	Alert is displayed "Account DNE or incorrect password"		

<b>Post-conditions</b>
1. User is redirected to login page

## Test Case 6:

<b>Test Case #:</b> 6	<b>Test Case Name:</b> Account In Use	<b>Page:</b> 1
<b>System:</b> User DB Server	<b>Subsystem:</b>	
<b>Designed by:</b> Avirat Sharma	<b>Design Date:</b> 26-10-2023	
<b>Executed by:</b>	<b>Execution Date:</b>	
<b>Short Description:</b> Signing up with an email associated with another account		

<b>Pre-Conditions:</b>
1. User enters an email already linked with another account

Step	Action	Expected System Response	Pass/Fail	Comment
1	User is shown the sign-up form	Website loads sign-up form		
2	User enters a used email and pwd	Website displays information filled in the form		
3	Click Sign-Up Button	DB checks if email does not belong to another account		
4	Erroneous Response	Alert : "This email is linked with an existing account"		

<b>Post-conditions</b>
1. User is redirected to the sign-up page

## Test Case 6:

<b>Test Case #:</b> 7	<b>Test Case Name:</b> Password Rules	<b>Page:</b> 1
<b>System:</b> User DB Server	<b>Subsystem:</b>	
<b>Designed by:</b> Avirat Sharma	<b>Design Date:</b> 26-10-2023	
<b>Executed by:</b>	<b>Execution Date:</b>	
<b>Short Description:</b> User does not follow password rules		

<b>Pre-Conditions:</b> <ol style="list-style-type: none"> <li>1. User has an account on LearnASL.com</li> <li>2. User is resetting their password</li> </ol>
--

Step	Action	Expected System Response	Pass/Fail	Comment
1	User is shown the reset pwd form	Website loads rest pwd form		
2	User enters erroneous password	Website displays information entered in the form		
3	Clicks Submit	Password rules are verified accordingly		
4	Error is received	Alert : "Follow the abovementioned password rules"		
5				
6				

<b>Post-conditions</b> <ol style="list-style-type: none"> <li>1. User is redirected to reset password form.</li> </ol>
--

## Test Case 7:

**Test Case #:** 7

**Test Case Name:** Password Rules

**Page:** 1

**System:** User DB Server

**Subsystem:**

**Designed by:** Avirat Sharma

**Design Date:** 26-10-2023

**Executed by:**

**Execution Date:**

**Short Description:** User does not follow password rules

### Pre-Conditions:

1. User has an account on LearnASL.com
2. User is resetting their password

Step	Action	Expected System Response	Pass/ Fail	Comment
1	User is shown the reset pwd form	Website loads reset pwd form		
2	User enters erroneous password	Website displays information entered in the form		
3	Clicks Submit	Password rules are verified accordingly		
4	Error is received	Alert : "Follow the abovementioned password rules"		
5				
6				

### Post-conditions

1. User is redirected to reset password form.



## Test Case 8:

**Test Case #:** 8

**Test Case Name:** ASL Sheet

**Page:** 1

**System:**

**Subsystem:**

**Designed by:** Avirat Sharma

**Design Date:** 26-10-2023

**Executed by:**

**Execution Date:**

**Short Description:** Viewing ASL sheet

**Pre-Conditions:**

Step	Action	Expected System Response	Pass/ Fail	Comment
1	User clicks on view ASL sheet button	The image is enlarged and displayed on the screen		
2				
3				
4				
5				
6				

**Post-conditions**

1. User can view the image of the ASL sheet on their screen.

## Test Case 9:

<b>Test Case #:</b> 9	<b>Test Case Name:</b> Hand Missing	<b>Page:</b> 1
<b>System:</b> Classifier	<b>Subsystem:</b>	
<b>Designed by:</b> Avirat Sharma	<b>Design Date:</b> 10-11-2023	
<b>Executed by:</b>	<b>Execution Date:</b>	
<b>Short Description:</b> No Hand Detection		

<b>Pre-Conditions:</b>
1. User is logged in
2. User has accessed the assignment
3. Classifier does not read user's hand

Step	Action	Expected System Response	Pass/ Fail	Comment
1	User is presented with assignment	Website loads the appropriate assignment		
2	User submits the image of their hand	Server sends the image to classifier.py file		
3	Erroneous response is received	Alert is displayed "No hand detected"		
4				
5				
6				

<b>Post-conditions</b>
1. An alert is displayed on the screen about the lack of hand detection

## Test Case 10:

<b>Test Case #:</b> 10	<b>Test Case Name:</b> Hand Detection	<b>Page:</b> 1
<b>System:</b> Classifier	<b>Subsystem:</b>	
<b>Designed by:</b> Avirat Sharma	<b>Design Date:</b> 10-11-2023	
<b>Executed by:</b>	<b>Execution Date:</b>	
<b>Short Description:</b> Classification of Hand Signal		

<b>Pre-Conditions:</b>
1. User is logged in
2. User is taking the assignment
3. Classifier reads user's hand

Step	Action	Expected System Response	Pass/Fail	Comment
1	User clicks the assignment question	Website loads the assignment		
2	User submits a picture of their hand	Server sends the image to the classifier.py file		
3	Response: "Data received"	Server returns the output from the classifier on the screen		
4				

<b>Post-conditions</b>
1. User has the output of the hand signal on their screen

## Test Case 11:

<b>Test Case #:</b> 11	<b>Test Case Name:</b> Invalid Credentials	<b>Page:</b> 1
<b>System:</b> User DB Server	<b>Subsystem:</b>	
<b>Designed by:</b> Avirat Sharma	<b>Design Date:</b> 26-10-2023	
<b>Executed by:</b>	<b>Execution Date:</b>	
<b>Short Description:</b> Invalid Credentials		

<b>Pre-Conditions:</b>
1. User does not have an account on LearnASL.com
2. User enters wrong email or password

Step	Action	Expected System Response	Pass/Fail	Comment
1	User is shown the login form	Website loads login form		
2	User enters invalid credentials	Website displays information filled in the form		
3	Click Login Button	Login credentials are verified with user DB		
4	Erroneous response is received	Alert is displayed "Account DNE or incorrect password"		

<b>Post-conditions</b>
1. User is redirected to login page

## Test Case 12:

<b>Test Case #:</b> 12	<b>Test Case Name:</b> Assingment Feedback	<b>Page:</b> 1
<b>System:</b> Assignment DB Server	<b>Subsystem:</b>	
<b>Designed by:</b> Avirat Sharma	<b>Design Date:</b> 26-10-2023	
<b>Executed by:</b>	<b>Execution Date:</b>	
<b>Short Description:</b> Grading Assignment		

<b>Pre-Conditions:</b>
1.User fills out the assignment form correctly
2. Manager is assigned to grade a specific assignment

Step	Action	Expected System Response	Pass/ Fail	Comment
1	Manager is shown assiignment data	Websiite loads relevant assignment data		
2	Manager checks the image submitted	Website serves image from media folder		
3	Manager fills out feedback field	The data is saved in the DB		
4	The data is sent to the dashboard	The assignment data is displayed on the feedback		

<b>Post-conditions</b>
1. User can view the feedback on the dashboard page

## Test Case 13:

<b>Test Case #:</b> 13	<b>Test Case Name:</b> Test Feedback	<b>Page:</b> 1
<b>System:</b> Assignment DB Server	<b>Subsystem:</b>	
<b>Designed by:</b> Avirat Sharma	<b>Design Date:</b> 26-10-2023	
<b>Executed by:</b>	<b>Execution Date:</b>	
<b>Short Description:</b> Grading Test		

**Pre-Conditions:**

1. User fills out the test form correctly
2. Manager is assigned to grade a specific test

Step	Action	Expected System Response	Pass/ Fail	Comment
1	Manager is shown test data	Website loads relevant test data		
2	Manager checks the zip file submitted	Website serves image from media folder		
3	Manager fills out feedback/grade field	The data is saved in the DB		
4	The data is sent to the dashboard	The test data is displayed on the feedback		

**Post-conditions**

1. User can view the feedback on the dashboard page

## Test Case 14:

<b>Test Case #:</b> 14	<b>Test Case Name:</b> No image in form	<b>Page:</b> 1
<b>System:</b> Image DB Server	<b>Subsystem:</b>	
<b>Designed by:</b> Avirat Sharma	<b>Design Date:</b> 26-10-2023	
<b>Executed by:</b>	<b>Execution Date:</b>	
<b>Short Description:</b> No image submitted		

<b>Pre-Conditions:</b> 1. User fills out the form without an image
---

Step	Action	Expected System Response	Pass/Fail	Comment
1	User is shown relevant image form	Website loads form		
2	Website checks if image field is filled	Website gives a erroneous response		
3	Error is received	System displays error "image field is mandatory"		

<b>Post-conditions</b> 1. User is shown the relevant error on the form
---

## Test Case 15:

<b>Test Case #:</b> 15	<b>Test Case Name:</b> Test Feedback	<b>Page:</b> 1
<b>System:</b> Assignment And Test DB Server	<b>Subsystem:</b>	
<b>Designed by:</b> Avirat Sharma	<b>Design Date:</b> 26-10-2023	
<b>Executed by:</b>	<b>Execution Date:</b>	
<b>Short Description:</b> Grading Test		

### Pre-Conditions:

1. User is logged in
2. User is on dashboard page

Step	Action	Expected System Response	Pass/ Fail	Comment
1	User navigates to dashboard page	Website loads dashboard.html		
2	User checks tables for data	Website queries assignment and test DB		
3				
4				

### Post-conditions

1. User can view the relevant test and assignment data on the dashboard.



## Test Case 16:

<b>Test Case #:</b> 16	<b>Test Case Name:</b> Logout	<b>Page:</b> 1
<b>System:</b> User DB	<b>Subsystem:</b>	
<b>Designed by:</b> Avirat Sharma	<b>Design Date:</b> 26-10-2023	
<b>Executed by:</b>	<b>Execution Date:</b>	
<b>Short Description:</b> Logging Out		

**Pre-Conditions:**  
1.User has logged in

Step	Action	Expected System Response	Pass/ Fail	Comment
1	User clicks logout option	Website checks if user is logged in		
2	Successful logout response	User's session is terminated		
3				
4				

**Post-conditions**  
1. User is redirected to the home page.

