

RajaMark User Manual

Documentation

Version: 0.1

Status: Pending review from S&C team

Date: 2024/04/28

Table of Content

Introduction.....	3
Getting Started.....	3
Operating System Requirements.....	3
Installation Steps.....	3
Account Setup.....	4
Register.....	4
Login.....	5
Forget Password.....	6
Logout.....	7
Features.....	10
Exam Creation.....	10
Edit Examination.....	12
View Exam's details.....	13
Manage student's answer.....	14
Upload Sample Answer.....	16
Upload Student Answer.....	20
Image Preprocessing.....	23
Score Calculation and Reporting.....	25
Troubleshooting.....	26
Common Issues.....	26
Solutions.....	26
Support Contact.....	26
Best Practices.....	27
Grading Tips.....	27
Accuracy Recommendations.....	30
Glossary.....	31
Appendix.....	32
Frequently Asked Questions.....	32

Introduction

Meet RajaMark, your reliable helper to automate the grading of multiple-choice question (MCQ) answer sheets. By leveraging Tesseract OCR for handwritten text recognition and OpenCV for image preprocessing, RajaMark can swiftly and accurately interpret handwritten answers (A-E) beside question numbers. This automation eliminates the tedious and error-prone manual grading process, making it ideal for educational institutions seeking a more efficient grading solution.

In addition to grading, RajaMark offers tools to compile class results, allowing educators to aggregate individual scores and generate comprehensive reports on class performance in quizzes and tests. This feature helps teachers quickly identify trends and areas for improvement, streamlining the assessment process. Overall, RajaMark is a valuable resource for schools and universities aiming to improve the speed and accuracy of MCQ evaluation while reducing the workload on educators.

Getting Started

Operating System Requirements

RajaMark requires (either one):

- the 64-bit version of Microsoft Windows 10 or later. These versions of Windows should include the required [Windows PowerShell](#) 5 or later.
- macOS 10.15 (Catalina) or later. This guide presumes your Mac runs the [zsh](#) as your default shell.
- Debian Linux 11 or later and Ubuntu Linux 20.04 LTS or later.
- ChromeOS.

Installation Steps

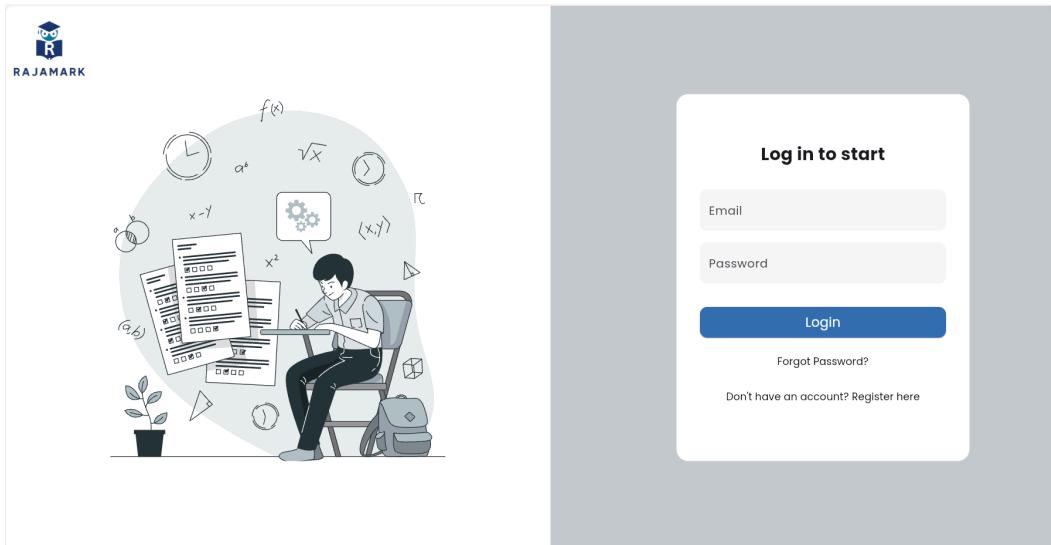
To install RajaMark:

1. Click [here](#) to access our Google Drive.
2. Download the .exe file.
3. Click the .exe file and allow it to make changes to your computer for execution.
4. You are all set.

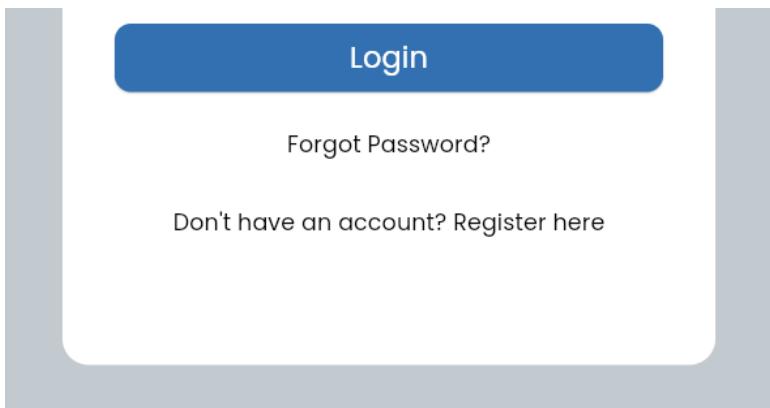
Account Setup

Register

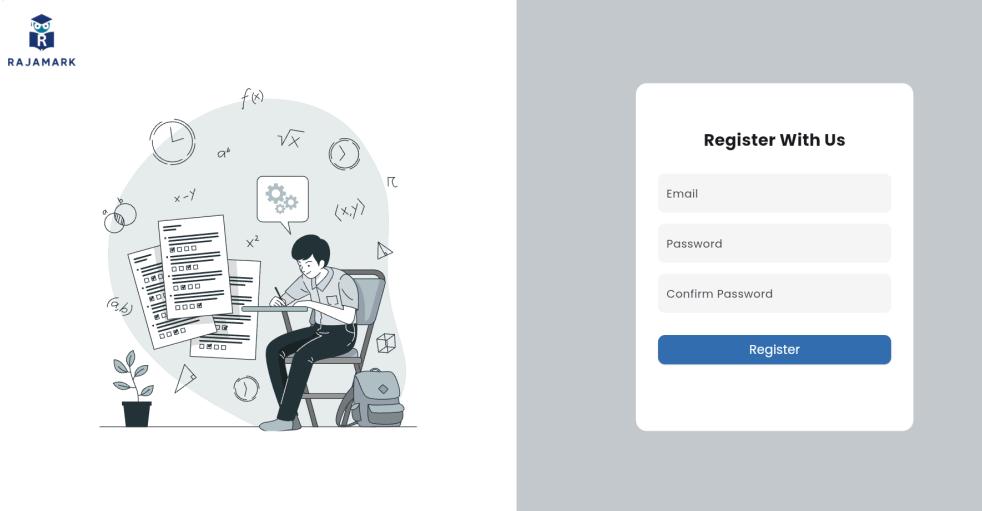
- Upon first launch into the system, you will be asked to enter your email and password to log into your existing account in the Login page.



- If you have not set up an account before, click the "Don't have an account? Register here" button. If you have already registered an account, go to [Login](#).



- You will be asked to give your email and password that you intend to use. Upon completing the registration, you will have to enter your password once again for confirmation.



4. Click the “Register” button once you have filled up the required information for registration.
5. You will be redirected to the [Login](#) if you have registered successfully.

Login

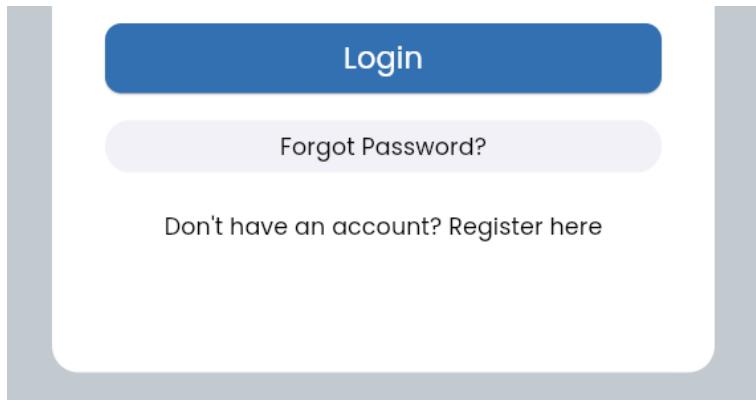
1. In the Login page, fill in your email or username and password then click on the “Log in” button.

The image shows a login interface with a light grey background. At the top center is the text 'Log in to start'. Below it are two input fields: one for 'Email' and one for 'Password', both with placeholder text. A large blue 'Login' button is centered below the fields. To the right of the 'Forgot Password?' link, there is a 'Don't have an account? Register here' link.

2. If you have forgotten your password and wish to create a new one, proceed to [Forgot Password](#).

Forget Password

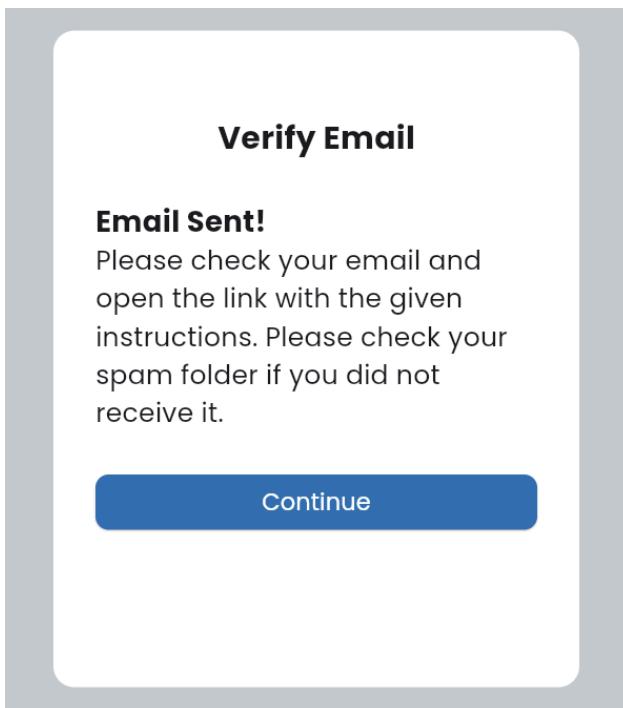
1. Click on the “Forgot Password?” button.



2. Enter your registered email address to receive a password reset link to change your password.

The image displays a "Forgot Your Password?" form. It features a large central rectangular area with rounded corners. Inside this area, at the top, is the text "Forgot Your Password?". Below this is a horizontal input field with the placeholder "Email". At the bottom of the central area is a blue rectangular button labeled "Change Password". The entire form is enclosed in a thick gray border.

3. You will be shown with this message if you have entered a valid email address.

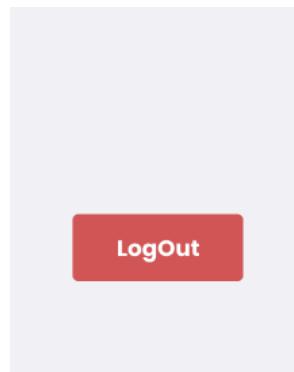


Logout

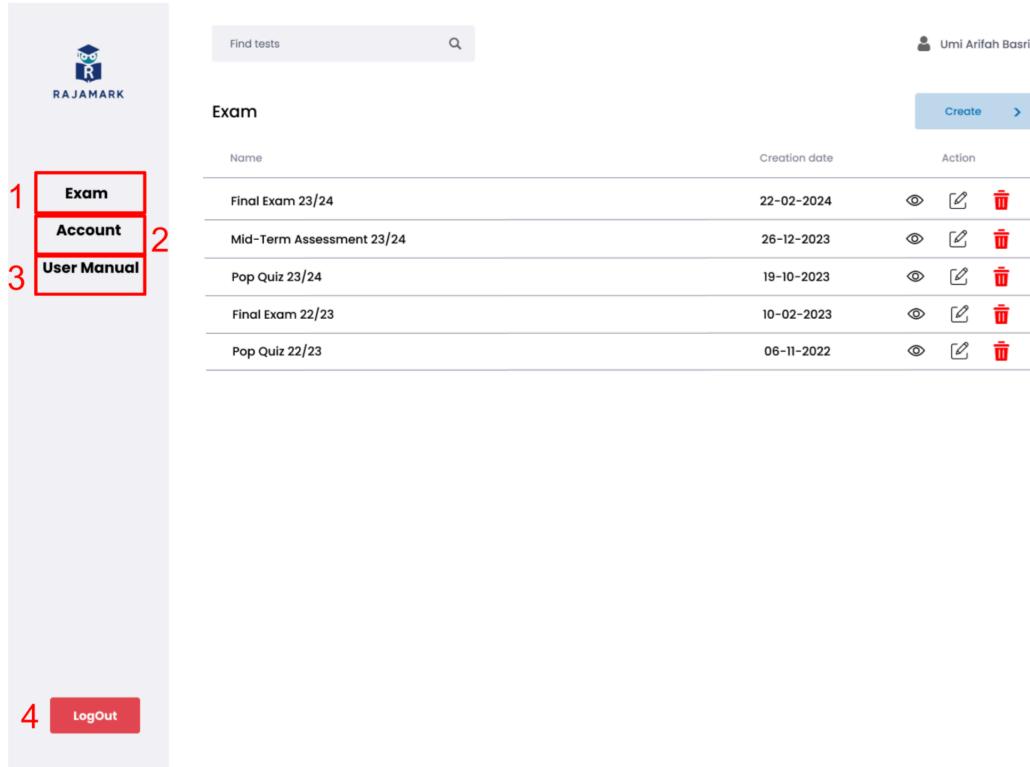
1. After successfully logged in, you will now see the Homepage (dashboard page) like the picture below:

A screenshot of the RAJAMARK dashboard. The top navigation bar includes 'Find tests' and a search icon. On the right, there's a user profile for 'Umi Arifah Basri'. A sidebar on the left has links for 'Exam', 'Account', and 'User Manual'. The main content area shows a table titled 'Exam' with columns for 'Name', 'Creation date', and 'Action'. The table lists six entries: 'Final Exam 23/24' (22-02-2024), 'Mid-Term Assessment 23/24' (26-12-2023), 'Pop Quiz 23/24' (19-10-2023), 'Final Exam 22/23' (10-02-2023), and 'Pop Quiz 22/23' (06-11-2022). Each row has edit and delete icons. At the bottom left is a red 'LogOut' button.

2. If you wish to log out, navigate to the navigation bar located at the leftmost of the screen and click on the “LogOut” button. You will then be redirected to the Login page again.



Navigation



1. Exam Page

The Exam Page contains all exams that have been created. The exams can be edited or deleted from this table. The date of creation will also be displayed on this page. It is also possible to create a new exam from this page.

2. Account Page

The Account Page will display the user's information. Users will also be able to check and manage their account subscription on this page.

3. User Manual Page

The User Manual Page contains the documentation of the user manual that provides detailed instructions on how to use this system effectively.

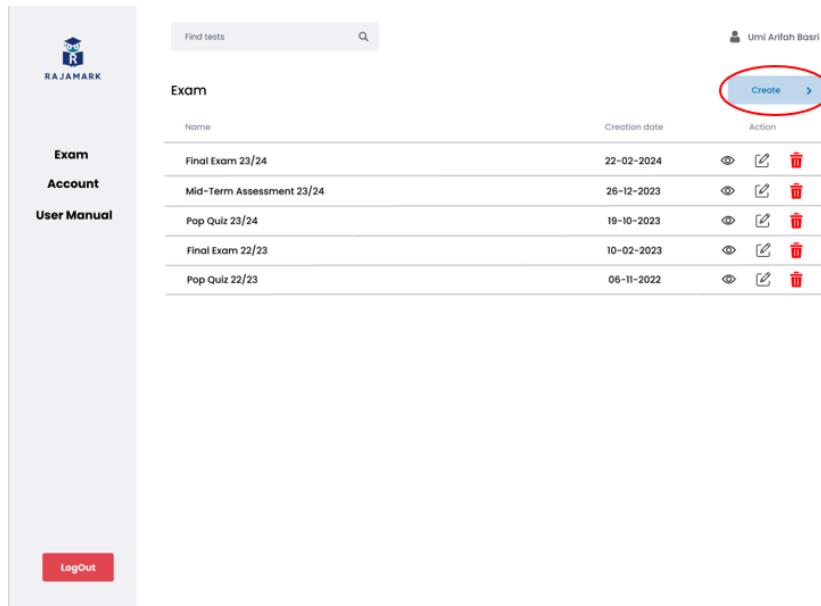
4. LogOut

Navigate to the navigation bar located at the leftmost of the screen and click on the “LogOut” button if you wish to log out from your account.

Features

Exam Creation

1. Go to the exam management page.
2. Click on the “Create” button to create a new examination/quiz.



The screenshot shows a user interface for managing exams. On the left, there is a vertical sidebar with a logo, a search bar, and three menu items: "Exam", "Account", and "User Manual". At the bottom of the sidebar is a "Logout" button. The main content area has a header "Exam" with a "Find tests" input field and a search icon. To the right of the header is a user profile "Umi Arifah Basri". Below the header is a table titled "Exam" with columns for "Name", "Creation date", and "Action". The table lists six exams:

Name	Creation date	Action
Final Exam 23/24	22-02-2024	
Mid-Term Assessment 23/24	26-12-2023	
Pop Quiz 23/24	19-10-2023	
Final Exam 22/23	10-02-2023	
Pop Quiz 22/23	06-11-2022	

A blue "Create >" button is located at the top right of the table, with a red circle drawn around it to indicate it as the target for the second step in the process.

3. Enter the examination's details and grading's criteria.

Development of OCR System for Handwritten MCQ Answer Sheet Evaluation

The screenshot shows the 'Create Exam' interface. On the left sidebar, there are links for 'Home', 'Account', and 'User Manual'. The main area has a 'Find tests' search bar and a user profile 'Umi Arifah Basri'. A back arrow leads to 'Create Exam'. The 'Exam Details' section contains fields for 'Exam Title' (Final Exam 23/24), 'Exam Description' (This exam is the final exam for software process and quality fro 23/24), 'Course Code' (WIF3002), and 'Session' (23/24). To the right is a 'Grading System' table:

Grade	Score	Score
A	80	- 100
A-	75	- 79
B+	70	- 74
B	65	- 69
B-	60	- 64
C+	55	- 59
C	50	- 54
D	40	- 49
F	0	- 39

A blue 'Next' button is at the bottom. Below this is the 'Answer scheme' section, which currently shows 'Question 1' with four options (A, B, C, D) where 'D' is highlighted. A red 'Logout' button is on the far left.

4. Scroll down to enter the answer scheme.

The screenshot shows the 'Answer scheme' page. The left sidebar includes 'Find tests', 'Umi Arifah Basri', and a back arrow to 'Create Exam'. The 'Answer scheme' section displays three questions: 'Question 1' (options A, B, C, D, 'D' is selected), 'Question 2' (options A, B, C, D, 'B' is selected), and 'Question 3' (options A, B, C, D, 'C' is selected). Below these is a large empty box with a plus sign, indicating where new questions can be added. At the bottom are 'Back' and 'Save' buttons.

5. Click the "save" button to create the examination record.
6. Exam Created

Edit Examination

- Click on the “edit” icon on the specific exam.

Name	Creation date	Action
Final Exam 23/24	22-02-2024	
Mid-Term Assessment 23/24	26-12-2023	
Pop Quiz 23/24	19-10-2023	
Final Exam 22/23	10-02-2023	
Pop Quiz 22/23	06-II-2022	

- Directed into the edit exam page, enter the changes required.

Grading System:			
A	80	-	100
A-	75	-	79
B+	70	-	74
B	65	-	69
B-	60	-	64
C+	55	-	59
C	50	-	54
D	40	-	49
F	0	-	39

- Scroll down and click the “save” button to apply the changes.

View Exam's details

- Click on the “eye” icon to view the exam’s details.

Name	Creation date	Action
Final Exam 23/24	22-02-2024	
Mid-Term Assessment 23/24	26-12-2023	
Pop Quiz 23/24	19-10-2023	
Final Exam 22/23	10-02-2023	
Pop Quiz 22/23	06-11-2022	

- Directed into exam details page.

← View details

Exam Title: Final Exam 23/24
 Exam Description: This exam is the final exam for software process and quality fro 23/24
 Course Code: WIF3002
 Session: 23/24

Mean score	Median score

Student ID	Name	Result	Actions
U200123	Ikhwan	100 %	

Manage student's answer

- Click on the “eye” icon to view the exam’s details.

Name	Creation date	Action
Final Exam 23/24	22-02-2024	
Mid-Term Assessment 23/24	26-12-2023	
Pop Quiz 23/24	19-10-2023	
Final Exam 22/23	10-02-2023	
Pop Quiz 22/23	06-11-2022	

- Directed into the exam details page, click into the “eye” icon to view the student’s detail, “note” icon to edit the student's details or “trash” icon to delete the student's information.

Student ID	Name	Result	Actions
U200123	Ikhwon	100 %	

- Student’s detail’s view page, click the “edit result” button to make changes to the student's details.

Development of OCR System for Handwritten MCQ Answer Sheet Evaluation

RAJAMARK

Find tests

Umi Arifah Basri

[← Results \(View\)](#) [Edit Result](#)

Student Answer 3/4 **Paper Image**

Question 1 Points 0
A B C D

Question 2 Points 0
A B C D

Question 3 Points 0
A B C D

[Logout](#)

If you take a photo of the entire page of the answer sheet and want to see the result of the current answer, click here.

Current Answer

Marked Answer

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

Upload Sample Answer

- Click on the “eye” icon to view the exam’s details.

Name	Creation date	Action
Final Exam 23/24	22-02-2024	
Mid-Term Assessment 23/24	26-12-2023	
Pop Quiz 23/24	19-10-2023	
Final Exam 22/23	10-02-2023	
Pop Quiz 22/23	06-11-2022	

- Click on the “upload answer” button to upload the sample answer scheme.

← View details

Exam Title: Final Exam 23/24
Exam Description: This exam is the final exam for software process and quality fro 23/24
Course Code: WIF3002
Session: 23/24

Mean score: 66% Median score: 81%

Student ID	Name	Result	Actions
U200123	Ikhwan	100 %	

- Directed into the answer scheme page, click the “+” icon to upload the sample answer scheme.

Development of OCR System for Handwritten MCQ Answer Sheet Evaluation

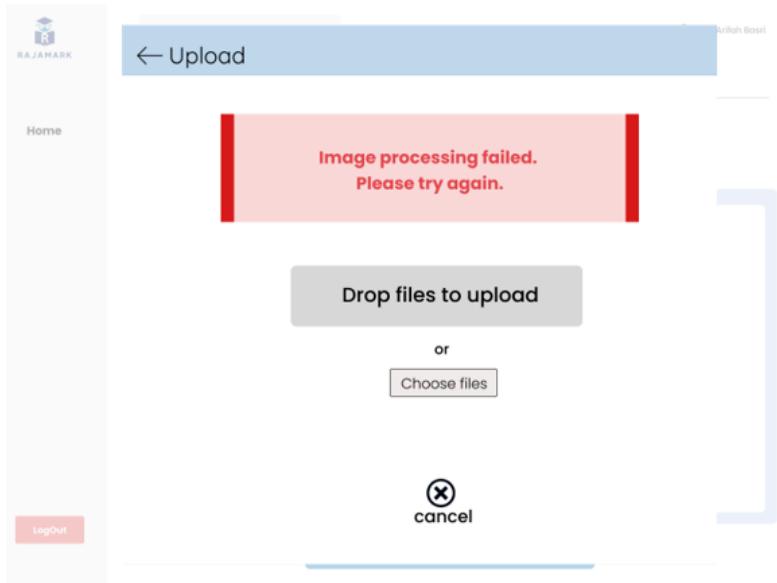
The screenshot shows a user interface for managing an exam. On the left, there's a sidebar with 'RAJAMARK' logo, 'Exam', 'Account', and 'User Manual' buttons, and a 'Logout' button at the bottom. The main area has a header 'Final Exam 23/24'. Below it, there's a 'Find tests' search bar and a user profile 'Umi Arifah Basri'. A 'Details' back arrow is present. The 'Answer scheme' section contains three questions: Question 1 (points 1), Question 2 (points 1), and Question 3 (points 2). Each question has four options (A, B, C, D) with 'C' highlighted in green. Below these is a '+ Add question +' button. To the right is an 'Upload file' section with a large red circle containing a plus sign, and the text 'Click to upload a file with answer scheme in handwritten form'. At the bottom are 'SAVE' and 'Logout' buttons.

4. Upload the answer scheme file.

The screenshot shows a 'File picker' dialog box. On the left, there's a sidebar with 'Home', 'Logout' button, and a 'File picker' title. The main area has a 'Recent files' section with a blue 'Upload a file' button highlighted. Below it are 'Private files', 'Wikimedia', 'Dropbox', and 'Google Drive' links. The central part of the dialog has a 'Drag files to upload' area, an 'Attachment' section with a 'Choose files' button (showing 'No file chosen'), a 'Save as' input field, an 'Author' input field, and a 'Upload this file' button at the bottom. At the bottom of the dialog is a 'SAVE' button.

5. If you fail, try to upload another file of the answer scheme.

Development of OCR System for Handwritten MCQ Answer Sheet Evaluation



6. Wait for the file to be processed.



Development of OCR System for Handwritten MCQ Answer Sheet Evaluation



7. Click the “confirm” button to apply the answer scheme.

A screenshot of a web-based application interface titled "Details". At the top left is the RAJAMARK logo. To its right is a user profile icon and the name "Umi Arifah Basri". Below the header is a "Find tests" input field and a search icon. On the left side of the main content area is a "Home" link. In the center, there is a section titled "Final Exam 23/24". Underneath it, there are two main sections: "Answer scheme" and "Upload file". The "Answer scheme" section contains three questions: Question 1 (Points 1), Question 2 (Points 1), and Question 3 (Points 2). Each question has a list of options A, B, C, and D, with the correct answer highlighted in green. Below these questions is a "+ Add question +" button. The "Upload file" section contains a "scanning zone" window showing a grid of handwritten responses, similar to the one in the previous screenshot. At the bottom of the main content area are three buttons: "Show answers" (with a magnifying glass icon), "Edit result" (with a pencil icon), "Discard", and "Confirm". At the bottom left is a "Logout" button.

Upload Student Answer

1. Navigate to the "Exam" and select the exam you wish to grade.

Name	Creation date	Action
Final Exam 23/24	22-02-2024	
Mid-Term Assessment 23/24	26-12-2023	
Pop Quiz 23/24	19-10-2023	
Final Exam 22/23	10-02-2023	
Pop Quiz 22/23	06-11-2022	

USA1

2. In the student column, locate and click the "Add" button to input student data.

USA2

3. Enter the student's ID and name into the designated fields.
4. Click the "Upload" button to update the student's answer sheet.

Student ID	:	<input type="text" value="U2000123"/>
Name	:	<input type="text" value="Ikhwan"/>
Answer Sheet :		<input type="button" value="Upload"/>
<input type="button" value="Cancel"/> <input style="border: 2px dashed #ccc;" type="button" value="Upload"/>		

USA3

5. To add the student's answer sheet, either drag a file or use the "Choose files" option to select the file from your computer.
6. After selecting a file, refer to [Image Preprocessing](#) for more details.

7. The student's details will be displayed on the page for confirmation.
8. Repeat steps 2 to 7 to add more students as necessary.
9. Once you have finished adding all students, click the "Save" button to save the student records.

Development of OCR System for Handwritten MCQ Answer Sheet Evaluation

The screenshot displays a user interface for managing answer schemes and student data. At the top, there is a navigation bar with a logo, a search bar labeled 'Find tests', and a user profile 'Umi Arifah Basri'. Below the navigation, a back arrow and the word 'Details' are visible.

Home

Final Exam 23/24

Answer scheme

Question 1
A B C D

Question 2
A B C D

Question 3
A B C D

Students

Student ID : U2000123
Name : Ikhwan

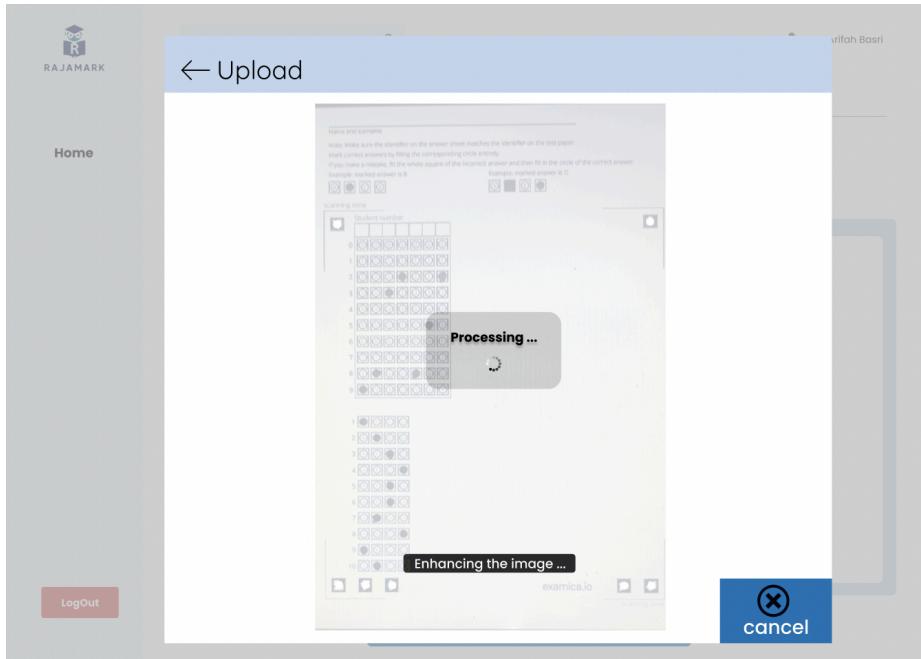
+
Click to add student data

LogOut

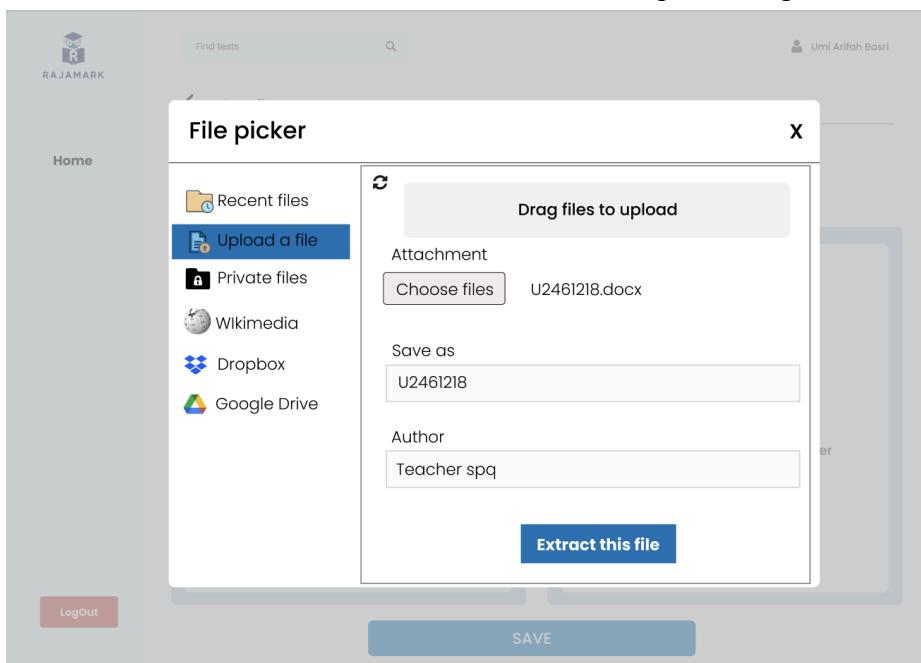
SAVE

Image Preprocessing

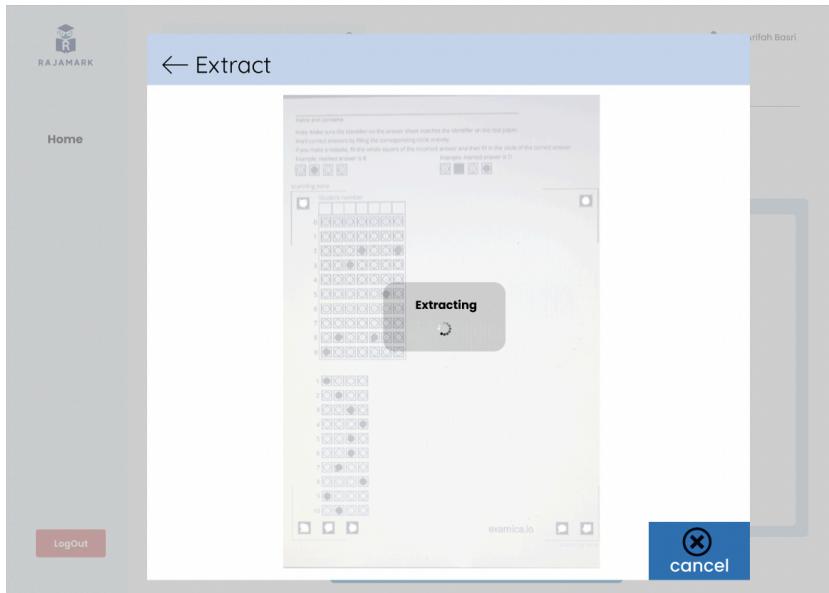
- Once a file is selected for upload, the system will begin processing the image.



- After successful processing, users are required to enter a file name for saving and the author's name. (In case of processing failure, refer to [Troubleshooting](#) for more info)
- Click on "Extract this file" to initiate OCR processing.



- The system will commence extracting text from the image.



5. Upon successful extraction, the extracted text (answers) will be displayed.
6. If the extracted data is incorrect, users may request a reupload. Otherwise, proceed to Step 7 of [Upload Student Answer](#) if no issues arise.

Score Calculation and Reporting

1. Navigate to "Exam" and select the eye icon of the exam you wish to view.
2. Upon uploading students' answers, the system will automatically calculate the score for each student and calculate the mean and median score of the class. (Refer to [Upload Student Answer](#) to know more about uploading student's answer)
3. To generate a report, click on the "Generate Report" button.
4. The report will include statistical measures such as the median, mean, and other relevant statistics.

Troubleshooting

Common Issues

1. Poor Image Quality: OCR accuracy may decrease if the input images are of low resolution or contain artifacts such as blurriness or distortion.
2. Unsupported Fonts: Certain fonts or styles may not be recognized accurately by the OCR system, leading to errors in text extraction.
3. Complex Layouts: Documents with complex layouts, such as tables, columns, or mixed fonts, can pose challenges for OCR algorithms and result in incorrect text extraction.
4. Handwritten Text: OCR systems are primarily designed for printed text and may struggle to accurately recognize handwritten text.

Solutions

1. Improve Image Quality: Ensure that input images are clear, well-lit, and have sufficient resolution. Avoid using images with excessive noise or compression artifacts.
2. Use Supported Fonts: Whenever possible, use standard fonts and avoid decorative or obscure fonts that may not be recognized reliably by the OCR system.
3. Simplify Layouts: If possible, preprocess documents to remove complex layouts or convert them into simpler formats before performing OCR. This can help improve accuracy and reduce errors.
4. Consider Handwriting Recognition: For handwritten text, consider using specialized OCR models or handwriting recognition software that are optimized for recognizing handwritten characters.

Support Contact

If you encounter any issues with the OCR system that cannot be resolved using the provided solutions, please contact our support team for assistance:

Email: support@example.com

Phone: +1 (555) 123-4567

Online Support: Support Portal

Best Practices

Grading Tips

1. Ensure students format answers consistently and legibly to aid OCR accuracy.



2. Advise clear separation of answers for each question to minimize ambiguity.



3. Caution against overlapping answers to enhance OCR interpretation.



4. Scan answers at high resolution in well-lit conditions for optimal recognition.
5. Encourage manual review of extracted text for clarity before submission.
6. Ensure students use dark, bold pens or pencils for writing to improve OCR readability.



7. Remind students to avoid excessive use of decorative elements or symbols that may interfere with OCR recognition.



8. Provide guidelines for students to write numbers and symbols clearly, especially those prone to misinterpretation
9. Advise against folding or creasing answer sheets, as it can distort text and hinder OCR accuracy.
10. Recommend students to use a ruler or straight edge for neat alignment of answers to improve OCR alignment.



Accuracy Recommendations

1. Provide clear handwriting guidelines to optimize OCR recognition; for example, require all multiple-choice answers to be in capital letters.
2. Conduct regular practice sessions to familiarize students with handwriting recognition and improve their writing.
3. Offer constructive feedback to students to enhance handwriting quality and OCR accuracy.
4. Provide comprehensive user training to educators to address accuracy challenges effectively.
5. Develop a standardized answer sheet template with clear instructions and designated areas for answers to facilitate OCR processing.
6. Encourage students to practice writing in a consistent style and size to aid OCR recognition.

Glossary

Term	Definition
Optical Character Recognition (OCR)	The technology used to convert different types of documents, such as scanned paper documents, PDF files, or images captured by a digital camera, into editable and searchable data.
Resolution	The level of detail that an image holds. In the context of scanning, it measures the number of pixels per inch (PPI) or dots per inch (DPI) in a digital image.
Layout	The arrangement of text, images, and other elements on a document or webpage.
Handwriting Recognition	The process of converting handwritten text into digital text. It involves analyzing and interpreting handwritten characters to recognize and convert them into machine-readable text.
Calibration	The process of adjusting and fine-tuning equipment or software to ensure accuracy and consistency in performance. In the context of scanning, calibration may involve adjusting settings such as brightness, contrast, and color balance to optimize image quality.
Standardized Format	A predefined layout or structure that follows specific guidelines or conventions. In the context of answer sheets, a standardized format ensures consistency in the presentation of questions and answers, facilitating accurate interpretation and grading.
Alignment	The positioning of text or objects relative to a reference point or line. In the context of OCR, alignment ensures that text is accurately detected and interpreted within predefined boundaries or regions.
Noise	Random variations or interference in an image that can degrade quality and affect OCR accuracy.
Preprocessing	The process of applying various techniques to raw data, such as images or text, to improve quality, enhance features, or prepare it for further analysis.

Appendix

Frequently Asked Questions

1. Which platforms are RajaMark compatible with?

A: RajaMark is designed to be compatible with multiple operating systems, which are Windows, macOS, Linux, Android and iOS.

2. How does RajaMark automate answer sheet grading?

A: RajaMark assumes the adherence of the answer sheets uploaded to a standardized format and layout, and conducts recognition of students' handwriting with OCR technology to compare the answers with the sample provided.

3. What format should the answer sheets uploaded be in?

A: The answer sheets should have the answers consistently written next to the corresponding question numbers in a predetermined manner and written in Capital Letters (e.g., letters A-E)

4. How does RajaMark ensure its accuracy in text recognition to compare uploaded answer sheets with the sample answers?

A: While we try our best to produce the most accurate text recognition results using OCR technology, it is inevitable to face minor inaccuracies in detecting the handwritten answers. Hence, we highly advise users to conduct a thorough checking of the graded answers and make the necessary corrections on the Student Answer Page.

5. Can I modify the grading system for a subject?

A: Yes! After the user has created a subject under the Exam Details page, a default grade will be automatically set for the subject and users can click "Edit" to amend the existing grading system.