



AI-KODA Score Application Manual

The application is being developed under the supervision of **Dr. Deepak Gunjan**, Associate Professor, Department of Gastroenterology & HNU, All India Institute of Medical Sciences, New Delhi, India and **Dr. Nidhi Gooel**, Professor at Department of Electronics and Communication Engineering, Indira Gandhi Delhi Technical University for Women, New Delhi, India. All the collected data will be utilized for research purpose only (Ref. No.: IEC-666/05.08.2022).

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1 Introduction

AI-KODA Score Application is a simple, and user-friendly application for gastroenterologists to score the Small Bowel Capsule Endoscopy (SBCE) frames as per the KOrea CanaDA (KODA) scoring system. KODA score is a bowel preparation scale for patients undergoing SBCE [1].

The main objective of this application is to collect medically scored SBCE frames from gastroenterologists for the development of automated KODA scoring system using Artificial Intelligence techniques.

The application will first teach you how to use the KODA score for assessing the cleanliness of SBCE frames [1]. Then a testing module has been developed to score the SBCE frames.

Requirements to download the application:

- Android Device with version 11 or above.

1.1 Steps to download AI-KODA Score Application

- Open the google drive link attached below.
- Download the apk file present in the google drive link using a registered google account on your android device.
- Click on “install”. Allow application permission for ‘camera/contacts/locations/microphone/music and audios/notification etc.
- Click on “Open”. You should see the ‘Registration Page’ at this moment.

Note- Please note the application does not collect any information stored in your android device. Refer 5.1 for more details.

Google Drive Link for Dr. Deepak Gunjan-

https://drive.google.com/file/d/1feZAck20zDbttz2lGoYYWKVqN6Uj7Aiu/view?usp=share_link

Google Drive Link for resident doctors-

https://drive.google.com/file/d/1YlZqSc6vRTAZKTcN12RamtpRDC5D-aiA/view?usp=share_link

[1] Alageeli, Mohammad, et al. "KODA score: an updated and validated bowel preparation scale for patients undergoing small bowel capsule endoscopy." *Endoscopy international open* 8.08 (2020): E1011-E1017.

(Necessary permission to use KODA score training module has been taken from the corresponding author.)

2 Getting Started

This section familiarises the user with login setup after installation of the AI-KODA Score Application.

2.1 Login Page

Figure 1 shows the snapshot of the Login Page of AI-KODA Score Application. As a new member, please click on “register” to Sign Up for the application. As an existing member, the user can directly put the email address and password to enter into the application.

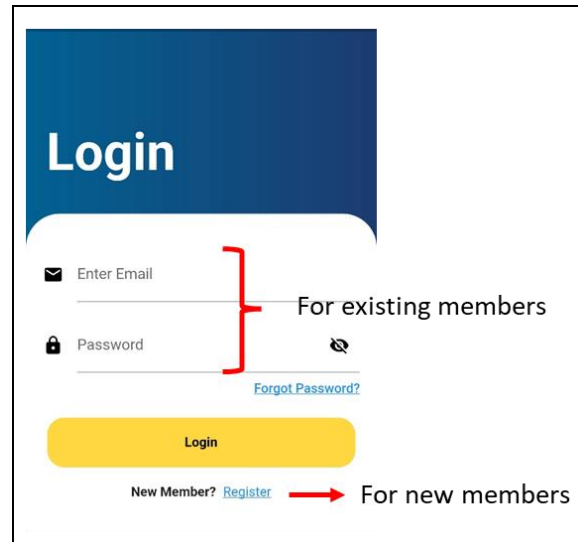


Figure 1. Snapshot of the Login Page of AI-KODA Score Application.

For new members:

- After clicking on “register”, Sign Up on the “Sign Up” page. Enter your email ID and password. The strength of the password is **at least 8** letters. Any numeric value, and or alphabetical value is allowed. The users are requested to avoid using any special key.
- Click on “Sign Up”. Please check your email or spam for verification as a user.
- Click on the verification link received on your email address.
- After successful verification, please enter the details on the “Registration Page” and setup your Profile.

Figure 2 shows the snapshot of the process for new members.

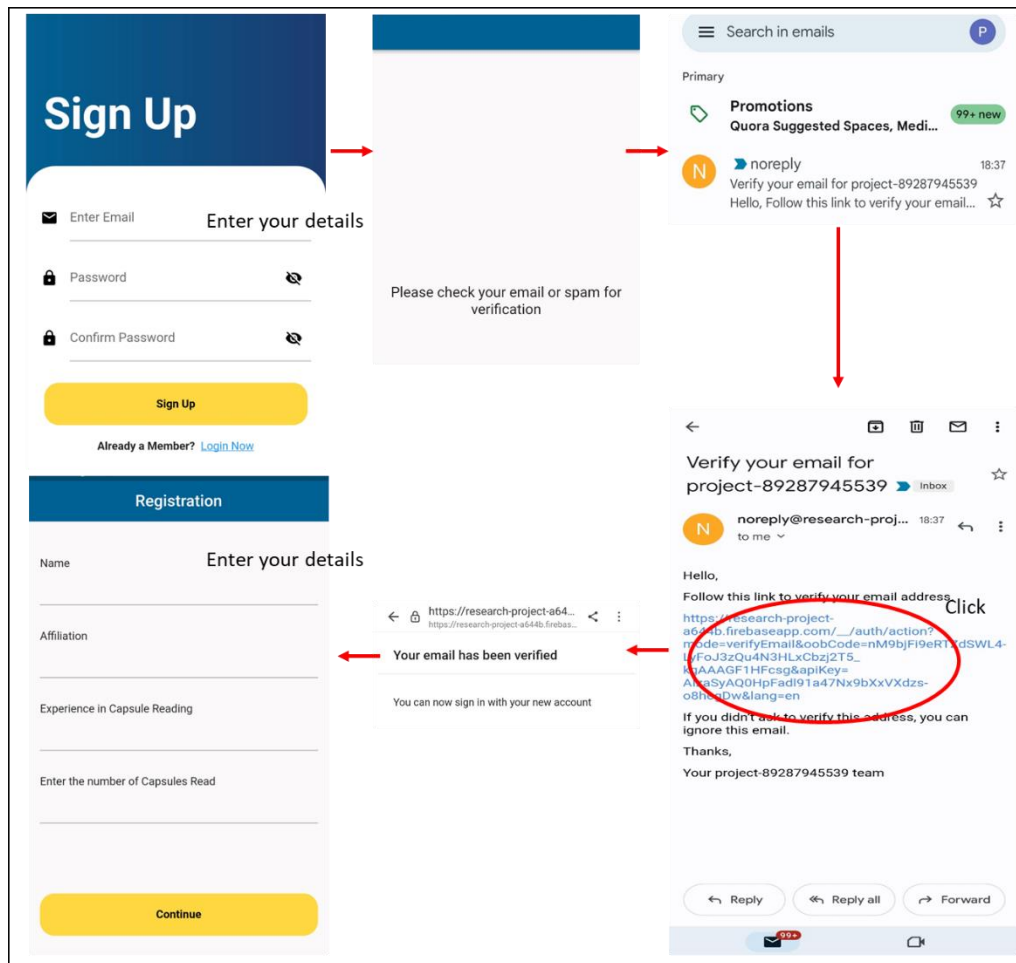


Figure 2. Snapshot of the Sign Up process of the AI-KODA Score Application for new members.

2.2 Profile Setup

Figure 3 shows the snapshot of the “Registration Page” for Profile Setup. It can be edited and updated later on using the “Profile” button in the menu drawer options. After filling the Registration Page, you will be directed to the “Home Page”.

Registration

Name

Affiliation
Enter your details

Experience in Capsule Reading

Enter the number of Capsules Read

Continue

Figure 3. Snapshot of the Registration Page for Profile Setup.

2.3 Home Page

Figure 4 shows the snapshot of the “Home Page”. The user can go to the training module to learn the KODA scoring system. The user can also directly start scoring the frames by clicking on the testing module. Figure 5, 6, and 7 shows the snapshot of the training module, testing module, and logout page respectively.

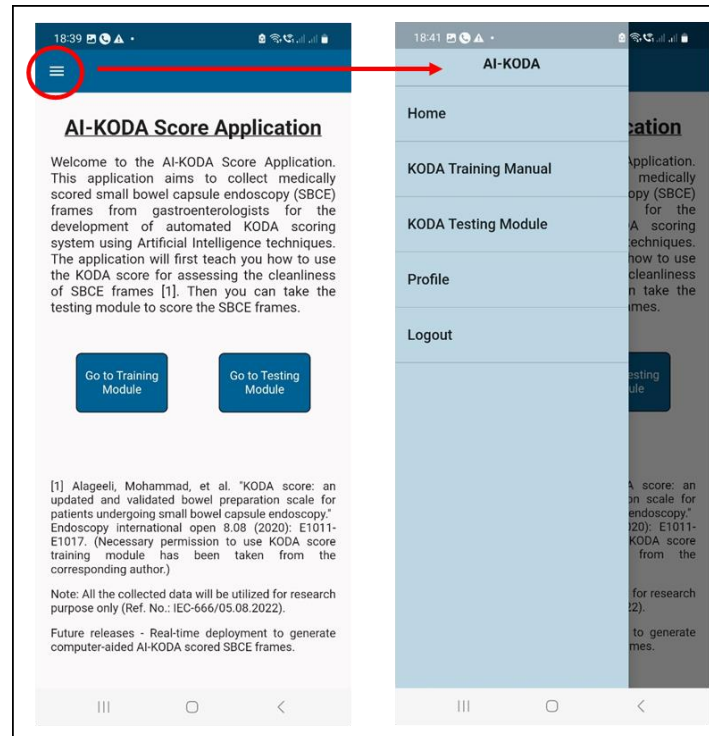


Figure 4. Snapshot of the Home Page.

2.4 Training Module

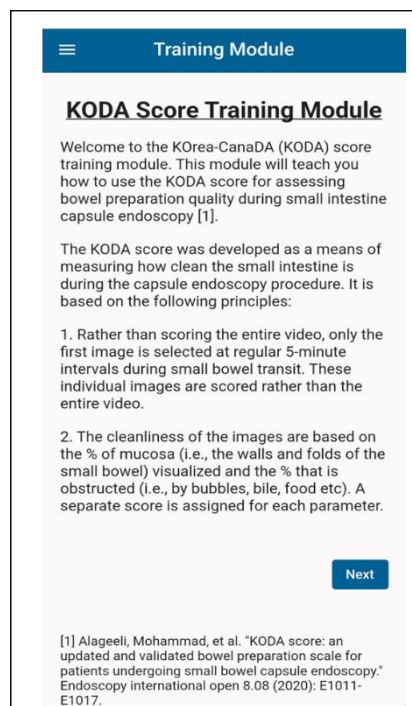
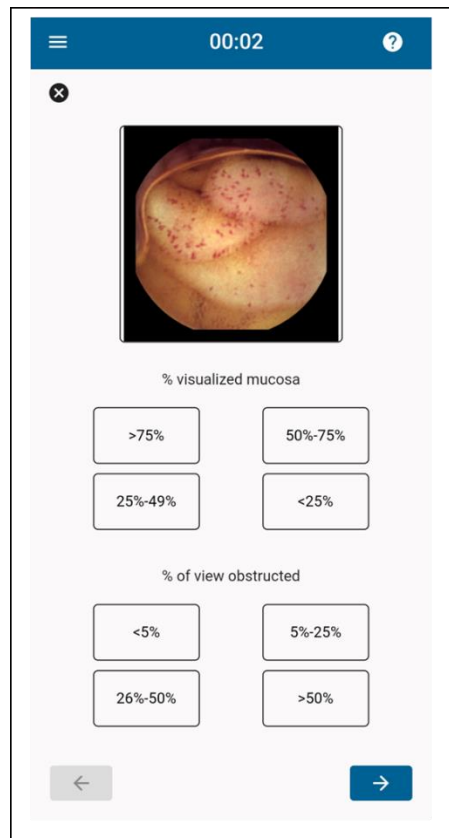


Figure 5. Snapshot of the Training Module.

2.5 Testing Module



The interface displays a video feed of a colonoscopy. Below the feed, there are two sections for selection:

% visualized mucosa

- >75%
- 50%-75%
- 25%-49%
- <25%

% of view obstructed

- <5%
- 5%-25%
- 26%-50%
- >50%

Navigation buttons: < (back) and > (next).

Figure 6. Snapshot of the Testing Module.

2.6 Logout

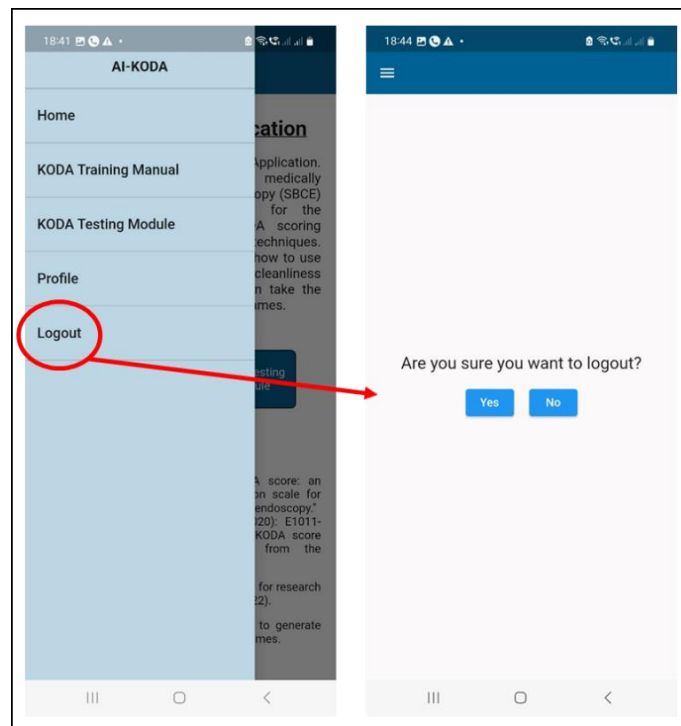



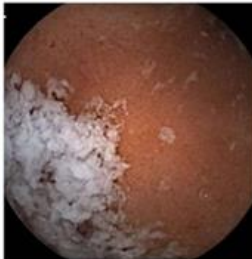
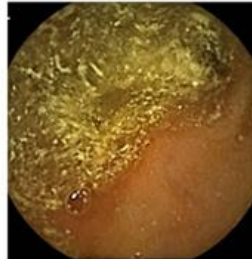
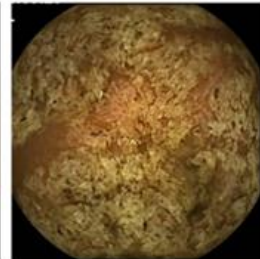
Figure 7. Snapshot of the Logout Page.

3 Features of Training Module

- User-friendly manual to learn and understand the KODA Score.
- Four examples and their correct answers to get familiar with the KODA Score.
- KODA Score reference sheet.

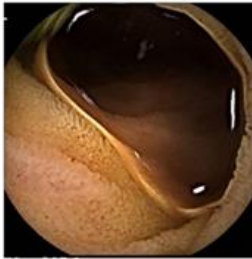

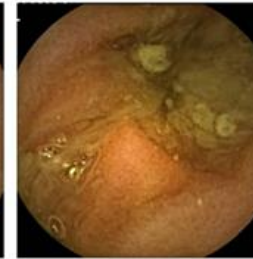
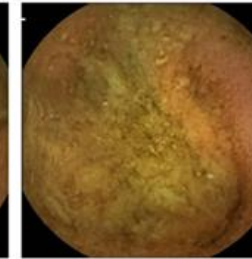
KODA SCORE REFERENCE SHEET

% visualized mucosa score

				
Score	3	2	1	0
% of mucosa visualized	>75%	50-75%	25-49%	<25%

“We care only about the amount of mucosa visualized. Thus, shadows are penalized.”

% obstructed view score

				
Score	3	2	1	0
% of view obstructed	<5%	5-25%	25-50%	>50%

“We care only about the obstructed view. Thus, shadows are not penalized.”

4 Features of Testing Module

- User-friendly Testing Module to score the SBCE frames on the screen.
- The KODA Score reference sheet can be viewed from the top question mark (?) button for any ambiguity/help to score the frame.
- A timer to note the time taken to score one frame.
- Forward button to view the next SBCE frame.
- Backward button to view the previous SBCE frame.
- A pop-up in case the user has not selected **ANY** option from the two questions.
- Exit button to exit the Testing Module.

Please note **ONLY ONE** option is **CORRECT** and can **ONLY** be chosen for Question 1 and 2.

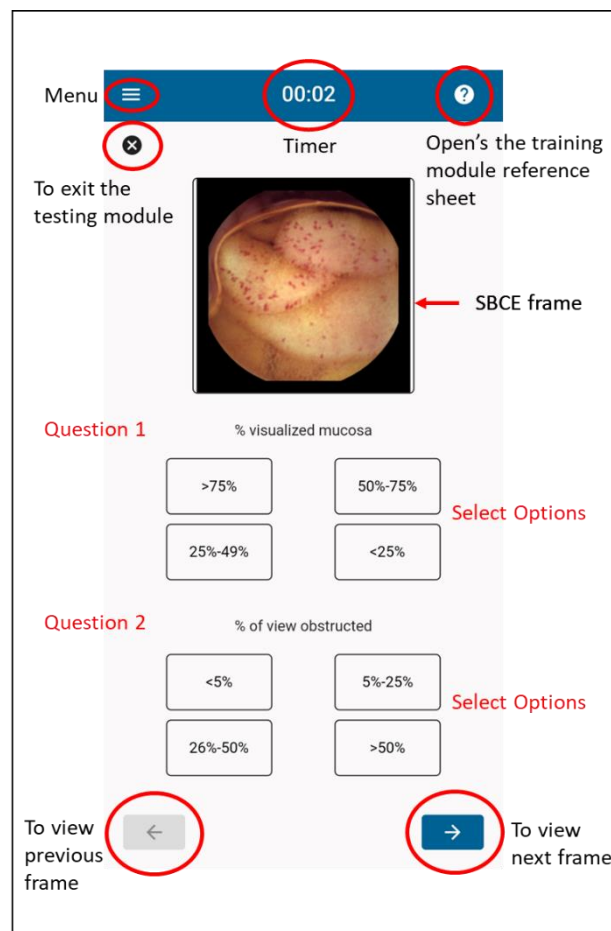


Figure 8. Snapshot of the Testing Module with different operations.

5 Technical features used by AI-KODA Score Application

The AI-KODA Score Application is built on flutter environment with firebase console for data storage. The final data is stored in Google sheets. The block diagram is shown in Figure 9.

5.1 Frontend and Backend Data Flow Storage

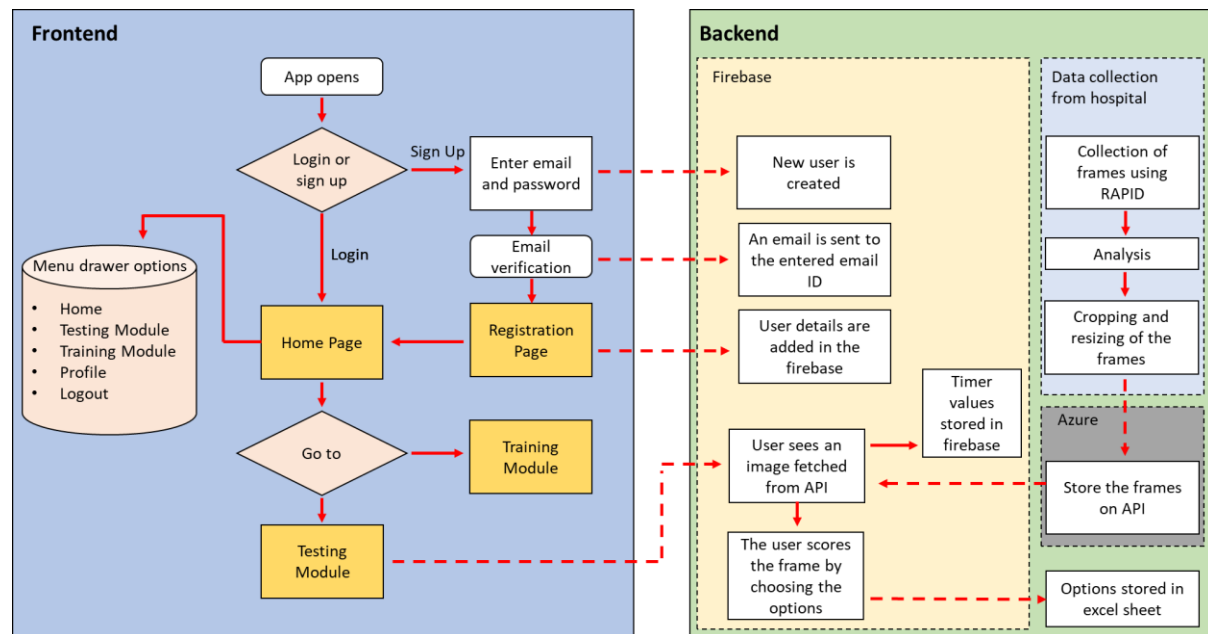


Figure 9. Frontend and Backend Data Flow Storage System of AI-KODA Score Application.

5.2 Present Limitations

- The application is available **ONLY** for android device users. The application is not supported for Apple IOS (iPhone) users at the moment.
- The user **MUST** login from the same android device.
- The application **SHOULD NOT** be uninstalled from the device once the user has started the testing module, otherwise the progress will be **deleted**. After the completion of the scoring of all the frames, twice, the user can delete the application.

5.3 Future release

- Real-time scoring of the SBCE frames using Artificial Intelligence techniques.
- Support with IOS.