

Dear Participant,

We appreciate your participation in this software testing survey, which will greatly help improving our project considering the public opinions. Before installing the Web3U2D Android app, please read the following guidelines:

Download link of Android App: <https://github.com/GoldenAL1990/GoldenAL/blob/main/Web3U2D.apk>

The Web3U2D app consists of two pages (Registration and Authentication). In the following, you can see the screenshots of these two pages. \*Note that our experiments confirm the safety level of Web3U2D is higher than the 2FA and U2F standard protocols active adversarial attacks inferring a victim device. According to our comparative results, the attack Resistance for Web3U2D (5/5), U2D (3/5), 2FA (2/5), and Standard PIN (2/5).



The difference between the Web3U2D and other existing password security systems (authentication tools) is that user has to pick two dynamic and random combinations based on the knowledge of Hidden PIN (HPIN) consists of non-repetitive digits and Hidden Passcode (HP), which could be any symbols (words in different languages, emojis and so on). A user must take the following steps.

- 1) Email/Phone number: The Web3U2D also requires a user to set email address or a phone number for recovering credentials in case of forgetting it, which is used as a Username. Once it is verified, the user is allowed to find the DPIN.
- 2) HPIN -> DPIN: User has to set and memorize a hidden PIN (HPIN) during the registration (sign up) that will be used to find a Dynamic (DPIN) from four lists (g., HPIN= 0259 and DPIN= first item of the first list, third item of second list, sixth item of the third list, and last item of the fourth list) while (s)he verifies her/himself during the login page.
- 3) AI algorithm will generate a one-time valid hint item (e.g., ❤️=-1) and if the DPIN is verified successfully, the user can tap on the hint item and see the operator.
- 4) HP -> ODC: HP consists of four items selected from ten emojis as default HP options (changeable), that needs to be set and memorized by the user during the registration. Then, the user has to find the One-time Dynamic Code (ODC) during the authentication after seeing the hint item (e.g., ❤️=-1) by picking the particular item before or after the item of HP from the four lists according to AI hint generated during the last step.

\* Note that all the list of HP options, hint items and operators can be defined by user during the registration phase and the AI only ensures that they are not repeated for at least five authentication processes.