BRAUDE
College of Engineering, karmiel

Video Motion Synchrony Measurement

User Documentation

Supervisor: Dr. Anat Dahan

© Bat-El Gardin, B.Sc. Information Systems Engineer student
Bat.El.Gardin@e.braude.ac.il

© Ohad Shamir, B.Sc. Software Engineer student
Ohad.Shamir@e.braude.ac.il

User's Guide Operating Instructions

1. General Description

   The VMSM system is based on our unique algorithm and Google's MediaPipe.
   VMSM is an automatic tool that measures interpersonal synchronization through a video file. Hence this system is an assistance tool for diagnosticians, and therefore, the probability of identifying social behavior problems will be higher. All of the selected ROIs are taken into consideration during the synchrony rate estimation. Note that if you want to check synchronization for a specific ROI, select only it for analysis purposes. Further, you can follow each ROI behavior using the reports produced by this system.

   Video demands

   - Two people only.
   - Well-seeing persons, non-interrupting view in the middle of an ROI.
   - A clear partition between both subjects. An organ of one cannot slide into the area of the second.
   - The resolution affects the system's runtime. A bigger resolution will cause a slower analysis. A resolution of 480p (640 x 480-pixel size) will give a rational analysis runtime. The VMSM algorithm saves the video's number of frames and decides whether the video quality is good enough for MediaPipe's detection.
   - Pay attention to the video's length. The analysis duration is directly related to it.

2. Operational process

   Software Environment

   - Windows operating system.
   - Python version 3.9.

   The software system requires the following dependencies:

   - tkVideo==0.1
   - customtkinter==5.0.3
   - reportlab==3.6.12
   - pylint==2.15.9
   - mediapipe==0.9.0.1
   - PyYAML==6.0
   - moviepy==1.0.3
   - pandas==1.5.2
   - RangeSlider==2021.7.4
   - fpdf==1.7.2

   Note that all the dependencies will be installed in the first application's run.

Running Instructions

1. Clone the GitHub repository.

   In case you have Git installed on your computer, you can open a Windows command line window and run the following command:

   git clone https://github.com/BatelG/VMSM.git

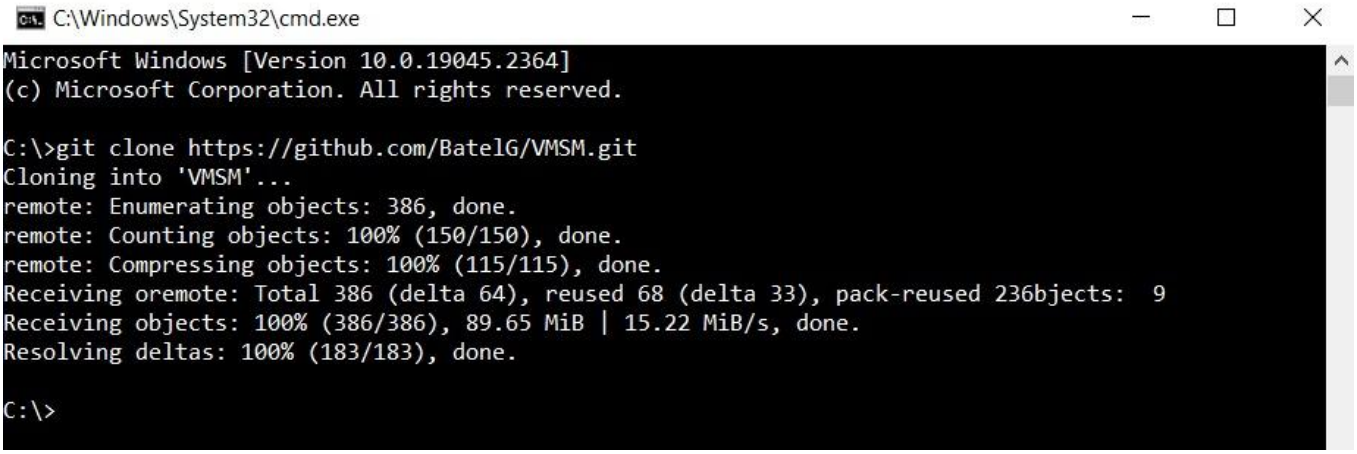

Figure 1: Cloning the VMSM git repository into the local computer via Windows command line window.

Alternative is to download the repository from the GitHub repository manually as a ZIP file, then unzip this file.

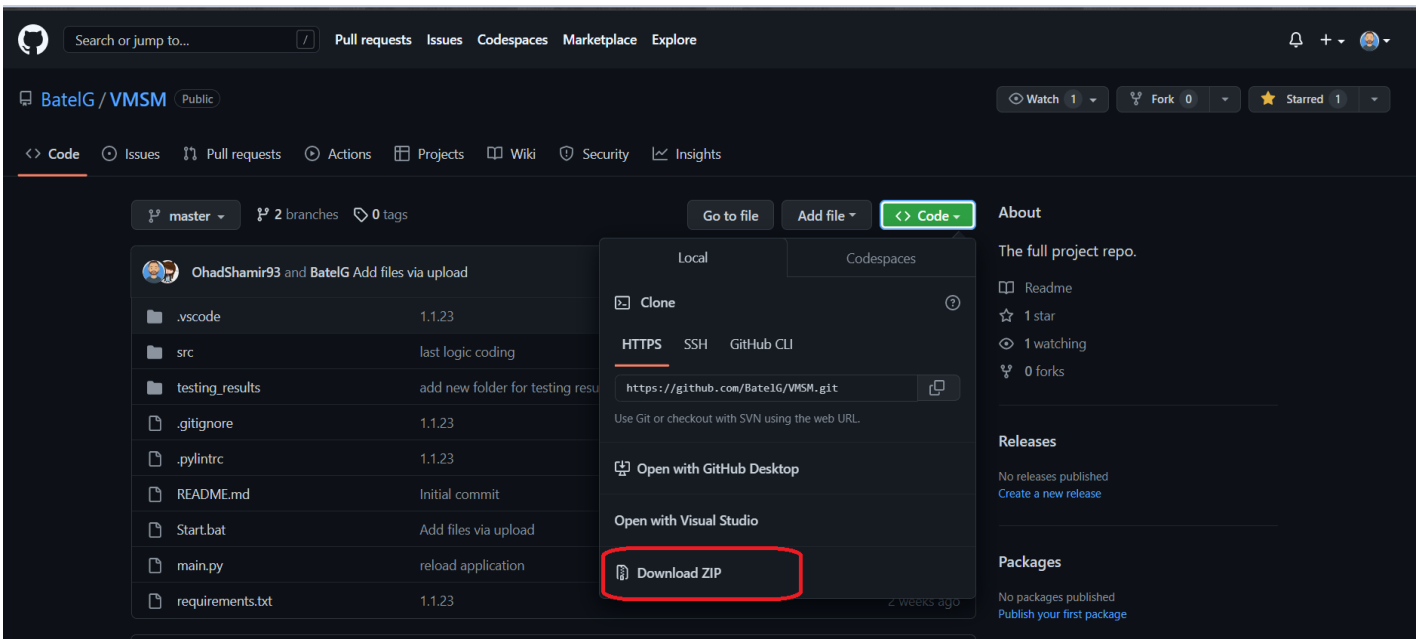

Figure 2: Downloading the VMSM git repository into the local computer as a ZIP file.

2. **Start.bat** file will install all the system's requirements.

   After all the installation are finished, the application will open automatically.

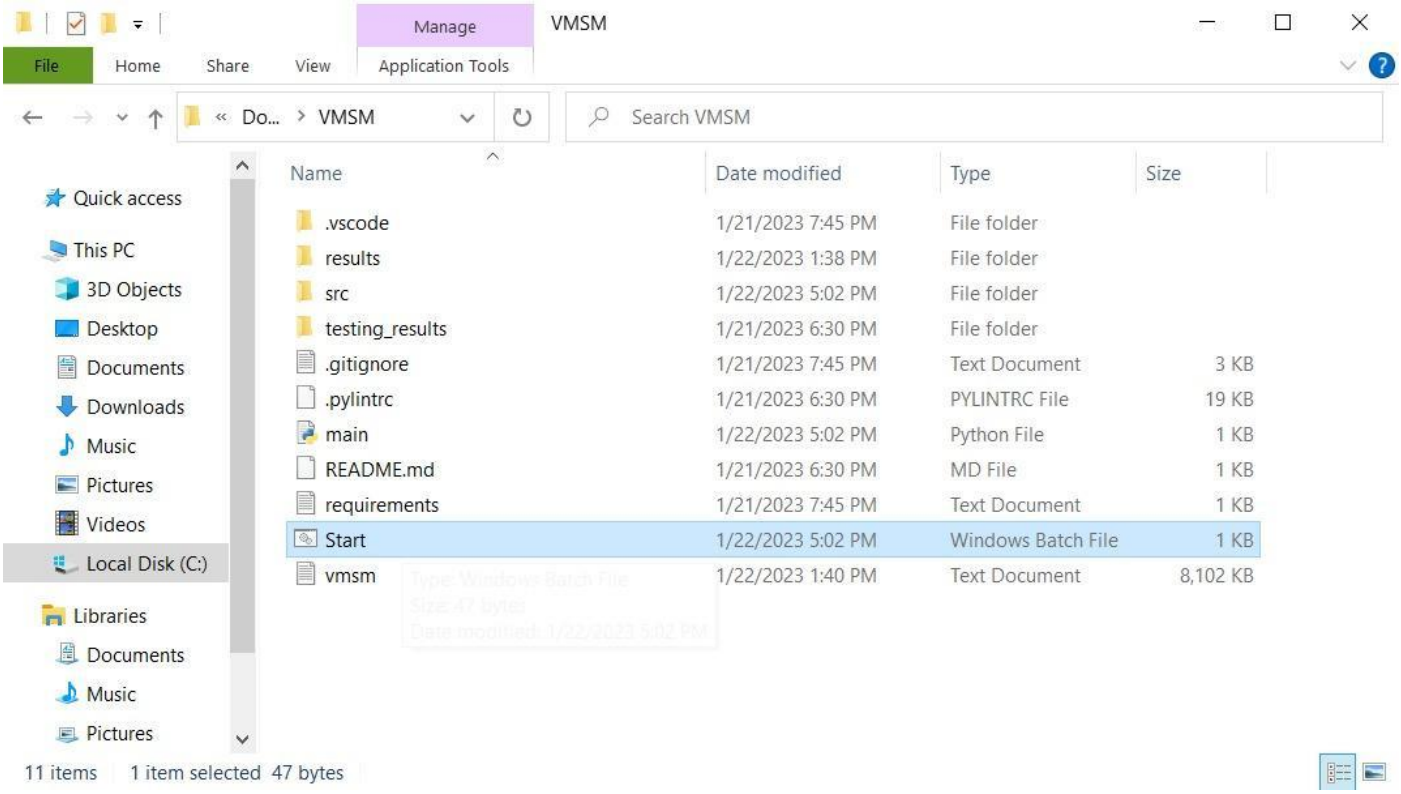

*Figure 3: Choosing **Start.bat** file and clicking on it so the system's requirements will be installed on the local Python's environment. Then, the application will start automatically .*

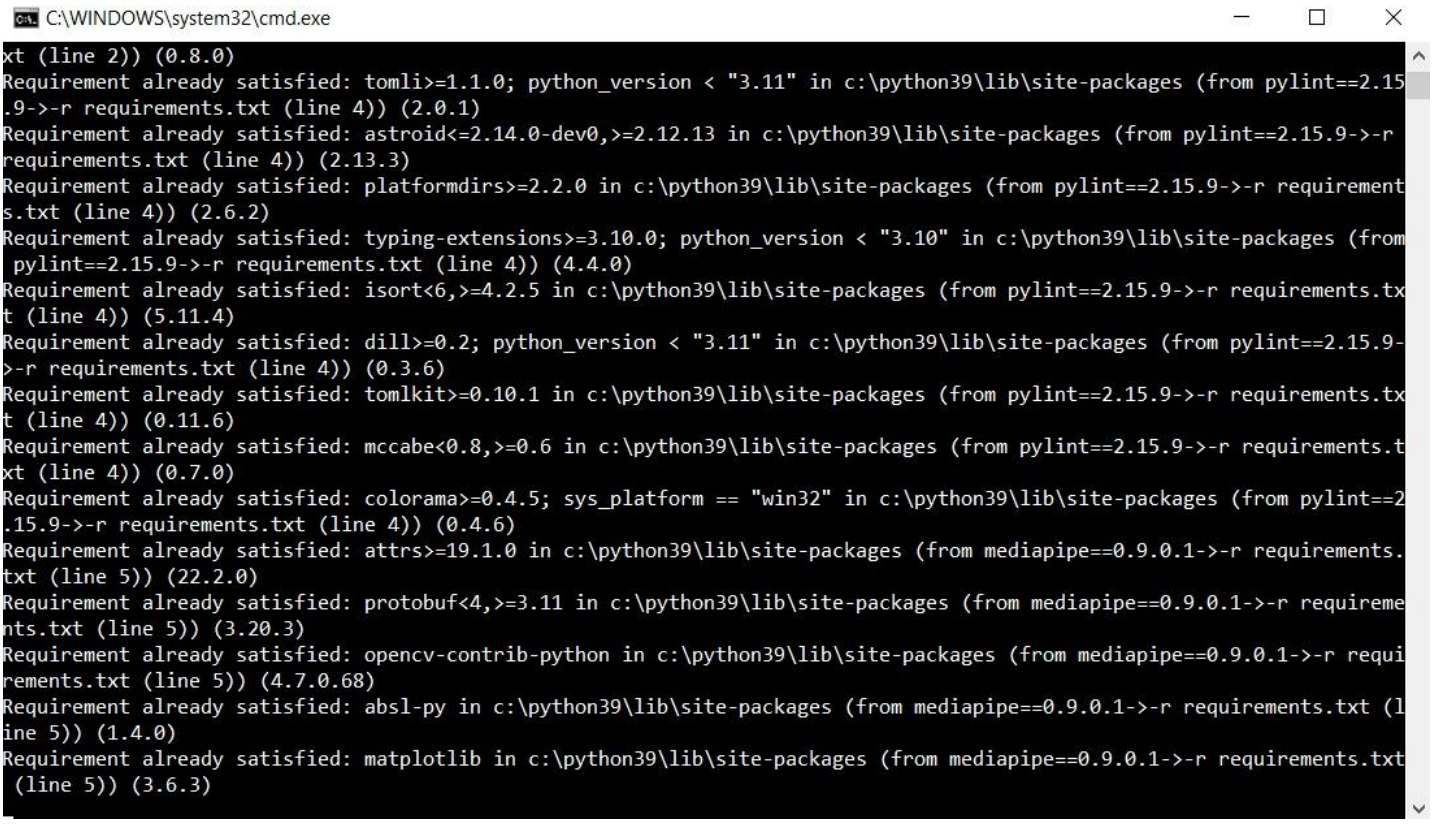

*Figure 4: **Start.bat** file is running and installing all the system's requirements.*

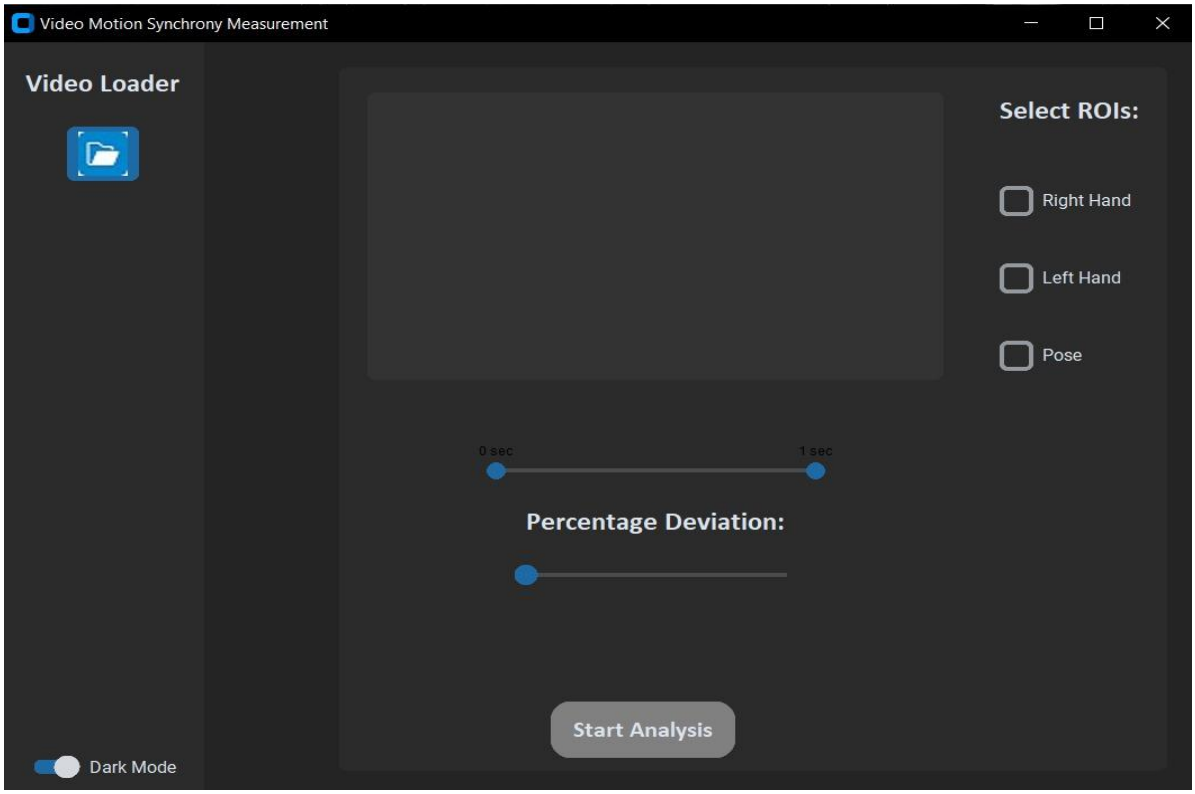

Figure 5: VMSM application main window.

GUI - User Actions

- Start the VMSM application.
- Load the video by pressing the "Video Loader" button.
  * VMSM supports MP4, MOV, and AVI video file types.

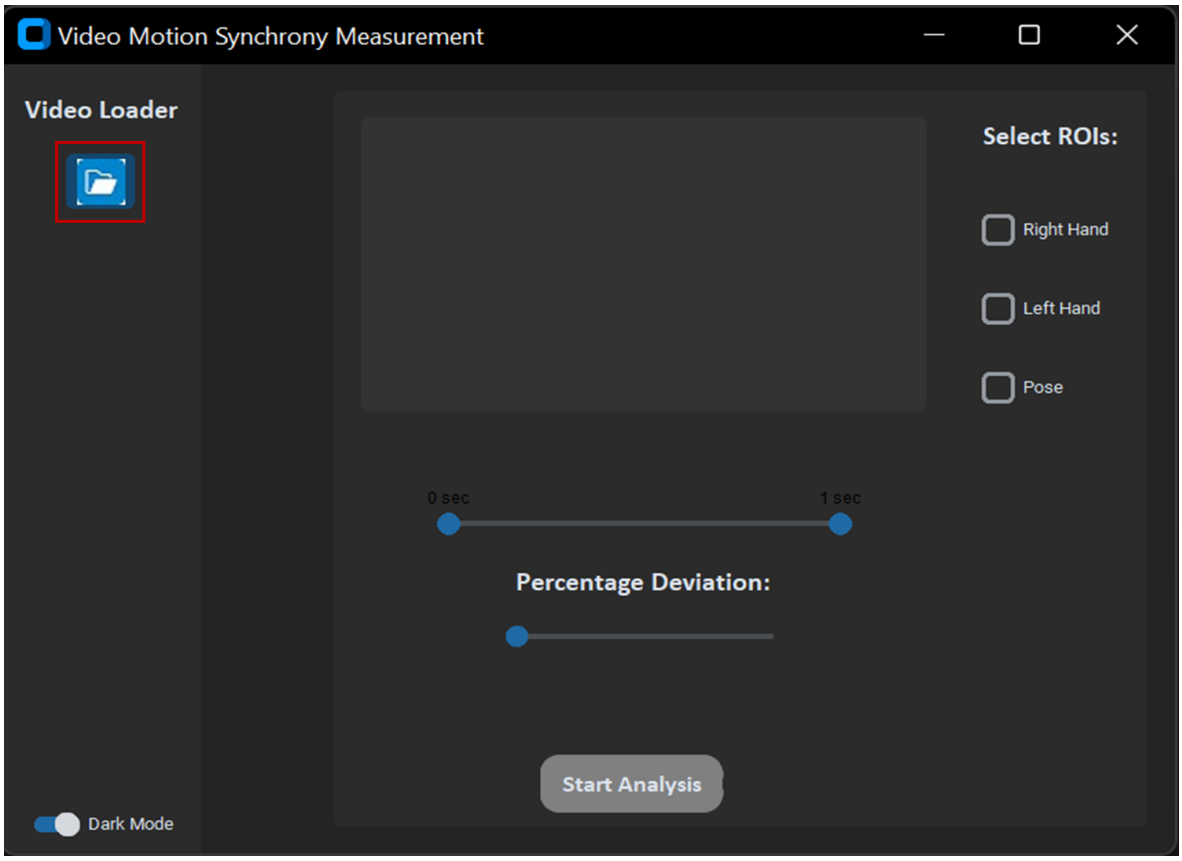

Figure 6: VMSM application home screen, dark mode theme. The "load video" functionality is marked by the red square.

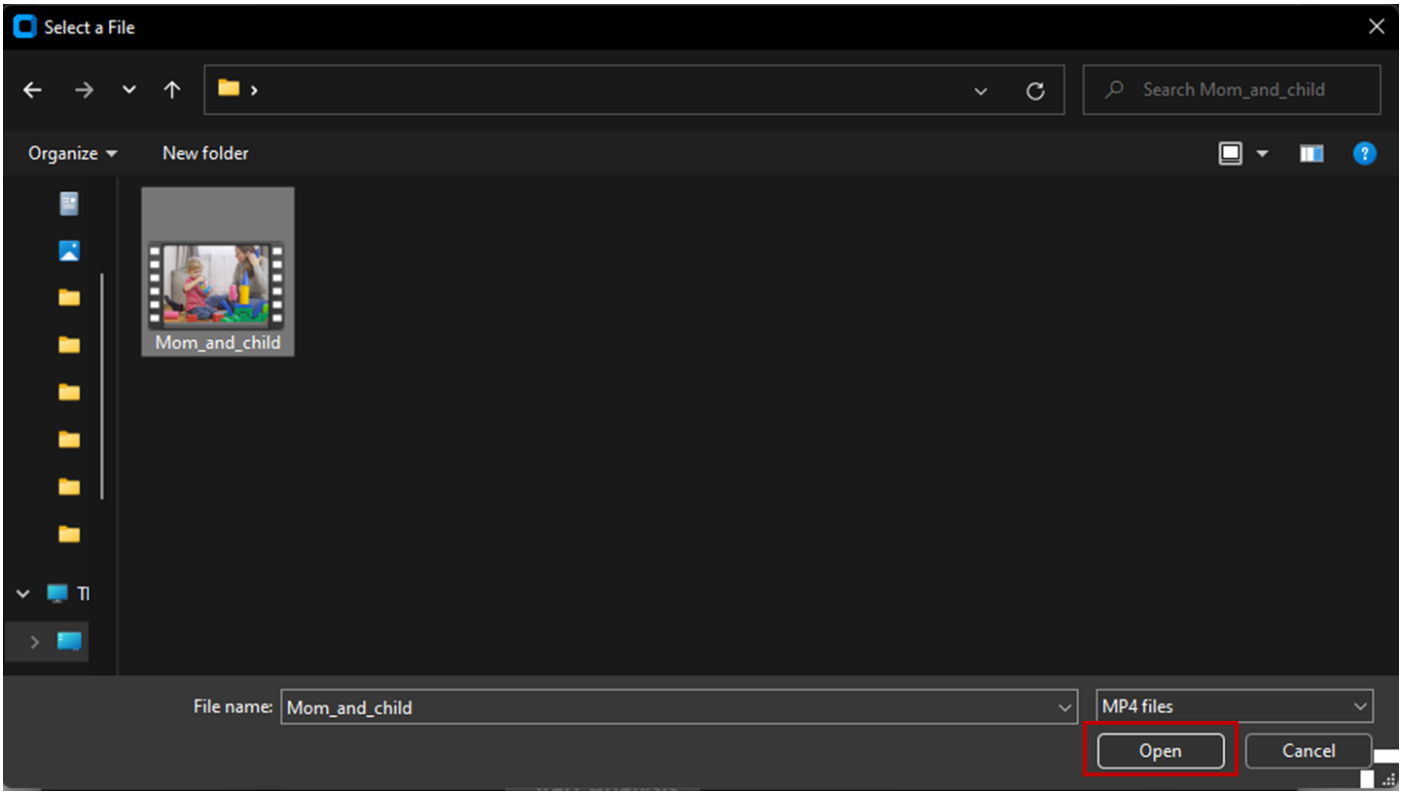

Figure 7: VMSM application, file explorer for choosing the desired video file to upload to the application and analyze.

- Extract the relevant seconds from the video (optionally).

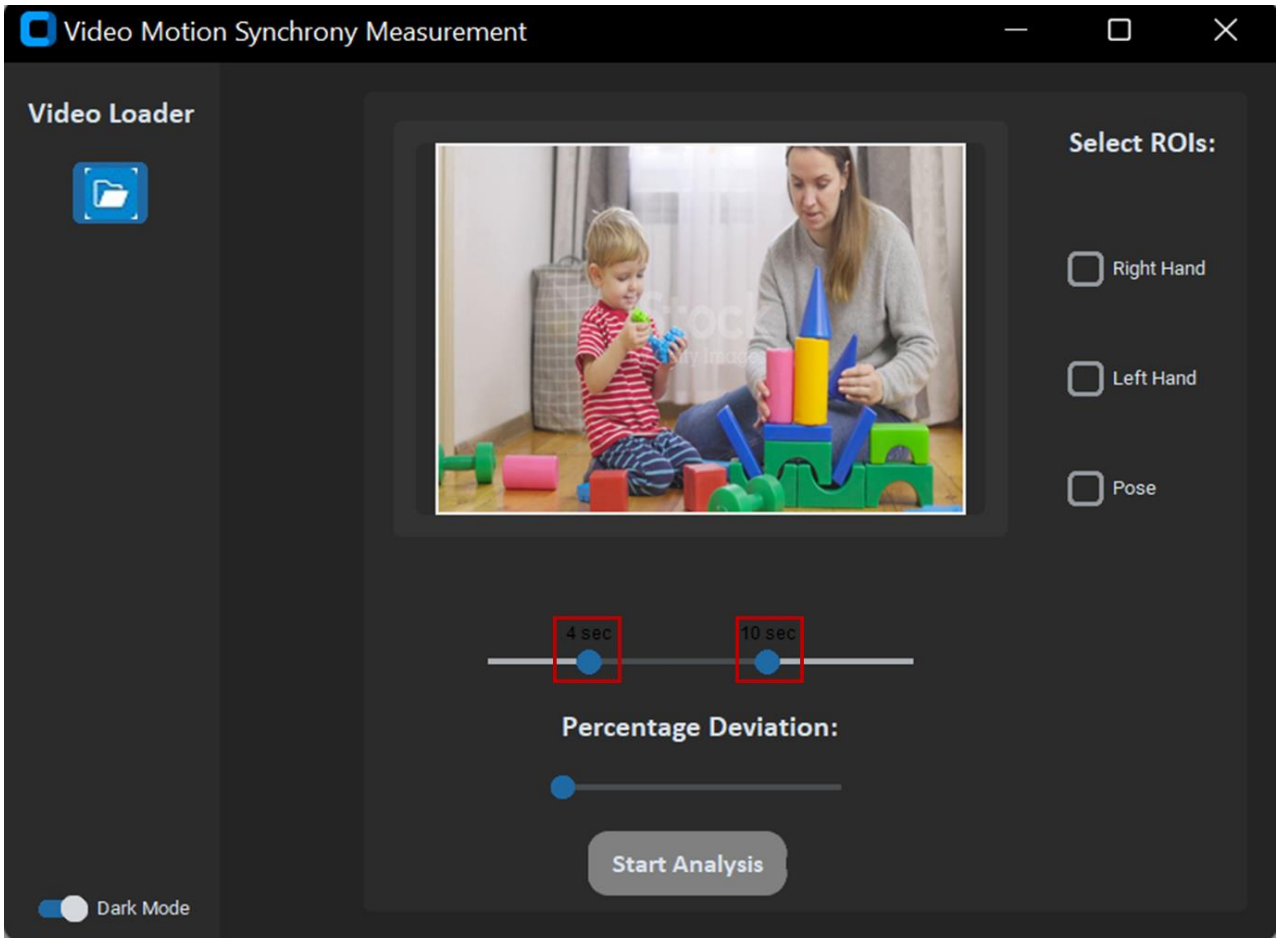

Figure 8: VMSM application, video uploaded. Cutting the video length by choosing the relevant seconds of the video.

- Choose percentage deviation (optionally).

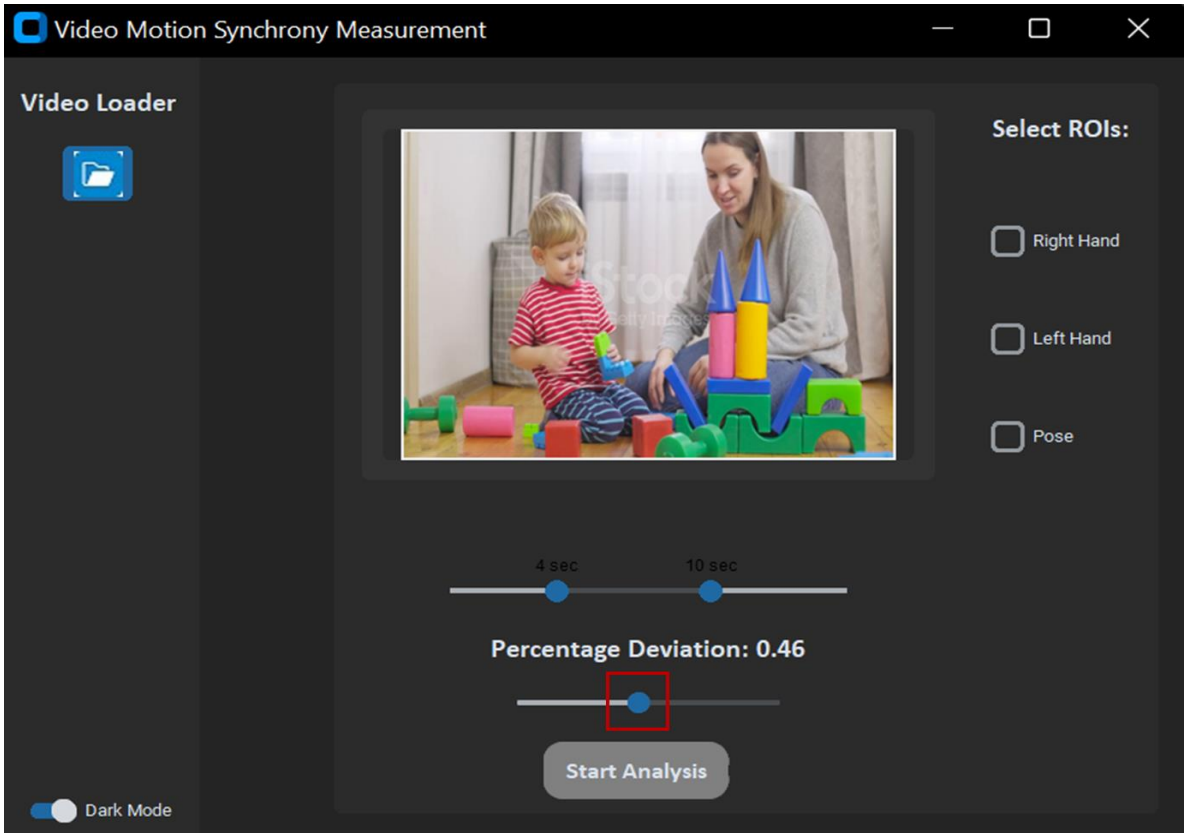

Figure 9: VMSM application, the percentage deviation is determined by moving the slide bar marked by the red square.

- Choose ROIs (must choose at least one, can be multiple choices).

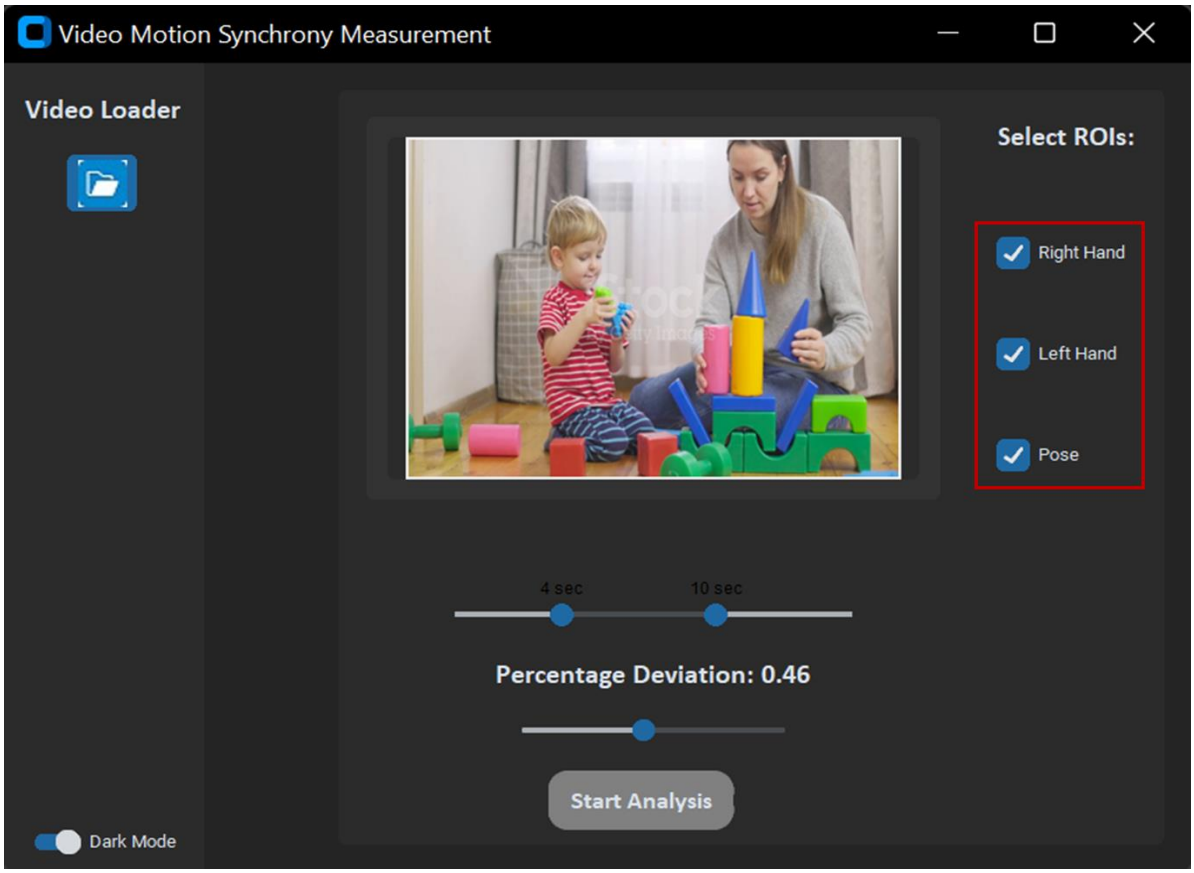

Figure 10: VMSM application, the red square represents the necessary selected ROIs.

- Press the “Start Analysis” button.

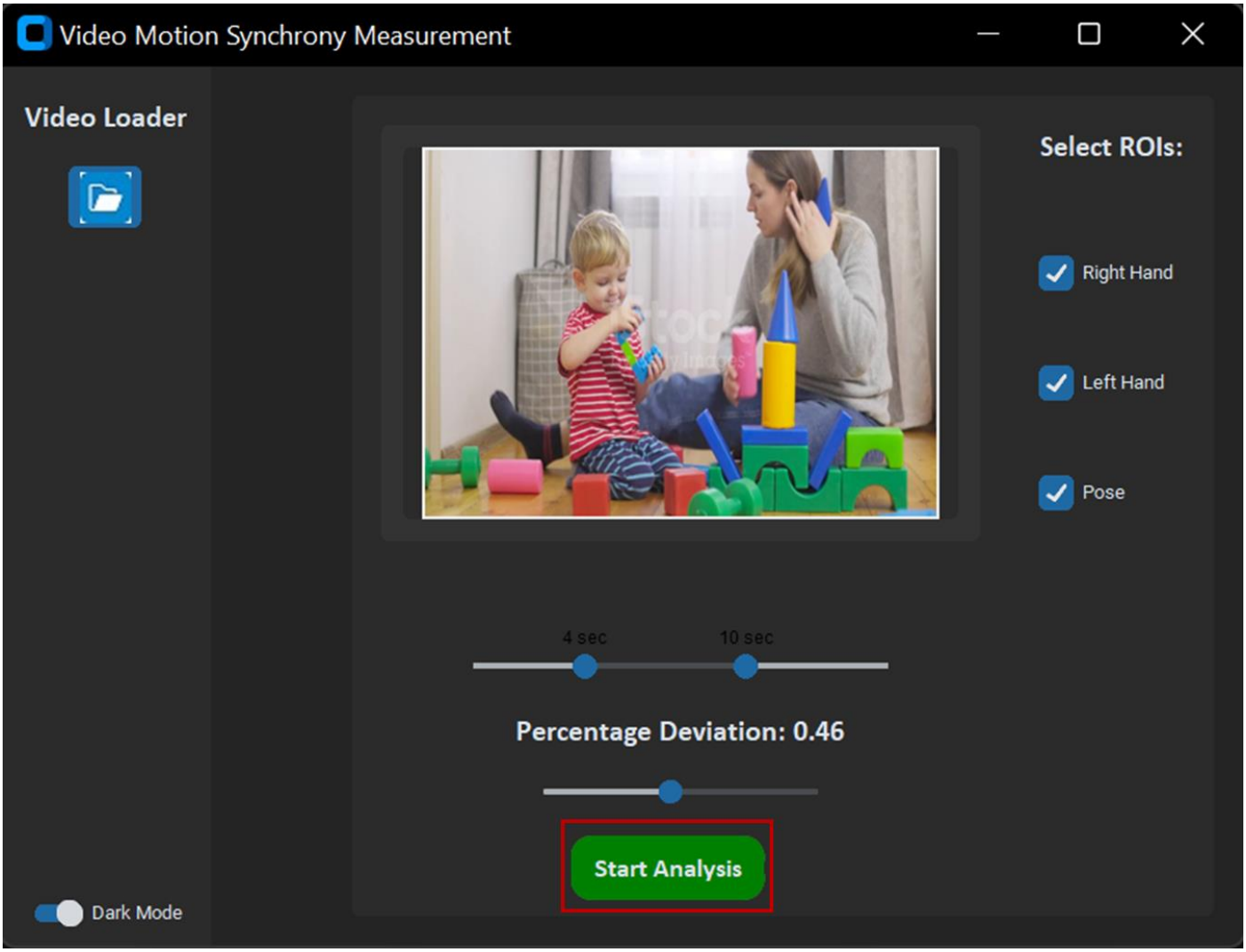

Figure 11: VMSM application, the user uploaded a video and chose ROI’s [Right Hand, Left Hand, Pose]. Now the researcher can press the “Start Analysis” button to begin the synchronization measurement process.

- The VMSM system launches the video analysis and the synchronization rating estimation. After the process ends, a pop-up message will appear on the screen. On the left menu will be added two new buttons: One for reloading the application for new analysis and the other one for producing reports.

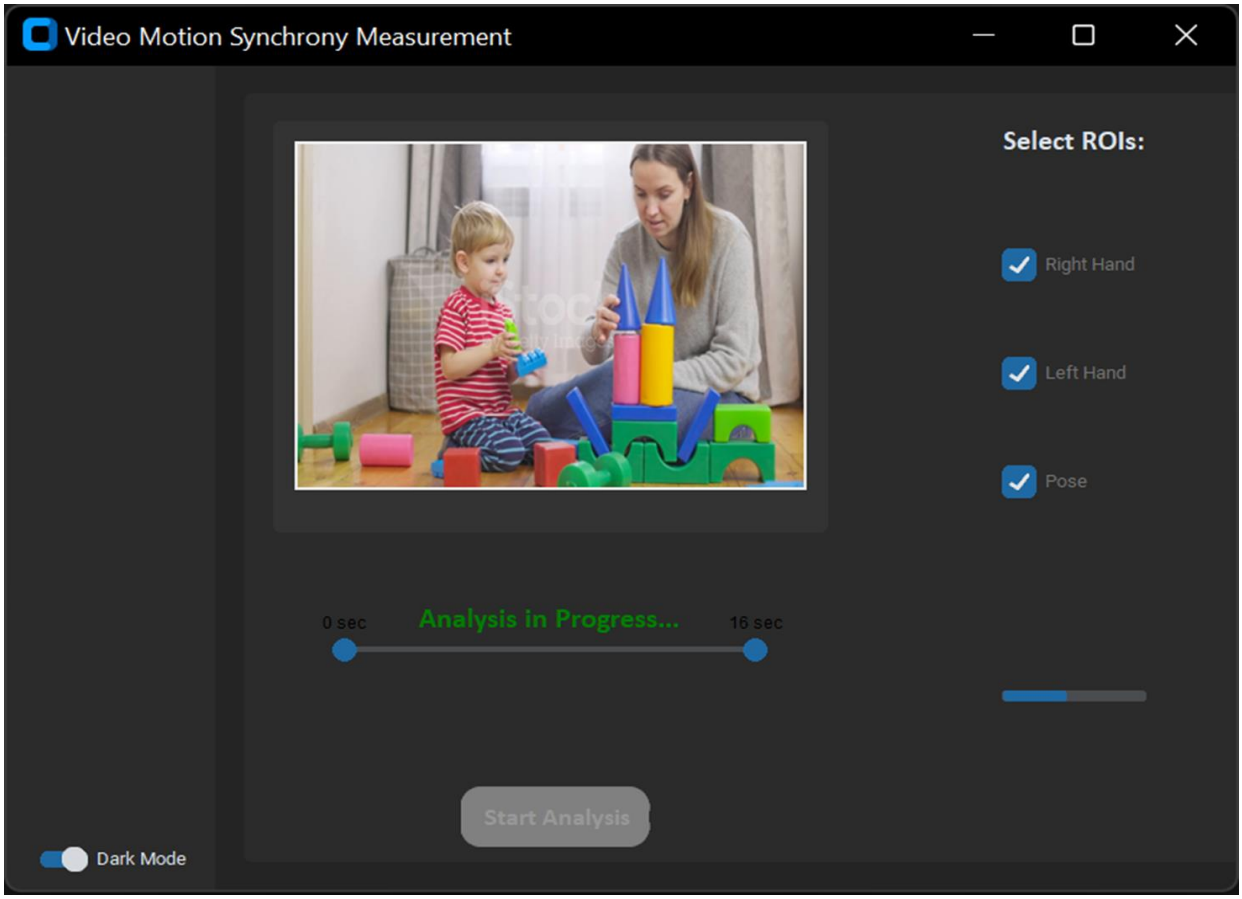

Figure 12: VMSM application, the user uploaded a video and chose ROI's [Right Hand, Left Hand, Pose]. Now the researcher can press the "Start Analysis" button to begin the synchronization measurement process.

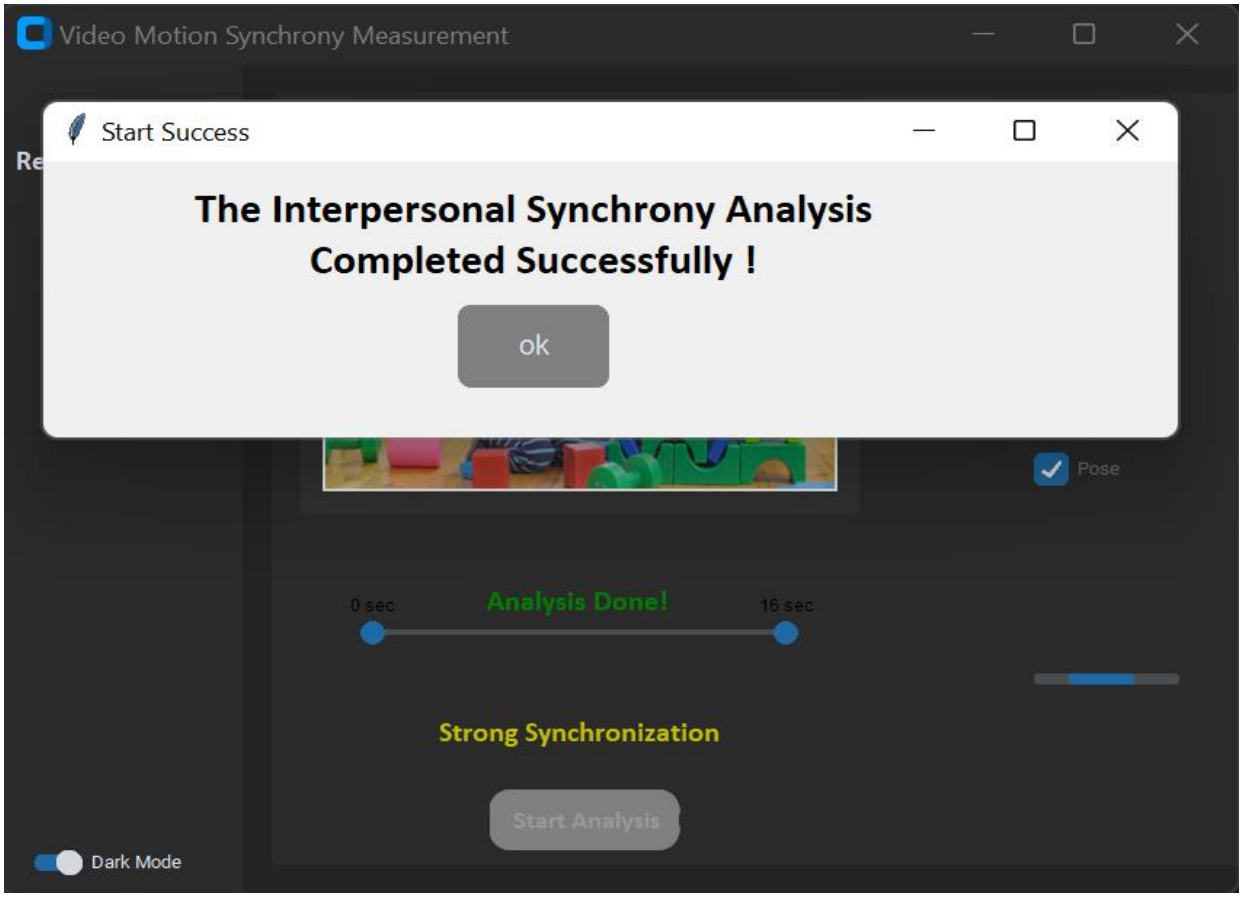

Figure 13: VMSM application pop-up window shows to the user that the synchrony analysis was completed successfully. The classification level is appearing inside the UI screen.

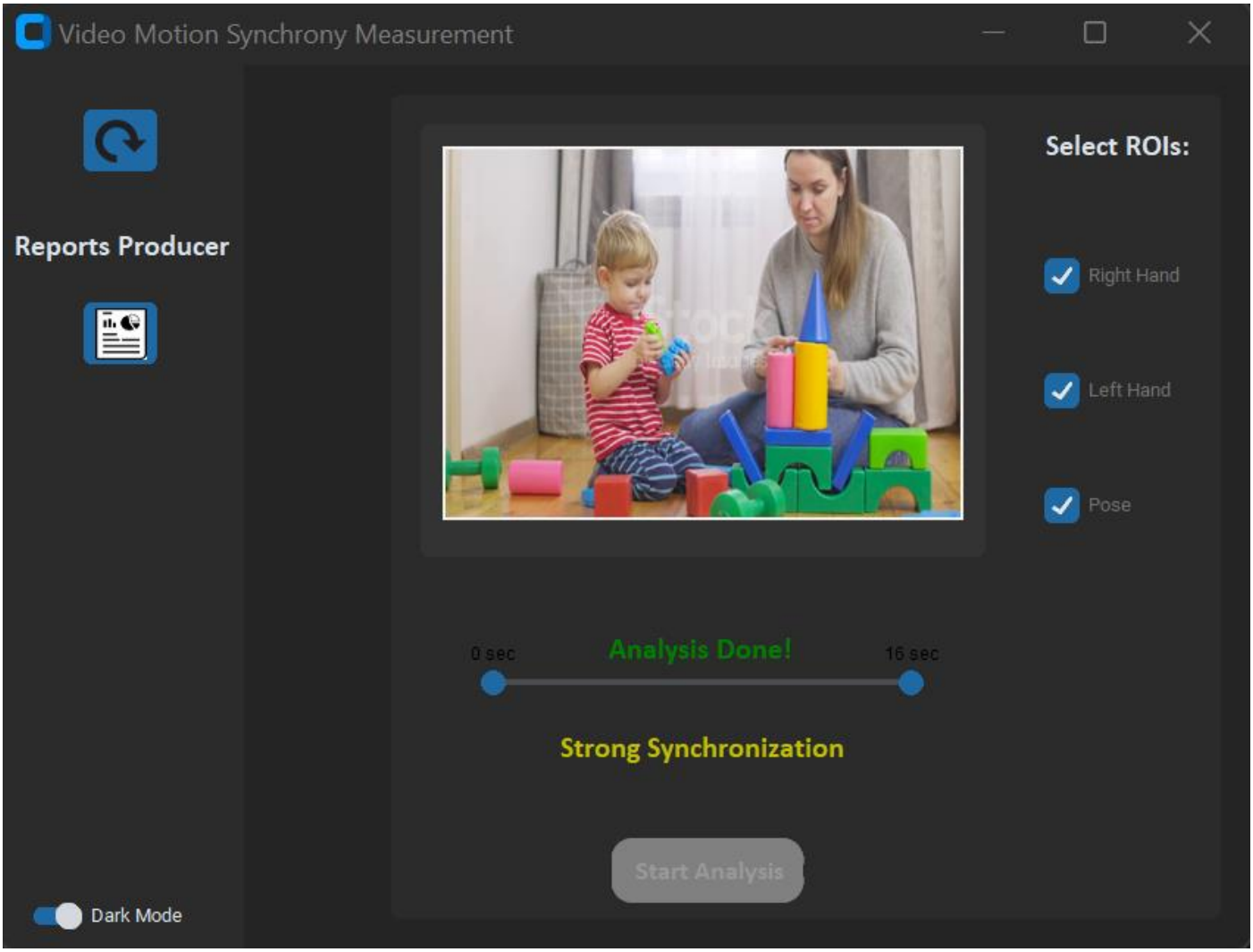

Figure 14: VMSM application, the interpersonal synchrony rate was calculated. Two new features are available on the left menu: the first one is reloading the application for new analysis and the second one is for exporting reports.

- You can export three types of reports:
  - TXT raw data file.
  - CSV raw data file.
  - PDF full report.

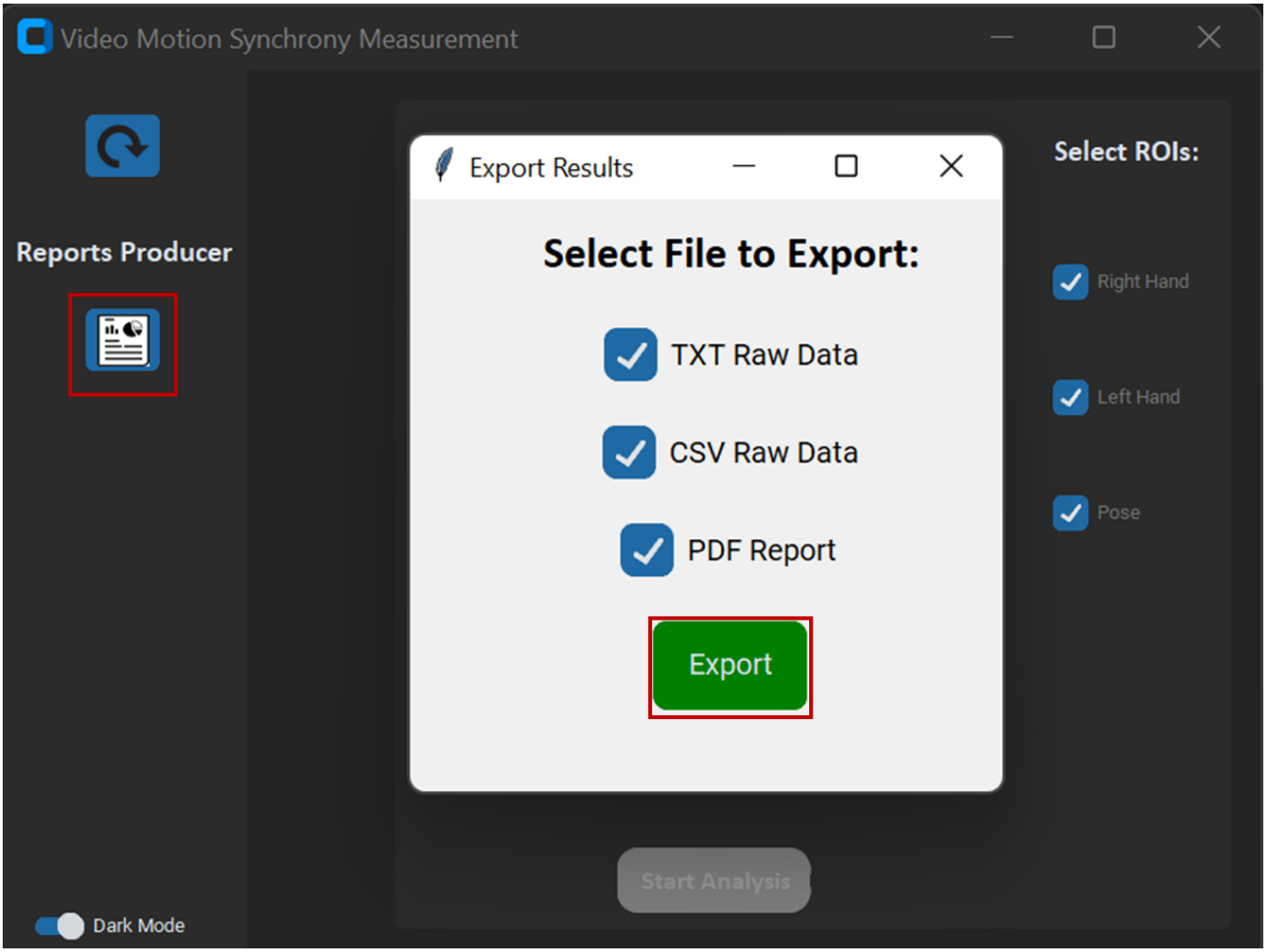

Figure 15: VMSM application, the user chose to produce reports. For exporting the reports, at least one option must be selected [TXT Raw Data, CSV Raw Data, PDF Report].

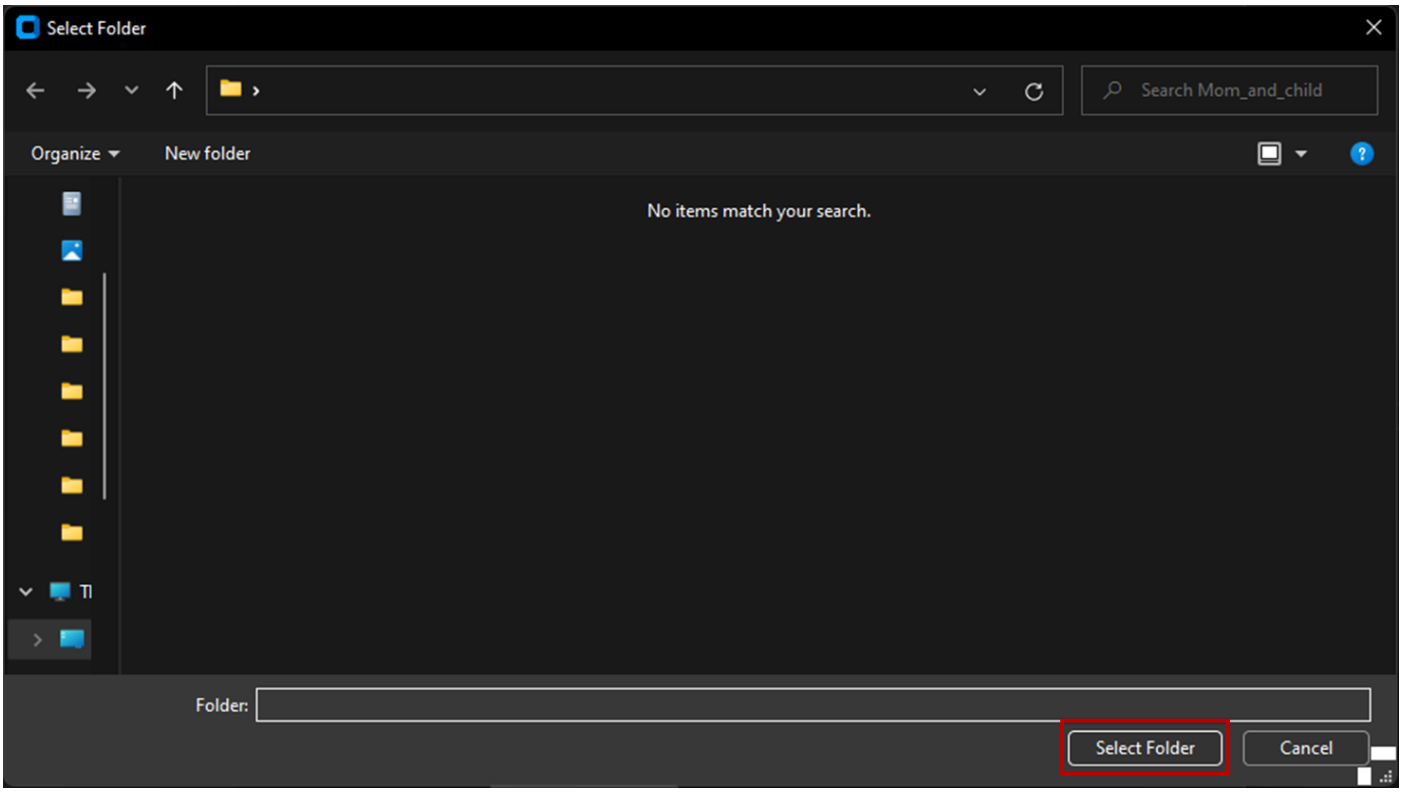

Figure 16: VMSM application, choosing the target folder via the file explorer for saving the produced reports.

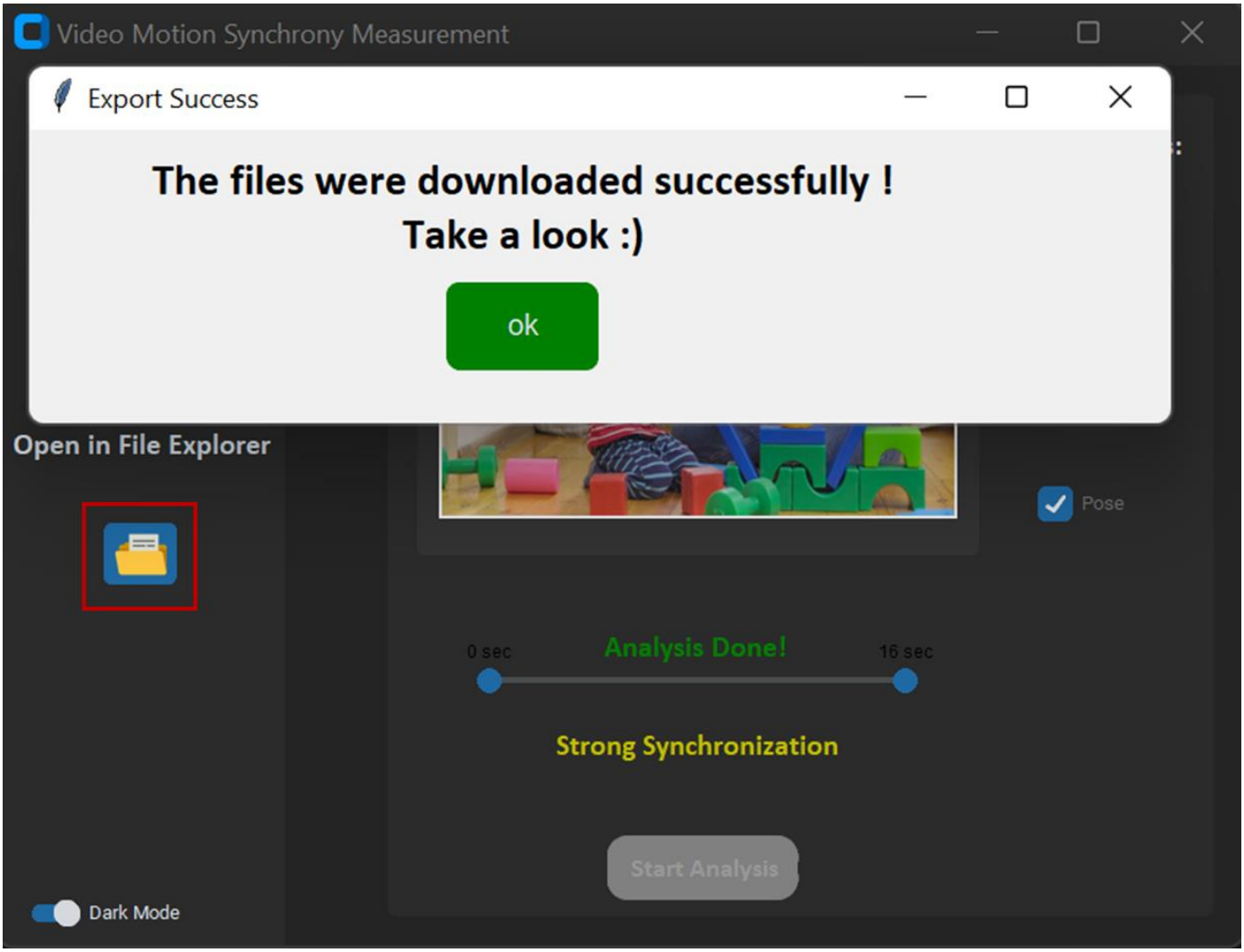

Figure 17: VMSM application pop-up window shows to the user that the selected reports were downloaded to the target folder successfully. The researcher can press the "Open in File Explorer" button to look at the reports in the selected folder.

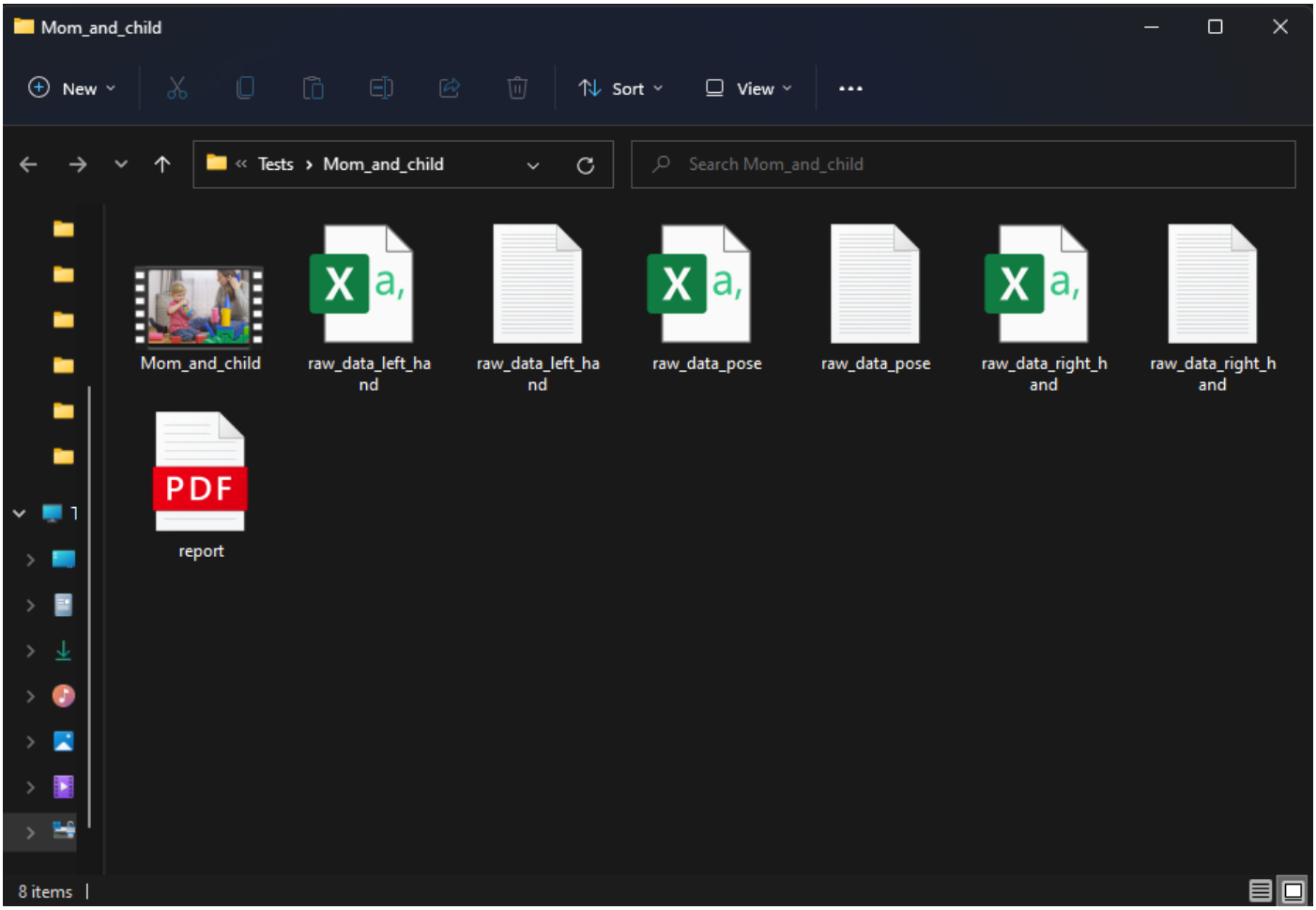

Figure 18: VMSM application, the downloaded files inside the target folder chosen by the user via the file explorer.

★ There is an option to define "debug mode" in the configuration file.
In this mode, while the system analyzes the video file, all the screens that the system produces will be displayed on the screen, including the detection of the MediaPipe landmarks and the transformations that led to the videos. This feature allows the user to understand the system's result calculation with more indication.

Maintenance Guide

The user should continue monitoring the ongoing versions of the VMSM application that will be released in the future. It is important to continuously update the versions because the dependencies versions are regularly upgraded, and accordingly, we must update the VMSM's source code.
Additionally, many features are intended for implementation in the near future, which will benefit the user and improve the interpersonal synchronization estimation results. The VMSM's version updates aim to maintain and keep up with the dependencies' version renewal. Also, VMSM's version updates are intended to bring as much user experience as possible and incessantly optimize its algorithm.