

# Xailient Face Recognition Evaluation Kit for SONY IMX500

## Overview



Xailient's Face Recognition enables high-speed edge AI processing with low-power consumption using Sony's IMX500 – a chip so small it can fit on the tip of your finger.

Xailient's Face Recognition (FR) Edge AI Evaluation Kit (FR-EK) is a complete solution to identify faces using the Xailient FR SDK and [IMX500 Intelligent Vision Sensor](#) from SONY.

The FR-EK consists of a Raspberry Pi CPU board, the SONY IMX500 Type 2 camera module, and the Xailient FR SDK. The FR solution is capable of fast, high-accuracy FR in both single-face and multi-face modalities under a broad range of real-world conditions.



## FR Solution Description

The FR-EK is aimed at a range of solutions, including smart home, retail, industrial, and automotive. With a 12 mega-pixel camera running at approximately 20 fps, it delivers high accuracy and low latency FR results at the IoT edge.

The following table provides an overview of solution performance:

Parameter	Units	Value (typical)
RAM utilization (DNN)	MB	7.2
Inference speed	frames-per-second	20
Accuracy	%	98.4 <sup>1</sup>
Operational range	meters	2.5
Max lighting level	lux	10,000
Min lighting level	lux	500
multi-face	-	yes
multi-pose	-	yes

<sup>1</sup> benchmarked against dlib and Labeled Faces in the Wild (LFW)

## Equipment Required

The FR-EK consists of the following components:

- [Raspberry Pi 4](#) CPU board
- SONY IMX500 Type 2 camera module
- Xailient FR SDK software

## Equipment Setup

### Hardware Setup

The IMX500 Start-up Guide describes the hardware set-up process and is supplied by SONY to approved customers/partners. When sourcing your IMX500 hardware from SONY, you should request the Start-up Guide also.

### Software Setup

#### Installing the FR app

At the Raspberry Pi console, unpack the supplied zip file containing the application:

```
rm -rf ~/sony-fv-app
unzip -d ~/sony-fv-app <path to .zip file>
```

#### Configuration

The Xailient SDK can be configured using the `json` config file (found in the 'config' folder). The config file is separated into sections, which are used or not depending if they are present and depending on the modes the app runs.

The app can be called using the argument `--xa-app-cfg` and the path to the config file.

Xailient recommends that the default configuration is used for the FR-EK. Configuration parameters can be changed but should be done so in consultation with Xailient.

## Running the FR Evaluation Demo

Face recognition applications require users to register images of their faces with the app so that the app can later identify that person.

### Registering a user

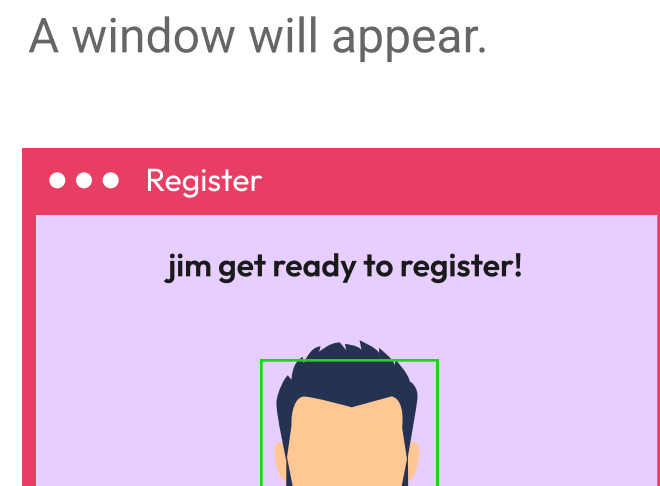
Edit `./apps/configs/default.json` and change the `modes.register.embedding_path` to point to a file name after the user is registered. For example, if you want to register Sally, then change it to:

```
...
"modes": {
  "model-dump": {
  },
  "register": {
    "embedding_path": "./output/embeddings/sally.json"
  },
  ...
}
```

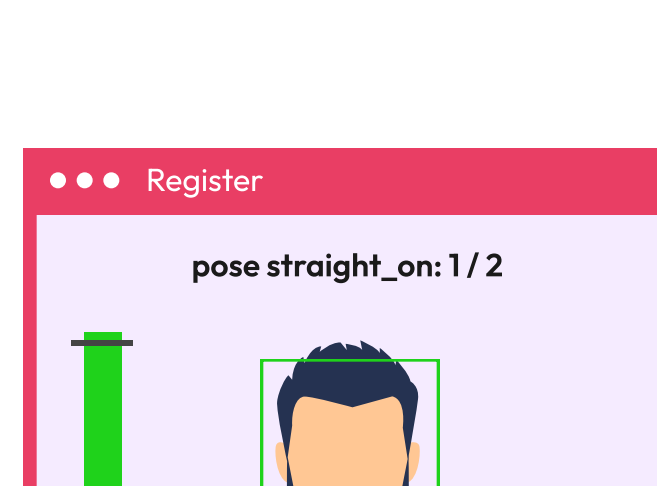
To register a user have the user stand in front of the camera approximately 0.75m away. Then start the app:

```
cd ~/sony-fv-app
./power_supply_start.sh
./imx500_start.sh --xa-app-cfg ./app/configs/default.json --xa-mode register
```

A window will appear.



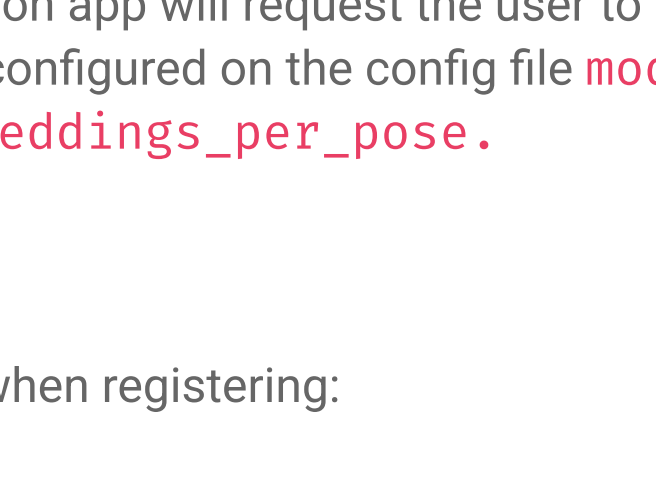
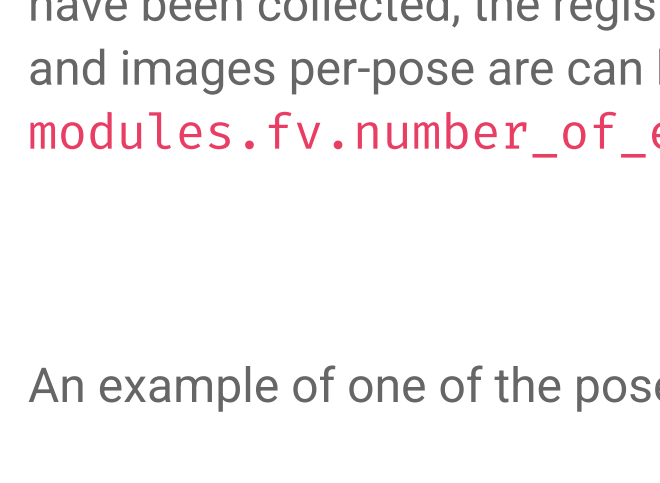
When you and the user being registered are ready, press the spacebar once. You will then see a prompt on the screen indicating the pose the user should use.



Press the spacebar when the user is looking straight at the camera and is approximately 0.75m away.

The registration process collects a few images of the user. When a sufficient number of images of the user have been collected, the registration app will request the user to change their pose. The number of poses and images per-pose can be configured on the config file `modules.fv.poses_to_register` and `modules.fv.number_of_embeddings_per_pose`.

An example of one of the poses when registering:



When images for all of the required poses have been captured, the registration app will indicate that registration is complete:



### Registering another user

To register another user simply edit the filename `modes.register.embedding_path` in `./apps/configs/default.json` to include the user's name. Now repeat the steps above to register a User.

### Explanation of poses

The app provides the best accuracy when users register their face using different poses. This helps the app better recognize faces at angles seen in real-world conditions. By default, the following poses are required when registering a user.

```
`straight_on` - the user should face directly at the camera
`looking_up` - the user should tilt their head up about 30 degrees
`looking_down` - the user should tilt their head down about 30 degrees
`looking_right` - the user should look to their right, turning their head about 45 degrees
`looking_left` - the user should look to their left, turning their head about 45 degrees
```

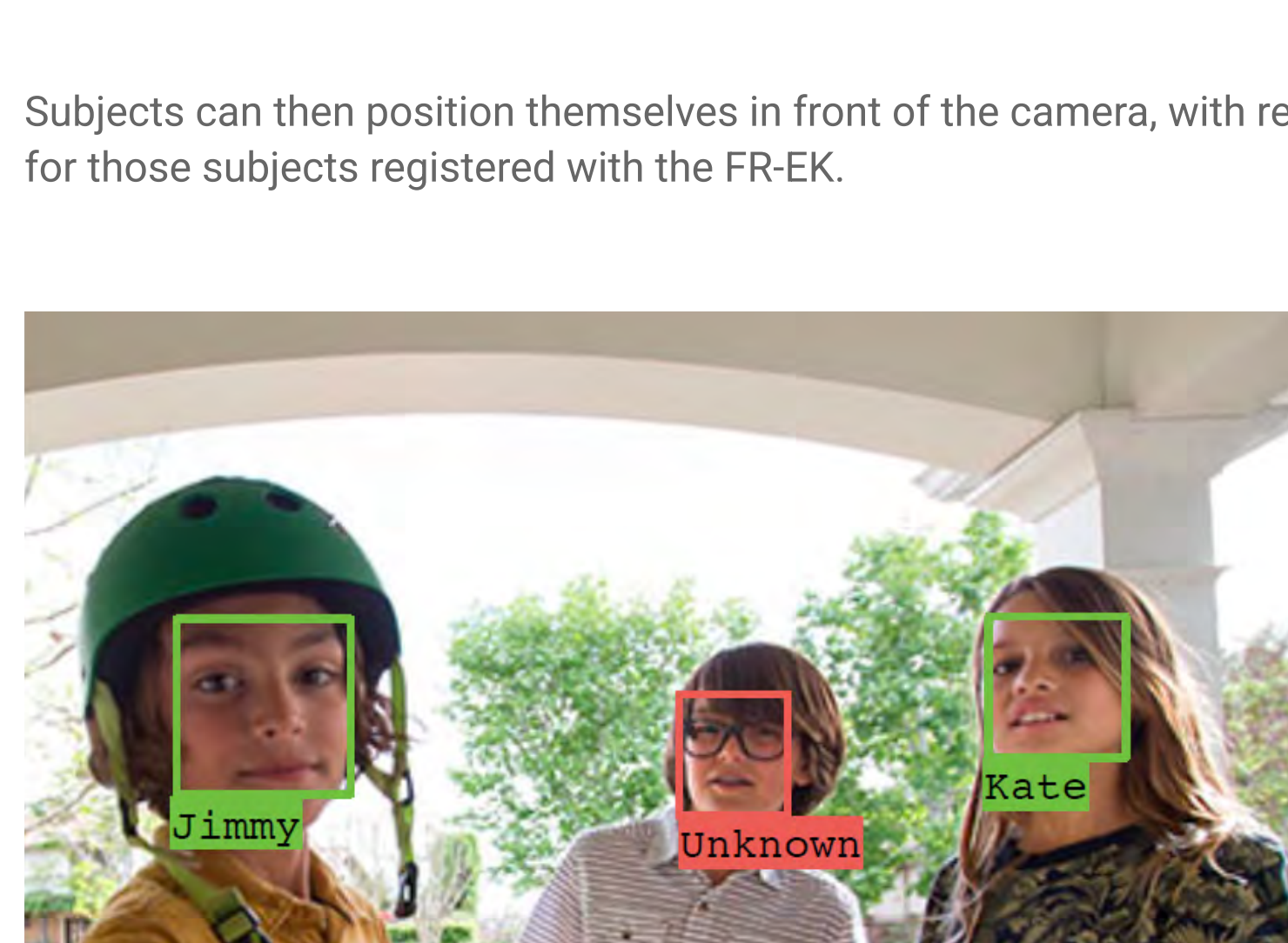
These poses are defined in [Xailient Config file](#).

### Using the face verification app

To perform face recognition, the application is started in the 'verify' mode:

```
cd ~/sony-fv-app
./imx500_start.sh --xa-app-cfg ./apps/configs/default.json --xa-mode verify
```

Subjects can then position themselves in front of the camera, with recognition occurring for those subjects registered with the FR-EK.



## Evaluation Guidelines

Using the FR-EK, performance can be assessed by varying the environmental conditions, e.g. lighting levels, and/or test subject appearance, e.g. pose angle, range, accessories (such as hats and glasses).

### About Xailient

Xailient is a Computer Vision company specializing in putting incredibly accurate AI onto impossibly small Edge devices.

We've built the world's smallest and fastest object detector to fit on extremely tiny devices running on exceptionally low power.

Specializing in TinyML computer vision for Edge devices, Xailient uses its patented technology to radically improve efficiency compared to other available solutions.

The result is accurate, real-time computer vision that's cost-effective.