



# MJB Software

## User Guide

MUG100-1.0E, 11/08/2021

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**Revision History**

Date	Version	Description
11/08/2021	1.0E	Initial version published.

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# 1 About This Guide

## 1.1 Purpose

This manual describes MJB software installation and operation, and it aims to help you learn the software functions to improve design efficiency. The software screenshots and the supported products listed in this manual are based on MJB software (Version 1.0.0). As the software is subject to change without notice, some information may not remain relevant and may need to be adjusted according to the software that is in use.

## 1.2 Related Documents

You can find related documents at [magicjellybeanfpga.github.io](https://magicjellybeanfpga.github.io).

## 1.3 Terminology and Abbreviations

Table 1-1 shows the abbreviations and terminology used in this manual.

**Table 1-1 Terminology and Abbreviations**

Terminology and Abbreviations	Meaning
MJB	Magic Jelly Bean
GUI	Graphical User Interface
AI	Artificial Intelligence
U2J	USB to JTAG
ML	Machine Learning
SoC	System on Chip
MCU	Microcontroller Unit
FPGA	Field Programmable Gate Array
GCC	GNU Compiler Collection
PC	Personal Computer

## 1.4 Support and Feedback

Magic Jelly Bean Organization provides customers with comprehensive technical support. If you have any questions, comments, or suggestions, please feel free to contact us directly using the information provided below.

Website: [magicjellybeanfpga.github](https://magicjellybeanfpga.github.io)

E-mail: [admin@magicjellybean.org](mailto:admin@magicjellybean.org)

# 2 Overview

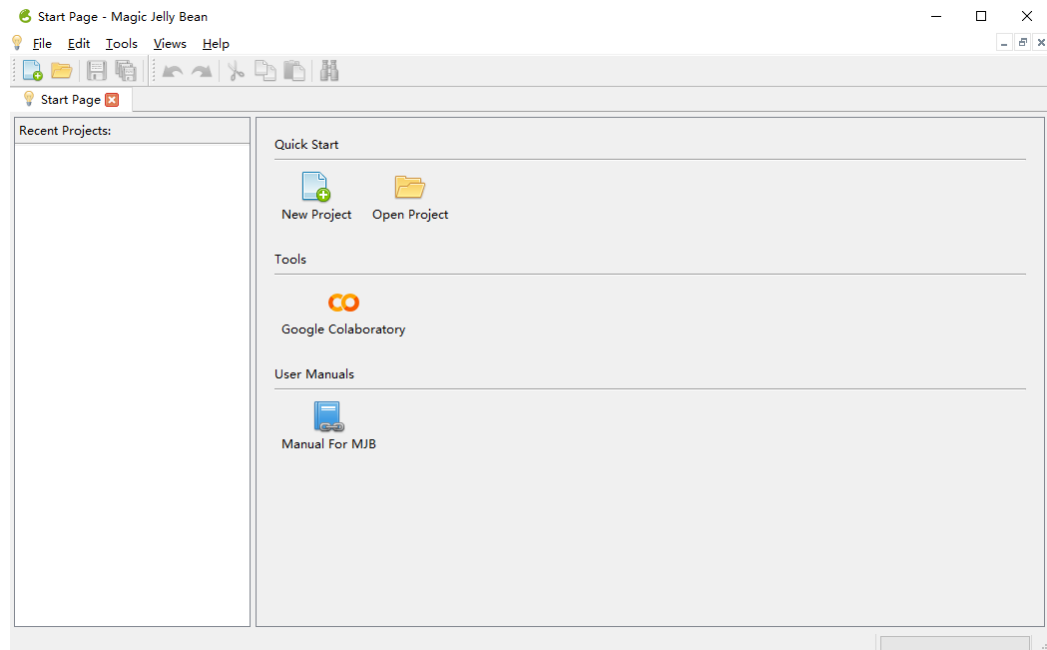
## 2.1 Introduction

Founded in 2021, Magic Jelly Bean is a non-profit organization established to enable hobbyists, academic researchers and electronic enthusiasts machine learning classification capabilities for embedded edge electronics projects. These machine learning capabilities are enabled through low cost development boards and an open software platform. The intent is to create a growing and on-going community of like-minded individuals who can share ideas, projects and wisdom in the machine learning and artificial intelligence field through a common platform.

MJB software is an integrated development environment developed for MJB machine learning. MJB software integrates with TensorFlow and TensorFlow Lite frameworks to automatically generate AI hardware convolution accelerator, MCU C/C++ for driving AI accelerator, and FPGA bitstreams with various sensor inputs, allowing you to deploy machine learning models directly to MJB Board and MJB Mini Board without any FPGA RTL or MCU C/C++ programming, enabling completely zero coding.

The MJB software includes two product platforms, MJB Board and MJB Mini Board. With front-end input such as Camera, Audio, Accelerometer, HDMI Rx and back-end output such as LED, UART, HDMI Tx, machine learning models such as person detection, car detection, gender detection, digital detection, clock detection, micro speech detection, gesture detection, sine curve, etc. can be deployed directly to MJB Board and MJB Mini Board.

The MJB software supports Windows and MacOS systems. The MJB software interface for Windows is as shown in Figure 2-1.

**Figure 2-1 MJB Software Interface for Windows**

## 2.2 Supported Products

MJB software supports two platforms, MJB Mini Board and MJB Board; for the details, you can visit the official website: [magiciellybeanfpga.github.io](https://magiciellybeanfpga.github.io).

### Note!

The supported products may vary according to the software version in use. Please refer to the software you use for more detailed information.

# 3 Software Installation

## 3.1 Environment Requirement

Windows: Win7/8/10 (32 bit/64 bit)

MacOS: MacOS 11.2.3

## 3.2 Software Download

The package for Windows, MJB\_V1.0.0\_win.exe, and the package for MacOS, MJB\_V1.0.0\_mac.pkg, are available at the official website: [magicjellybeanfpga.github.io](https://magicjellybeanfpga.github.io).

## 3.3 Software Installation

### Note!

- You must close anti-virus programs, such as 360 or Kingsoft AntiVirus, etc. before installing MJB software.
- The installation path should not contain any Chinese characters or spaces.
- Before installing any new version of MJB software, old version should be uninstalled.
- Table 3-1 shows the components to install.

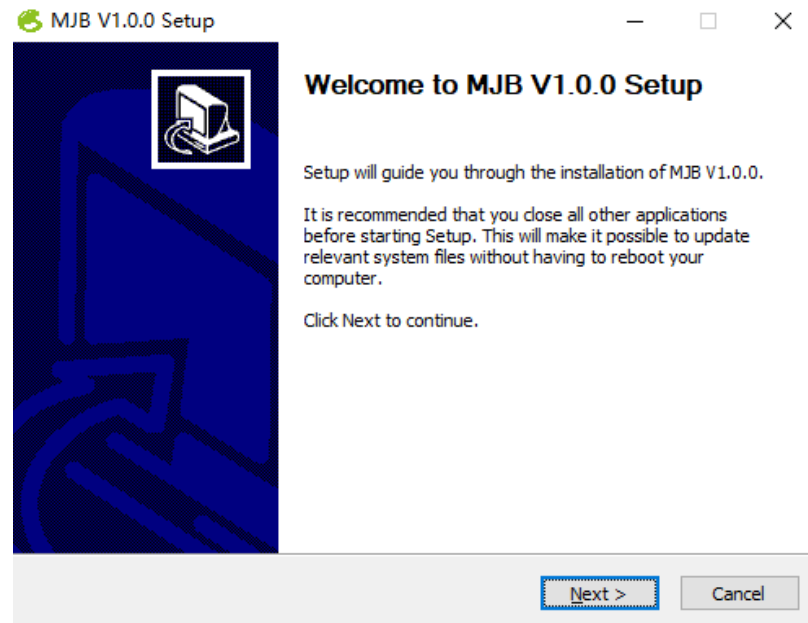
**Table 3-1 Components to Install**

Component	Description	Note
MJB GUI	MJB GUI	MJB_V1.0.0_win.exe MJB_V1.0.0_mac.pkg
U2J	USB to JTAG driver for Windows	zadig-2.5.exe

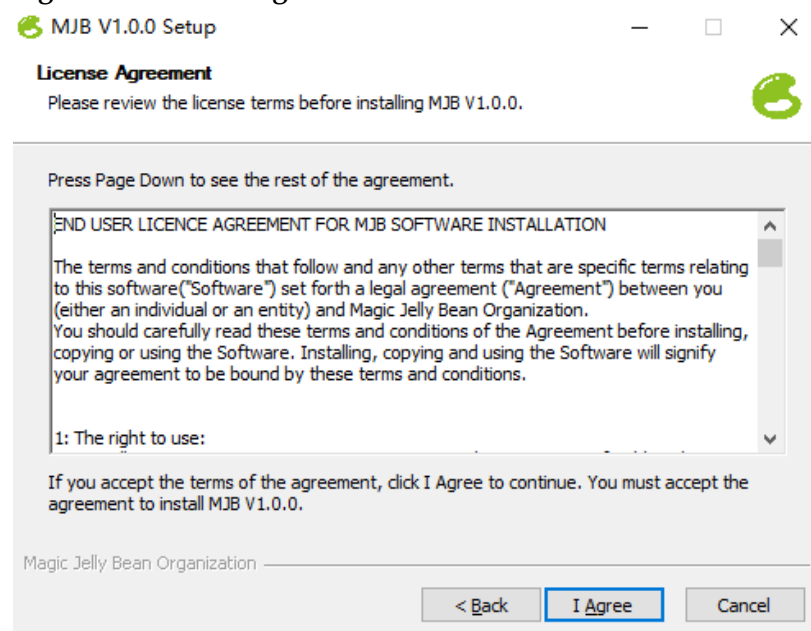
### MJB Software Installation Flow for Windows

The installation flow is as follows.

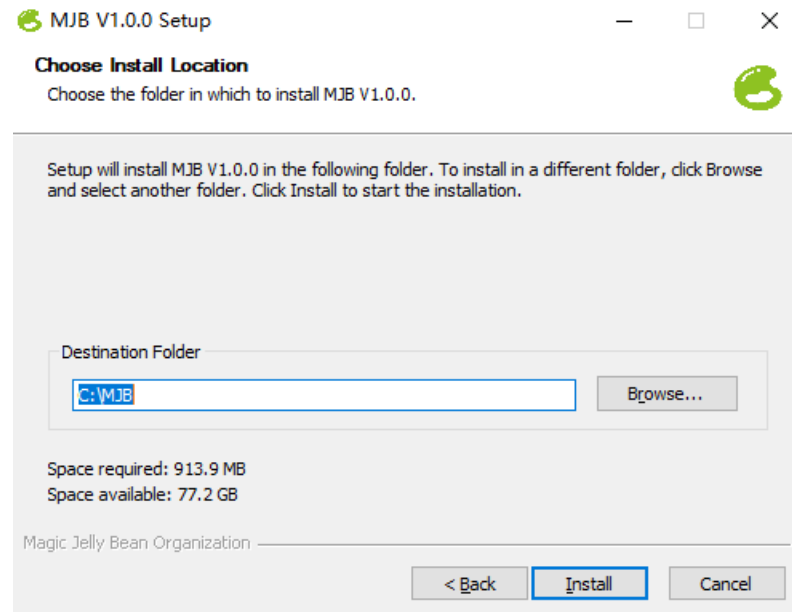
1. Double-click the package MJB\_V1.0.0\_win.exe to enter the MJB software setup interface, click “Next”, as shown in Figure 3-1.

**Figure 3-1 Setup**

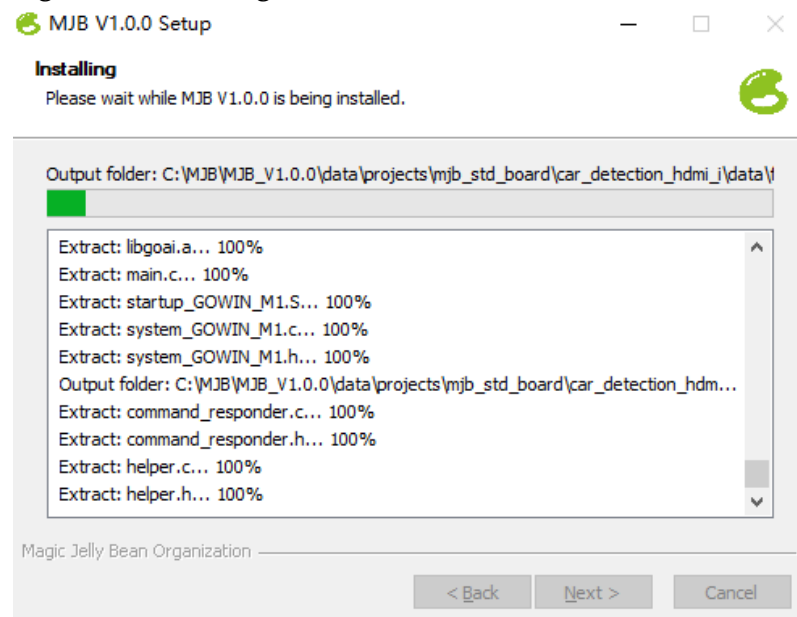
2. Click "I Agree" for the license agreement, as shown in Figure 3-2.

**Figure 3-2 License Agreement**

3. Click "Browse" to select the destination folder. Then click "Install", as shown in Figure 3-3. The default is C:\MJB.

**Figure 3-3 Select Destination Folder**

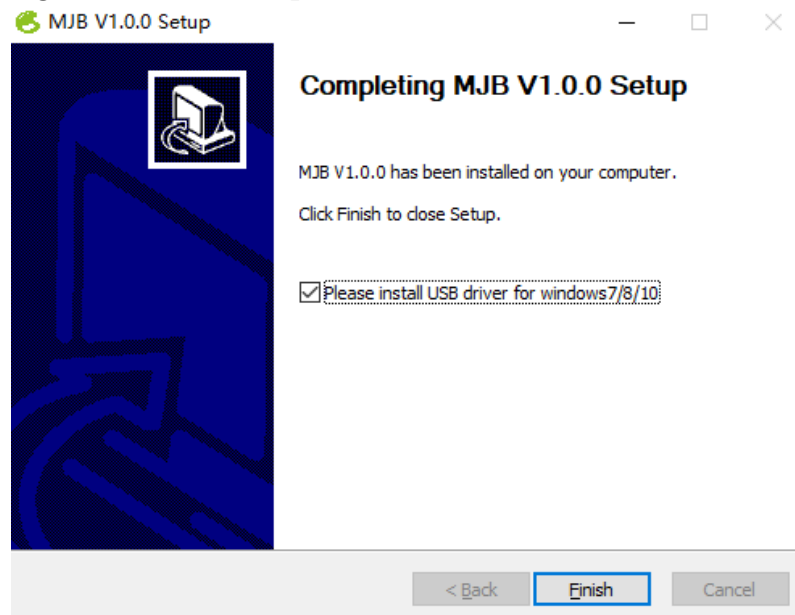
4. The installing is as shown in Figure 3-4.

**Figure 3-4 Installing**

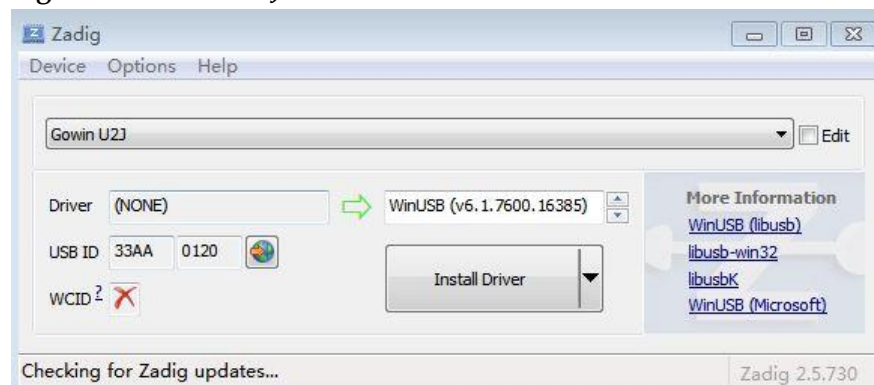
5. After the MJB software is installed, you can select whether to install the U2J driver or not.
  - If you choose to install, check “Please install USB driver for windows7/8/10”, click “Finish” and start Zadig-2.5. exe to install the U2J driver.
  - If you don't choose to install, do not check “Please install USB driver for windows7/8/10”, click “Finish” directly to finish the MJB software installation, as shown in Figure 3-5.

**Note!**

- If you do not choose to install U2J driver here, later you can choose to install it in the installation directory MJB\_V1.0.0\tools\programmer\driver\zadig-2.5.exe.
- If U2J driver software has been installed locally, it is recommended not to check "Please install USB driver for windows7/8/10" to repeat the installation.

**Figure 3-5 Finish Setup**

6. If you check "Please install USB driver for windows7/8/10", then open Zadig to install U2J driver. Select "Gowin U2J", "WinUSB(v6.1.7600.16385)", then click "Install Driver", as shown in Figure 3-6.

**Figure 3-6 Install U2J Dirver****Note!**

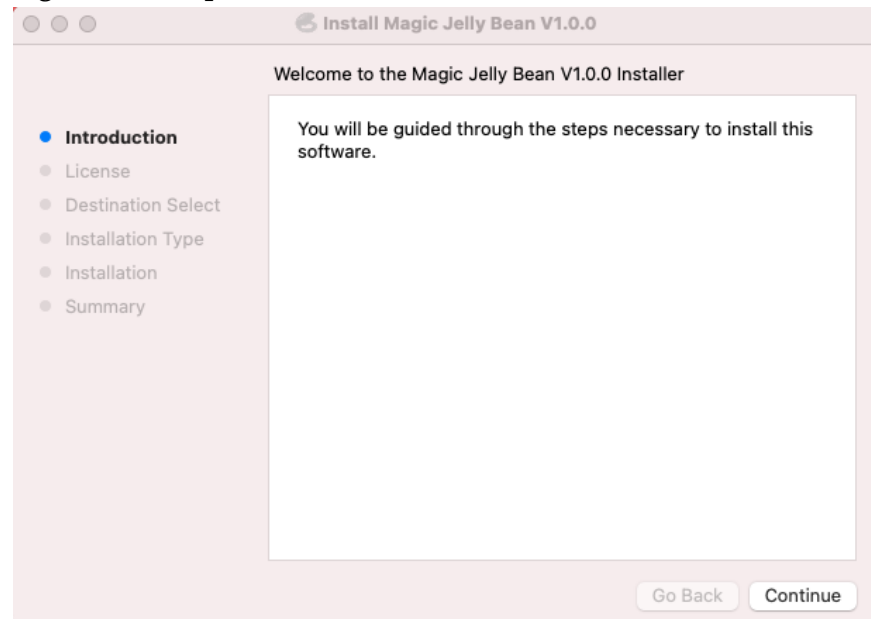
- During the installation, please be sure to keep the MJB Board or MJB Mini Board connected to the PC.
- During the installation, please do not connect MJB Board or MJB Mini Board to MJB\_Camera, MJB\_MIC, or MJB\_Accelerometer board.

**MJB Software Installation Flow for MacOS**

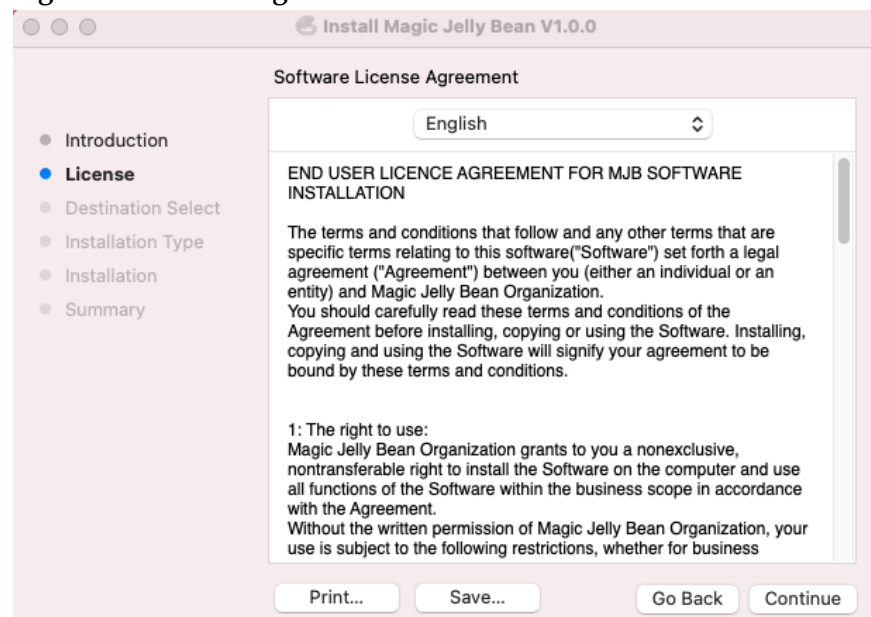
The installation flow is as follows.

1. Double-click the package, MJB\_V1.0.0\_mac.pkg, to enter the MJB software setup interface, click "Continue", as shown in Figure 3-7.

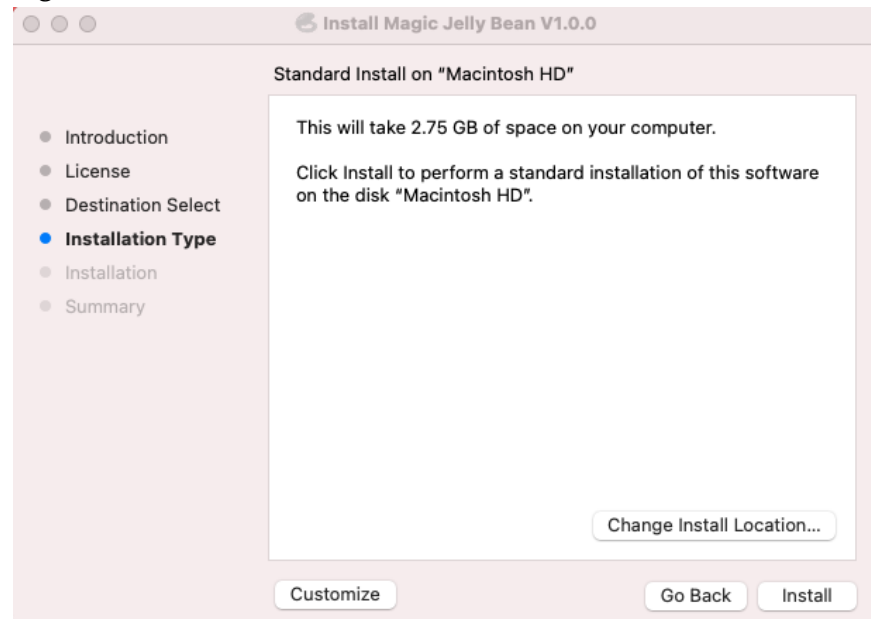


**Figure 3-7 Setup**

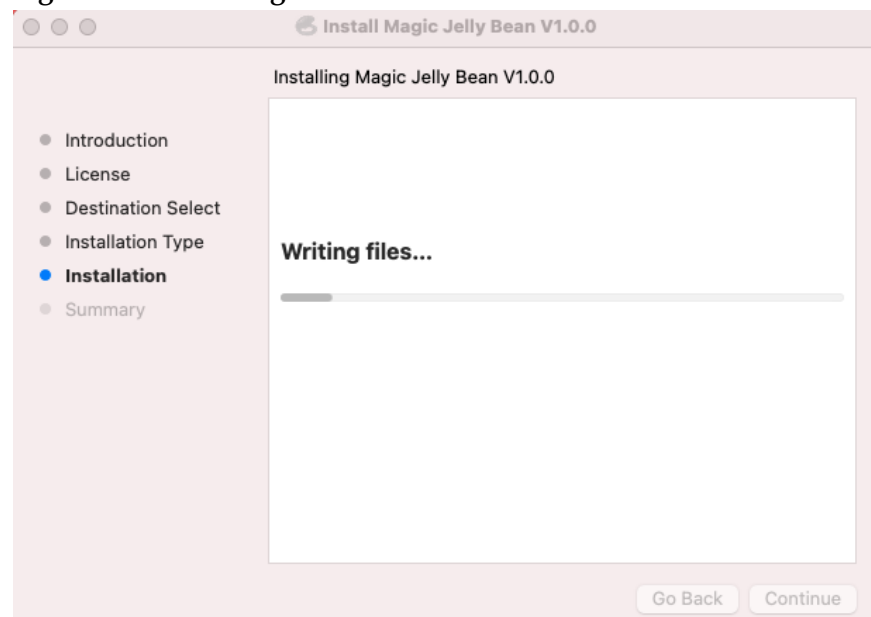
2. Click “Continue” for the license agreement, as shown in Figure 3-8.

**Figure 3-8 License Agreement**

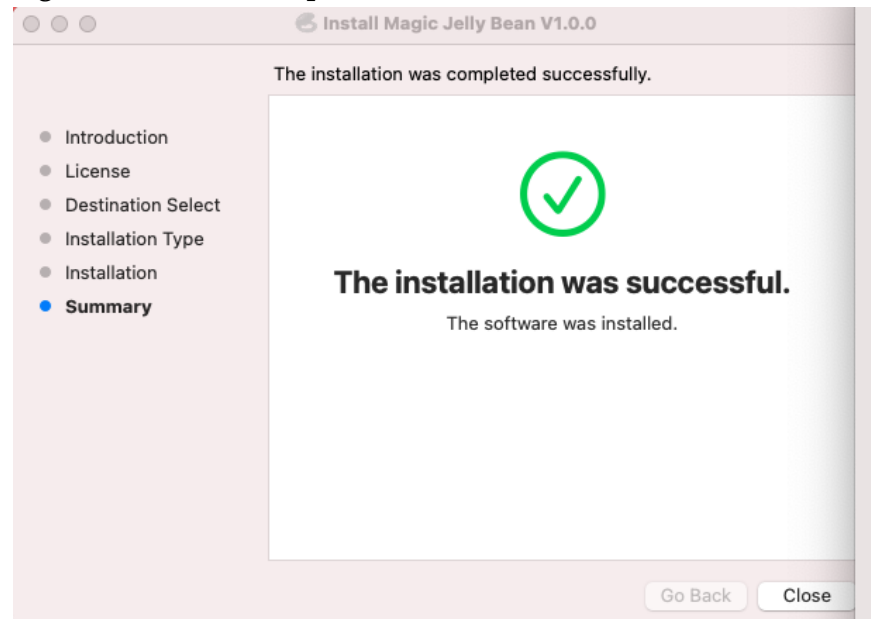
3. Click “Change Install Location...” to select the destination folder. Then click “Install”, as shown in Figure 3-9.

**Figure 3-9 Select Destination Folder**

4. The installing is as shown in Figure 3-10.

**Figure 3-10 Installing**

5. Finish installation, as shown in Figure 3-10.

**Figure 3-11 Finish Setup**

After installation, click “Finder” > “Applications” > “Magic Jelly Bean.app” to start MJB software.

**Note!**

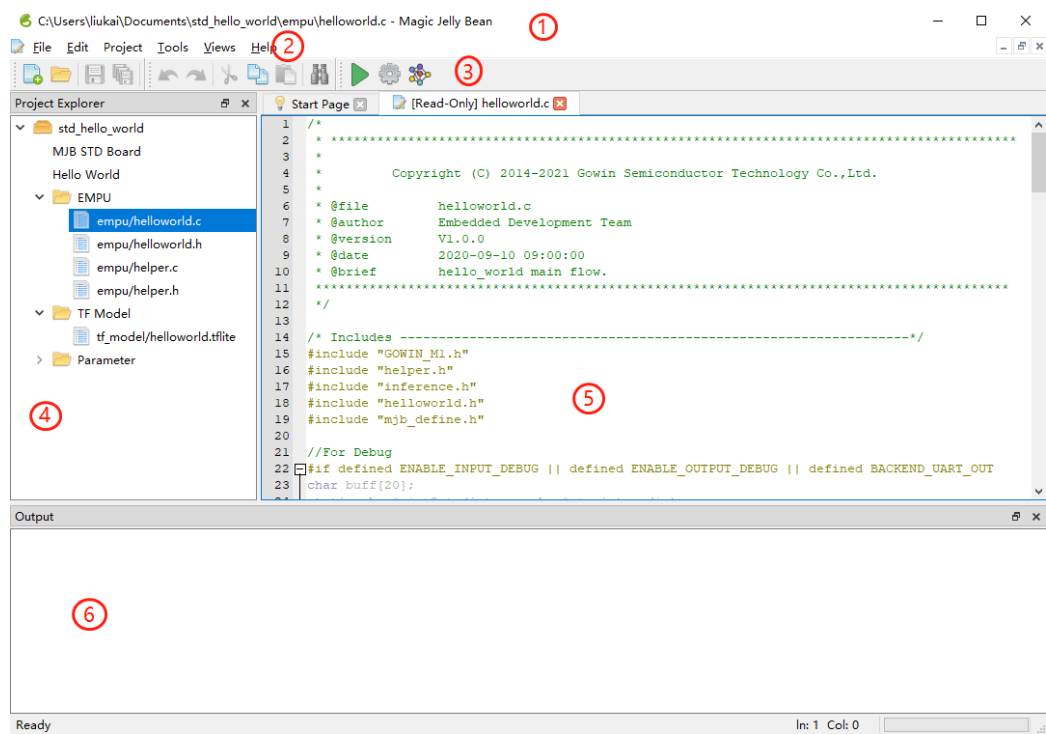
MacOS system comes with USB driver, no need to install it manually.

# 4 GUI

MJB software GUI is introduced with the example of Windows MJB software.

The GUI is as shown in Figure 4-1. It consists of the title bar, menu bar, tool bar, project management area (Project Explorer), source code edit area, and information output area.

**Figure 4-1 GUI**



- |                            |                           |
|----------------------------|---------------------------|
| ① Title Bar                | ② Menu Bar                |
| ③ Tool Bar                 | ④ Project Area            |
| ⑤ Source File Editing Area | ⑥ Information Output Area |

## 4.1 Title Bar

Title bar shows the path and name of the file opened in the project.

## 4.2 Menu Bar

The menu bar contains links to the tools that are commonly used in projects, including the File, Edit, Project, Tools, Views, and Help options, and the details are as follows.

### 4.2.1 File

- New...: Create a new project
- Open...: Open a project
- Save: Save the project files
- Save As...: Save the project files using a different project name
- Save All: Save all the project files
- Close: Close the file opened in the project
- Close Start Page: Close the Start Page
- Close Current Project: Close the current project
- Recent Files: Show the files opened. You can click on the names of these files to re-open.
- Recent Projects: Show the projects opened. You can click on the names of these projects to re-open.
- Exit: Exit and close the software

### 4.2.2 Edit

- Undo: Undo your last operation
- Redo: Redo your last operation
- Cut: Cut
- Copy: Copy
- Paste: Paste
- Select All: Select all
- Find...: Find key words
- Replace...: Replace key words

### 4.2.3 Project

- Run...: Run a current project
- Configuration...: Configure the project input/output
- Model Viewer: View the machine learning model

### 4.2.4 Tools

- Start Page: The start page
- Google Colaboratory: User model training

- Options...: Configure an external text editor

## 4.2.5 Views














- Full Screen: Full screen
- Tool Bars: Select tools in Tool Bar
- Panels: Select whether to display GUI models or not

## 4.2.6 Help

- About Magic Jelly Bean: Show software version and copyright

## 4.3 Tool Bar

It provides quick access to some commonly used functions and the buttons from left to right are:

- : New Project
- : Open Project
- : Save the file.
- : Save all the project files
- : Undo your last operation
- : Redo your last operation
- : Cut
- : Copy
- : Paste
- : Find
- : Run the project
- : Configure the project input/output
- : View the machine learning model

## 4.4 Project Explorer

You can manage project files in the project explorer, such as, MCU C/C++, machine learning model (.tflite), and model parameter (tflite\_model\_parameters.h).

## 4.5 Source File Editing Area

You can view, edit and highlight source files in the source file edit area.

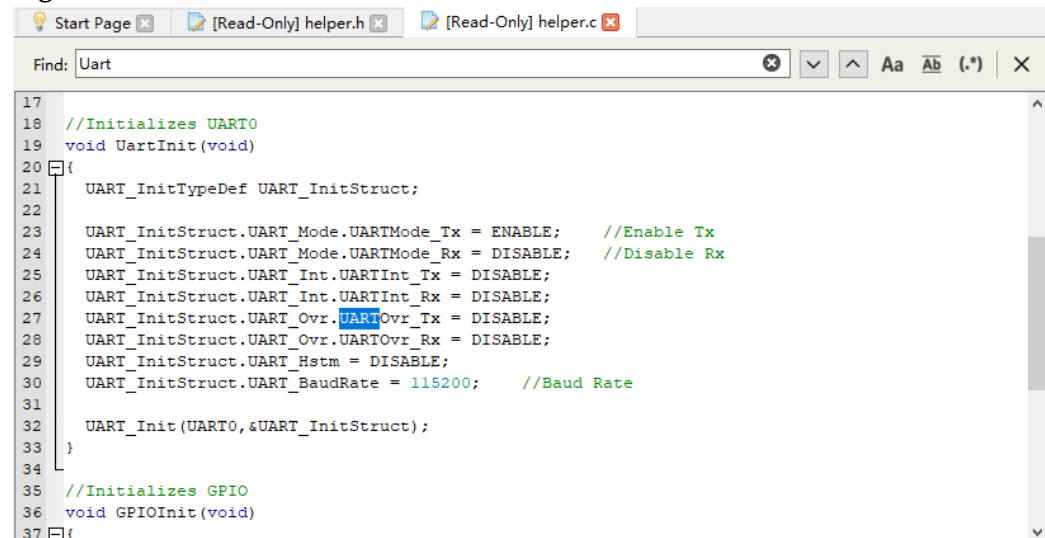
The source file edit area displays different files, including new files or opened files, tflite\_model\_parameters.h files, and the “Start Page” is also displayed.

The files in the current project are all read-only and cannot be edited or modified.

Click “File > Close”, or click on the icon “✕” in the file editing area to close files.

You can open “Find” option by shortcut Ctrl+F or clicking the icon “Find” after opening files, as shown in Figure 4-2.

**Figure 4-2 Find**

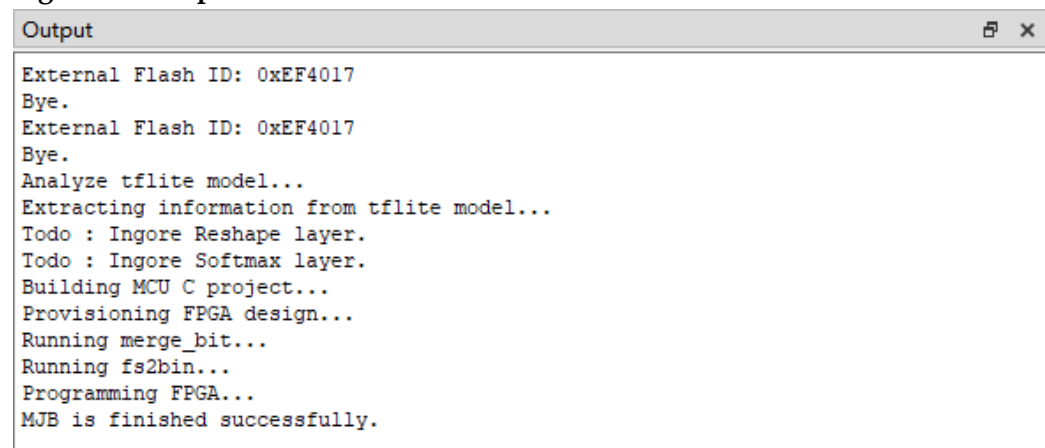


## 4.6 Output Area

The output area displays the output information, as shown in Figure 4-3.

Right-click and select “Clear” to clear the page information.

**Figure 4-3 Output Area**



# 5 Usage

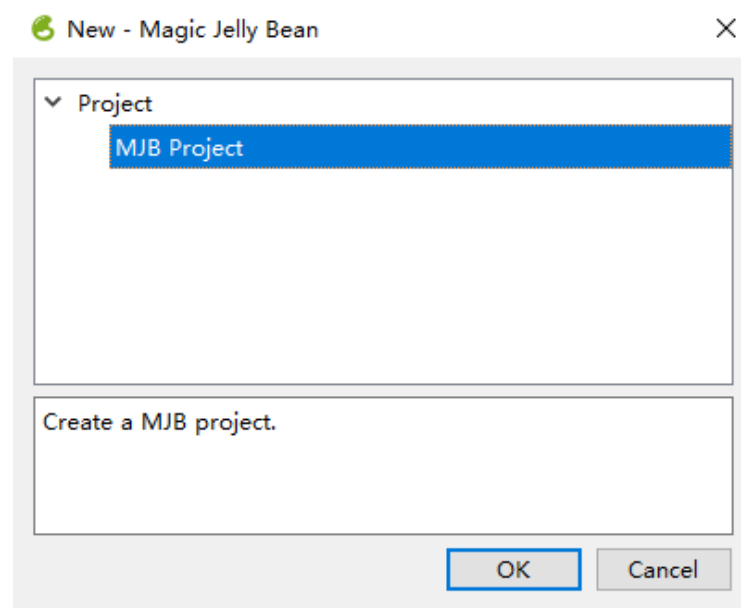
MJB software usage is introduced with the example of Windows MJB software.

Take GUI in Windows10 as an example to introduce how to use the software.

## 5.1 Create a New Project

1. From the File menu, choose “File> New...” to open the “New” dialog, as shown in Figure 5-1.

Figure 5-1 Create a New Project



**Note!**

There are different ways to open a “New” dialog:

- Use the “Ctrl+N” shortcut.
  - Click on the “New File or Project” icon in the toolbar.
  - Click “Quick Start > New Project” on the Start Page.
2. Select “MJB Project”, and then click “OK” to open “Project name”, as shown in Figure 5-2.



Figure 5-2 Create Project Name and Path

**Project Name**

Name:

Create in:

3. Create the project name and path, as shown in Figure 5-2.
  - a) Enter the project Name in the “Name” text box.
  - b) Click on the “” icon to choose the project path.

**Note!**

- The file path length is limited in both Windows and Linux. You cannot delete or copy the files with the length going over the limits;
  - Different from Linux, the path separator is “\” in Windows, for example, E:\MJB.
4. Click “Next” to open the “Project Type”, as shown in Figure 5-3.
    - Select the board type from the “Board Type” drop-down list, such as MJB STD Board and MJB Mini Board.
    - Select the project type in the “Project Type” drop-down list, such as Car Detection, Clock Detection, Digit Detection, Gender Detection, Hello World, Magic Wand, Micro Speech and Person Detection.
    - Select the frontend input in the “Frontend Input” drop-down list, such as Camera, HDMI, Accelerometer and Microphone.
    - Select the backend output by the “Backend Output”, such as LED, HDMI, and UART.

Figure 5-3 Set Project Type

**Project Type**

Type

Board Type: MJB STD Board

Project Type: Person Detection

I/O

Frontend Input: Camera

Backend Output: ☒ LED ☒ HDMI ☒ UART

< Back Next > Cancel

The four items relation is as shown in Table 5-1.

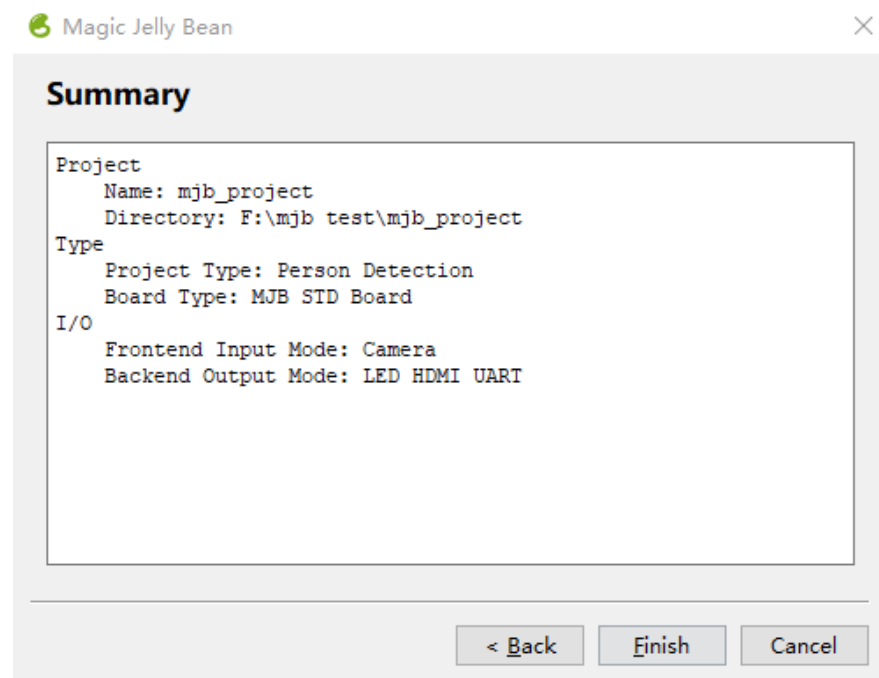
Table 5-1 Items Relation

Board Type	Project Type	Frontend Input	Backend Output
MJB Mini Board	Car Detection	Camera	LED
			UART
	Clock Detection	Camera	LED
			UART
	Digit Detection	Camera	LED
			UART
	Gender Detection	Camera	LED
			UART
	Hello World	-	LED
			UART
	Magic Wand	Accelerometer	LED
			UART
Person Detection	Camera	LED	
		UART	
MJB Board	Car Detection	Camera	LED
		HDMI	HDMI
			UART
	Clock Detection	Camera	LED
		HDMI	HDMI
			UART

Board Type	Project Type	Frontend Input	Backend Output
	Digit Detection	Camera	LED
		HDMI	HDMI
		-	UART
	Gender Detection	Camera	LED
		HDMI	HDMI
			UART
	Hello World	-	LED
			UART
	Magic Wand	Accelerometer	LED
			UART
	Micro Speech	Microphone	LED
			UART
	Person Detection	Camera	LED
		HDMI	HDMI
			UART

- Click “Next” to open the project information summary window, as shown in Figure 5-4.

**Figure 5-4 Project Information Summary**



- Click “Finish”. The project now is created.


## 5.2 Open a Project

You can use one of the following four methods to open a created project.

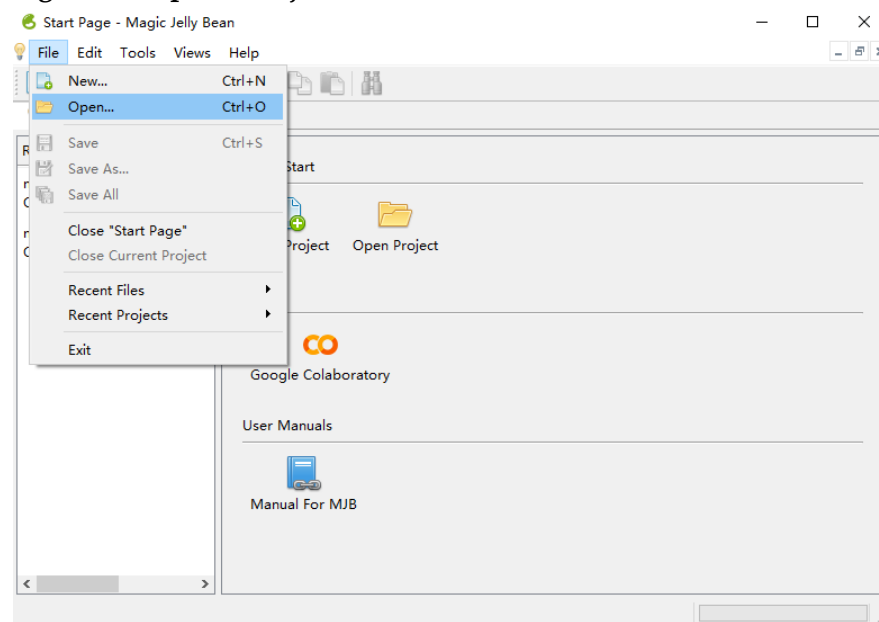
### Open From Menu

1. From the File menu, select “File> Open ...” to open the “Open File” dialog box, as shown in Figure 5-5.

**Note!**

You can also click the “” icon in the tool bar to open the “Open File Project” dialog box.

**Figure 5-5 Open a Project**



2. Select the project file (\*.gprj) and click “Open” to open the project.

### Open from Start Page

1. On the start page, click “” to open “Open Project” dialog box.
2. Click “Open” to open the project.

### Open form Recent Projects

From the menu, click “File > Recent Projects” to open your required project.

**Note!**

- You can also open recent projects from the projects list that is displayed on the left side of the start page.
- Recent Projects shows the recently opened projects.
- If the project was deleted, the “Open Project” dialog box will pop up.

### Open From Project File

Find the project \*.mjb file, and double-click the \*.gprj file to open the project automatically via MJB software.

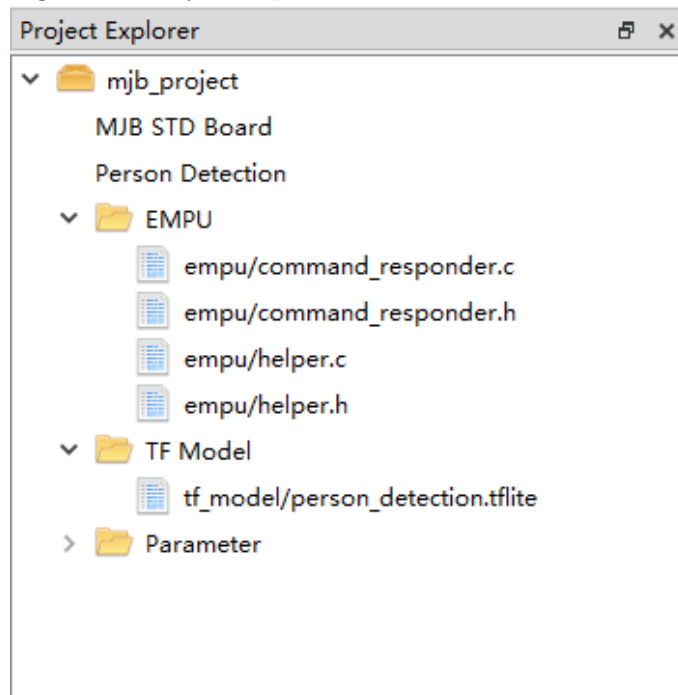
## 5.3 Project Explorer

After creating or opening a project, you can view the files, such as MCU C/C++, .tflite, and tflite\_model\_parameters.h in the project explorer, as shown in Figure 5-6.


The Project Explorer contains the followings.

- MCU C/C++ files
- Machine learning mode (.tflite)
- Machine learning model parameter (tflite\_model\_parameters.h)

Figure 5-6 Project Explorer



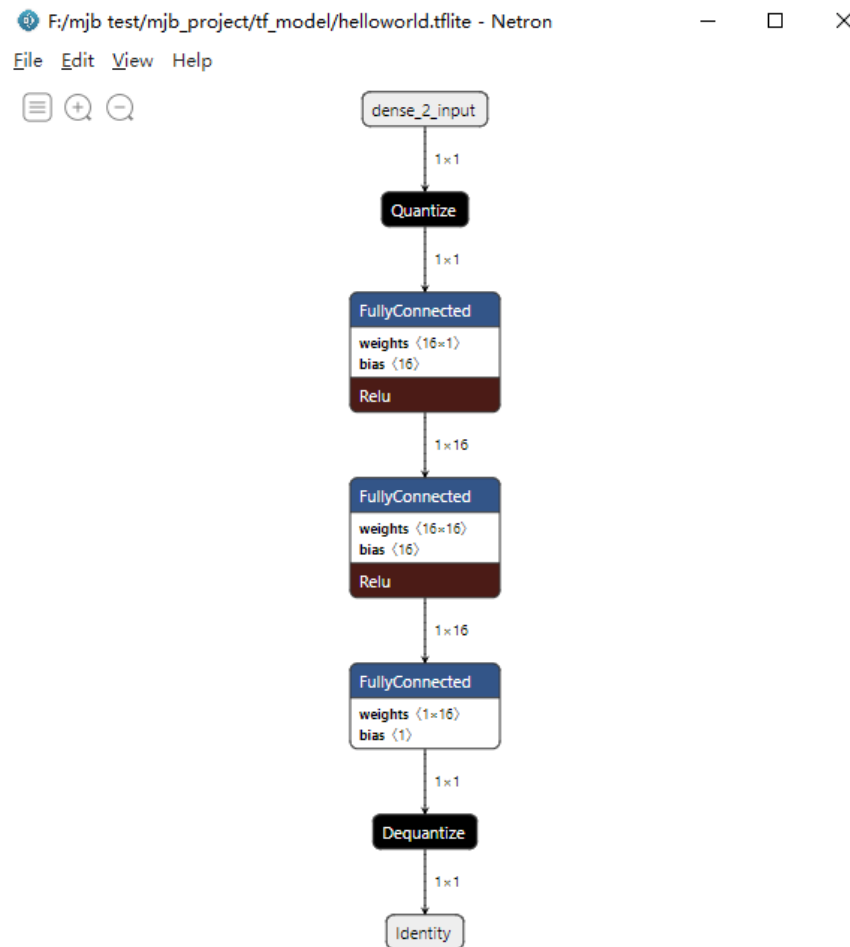
**Note!**

You can also click “” to view the machine learning model (.tflite).

### 5.3.1 View Machine Learning Mode

You can double-click .tflite in the project explorer to view the machine learning model by Model Viewer (Netron), such as, hello\_world .tflite, as shown in Figure 5-7.

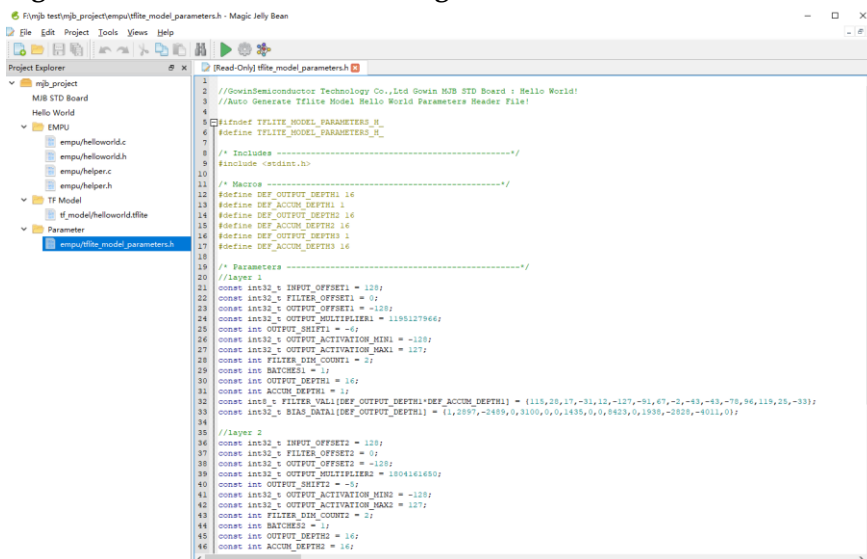
Figure 5-7 View Machine Learning Model



### 5.3.2 View Machine Learning Model Parameter

Run the project to generate machine learning model parameter, and you can double click `tf_lite_model_parameters.h` to view the parameter, such as, `hello_world.tflite` parameters, as shown in Figure 5-8.


Figure 5-8 View Machine Learning Model Parameter



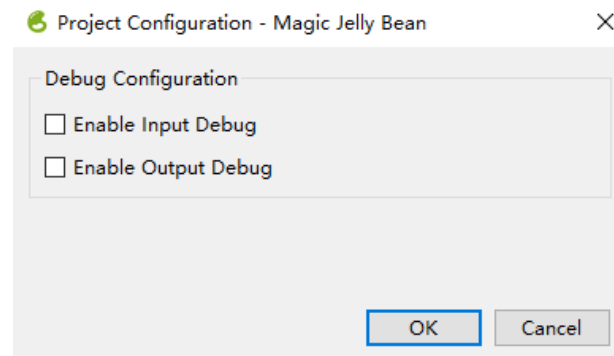
### 5.3.3 Modify Project Configuration

From the menu, select “File > Open ...” to open the “Open File” dialog box, as shown in Figure 5-9.

**Note!**

You can also click on the “” icon in the tool bar to open the “Configuration” dialog box.

**Figure 5-9 Modify Project Configuration**



You can configure “Enable Input Debug” and “Enable Output Debug”.


- Enable Input Debug: Print frontend input debug.
- Enable Output Debug: Print backend input debug.

For the frontend input debug information and backend output debug information, please connect the serial port and print.

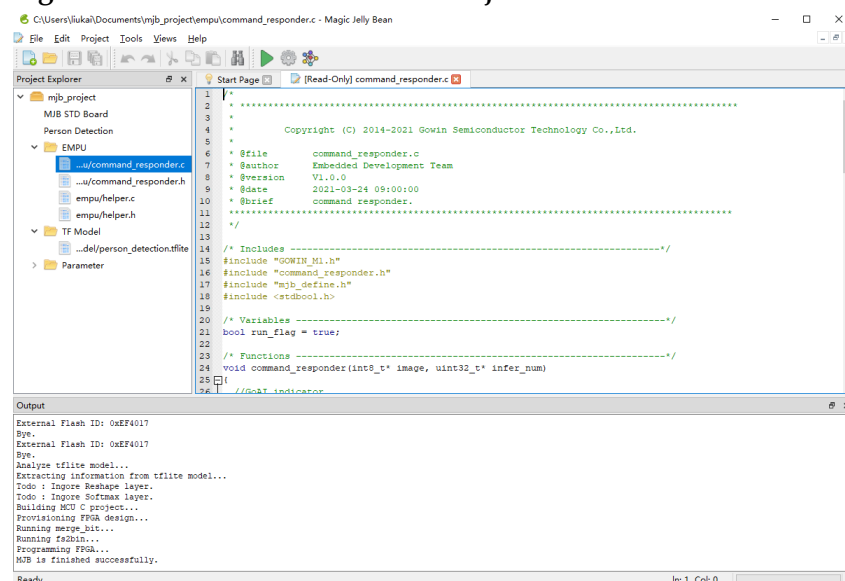
## 5.4 Run and Download a Project

From the menu, you can click “Project > Run” to run and download the project, as shown in Figure 5-10.

**Note!**


You can also click the “” icon in the tool bar to run and download a project.

**Figure 5-10 Run and Download a Project**



## 5.5 Exit IDE

There are two ways to exit software:

1. Select “File > Exit” from the File menu.
2. Click the “” icon on the upper right of the IDE.



# 6 Project Introduction

## 6.1 Car Detection

It is used for the car detection, and detects and identifies the presence and absence of a car, as shown in Figure 6-1.

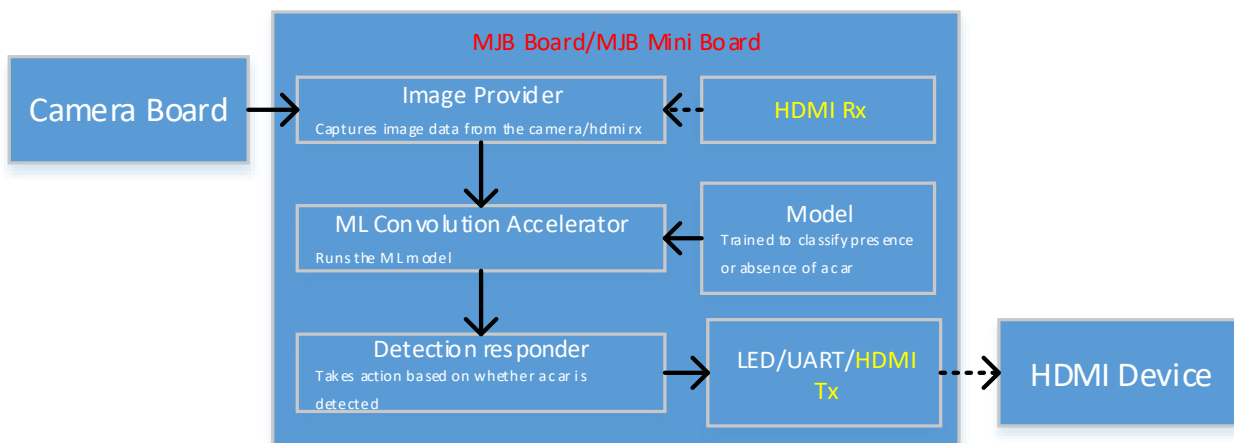
Frontend input:

- Camera
- HDMI

Backend input:

- LED
- UART
- HDMI

Figure 6-1 Car Detection



**Note!**

Only MJB Board supports HDMI Rx and HDMI Tx.

## 6.2 Clock Detection

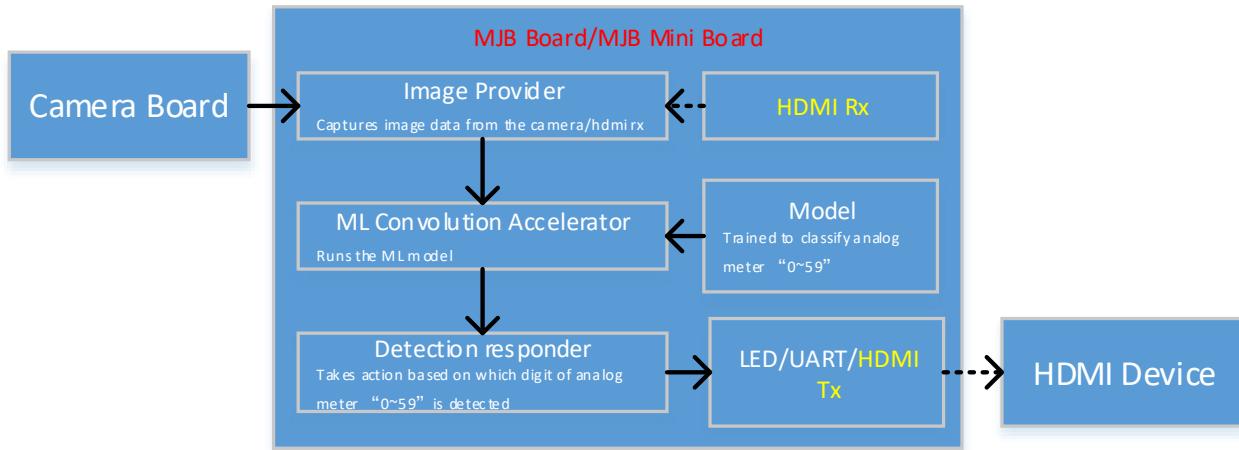
It is used to detect analog dashboard “0~59”, as shown in Figure 6-2.

Frontend input:

- Camera

- HDMI
- Backend input:
- LED
  - UART
  - HDMI

Figure 6-2 Clock Detection

**Note!**

Only MJB Board supports HDMI Rx and HDMI Tx.

## 6.3 Digit Detection

It is used to detect the number “0~9”, as shown in Figure 6-3.

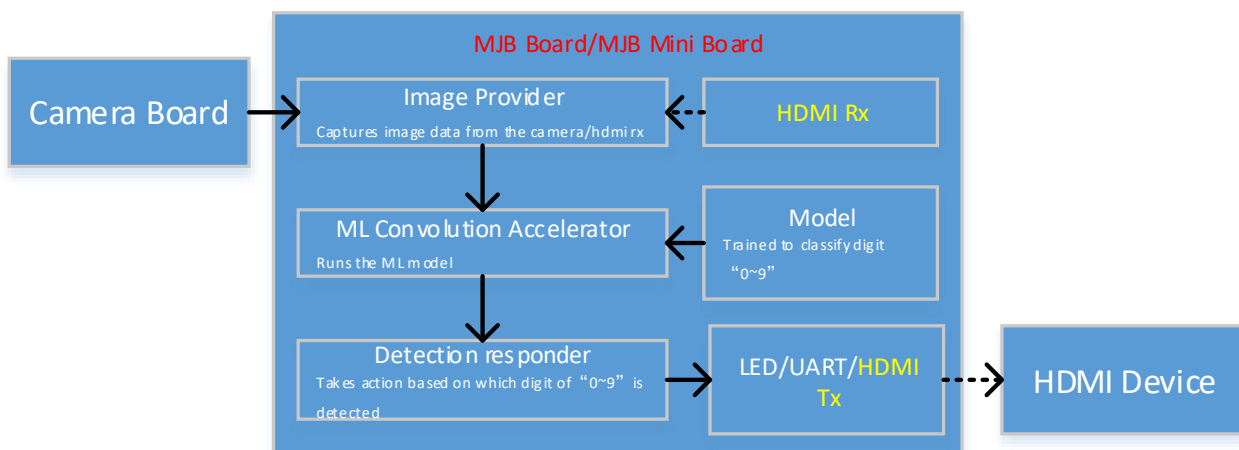
Frontend input:

- Camera
- HDMI

Backend input:

- LED
- UART
- HDMI

Figure 6-3 Digit Detection



**Note!**

Only MJB Board supports HDMI Rx and HDMI Tx.

## 6.4 Gender Detection

It is used to detect gender, and detects and identifies female, male and unknown, as shown Figure 6-4.

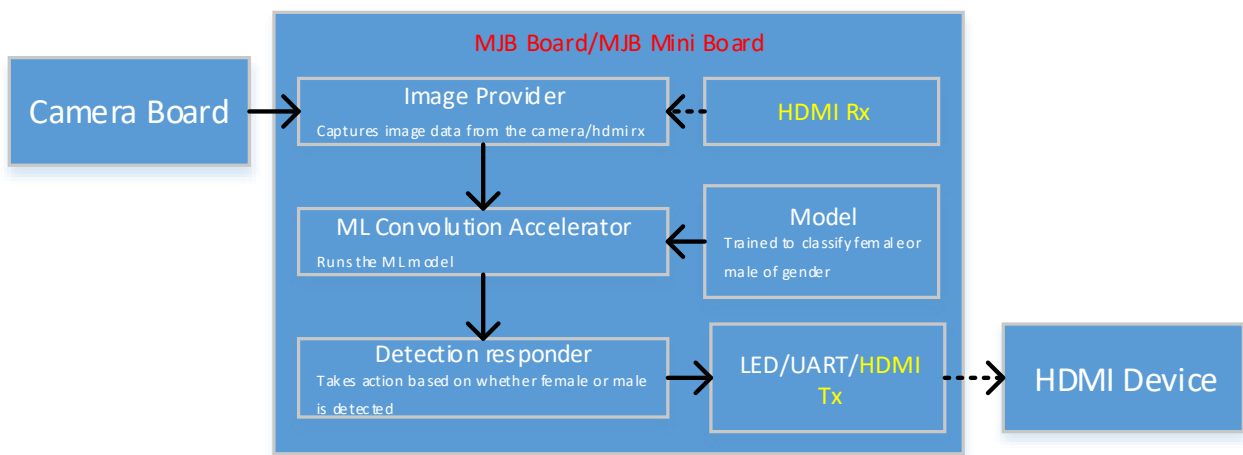
Frontend input:

- Camera
- HDMI

Backend input:

- LED
- UART
- HDMI

Figure 6-4 Gender Detection

**Note!**

Only MJB Board supports HDMI Rx and HDMI Tx.

## 6.5 Person Detection

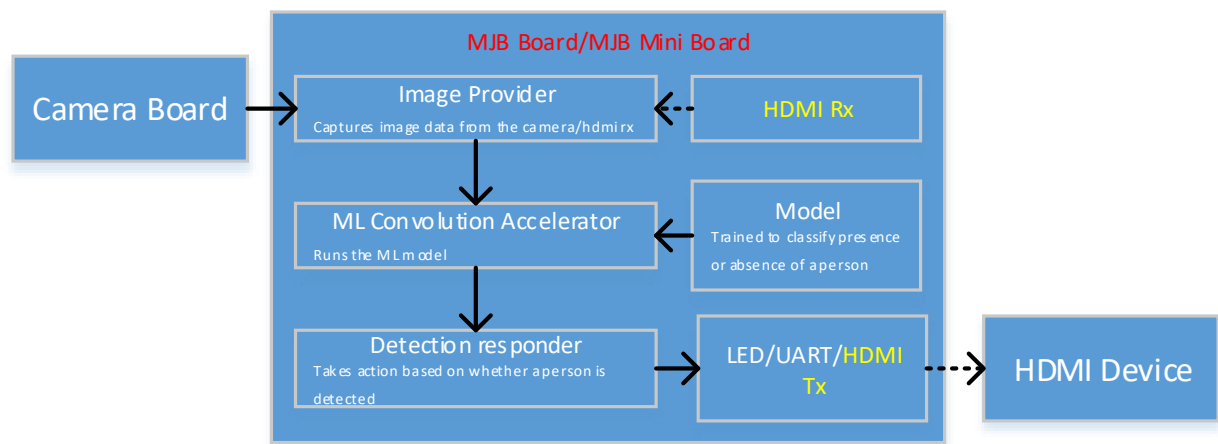
It is used to detect person, and detects and identifies the presence and absence of a person as shown in Figure 6-5.

Frontend input:

- Camera
- HDMI

Backend input:

- LED
- UART
- HDMI

**Figure 6-5 Person Detection****Note!**

Only MJB Board supports HDMI Rx and HDMI Tx.

## 6.6 Hello World

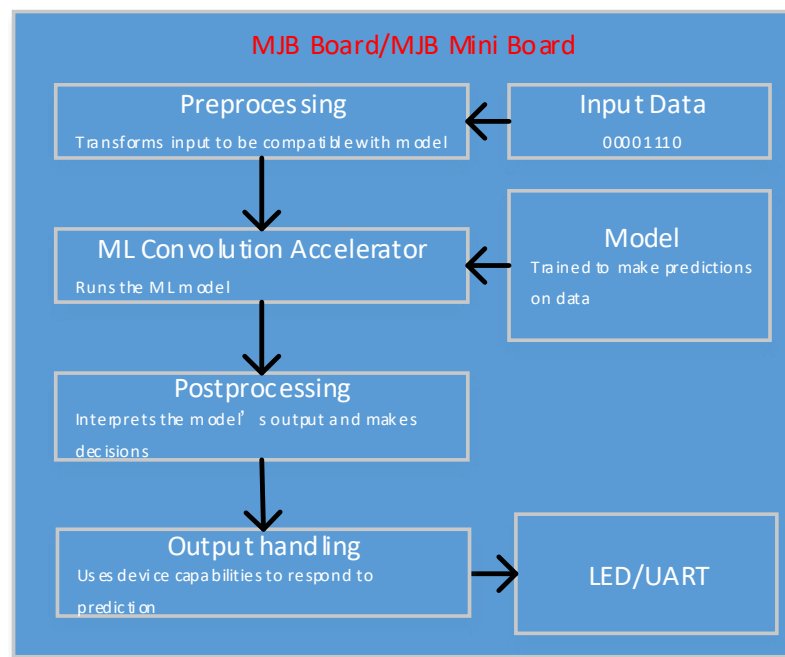
The sine curve  $Y=\sin(X)$ , inputs  $X$ , and predicts  $Y$ , as shown in Figure 6-6.

Frontend input:

- Read/Write

Backend input:

- LED
- UART

**Figure 6-6 Hello World**

## 6.7 Magic Wand

It is used to detect gestures and actions, and detects and identifies Wing, Ring, Slope and unknown, as shown in Figure 6-7.

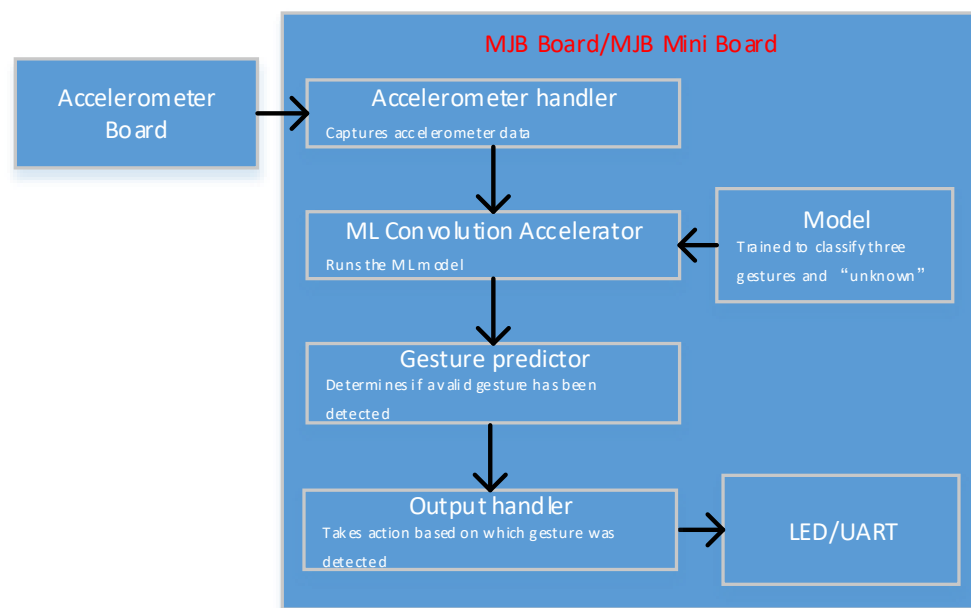
Frontend input:

- Accelerometer

Backend input:

- LED
- UART

Figure 6-7 Magic Wand



## 6.8 Micro Speech

It is used to detect speech, and detects and identifies Silence, Yes, No and Unknown, as shown in Figure 6-8.

Frontend input:

- Microphone

Backend input:

- LED
- UART

**Figure 6-8 Micro Speech**