

# Robin Bird Library

experimental, small and flexible C++ machine learning library for embedded  
systems

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Robin Bird is a small and flexible machine learning library, written in C, that aims to provide simple and extensible implementations of machine learning algorithms for solving real world problems on embedded systems. Robin Bird provides these algorithms as simple command-line programs, Python bindings, and C classes which can be used and integrated into low to medium-scale machine learning solutions.

# INTRODUCTION

## Artificial Intelligence and Machine Learning

### Overview

Machine Learning make our minds probably deliberate about robots and talking machines, some of us might even related Machine Learning to advanced robots bent on destroying the world. Although this could actually happens in the future, for the time being this technology is more about building intelligent systems with decision making abilities.

Think about Machine Learning as a sub-field of Artificial Intelligence that can analyze large amounts of data and automate analytical model buildings. This branch of AI was born from pattern recognition and the theory that computer can learn, and having the ability to independently draw knowledge from experience.

### Historically

All the programs related to AI typically excelled at just on feature, like the Deep Blue computer, that could play chess in a high level championship but that's all it could do. Presently, large data centers and huge storage capacities make things, that were believed for years to be distant concepts, possible.

To write a program to play the Tic-Ta-Toe would required all the instructions, even this is not impossible, the problem starts when it goes from a few possibilities from TTT game to for example chess that has an average of 35 possible possibilities for each move, the rules gets bigger, and as deeper it dives into the problem, more messy it gets and the written rules starts to break down.

The program and all its covers for each possibility becomes, almost impossible, or worse, impracticable. The rules does not need to be written by an human, with the right instructions the computer can learn create its own programs.

### Presently

Even ML existing solely as software, most cases requires the use of hardware components to build intelligent machines. Having a basic form, ML combined with embedded systems can reach significant improvements in image and video recognition, and the reason is due a certain level of smartness that embedded systems reach over the last years.

This also explains the cause it has been gaining space and moment in several types of industrial processes nowadays. Driving cars were made only by humans at least until a few years ago. The computer learning and its advance are making improvements over the last decade, where autonomous car and talking driver assistants are already in test.

### Coding

This field boils down on spending time to write many lines of code, that eventually solve a problem by applying some type of intelligent algorithm. For instance, some smart houses have lighting

systems which automatically turn on and off based on whether anyone is present in the room. This idea does not amuse, but thinking about this, it realizes that the system is actually making decision on its own.

## **Algorithm**

The much-needed algorithms required for real-time image and video recognition are being developed and will get it all quickly. Not just that, several types of algorithms for different issues are being created every day and embedded systems is fully prepared to completely embrace this technology replacing the work of a human being.

# GETTING STARTED

**NOTE** | This entire doc was tested on **GNU/Linux Ubuntu 18.04**.

## Prerequisites Packages

- [gtkmm - C++ Interfaces for GTK+ and GNOME](#)
- [libpng - C functions for handling PNG images](#)

## Installing Packages

On GNU/Linux Ubuntu, install the following requirements:

```
$ apt-get install g++ libgtkmm-3.0-dev libpng++-dev
```

## Robin Bird Source Code

Get **Robin Bird** source code **experimental** release:

```
$ git clone https://gitlab.com/robinbird/robin-bird.git
$ cd robin-bird-library/
$ git checkout robin-bird-library-experimental_v1.0.0
```

## Robin Bird Cmake

- For developers using x86 as a platform developing:

```
$ mkdir build
$ cd build
```

## Compilation Flags

- `-DROBIN_BIRD`, enables **Robin Bird** library.
- `-DSAMPLES`, enables **Robin Bird** samples.
- `-DINSTURMENT_FOR_FUZZING`, enables [fuzzing](#) tests.
- For a normal **Robin Bird** installation:

```
$ cmake .. -DROBIN_BIRD=ON -DSAMPLES=ON -DINSTURMENT_FOR_FUZZING=ON
$ make
```

Use **root privileges** for the next steps:

```
$ make install  
$ ldconfig
```

- For generating a full [eIQ](#) image for *i.MX8 Arm 64* boards, start by using the [NXP eIQ™ Machine Learning Enablement](#) for setting up the Yocto accordingly. Then:

```
$ cp -a meta-robinbird fsl-community-bsp/sources  
$ bitbake robin-bird
```

# Robin Bird

## Overview

Machine Learning is the study of algorithms that learn from examples and experiences instead of relying on hard-coded rules. Robin Bird comes for solving real world problems using only math and object-oriented programming language, including an easy extensible implementation of its oriented classes for enthusiast developers.

For instance, think about the following situation where is required to write a code to recognizer two types of fruit, or cars, or animals. This is absolutely impossible without Machine Learning. Robin Bird can make predictions based on a huge amount of data, just by recognizing aspects and relations.

## Classification

Problems like image, speech and character recognition belongs to a category that is called Classification problems, which a certain given input, the machine should be able to select a category where it belongs and labeled.

## Robin Bird Release

This Robin Bird release includes algorithms for recognition problems, it can be integrated with machine learning solutions from low to medium-scale.

## Getting Started with Robin Bird Library

to be continued