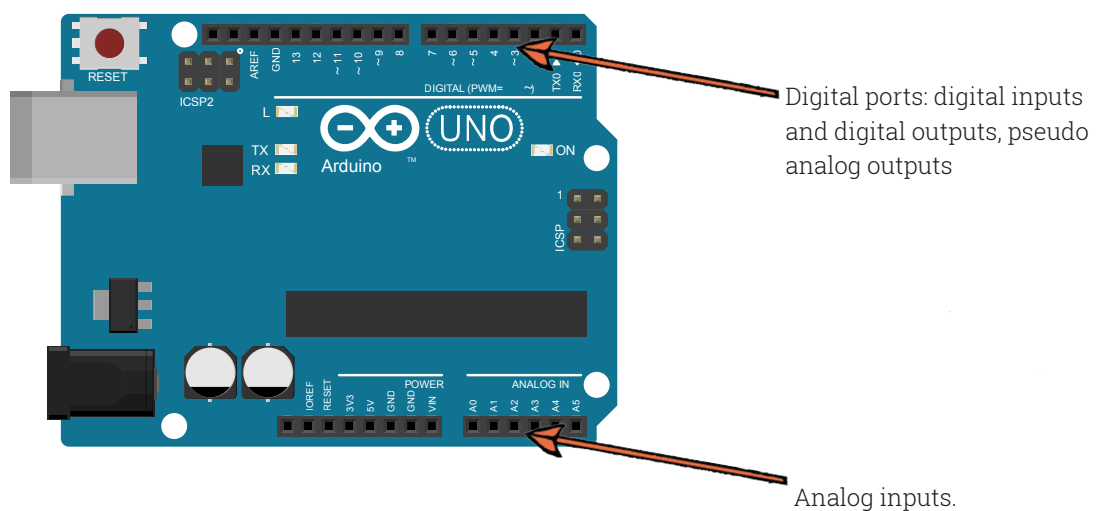# INPUTS & OUTPUTS

Understand how the board interacts with
the outside world

The input/output (I/O – input/output) represents the way in which the Arduino board interacts with the outside world. The outputs are controlled by the board allowing the microcontroller program to trigger actions (switch on or switch off a LED, a ventilator or a motor). The inputs are read by the microcontroller which allows it to become aware of the state of the system that it is linked to.

Outputs are voltage sources and are controlled by the board.
Inputs are voltmeters and their measurements are read by the board.

There are two types of I/O: digital I/Os, and analog I/Os.

Digital ports: digital inputs and digital outputs, pseudo analog outputs

Analog inputs.

INPUTS / DIGITAL OUTPUTS

The digital inputs / digital outputs can only take two values, the value LOW (that is to say GND, zero volts), and the value HIGH (that is to say 5 volts). The value of a digital port can therefore be coded on one bit, 0 or 1, true or false.
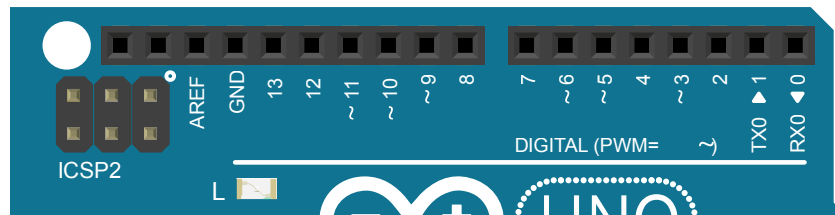
The Arduino board is comprised of 14 digital ports (named DIGITAL on the board), numbered 0 to 13. Each of the ports can be declared as being inputs or outputs in the microcontroller program (see "digital outputs" and digital inputs" sheets).

PSEUDO-ANALOG OUTPUTS

The Arduino board does not have a true analog output capable of producing voltage of an arbitrary value chosen by the user. Certain digital ports however can simulate an analog output by using the PWM (Pulse Width Modulation) technique: it concerns ports 3, 5, 6, 9, 10 and 11 (indicated using a ~ on the board). These ports can simulate a voltage between 0 and 5 volts by switching rapidly between LOW (0 V) and HIGH (5 V). The average voltage value then depends on the time spent in the LOW state compared to the time spent in the HIGH stare, all controlled by the board (see "PWM output" sheet).

ANALOG INPUTS

An analog input is a kind of voltmeter: the board reads the voltage that is applied to the port. However, the microcontroller only works with numbers: you must therefore transform the applied voltage into a numerical value. It is the work of the analog/digital converter, called "ADC" (see "Analog inputs" sheet.)