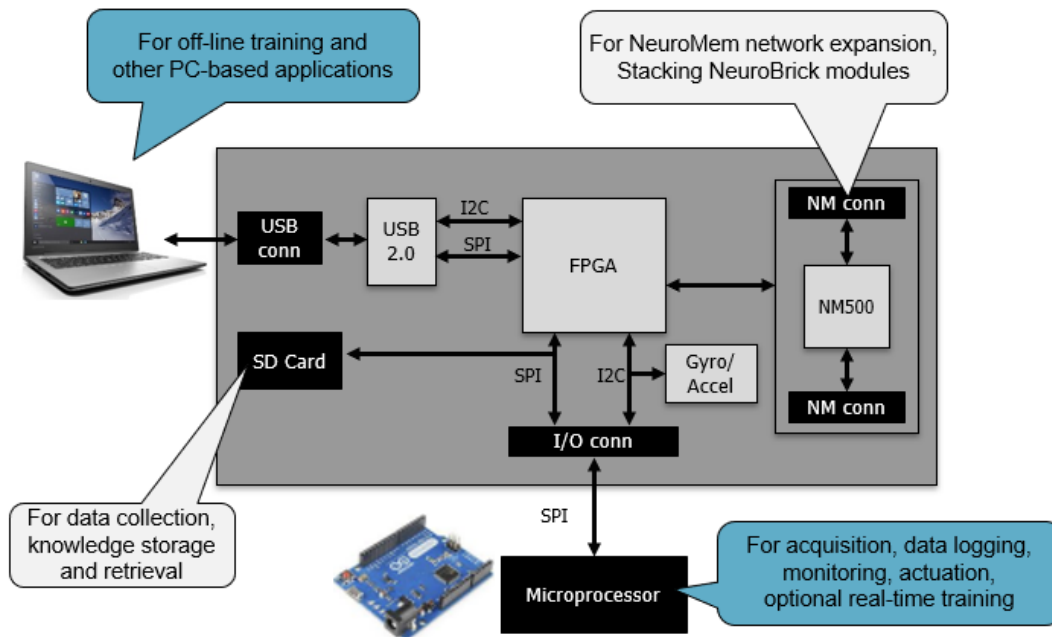
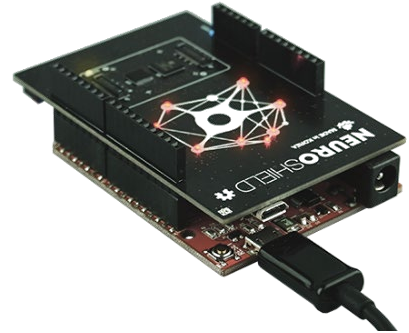


NeuroShield

NeuroShield is a shield board featuring the NM500 neuromorphic chip with 576 neurons ready to learn and recognize stimuli extracted from any type of sensors including IMU, audio, environmental sensors, bio-signal, video and more.

- SPI interface:
 - For use as a shield with Arduino, Mbed, Raspberry PI, and other microcontrollers to empower embedded systems with access to a NeuroMem network.
- USB Serial interface
 - For use as a simple USB dongle to empower PC-based applications with access to a NeuroMem network.



NeuroShield and NeuroBrick are products from nepes.
 The NeuroMem® NM500 is a chip manufactured by nepes under license from General Vision Inc.
 General Vision Inc. is the inventor and owner of the NeuroMem® technology.

Download the Board Support package at <https://www.general-vision.com/bsp/>.

The General Vision **Board Support Package** let you develop a complete workflow with the training of the neurons performed (1) on the NeuroShield mounted on a microcontroller or (2) off-line on the NeuroShield connected to a PC via USB, or a combination of both.

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Arduino Interface

Our [Arduino library](#) is compatible with the NeuroShield as well as our former BrainCard. It allows saving data files and project files in a format compatible with our Knowledge Builder tools and SDKs.

Examples include

- **Academic scripts** to understand how easily you can teach the neurons and query them for simple recognition status, or a best match, or a detailed classification of the K nearest neurons.
- **Motion recognition examples** using the on-board IMU from Invensense (MPU6050) and the IMU from the Arduino101.
- **Video recognition examples** using an ArduCAM shield.



Documentation:

[Academic Script](#)

[IMU Monitoring script](#)

[Video Monitoring script](#)

[Object Tracking script](#)

We have tested NeuroShield with the following boards:

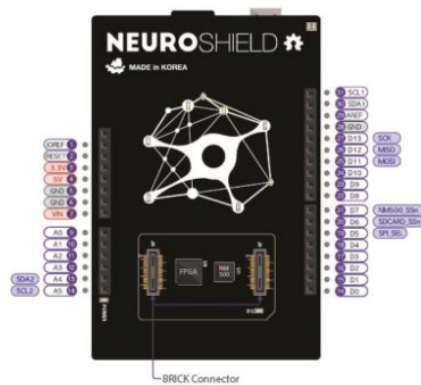
- Intel Arduino/Genuino 101
- Arduino/Genuino Uno (limited memory)
- Kocoafab Orange board (limited memory)
- ADAFruit Metro (limited memory)

Other SPI interface

NeuroShield can be interfaced to any device supporting an SPI interface and access to the neurons is made through a simple API based on a 10-bytes protocol described in https://www.general-vision.com/documentation/TM_NeuroMem_Smart_protocol.pdf.

Source code of the primitive SPI_Read and SPI_Write as well as more advanced functions to learn and recognize patterns can be found in the Board Support Package:

- Arduino\Libraries\Src
- USB\NeuroMemAPI\lib
- Python ex\NeuroShield.py



pin		pin	Description
3	3.3v	D13	SCK
4	5 v	D12	MISO
5	GND	D11	MOSI
		D7	SPI_CS_NMn, to access the neurons
		D6	SPI_CS_SDn, to access SD card
		D5	Arduino_Select (low) USB_Select (high, default thru pull up)

For more details regarding the hardware, refer to the nepes [NeuroShield Hardware Manual](#)

USB interface (windows)

NeuroShield can be connected to a PC through USB so you can access the neurons from our Knowledge Builder software or develop your own applications using our standard API or SDKs.

- [NeuroMem Knowledge Builder](#)
- [NeuroShield Console Manual \(PDF\)](#) and [video tutorial](#)
- [NeuroMem API](#)

Additional tools available from General Vision:

- [CogniPat SDK](#)
- [CogniPat SDK MatLab](#)
- [CogniPat SDK LabVIEW](#)



USB interface (Linux)

While General Vision's current Knowledge Builder applications and Software Development Kits are not yet available for Linux, our NeuroMem API features C/C++ source code and documentation showing how to interface to the NeuroShield through the Cypress USB Serial driver for windows.

- [NeuroMem API](#)

This source code can be used and adapted for Linux, knowing that for Linux and OS-X, there are no installation steps necessary to use products with USB ports powered by Cypress' USB-Serial products. Linux and OS-X does not need separate driver or library in CDC device class operation. Please use native Serial communication API's for accessing the CDC mode device.

For more information, please refer to:

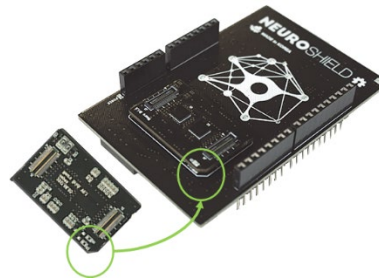
<http://www.cypress.com/documentation/software-and-drivers/usb-serial-software-development-kit>



Expanding the network

The NeuroMem network of the NeuroShield is composed of a single NM500, but it has the provision to be expanded by stacking passive NeuroBrick modules:

NeuroShield	576 neurons
+ 1st NeuroBrick	1728 neurons
+ 2 nd NeuroBrick	2880 neurons
+ 3 rd NeuroBrick	4032 neurons



- Make sure to disconnect the NeuroShield from its power supply before plugging a NeuroBrick module
- Make sure to align the cut corner of the NeuroBrick with the same marking on the NeuroShield
- The Connect function of the API automatically detects the size of the NeuroMem network and returns its value through the GetNetworkInfo function