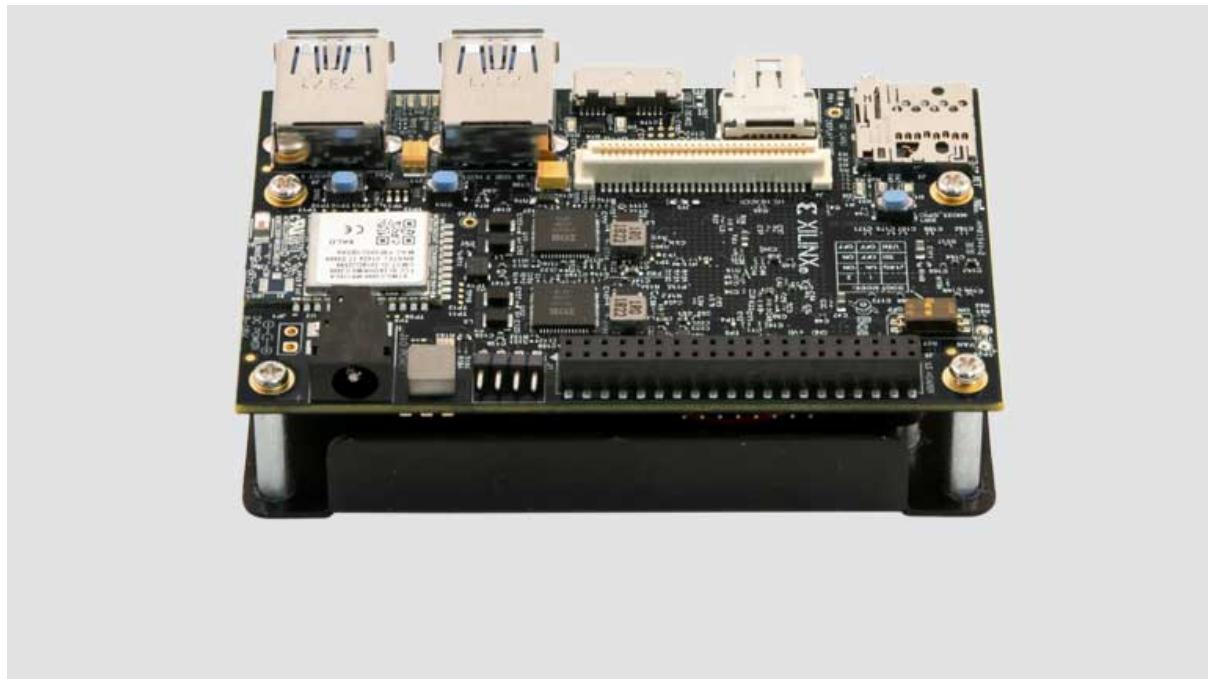


# The Tutorial for FPGA Beginners

In this tutorial, we use PYNQ as the image. Please check <http://www.pynq.io/home.html> for more details.

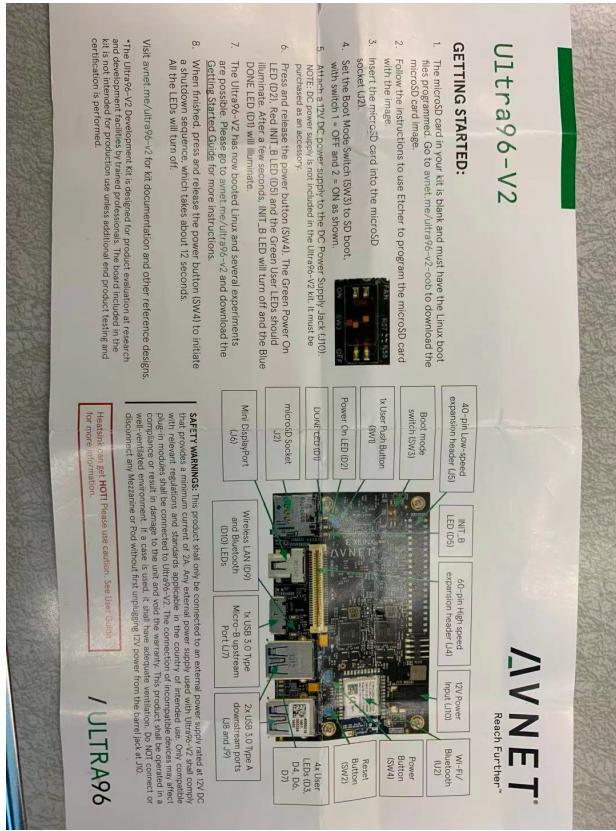
## Materials:

FARNELL ref 3050481: Ultra96-V2 Zynq UltraScale+ ZU3EG Single Board Computer  
Link: <https://www.avnet.com/wps/portal/apac/products/product-highlights/ultra96-v2-board/>



FARNELL ref 3216978: Ultra96 Power Supply Kit, 12V, 4A 03AH7039





## Write Images into the MicroSD card

1) Download Image **Ultra96V2** from url: <http://www.pyng.io/board.html>, we can get **ultra96v2\_v2.6.0.img**

<http://www.pyng.io/board.html>

PYNQ supports Zynq based boards (Zynq, Zynq Ultrascale+, Zynq RFSoC), and **Xilinx Alveo** accelerator boards and **AWS-F1** instances.  
See the [PYNQ Alveo Getting Started guide](#) for details on installing PYNQ for use with Alveo and AWS-F1.

### Downloadable PYNQ images

If you have a Zynq board, you need a PYNQ SD card image to get started. You can download a pre-compiled PYNQ image from the table below. If an image is not available for your board, you can build your own SD card image (see details below).

Board	SD card image	Documentation	Vendor webpage
PYNQ-Z2	<a href="#">v2.6</a>	<a href="#">PYNQ setup guide</a>	<a href="#">TUL Pynq-Z2</a>
PYNQ-Z1	<a href="#">v2.6</a>	<a href="#">PYNQ setup guide</a>	<a href="#">Digilent Pynq-Z1</a>
ZCU104	<a href="#">v2.6</a>	<a href="#">PYNQ setup guide</a>	<a href="#">Xilinx ZCU104</a>
RFSoC 2x2	<a href="#">v2.6</a>	<a href="#">RFSoC 2x2 GitHub Pages</a>	<a href="#">XUP RFSoC 2x2</a>
ZCU111	<a href="#">v2.6</a>	<a href="#">PYNQ RFSoC workshop</a>	<a href="#">Xilinx ZCU111</a>
Ultra96V2	<a href="#">v2.6</a>	<a href="#">Avnet PYNQ documentation</a>	<a href="#">Avnet Ultra96V2</a>
Ultra96 (legacy)	<a href="#">v2.6</a>	See Ultra96V2	See Ultra96V2
TySOM-3-ZU7EV	<a href="#">v2.5</a>	<a href="#">GitHub project page</a>	<a href="#">Aldec TySOM-3-ZU7EV</a>
TySOM-3A-ZU19EG	<a href="#">v2.5</a>	<a href="#">GitHub project page</a>	<a href="#">Aldec TySOM-3A-ZU19EG</a>

### Build a PYNQ SD card image

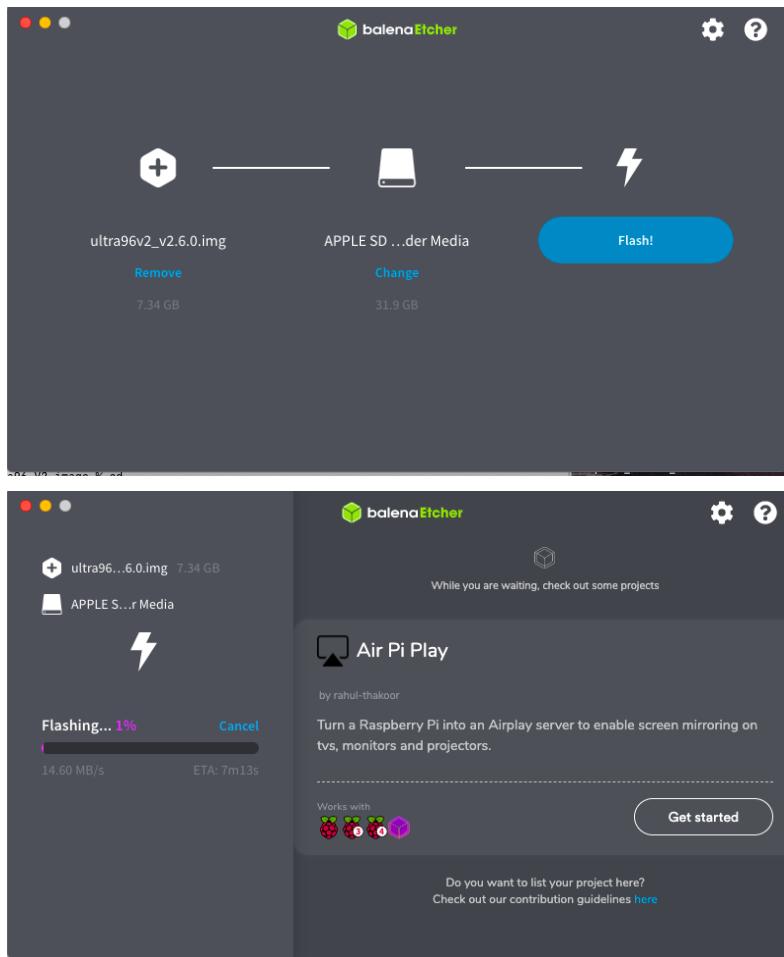
See the [PYNQ image build guide](#) or details on building the PYNQ image.

The following `rootfs` files can be used for rebuilding an image for a custom board:

- [PYNQ rootfs aarch64 v2.6](#)
- [PYNQ rootfs arm v2.6](#)

```
[feifei@feifeideAir Ultra96-V2-image % ls
ultra96v2_v2.6.0.img    ultra96v2_v2.6.0.zip
[feifei@feifeideAir Ultra96-V2-image %
[feifei@feifeideAir Ultra96-V2-image %
[feifei@feifeideAir Ultra96-V2-image %
```

2) Download Etcher for your host at <https://etcher.io/> and install it, which is used for write the image into sd card



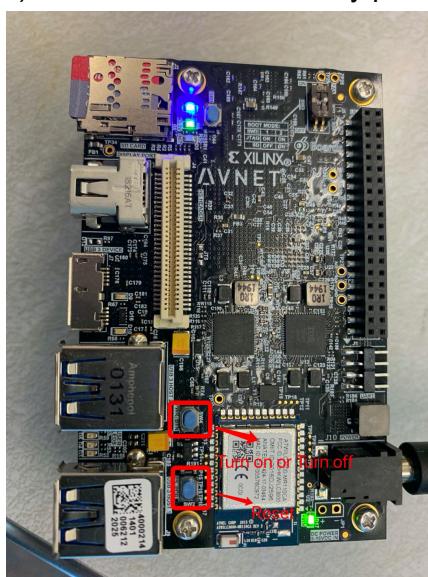
## Ultra96-v2 Setup

1) Insert SD card and plugin the power supply

2) Connect the Ultra96-V2 to the computer (Windows/Linux) using Micro-USB cable

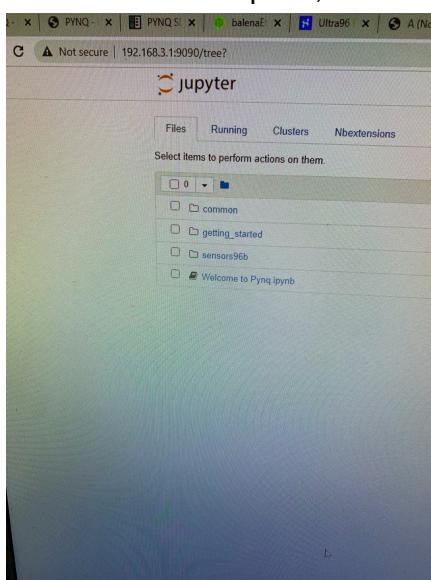


3) Turn on the Ultra96-V2 by press the turn-on button



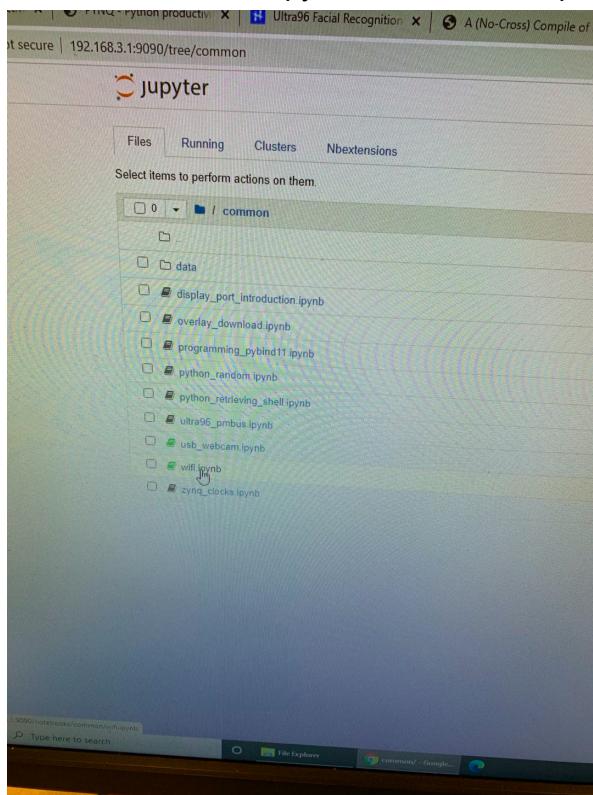
4) Connecting to Jupyter Notebooks environment

- On the computer, from the Chromium browser, browse to <http://192.168.3.1>



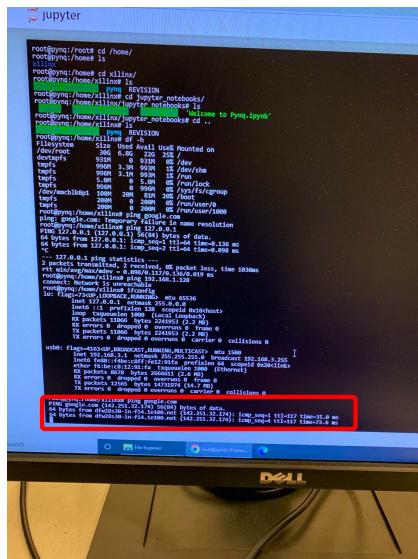
## 5) Connect to ASCCLab Wifi

- Click the wifi.ipynb and run the script.



- Also, you can run the code on the terminal

```
binding on Socket/fallback
DHCPRELEASE on wlan0 to 192.168.1.1 port 67 (xid=0x71dde66a)
send packet: Network is unreachable
send packet: please consult README file regarding broadcast address
dhclient.c:2864: Failed to send 300 byte long packet over fallback
Internet Systems Consortium DHCP Client 4.3.5
Copyright 2004-2016 Internet Systems Consortium.
All rights reserved.
For info, please visit https://www.isc.org/software/dhcp/
Listening on LPF/wlan0:f8:ff:05:76:c9:72
Sending on LPF/wlan0:f8:ff:05:76:c9:72
Sending on Socket/fallback
DHCPDISCOVER on wlan0 to 255.255.255.255 port 67 interval 3 (xid=0x59f853f)
DHCPDISCOVER on wlan0 to 255.255.255.255 port 67 interval 8 (xid=0x60332)
No DHCPOFFERS received.
>>> pad - 6 leases in persistent database - sleeping.
>>> asciilab304'
>>> ssid
'ASCIILab'
>>> port.connect(ssid, pad, force=True)
>>> killed old client process
Internet Systems Consortium DHCP Client 4.3.5
Copyright 2004-2016 Internet Systems Consortium.
All rights reserved.
For info, please visit https://www.isc.org/software/dhcp/
Listening on LPF/wlan0:f8:ff:05:76:c9:72
Sending on LPF/wlan0:f8:ff:05:76:c9:72
Sending on Socket/fallback
DHCPDISCOVER on wlan0 to 192.168.1.1 port 67 (xid=0x59f853f)
Internet Systems Consortium DHCP Client 4.3.5
Copyright 2004-2016 Internet Systems Consortium.
All rights reserved.
For info, please visit https://www.isc.org/software/dhcp/
Listening on LPF/wlan0:f8:ff:05:76:c9:72
Send on interface wlan0:f8:ff:05:76:c9:72
Sending on Socket/fallback
DHCPDISCOVER on wlan0 to 255.255.255.255 port 67 interval 3 (xid=0xb1f1fa)
DHCPDISCOVER on wlan0 to 255.255.255.255 port 67 interval 8 (xid=0xb1f1fa)
DHCPREQUEST of 192.168.1.118 on wlan0 to 255.255.255.255 port 67 (xid=0x60332)
DHCPREQUEST of 192.168.1.118 on wlan0 to 255.255.255.255 port 67 (xid=0x60332)
bound to 192.168.1.118 via wlan0 renewal in 33/97 seconds.
>>>
```

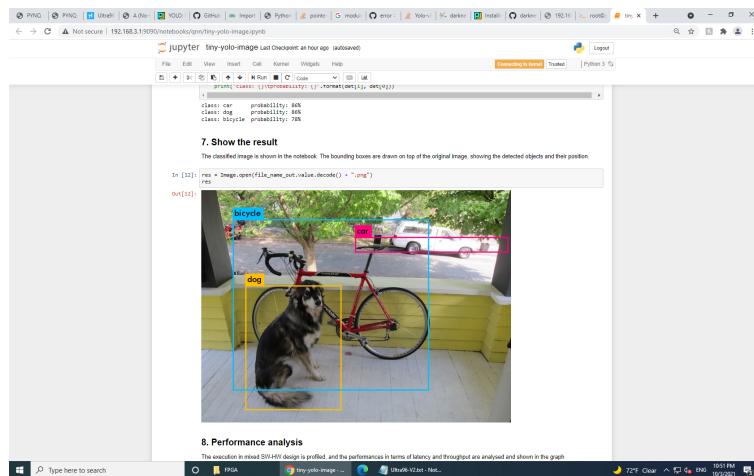


## 6) Demo

# (on PYNQ v2.3 and later versions, tested up to v2.5)

```
sudo pip3 install git+https://github.com/Xilinx/QNN-MO-PYNQ.git
```

<https://github.com/Xilinx/QNN-MO-PYNQ>



## Reference:

- 1) <https://www.element14.com/community/docs/DOC-96291/l/ultra96-v2-getting-started-guide-v21-20201-image>
- 2) [https://pynq.readthedocs.io/en/latest/getting\\_started.html](https://pynq.readthedocs.io/en/latest/getting_started.html)
- 3) <https://github.com/Xilinx/PYNQ>
- 4) <https://ohwr.org/project/soc-course/wikis/Avnet-Ultra96-V2>