

OR - Aperitech

NVIDIA Jetson Xavier NX

Agenda:

- Hands on
 - Caratteristiche
 - Prestazioni
 - Benchmark
 - Cloud Native
- Q&A



Recensione completa

<https://www.rnext.it/review/jetson-xavier-nx/>

Raffaello Bonghi

Qualcosa su di me

- Robotics and control theory engineer
- Website: <https://www.rnext.it>

Panther



- Robot ROS based
- NVIDIA Jetson AGX Xavier
- Stereolabs ZED2





NVIDIA Jetson Xavier NX

- Caratteristiche
- Architettura
- Confronto con NVIDIA Jetson Nano

NVIDIA Jetson Xavier NX

Caratteristiche



OFFICINE
ROBOTICHE

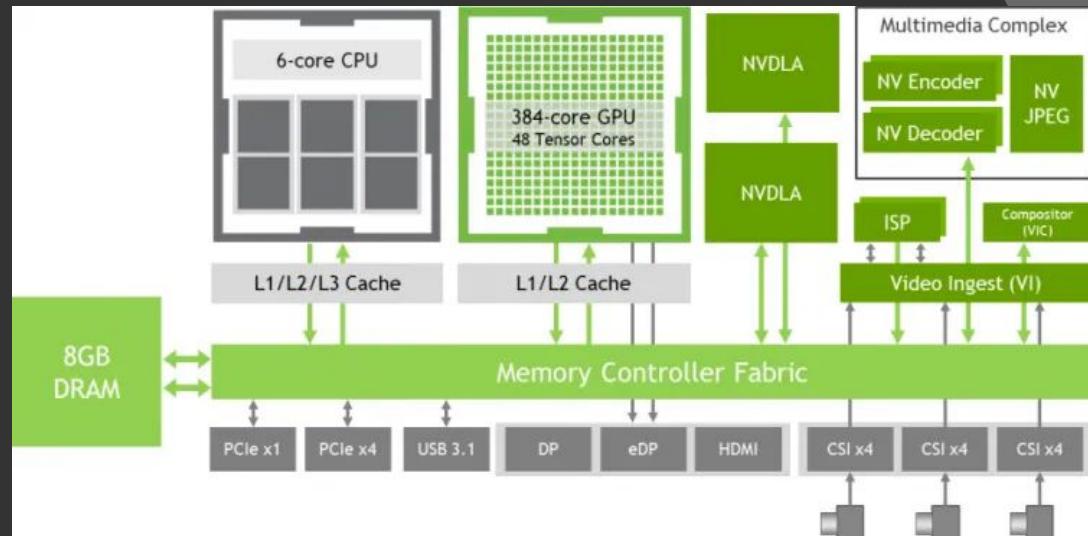


NVIDIA Jetson Xavier NX

Architettura

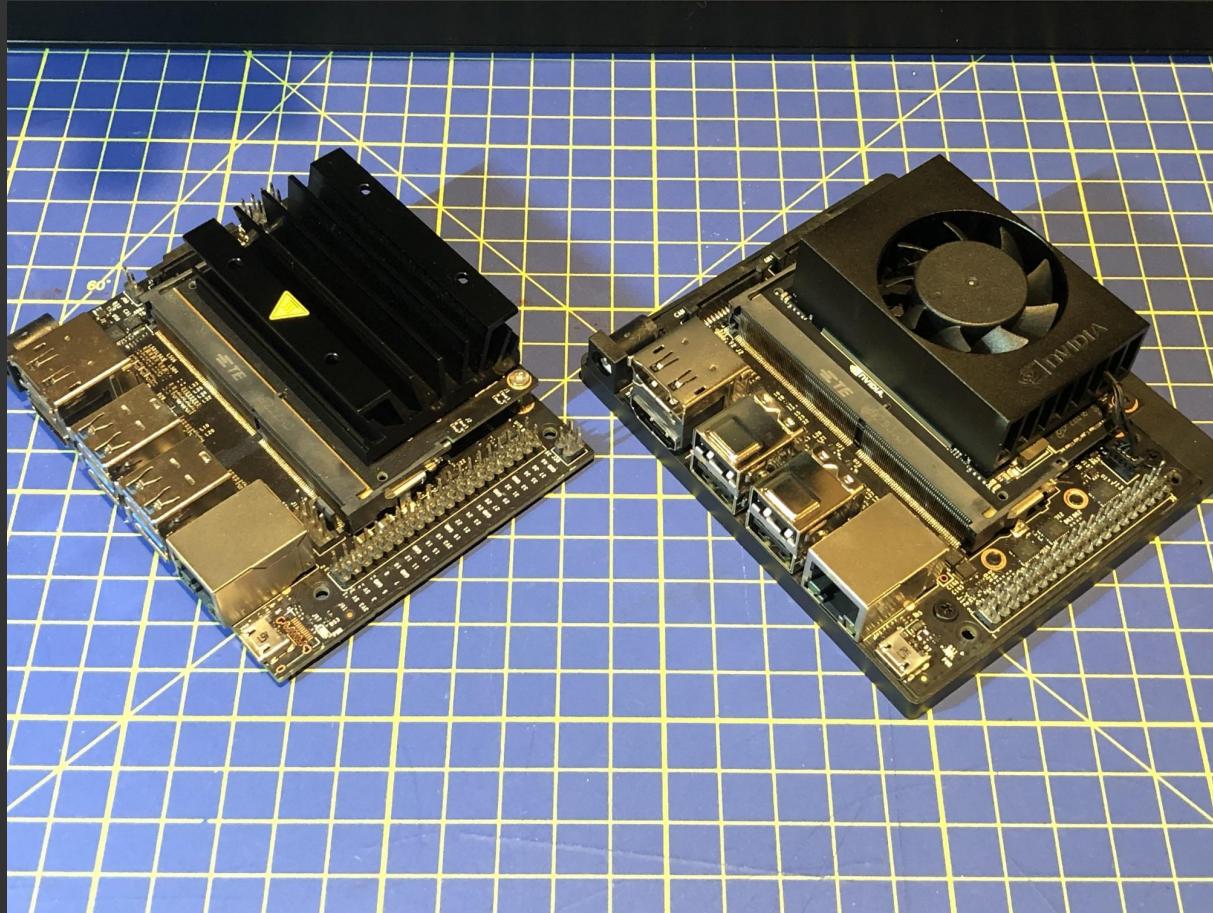


Developer Kit Technical Specifications	
GPU	NVIDIA Volta™ architecture with 384 NVIDIA® CUDA® cores and 48 Tensor cores
CPU	6-core NVIDIA Carmel ARM®v8.2 64-bit CPU 6 MB L2 + 4 MB L3
DLA	2x NVDLA Engines
Vision Accelerator	7-Way VLIW Vision Processor
Memory	8 GB 128-bit LPDDR4x 51.2GB/s
Storage	microSD [Card not included]
Video Encode	2x 4Kp30 6x 1080p 60 14x 1080p30 [H.265/H.264]
Video Decode	2x 4Kp60 4x 4Kp30 12x 1080p60 32x 1080p30 [H.265] 2x 4Kp30 6x 1080p60 16x 1080p30 [H.264]
Camera	2x MIPI CSI-2 D-PHY lanes
Connectivity	Gigabit Ethernet, M.2 Key E (WiFi/BT included), M.2 Key M (NVMe)
Display	HDMI and DP
USB	4x USB 3.1, USB 2.0 Micro-B
Others	GPIOs, I2C, I2S, SPI, UART
Mechanical	103 mm x 90.5 mm x 34 mm



Confronto

Jetson Nano <-> Jetson Xavier NX



NVIDIA Jetson Xavier NX

Tabella Prestazioni

	NVP model	With Jetson Clocks	
0	MODE_15W_2CORE	1.2-1.9Ghz	<u>1.9Ghz</u>
1	MODE_15W_4CORE	1.2-1.4Ghz	1.4Ghz
2	MODE_15W_6CORE	1.2-1.4Ghz	1.4Ghz
3	MODE_10W_2CORE	1.2-1.5Ghz	1.5Ghz
4	MODE_10W_4CORE	1.2Ghz	<u>1.2Ghz</u>
CPU frequencies			

	Without Jetson Clocks	10W Jetson Clocks	15W Jetson Clocks
GPU	114Mhz	803Mhz	1.1Ghz
EMC	204Mhz	1.6Ghz	1.6Ghz



NVIDIA Jetson Xavier NX

Benchmarks

Model Name	FPS	FPS	FPS
	Jetson Nano	Jetson Xavier NX 15W 2 Core With Jetson Clocks	Jetson Xavier NX 15W 6 core With Jetson Clocks
0 inception_v4	10.631948	316.895566	316.478577
1 vgg19_N2	7.692173	65.424157	63.582191
2 super_resolution_bsd500	10.704373	152.186116	159.201983
3 unet-segmentation	11.502981	144.152678	144.005892
4 pose_estimation	10.191128	234.183907	235.400592
5 yolov3-tiny-416	33.927461	570.071398	589.816623
6 ResNet50_224x224	25.933791	845.337518	830.919699
7 ssd-mobilenet-v1	29.884008	884.193146	894.364623

Benchmark compare Jetson nano and Jetson Xavier NX



Potete eseguire questi benchmark eseguendo questo
https://github.com/NVIDIA-AI-IOT/jetson_benchmarks

jetson-stats (1/2)

jtop - Monitor and control

```
File Edit View Search Terminal Help
NVIDIA Jetson Xavier NX - Jetpack 4.4 DP [L4T 32.4.2]
CPU1 [|||||] Schedutil - 26% 1.4GHz CPU4 [|||||] Schedutil - 100% 1.4GHz
CPU2 [|||] Schedutil - 12% 1.4GHz CPU5 [|||||] Schedutil - 100% 1.4GHz
CPU3 [ ] Schedutil - 1% 1.4GHz CPU6 [ ] Schedutil - 3% 1.4GHz

MTS FG [ 0% ] BG [ 0% ]
Mem [|||||] 5.1G/7.8GB] (lfb 308x4MB)
Swp [ 0.0GB/3.9GB] (cached 0MB)
EMC [ 72% ] 1.6GHz

GPU [|||||] 52% 1.1GHz
Dsk [#####] 12.7GB/58.1GB

[info] [Sensor] — [Temp] — [Power/mW] — [Cur] [Avr]
UpT: 0 days 0:9:7 AO 36.00C CPU GPU CV 6788 7191
FAN [|||||] 100% AUX 36.50C SOC 1513 1552
Jetson clocks: Running+
NV Power[2]: 15W 6CORE CPU 39.00C IN 11673 12226
—— [HW engines] —— GPU 38.50C
APE: 75MHz thermal 38.00C
NVENC: [OFF] NVDEC: [OFF]
NVJPEG: [OFF]

1ALL 2GPU 3CPU 4MEM 5CTRL 6INFO Quit Raffaello Bonghi
```

sudo -H pip install -U jetson-stats

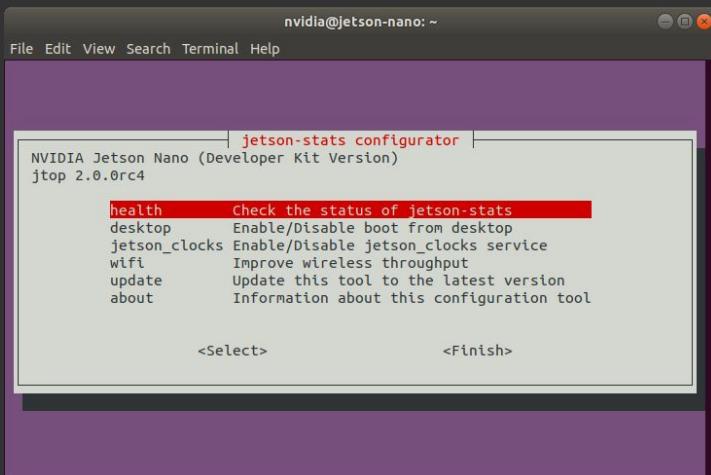
<https://pypi.org/project/jetson-stats/>



jetson-stats (2/2)

Altri tools inclusi

- jetson_config
 - Configurazione scheda
- Jetson_release
 - Informazioni scheda
- Jetson_swap
 - Abilitazione swap



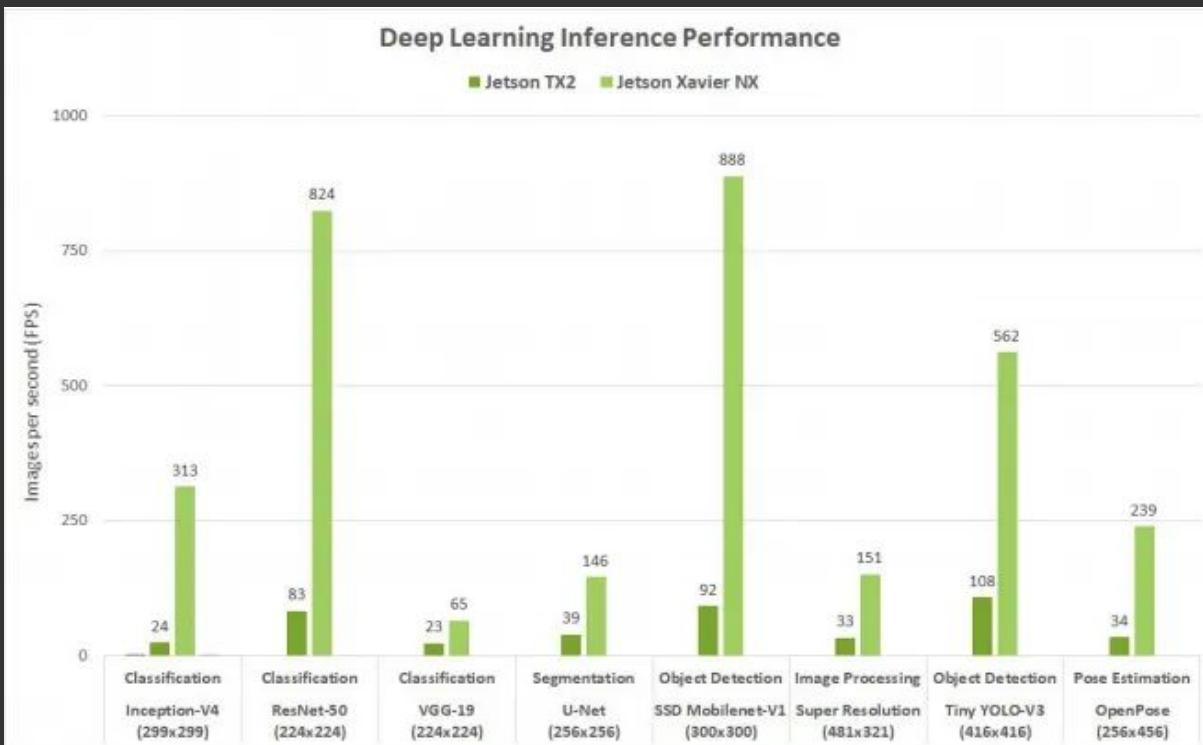
```
nvidia@jetson-nano:~$ jetson_release -v
- NVIDIA Jetson Nano (Developer Kit Version)
  * Jetpack 4.2.2 [L4T 32.2.1]
  * NV Power Mode: MAXN - Type: 0
  * jetson_clocks service: active
- Board info:
  * Nano (Developer Kit Version) - CN: porg
  * SoC Family: tegra210 - ID:33
  * Board(s): P3448-0000 P3449-0000 (3448)
  * CUDA GPU architecture (ARCH_BIN): 5.3
  * Serial Number: 042121902512608003FC
- Libraries:
  * CUDA: 10.0.326
  * cuDNN: 7.5.0.56
  * TensorRT: 5.1.6.1
  * Visionworks: 1.6.0.500n
  * OpenCV: 3.3.1 compiled CUDA: NO
- jetson-stats:
  * Version 2.0.0
  * Works on Python 3.6.9
nvidia@jetson-nano:~$
```

```
nvidia@jetson-nano:~/\$ sudo jetson_swap -h
usage: createSwapFile [[-d directory] [-s size] -a] | [-h] | [--off]
-d | --dir    <directoryname> Directory to place swapfile
-n | --name   <swapname> Name swap file
-s | --size   <gigabytes>
-a | --auto   Enable swap on boot in /etc/fstab
-t | --status Check if the swap is currently active
--off        Switch off the swap
-h | --help   This message
```



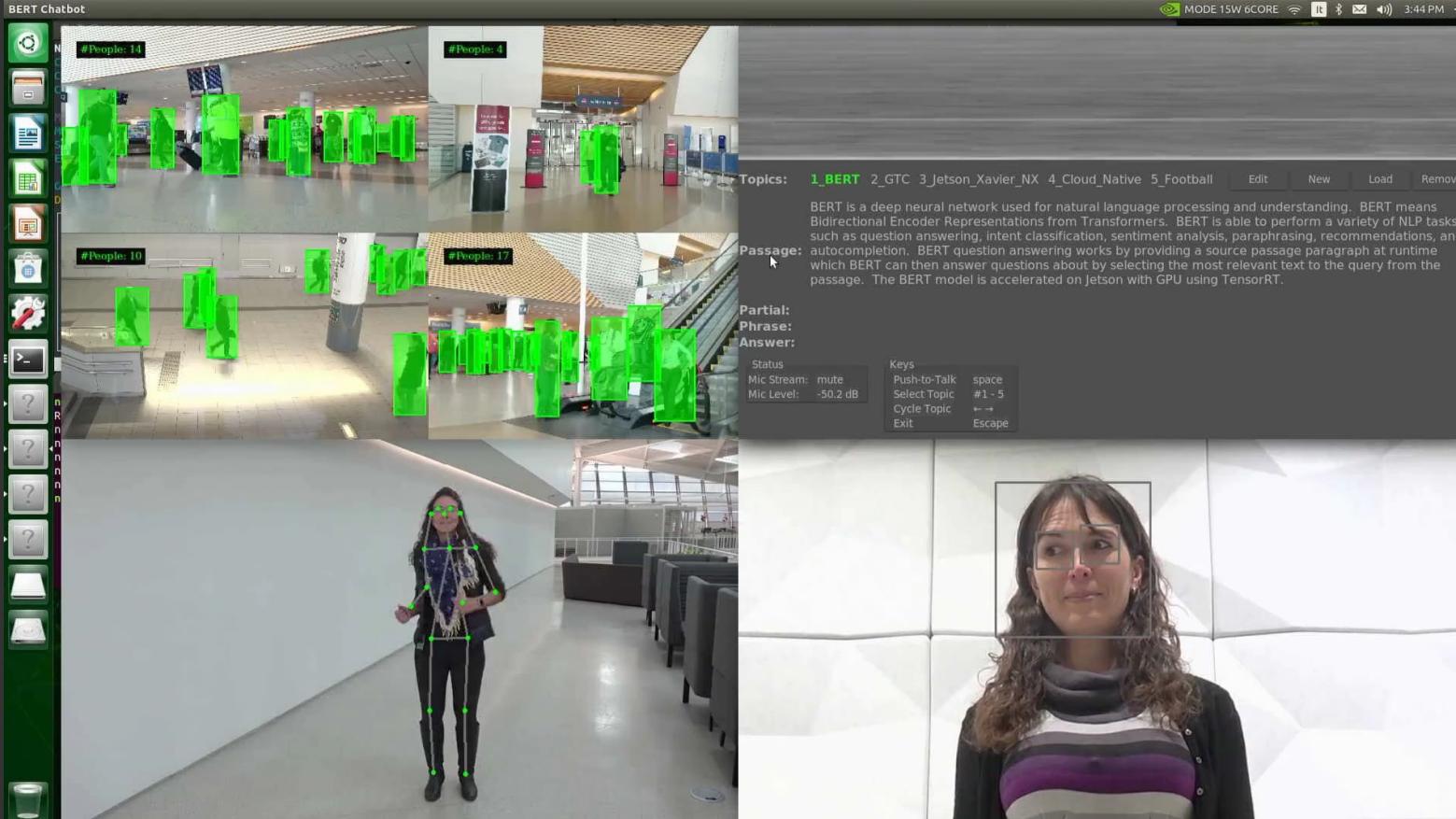
NVIDIA Jetson Xavier NX

Deep Learning Inference Performance



Cloud Native

4 containers attivi nello stesso momento



Jetson Xavier NX

Costo e dove comprarla

- Jetson Xavier NX
 - 429€

- Jetson Nano
 - 109€



<https://www.nvidia.com/it-it/autonomous-machines/embedded-systems/jetson-xavier-nx>

OR - Aperitech

JetRacer & DonkeyCar



OR OFFICINE
ROBOTICHE



Alessio
Morale

OR - Aperitech

Question & Answer

Recensione NVIDIA Jetson Xavier NX

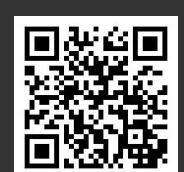
<https://www.rnext.it/review/jetson-xavier-nx>

Canale



<https://t.me/officinerobotiche>

OR – Aperitech



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