Computing Challenges (COMCHA):

3rd COMCHA School, Oviedo, October 2023
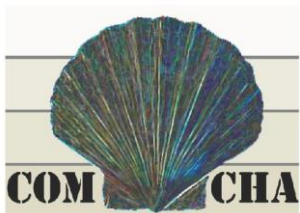
A. Oyanguren (IFIC – Valencia)

GOBIERNO DE ESPAÑA

AGENCIA ESTATAL DE INVESTIGACIÓN

MINISTERIO DE CIENCIA E INNOVACIÓN

Universidad de Oviedo

Artemisa

ARTificial Environment for ML and Innovation in Scientific Advanced Computing

COM CHA

Arantza Oyanguren
IFIC – CSIC/UV

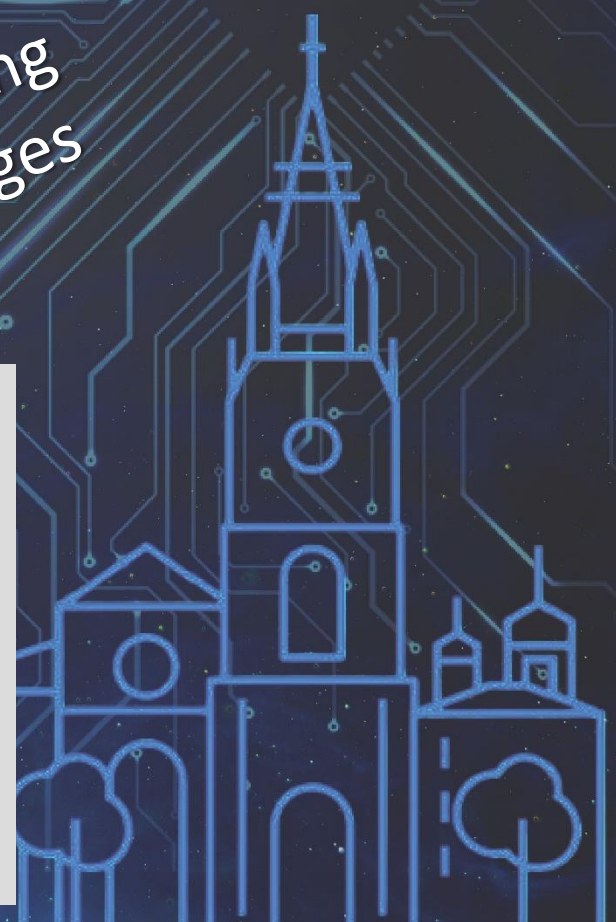# 3rd COMCHA School

23-31 OCTOBER 2023
OVIEDO

COMputing CHAllenges

Scientific Committee

Luca Fiorini
Santiago Folgueras Gómez
Pablo Martínez Ruiz del Árbol
Arantza Oyanguren Campos
Xavier Vilasís Cardona

Local Organising Committee

Bárbara Álvarez González
Isidro González Caballero
Santiago Folgueras Gómez

What is COMCHA ?

- Created 5 years ago: a forum of discussions, with very interesting meetings and talks.
- comcha@pegaso.ific.uv distribution lists for communication (announcement of workshops, conferences and other info of interest)
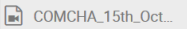

Computing Challenges meeting (COMCHA)

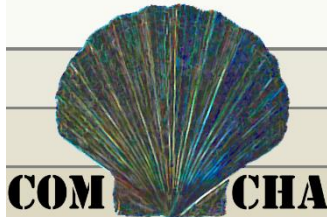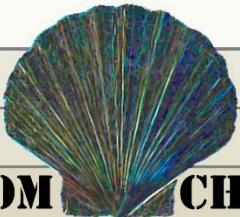📅 jueves 15 oct. 2020 15:00 → 17:00 Europe/Madrid

📍 Vidyo

Descripción *Subject of the day:* **Heterogeneous architectures**
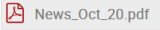
Zoom to COMCHA

Recorded session

📎 📄 COMCHA_15th_Oct...

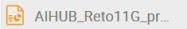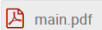|		
15:00 → 15:05	**COMCHA: News & Introduction**	⏱5m
	Ponentes: Arantza Oyanguren (IFIC- Valencia), Luca Fiorini (IFIC / U. Valencia)	
	📄 News_Oct_20.pdf	
15:05 → 15:25	**Low-Power Sustainable Hardware for AI (AIHUB-CSIC)**	⏱20m
	Ponente: Teresa Serrano (IMSE-CNM, Sevilla)	
	📄 AIHUB_Reto11G_pr...	
15:30 → 16:00	**The LHCb HLT1 trigger on GPUs (Allen)**	⏱30m
	Ponente: Daniel Campora (CERN)	
	📄 main.pdf	
16:05 → 16:25	**Tracking reconstruction in HEP on FPGAs**	⏱20m
	Ponentes: Giovanni Punzi (Universita & INFN Pisa (IT)), Giovanni Punzi (INFN-Pisa)	
	📄 Punzi-ComCha2020...	
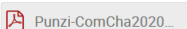
https://twiki.ific.uv.es/twiki/bin/view/Main/ComCha

What is COMCHA ?

- The idea: to identify (part of) the Spanish community interested and join them

- Create a interdisciplinary and transversal network → **FUNDED in 2022 call!!**

  (Groups working on collider physics, operations and computing, astroparticles)

- Aiming to provide students with new skills & keep communication:

  → 3 schools (1st Barcelona (2019) , 2nd Valencia (2021) y 3rd Oviedo(2023))

- Topics of interest of COMCHA are tackled and have application also in other areas of knowledge

- Important also for communication with industry

What is COMCHA ?

1st COMCHA School

3-9 octubre 2019
Europe/Madrid timezone

https://indico.ific.uv.es/event/3825/

Vista general

Cronograma

Lista de Contribuciones

Inscripción

Lista de participantes

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08022 Barcelona ...

The School has a fe... ...ccoun...
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Local Organizers:

- Xavier Vilasís Ca...
- Deborah Domène...
- Alessandro Camb...
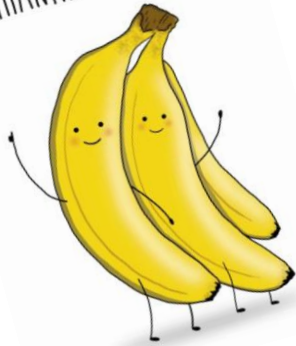- Virginia Jimenez P...

https://www.salleurl.edu/en/la-salle-url-and-ific-organise-comcha-first-school-computing-challenges-high-energy-physics

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2nd COMCHA School

24 November 2021 to 2 December 2021

Europe/Madrid timezone

https://indico.ific.uv.es/event/6422/overview

Thanks!!!

What is COMCHA ?

Some of the COMCHA contributions during the past years can be found at:

- *COMCHA: Hardware accelerators for High Energy Physics*, A. Oyanguren, XIII CPAN Days, Huelva, March 2022. https://indico.ific.uv.es/event/6457/

- *Future of COMCHA*, L. Fiorini, A. Oyanguren, I Workshop de Computing y Software de la Red Española de LHC, Madrid, Aprill 2021. https://indico.cern.ch/event/1019366/

- *High Energy Physics at Large Hadron Collider - CERN: Computing Advances, Designs and Challenges.* A. Oyanguren Campos, L. Fiorini, I. Gonzalez C., X. Vilasis Cardona. Panel II at HPCS 2020. March 25, 2021. https://hpcs2020.cisedu.info/4-program

- *COMCHA: Computing Challenges for the HL-LHC (and beyond),* P. Martínez Ruiz Del Árbol, XI CPAN Days, Oviedo, October 2019. https://indico.ific.uv.es/event/3780/

- 1st COMCHA meeting, XI CPAN Days, Oviedo, October 2019
https://indico.ific.uv.es/event/3780/sessions/

- *COMCHA: Computing Challenges for the HL-LHC, Spain*, A. Oyanguren, XLVII International Meeting on Fundamental Physics, Madrid, June 2019 https://indico.fis.ucm.es/event/1/

- *Computing Challenges for HL-LHC (COMCHA)*, L. Fiorini, 3rd Workshop of the RED LHC, Madrid, Mayo 2019 https://indico.cern.ch/event/797182/

- *Computing Challenges meeting (COMCHA)*, A. Oyanguren, L. Fiorini, (IFIC, Valencia) P. Martínez Ruiz Del Árbol (ETH) (Zurich, Suiza)., Virtual, Mayo 2019
https://indico.ific.uv.es/event/3332/

- *Computing Challenges for particle reconstruction in the HL-LHC era*, A. Oyanguren, 2nd Workshop of the RED LHC, May 2018 https://indico.cern.ch/event/707350

What is COMCHA ?
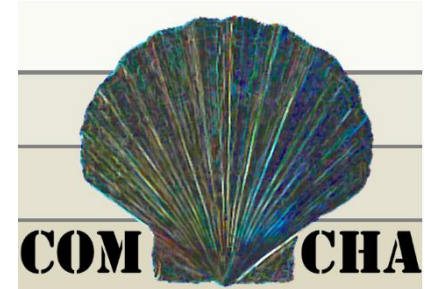
The groups:

Grupo 1- Galicia. IP: Xabier Cid Vidal -- USC/IGFAE

Grupo 2- Asturias. IP: Santiago Folgeras Gomez – ICTEA /U. Oviedo

Grupo 3- Cantabria: IP: Pablo Martinez Ruiz del Arbol -- IFCA -CSIC/U. Cantabria

Grupo 4- Catalunya: IP: Xavier Vilasís Cardona -- La-Salle/URL

Grupo 5- C.Valenciana: M. Aranzazu de Oyanguren Campos -- IFIC-CSIC/U. Valencia

Grupo 6- Andalucía: Miguel Ángel Martínez del Amor -- U. Sevilla

Grupo 7- Madrid Cristina Fernández Bedoya -- CIEMAT (Madrid)

Grupo 8- PIC [IFAE] - Martin Børstad Eriksen – IFAE

Grupo 9- ARTEMISA [IFIC] – Jose Enrique García Navarro - IFIC-CSIC/U. Valencia

(63 subscribers in the COMCHA distribution list)

What is COMCHA ?

ATLAS

- Investigating FPGA implementation of deep learning algorithms for real-time signal reconstruction in particle detectors under high pile-up conditions [JINST 14 (2019) 09, P09002]

- Machine Learning: NN models usually use floating point models, not efficient for FPGAs
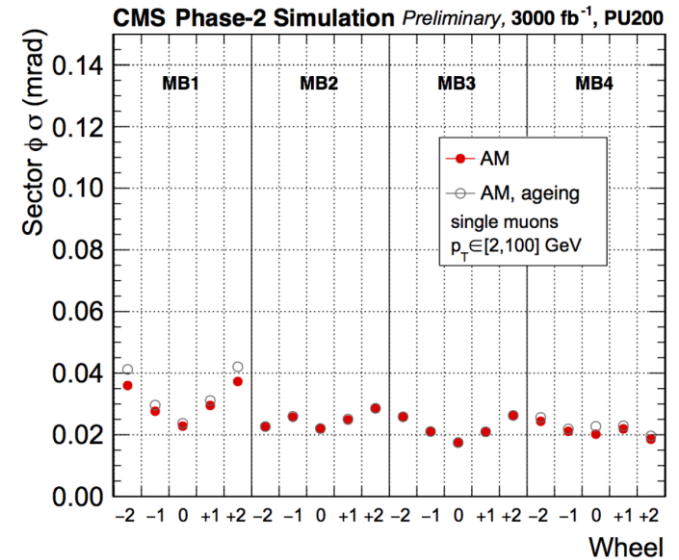 → study of the impact of the quantization on convolutional neural network models
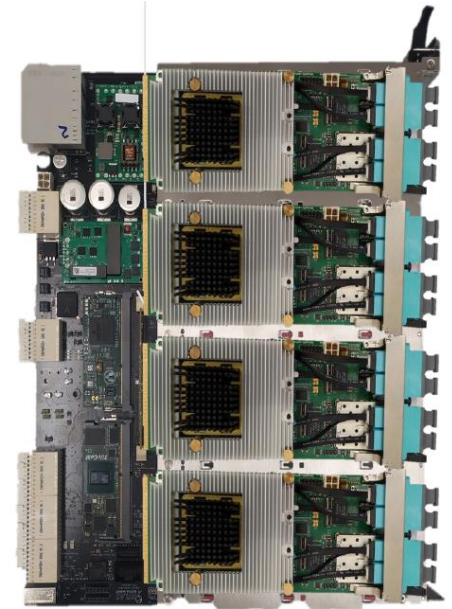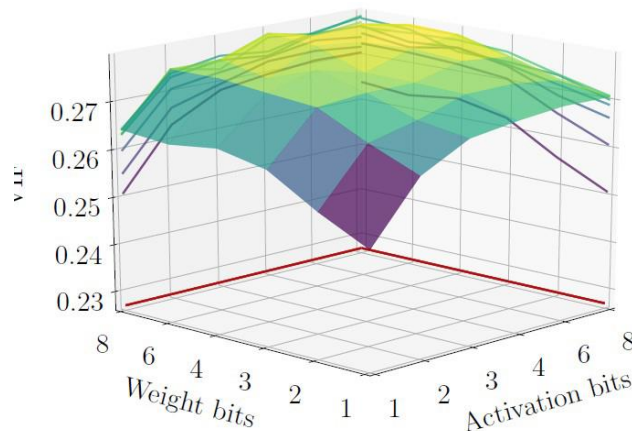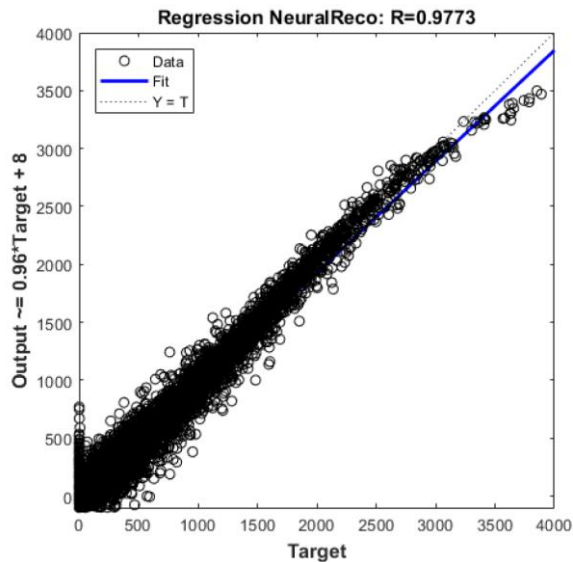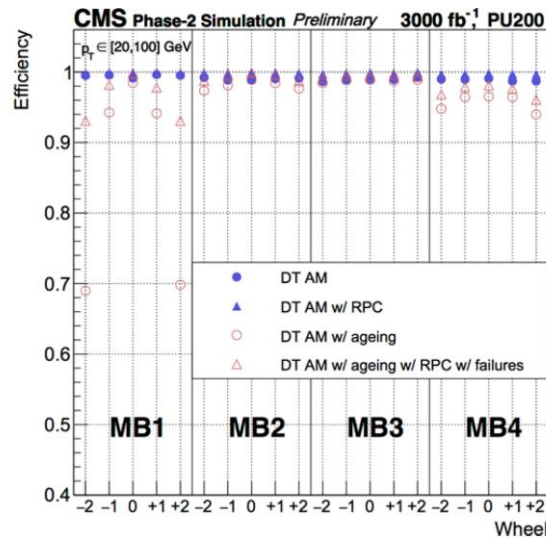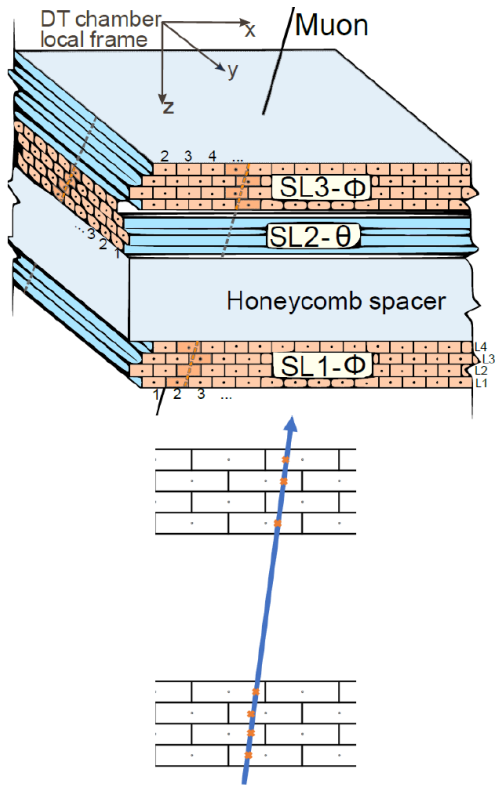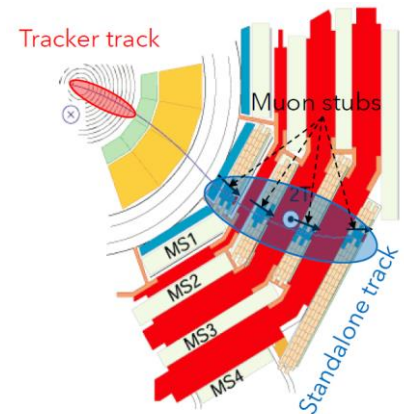

- Tests of quantized models in FPGA (Xilinx ZC104) showed up to 5 times more power efficiency with respect to a GPU (Nvidia RTX 2080TI) for the CNN reconstruction.

What is COMCHA ?

CMS
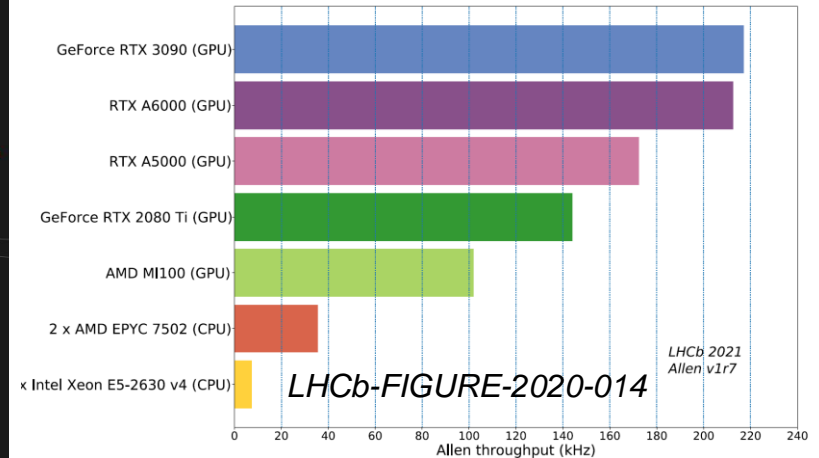
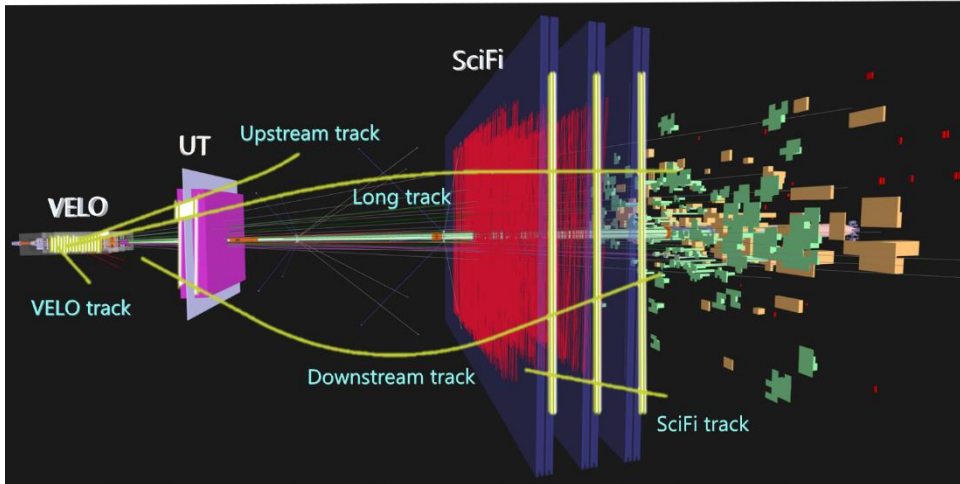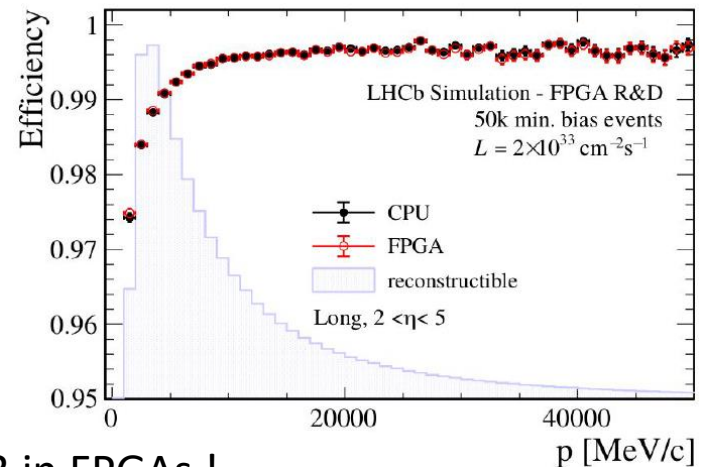- Real-time muon tracking algorithm on FPGAs for the Upgrade CMS
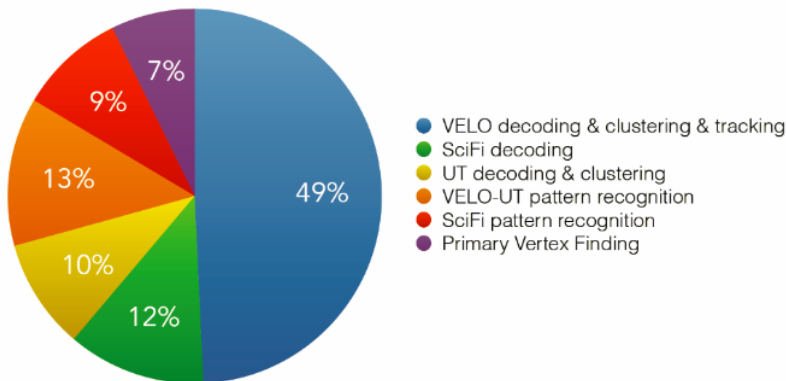
What is COMCHA ?

LHCb

- Full first level of the trigger on GPUs:

[Comput Softw Big Sci 4, 7 (2020)]

LHCb-FIGURE-2020-014

- Real-time reconstruction on FPGAs with the "artificial retina"architecture

- VELO clustering already implemented for Run3 in FPGAs !
- Downstream tracking in development for Run4 and 5

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COMCHA activities this year:

Trigger and readout at the LHC experiments for Run 3 and beyond in Spain - COMCHA

20-22 March 2023
Universe
Europe/Madrid timezone

Overview
Call for Abstracts
Timetable
Contribution List
Registration
Participant List
Local information

The goal of this workshop is to give an overview of the plans of the different groups working in the trigger and data acquisition systems of the LHC experiments at CERN for Run 3 and beyond, as well as to establish new synergies. The current status, operation and upgrade of the ATLAS, CMS and LHCb experiments will be discussed.

Supported by:

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The future of COMCHA ?

It depends on you !

- Continue meetings, and contributions in workshops and conferences

- Promote interaction among students

- Coordinate with other AI initiatives (AIHUB-CSIC)

- We need a map of objectives from the groups

- Work on the COMCHA roadmap

- Take benefit of Spanish infrastructures (ex: ARTEMISA @ IFIC)

- Increase our national and international visibility – DRD7