

# Connecting The Dots & Workshop on Intelligent Trackers

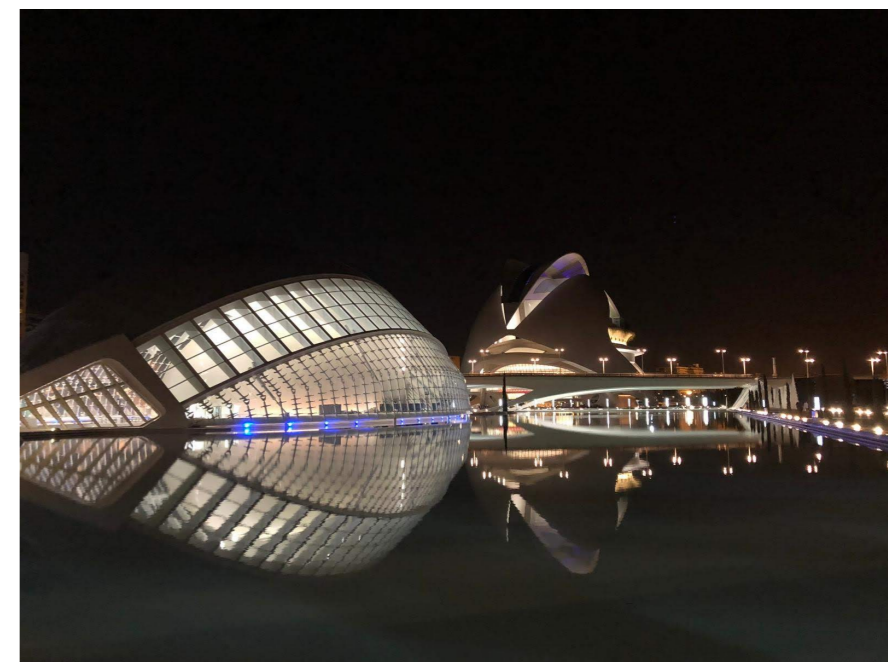
J.E. García & S. Martí  
5/April/2019







- Contrapunto Restaurant at Ciutat de les Arts i les Ciències





- Attendance certificate and fee payment certificate were sent by e-mail by ADEIT staff
  - Ms María José GARCIA & Ms Rosa LUCAS
  - Registration desk
- In case you need a certificate of your talk:
  - Either ask to the registration desk
  - Contact us by e-mail: [ctdwit19@cern.ch](mailto:ctdwit19@cern.ch)





- Pictures of the conference available at the indico page

2-5 April 2019

Jardí Botànic de València

Europe/Zurich timezone

Overview

Scientific Programme

Call for Abstracts

Timetable

Contribution List

My Conference

↳ My Contributions

Book of Abstracts

Registration

Local Information

↳ Venue

↳ Travel Information

↳ Accommodation

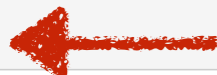
↳ Social Programme

Organization

↳ First Bulletin

Proceedings

Pictures



## CTD/WIT 2019

2-4 abr. · Compartidos

Unirte

C

Connecting the Dots and Workshop on Intelligent Trackers. IFIC (Valencia). April 2-5, 2019





# Group picture



CTD/WIT 2019  
Connecting the Dots and Workshop on Intelligent Trackers  
IFIC, València, Spain  
2nd - 5th April 2019

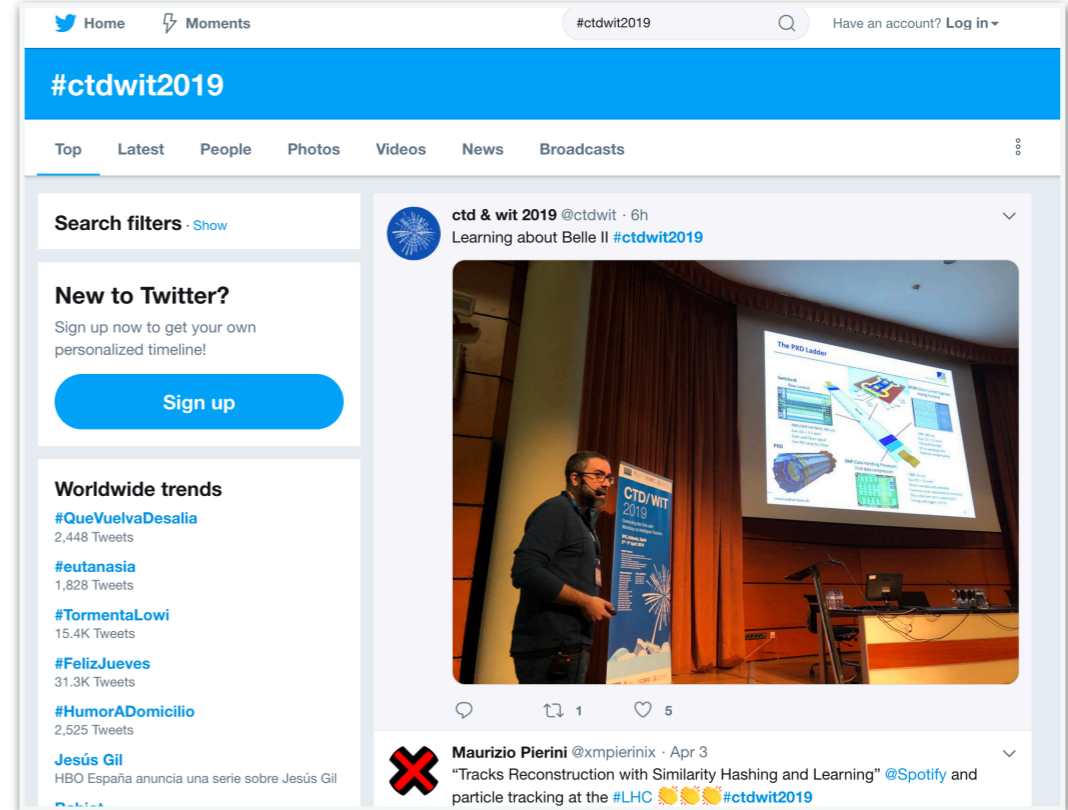


- Group picture of the conference available at the indico page





- CTD/WIT 2019 twitter was active
  - <https://twitter.com/ctdwit>
- Event in local news:
  - Follow this [link](#)





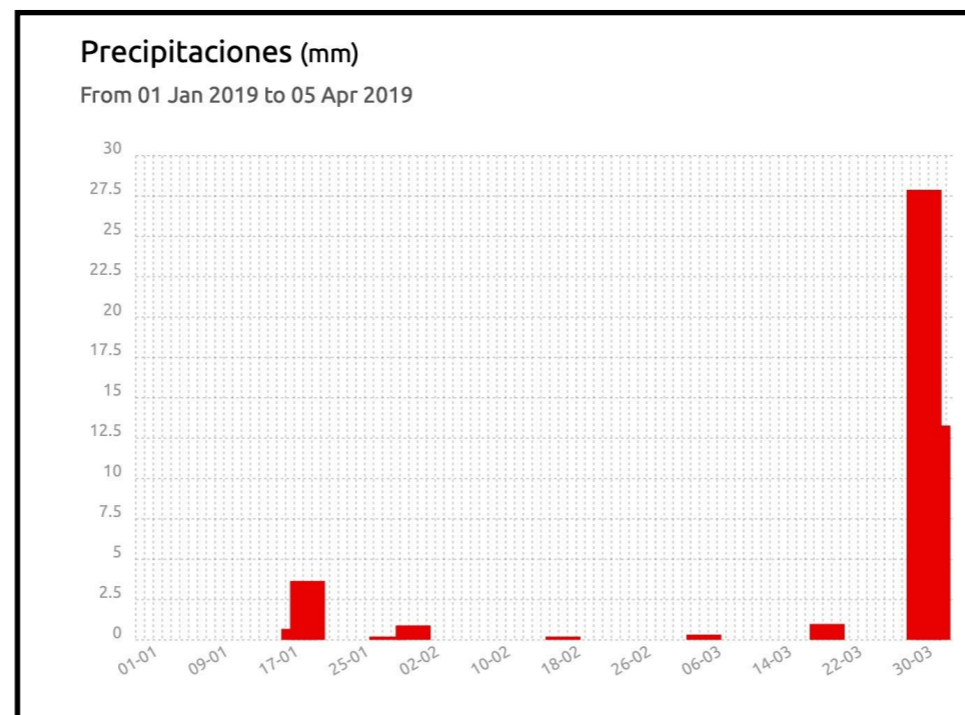
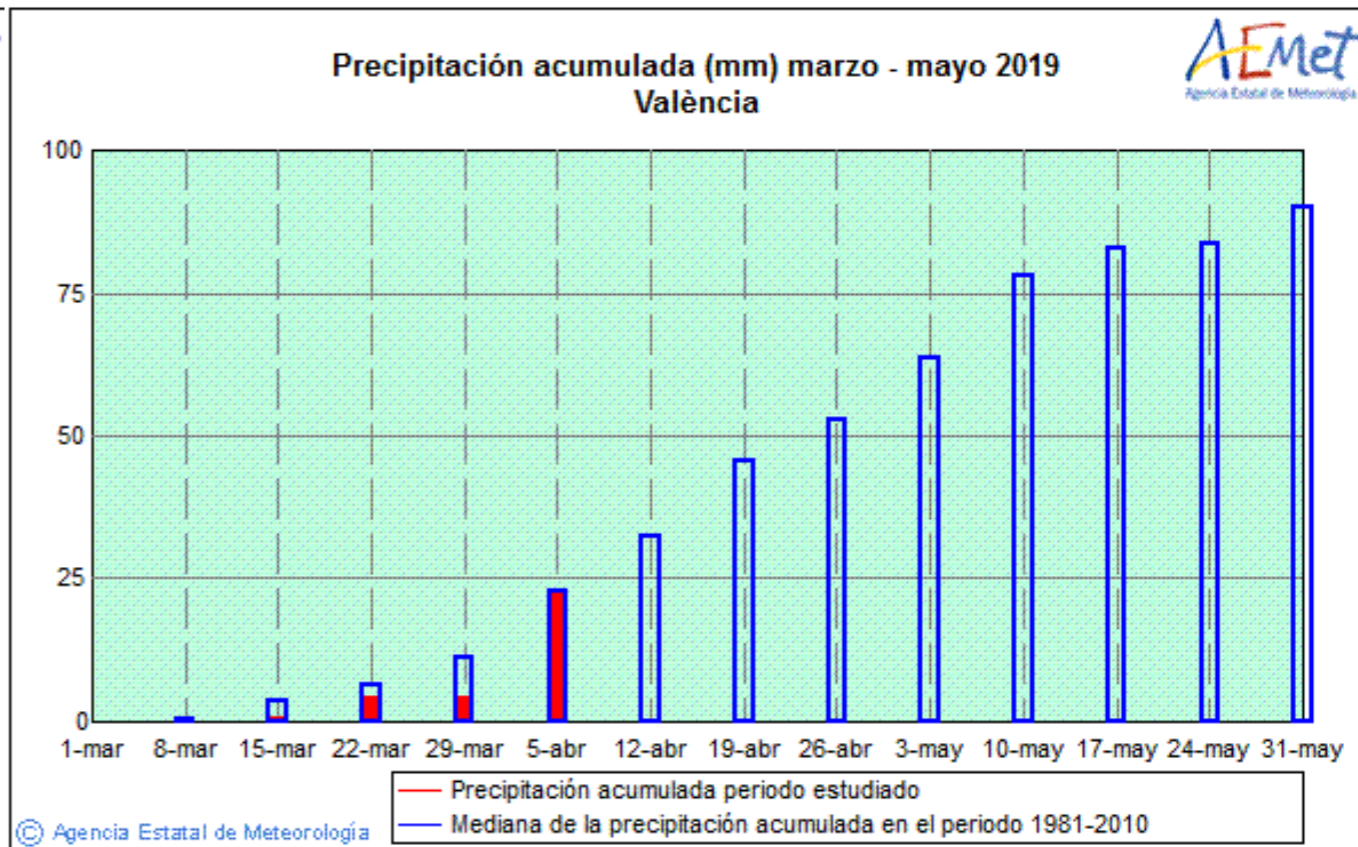
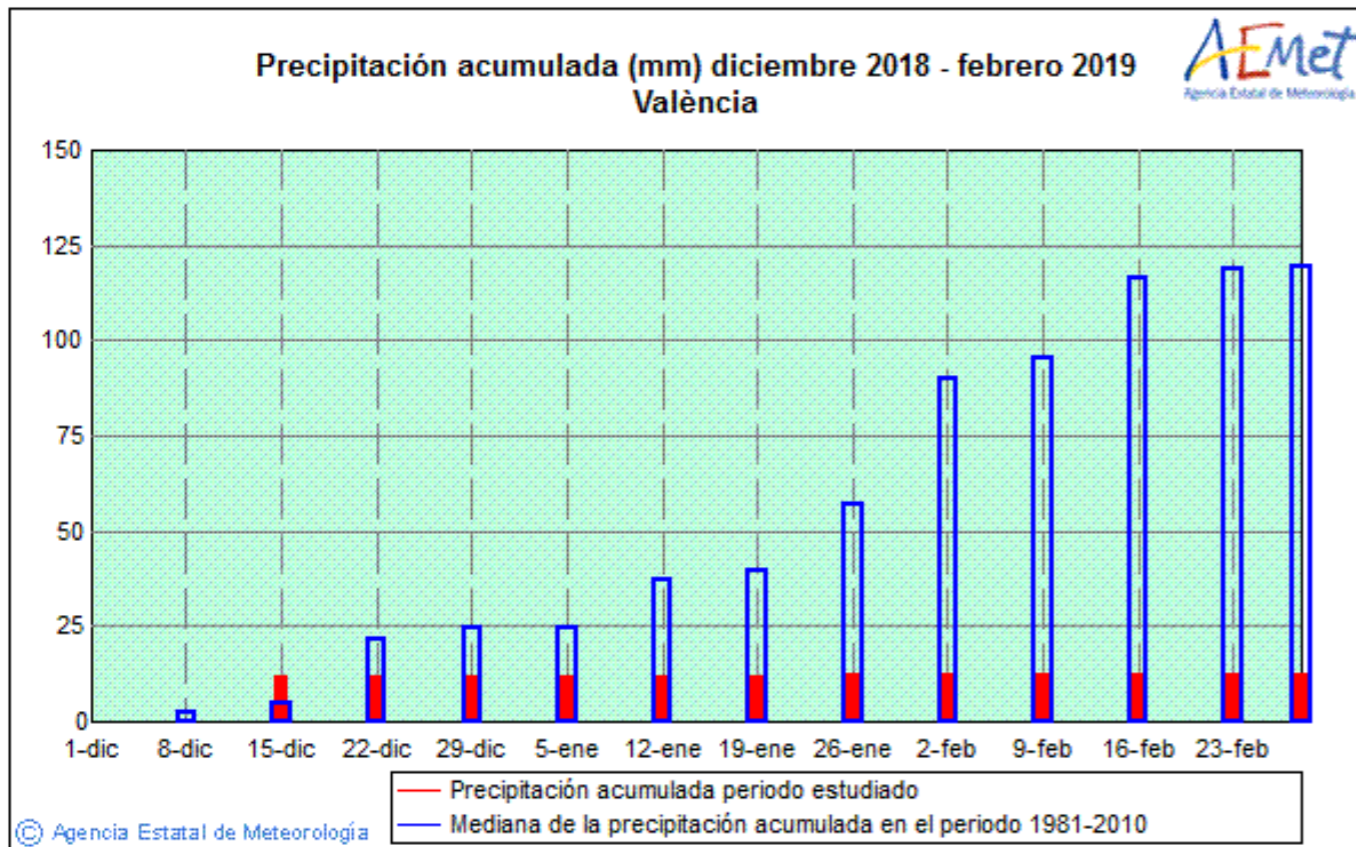






Blue: integral of expected rainfall

Red: integral of recorded rainfall





# Facts and figures



**CTD/WIT 2019**  
Connecting the Dots and Workshop on Intelligent Trackers  
**IFIC, València, Spain**  
2nd - 5th April 2019



**EXCELENCIA SEVERO OCHOA**

- Attendance
  - 90 people (28 PhD students)

List of registration forms

CTD2019 registration

👤 Registrations
90
⚙️ Manage
🗑️

- Talks:
  - 35 senior, 10 YSF, 12 posters, 1 Botanic Garden + 1 discussion session
  - Female 11, Male 34

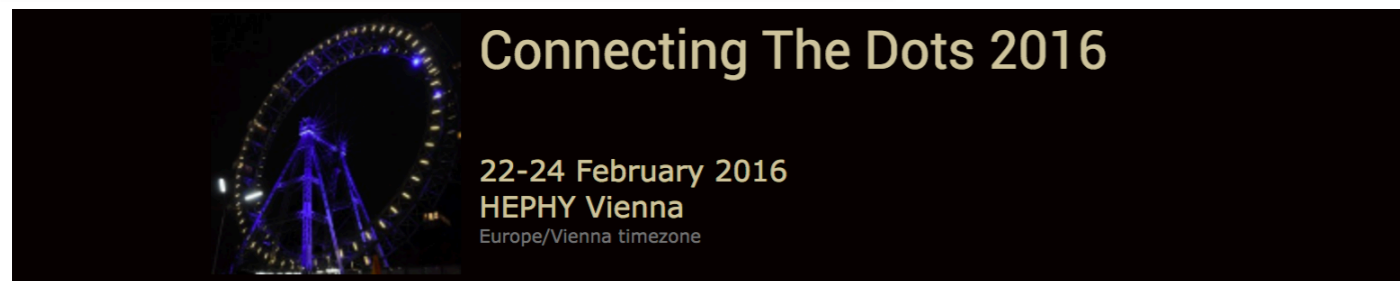
	2 Apr 2019	3 Apr 2019	4 Apr 2019	5 Apr 2019
<b>AM</b>	<p>09:00 Registration ( )</p> <p>09:30 Introduction - Jose Enrique Garcia Navarro (Univ. of Valencia and CSIC (ES)) Salvador Marti I Garcia (IFIC-Valencia (UV/EG-CSIC)) ( )</p> <p>10:00 Patatrack: accelerated Pixel Track reconstruction in CMS - Felice Pantaleo (CERN) ( )</p> <p>10:30 Tracking Performance of the ATLAS Fast Tracker (FTK) - Benjamin Henry Hooberman (Univ. Illinois at Urbana Champaign (US)) ( )</p> <p>11:00 --- Coffee Break ---</p> <p>11:30 GPGPU-implemented Tracking in a COMET Phase-I Drift Chamber - Beomki Yeo (KAIST) ( )</p>	<p>08:55 Day 2 Introduction - Jose Enrique Garcia Navarro (Univ. of Valencia and CSIC (ES)) Salvador Marti I Garcia (IFIC-Valencia (UV/EG-CSIC)) ( )</p> <p>09:00 DeepCore: Convolutional Neural Network for high pT jet tracking - Valerio Bertacchi (INFN Sezione di Pisa, Universita' e Scuola Normale Superiore, P) ( )</p> <p>09:30 A hybrid deep learning approach to vertexing - Henry Fredrick Schreiner (University of Cincinnati (US)) ( )</p> <p>10:00 Charged Particle Tracking as a QUBO problem solved with Quantum Annealing-Inspired Optimization - Dr Jean-Roch Vilimant (California Institute of Technology (US)) ( )</p> <p>10:15 QUBO for Track Reconstruction on D-Wave - Lucy Linder (School of Engineering and Architecture of Fribourg (Switzerland), HES-SO, iCoSys Institute) ( )</p> <p>10:40 Talk Botanic Garden - Dr Olga Mayoral Garcia-Berlanga ( )</p> <p>11:00 --- Coffee Break ---</p> <p>11:30 HEP.TrkX Charged Particle Tracking using Graph Neural Networks - Xiangyang Ju (Lawrence Berkeley National Lab. (US)) ( )</p>	<p>08:55 Day 3 Introduction - Jose Enrique Garcia Navarro (Univ. of Valencia and CSIC (ES)) Salvador Marti I Garcia (IFIC-Valencia (UV/EG-CSIC)) ( )</p> <p>09:00 Randomized Computer Vision Approaches for Pattern Recognition in Timepix and Timepix3 Detectors - Petr Manek (Czech Technical University (CZ)) ( )</p> <p>09:30 The Phase 2 run of the Belle II experiment - Carlos Marinas Pardo (University of Bonn (DE)) Carlos Marinas (University of Bonn) ( )</p> <p>10:00 Speeding up Particle Track Reconstruction using a Vectorized and Parallelized Kalman Filter Algorithm: Recent Improvements and Applicability to the Software Trigger - Alison Reinsvold Hall (Fermilab) ( )</p> <p>10:30 Global Track Reconstruction and Data Compression Strategy in ALICE for LHC Run 3 - David Rohr (CERN) ( )</p> <p>11:00 --- Coffee Break ---</p> <p>11:30 Use of R-trees to improve reconstruction time in pixel trackers - Albert Pernia Vázquez (DS4DS, La Salle - Universitat Ramon Llull) ( )</p>	<p>09:00 Free ( )</p> <p>09:30 Big data challenges for Earth observation imaging - Helena Buriel Navarro ( )</p> <p>09:45 Overview of CMOS sensors for future tracking detectors - Ricardo Marco Hernandez (Instituto de Física Corpuscular (ES)) Ricardo Marco Hernandez (CERN) ( )</p> <p>10:00 Unconventional Tracking Techniques for Long-Lived Particle Searches in ATLAS - Matthew Gignac (University of California, Santa Cruz (US)) ( )</p> <p>10:30 A novel 4D fast tracking pixel detector - Marco Petruzzo (Università degli Studi e INFN Milano (IT)) ( )</p> <p>11:00 --- Coffee Break ---</p> <p>11:30 Optimization of the Adaptive Multi Vertex Finder in ATLAS - Isaac Sanderswood (Lancaster University (GB)) ( )</p> <p>11:50 Another approach to track reconstruction: cluster analysis - Ferenc Siklér (Wigner RCP, Budapest (HU)) ( )</p>
<b>PM</b>	<p>12:00 Low Latency Neural Networks using Heterogenous Resources on FPGA for the Belle II Trigger - Steffen Baehr (Karlsruhe Institute of Technology) ( )</p> <p>12:30 The ATLAS Hardware Track Trigger design towards first prototypes - Richard Brenner (Uppsala University (SE)) ( )</p> <p>13:00 FPGA-accelerated machine learning inference for particle physics computing challenges - Javier Mauricio Duarte (Fermi National Accelerator Lab. (US)) ( )</p> <p>13:30 --- Lunch break ---</p> <p>15:00 The RD53 data format and communication efficiency - Anders Ryd (Cornell University (US)) ( )</p> <p>15:30 Precision timing detectors for the upgrade of the LHC experiments - Lucia Masetti (Johannes Gutenberg Universitaet Mainz (DE)) ( )</p> <p>16:00 Silicon Detectors for the LHC Phase-II Upgrade and Beyond - RD50 Status Report - Marco Mandurrino (INFN Torino (IT)) ( )</p> <p>16:30 --- Coffee Break ---</p> <p>17:00 The CMS Tracker Upgrade for the High-Luminosity LHC - Ernesto Migliore (Universita e INFN Torino (IT)) ( )</p> <p>17:30 LHCb phase 2 upgrade program - Olaf Steinkamp (Universitaet Zuerich (CH)) ( )</p>	<p>12:00 Machine Learning For Track Finding - Mr Waleed Esmail (Forschungszentrum Jülich GmbH, IKP1) ( )</p> <p>12:30 Convolutional Neural Network for Track Seed Filtering at the CMS HLT - Mr Adriano Di Florio (Universita e INFN, Bari (IT)) ( )</p> <p>13:00 Tracks Reconstruction with Similarity Hashing and Learning - Sabrina Amrouche (Université de Geneve (CH)) ( )</p> <p>13:30 --- Lunch break ---</p> <p>15:00 Report from RAMP challenge November on fast vertexing - Florian Reiss (Centre National de la Recherche Scientifique (FR)) ( )</p> <p>15:20 The FCC pp, ep and ee tracking detector concepts and their projected performance - Julia Hrdinka (University of Innsbruck (AT)) ( )</p> <p>15:40 Track seed classification with DNNs - Mr Felix Dietrich (University of Innsbruck (AT)) ( )</p> <p>16:00 Firmware oriented trigger algorithm for CMS Drift Tubes in HL-LHC - Silvia Goy Lopez (Centro de Investigaciones Energéticas Medioambientales y Tecnológicas) ( )</p> <p>16:20 Time based reconstruction of hyperons with PANDA at FAIR - Jenny Regina (Uppsala University) ( )</p> <p>16:40 --- Coffee Break ---</p> <p>17:00 Tracking performance for long living particles at LHCb - Luis Miguel Garcia Martin (Univ. of Valencia and CSIC (ES)) ( )</p> <p>17:20 Sensor shapes and weak modes of the ATLAS Inner Detector track based alignment - Julian Wollrath (Albert Ludwigs Universitaet Freiburg (DE)) ( )</p> <p>18:00 City Center Guided Tour Information ( )</p> <p>18:01 --- City center guided tour ---</p>	<p>12:00 Level-1 track finding with an all-FPGA system at CMS for the HL-LHC - Thomas Owen James (Imperial College (GB)) ( )</p> <p>12:30 Performance of Belle II tracking in central drift chamber - Alexander Glazov (Deutsches Elektronen-Synchrotron (DE)) ( )</p> <p>13:00 New developments in conformal tracking for the CLIC detector - Erica Brondolin (CERN) ( )</p> <p>13:30 --- Lunch break ---</p> <p>15:00 Tracking performance with the HL-LHC ATLAS detector - Maximilian Emanuel Goblirsch-Kolb (Brandeis University (US)) ( )</p> <p>15:30 A GPU High Level Trigger 1 for the upgraded LHCb detector - Brij Kishor Jashal (IFIC, Valencia) ( )</p> <p>16:00 Performance of the Belle II Silicon Vertex Detector stand alone track finder - Giulia Casarosa (INFN - National Institute for Nuclear Physics) ( )</p> <p>16:30 --- Coffee Break ---</p> <p>17:00 Review of the TrackML challenge - Andreas Salzburger (CERN) ( )</p> <p>17:30 Discussion on the TrackML challenge ( )</p> <p>20:30 --- Conference dinner ---</p>	<p>12:20 Increasing track reconstruction efficiency in dense environments at ATLAS - Sofia Adomi Braccosi Chiassi (Universite de Geneve (CH)) ( )</p> <p>12:50 CTD 2020 Proposal: Princeton - Peter Elmer (Princeton University (US)) ( )</p> <p>12:55 CTD 2020 Proposal: LNF - Frascati National Laboratory - Marianna Testa (INFN e Laboratori Nazionali di Frascati (IT)) ( )</p> <p>13:00 Workshop Summary - TBA ( )</p> <p>13:10 Closing ( )</p>



- Attendance
  - 90 people (28 PhD students)
- Talks:
  - 35 senior, 10 YSF, 12 posters, 1 Botanic Garden + 1 discussion session
  - Female 11, Male 34



Attendants: 55  
Talks: 24



Attendants: 74  
Talks: 39



Attendants: 100  
Talks: 51



Attendants: 60 (15 students)  
Talks: 32



- WIT: RD50 and RD53 overview, timing detectors aim 30 ps
- GPU/FPGA based tracking for trigger/online,
  - both classical and ML based, for HLT or L1
- FTK shows first tracking results, design of FPGA L1Track in CMS is progressing
- ML R&D for tracking is massive, moving into production readiness of first applications
- QUBO quantum computing is reconstructing HEP events
- Music searches inspire HEP tracking
- Tracking and Vertexing Challenges were a success
  - Tracking ML results are fascinating, 4 years after it started at CTD 2015, we discussed about the future
  - Tracking ML dataset used widely in results presented in talks, it fulfils its purpose
- Tuning of classical tracking is still relevant for upgrades and non-conventional tracking
  - Classical tracking on CPUs (vectorising, data structures, ...)
- Contributions beyond LHC and BELLE II: PANDA, COMET
  - LHC Run 2 and readiness for Run 3
  - Belle II Phase 3 has started and detector performance looks good !
- The future (FCC, CLIC) is challenging



- Result of the week



- Result of the week: wednesday 3/April/2019

València CF

Real Madrid



2 - 1





- Universitat de València Botanic Gardens staff
  - Director Jaume Guemes
  - Dr Olga Mayoral (speaker)
  - Mr Alfonso Cuadros Martínez (audio-video-lights)
  - Ms Amparo Ibors (administration)





- Administration
  - M.J. García (ADEIT)
  - R. Lucas (ADEIT)
  - M.J. Gracia (IFIC-València)





- ATLAS València PhD students





- International Advisory Committee members
- Local organising Committee members







- CTD/WIT 2019 is over



- CTD/WIT 2019 is over





# Adéu!



Connecting The Dots / Intelligent Trackers 2019

**CTD/WIT 2019**

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IFIC, València, Spain

2nd - 5th April 2019

**IFIC**  
INSTITUT DE FÍSICA  
CORPUSCULAR



EXCELENCIA  
SEVERO  
OCHOA



**Bon viatge! aneu espai!**