



Christophe Delaere

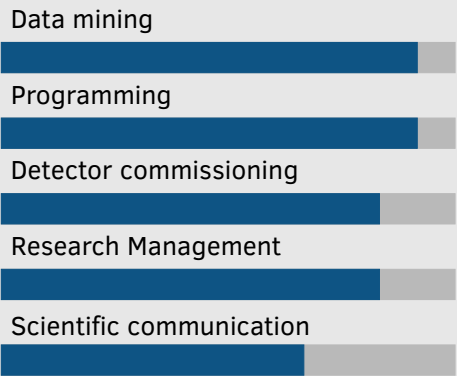
Senior Research Associate

- 4 May 1979
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- christophe.delaere@uclouvain.be

About me

Professor at UCL since 2009, I am FNRS Senior research associate in experimental Particle physicist. I am member of the CMS and ALEPH collaborations at CERN and responsible for the Delphes and MoMEMta projects.

Skills



Monte Carlo techniques*4 Machine learning*3 Scientific writing*5 Object oriented programming*5 Data modeling*4 Statistical techniques*4 Data acquisition*5

(*)[The skill scale is from 0 (Fundamental Awareness) to 6 (Expert).]

Interests

My interests range from particle physics detector integration, commissioning and operation (e.g. CMS tracker) to data analysis in the scalar sector, with a particular focus on advanced analysis methods for LHC (e.g. machine learning, multivariate analysis and MEM).

Experience

- 2017 - FNRS Senior Research Associate CP3 - UCLouvain
CMS data analysis, CMS phase-2 tracker, Advanced Analysis Methods for LHC
- 2009 - 2017 FNRS Research Associate CP3 - UCLouvain
Study of the $l\bar{l}b\bar{b}$ topology at LHC; CMS run coordination (deputy)
- 2008-2009 FNRS Scientific Research Worker CP3 - UCLouvain
CMS detector commissioning; Coordinator of the CMS tracker simulation group
- 2006 - 2008 Scientific Fellow CERN
Development of procedures for the high level commissioning of the CMS tracker; Physics of the top quark in topologies with tau leptons.
- 2005 - 2006 IAP post-doc FYNU - UCLouvain
Integration and commissioning of the CMS tracker endcaps.
- 2001 - 2005 FNRS research fellow FYNU - UCLouvain
Study of Standard Model Higgs boson decay in the WW channel, both in ALEPH and CMS experiments.

Education

- 2001-2005 PhD in Sciences - Particle Physics Université catholique de Louvain
Study of WW decay of a Higgs boson with the ALEPH and CMS detectors

Teaching duties

- LPHY1342 Solid State Physics Université catholique de Louvain
Introduction to solid state physics: Symmetries, phonons, thermal and electrical properties, semiconductors, superconductors.
- LPHY2131 Particle Physics I Université catholique de Louvain
Introduction to particle physics; organization of a data analysis lab where students measure properties of electroweak bosons.
- LPHY2135 Computing and numerical methods in particle physics Université catholique de Louvain
Hardware and software triggering systems; Event reconstruction methods; Calibration and alignment techniques; Data analysis methods; Monte Carlo Simulation of particle propagation in matter.

Awards

- 2009 Ranked first at the CNRS concours for Chargé de recherche
- 2008 CMS achievement Award
- 2006 CMS thesis Award
- 2002 Scientific prize of the Belgian Physical Society



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Skills

Data mining



Programming



Detector commissioning



Research Management



Scientific communication



Monte Carlo techniques*4 Machine learning*3 Scientific writing*5 Object oriented programming*5 Data modeling*4 Statistical techniques*4 Data acquisition*5

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Responsibilities

For the Institute:

- 2016- Member of the jury for FRIA grants (jury PE-9) (FNRS)
- 2012- Member of the Belgian selection committee for CERN fellows (FNRS-FWO)
- 2012- Member of the bureau of the Institute of Research in Mathematics and Physics (IRMP)

For the CMS collaboration:

- 2015- Belgian representative at the CMS tracker management board
- 2015- Belgian representative at the CMS finance board and CMS tracker finance board
- 2014- Belgian representative at the CMS tracker phase 2 management board
- 2012- Member of the CMS tracker conference committee
- 2012-2013 CMS Deputy Run Coordinator (Level-1)
- 2010- UCLouvain representative at the CMS Tracker Institution Board
- 2010-2011 Convener of the CMS tracker performance group (Level-2)
- 2009 Convener of the CMS tracker simulation group (Level-3)
- 2006 Responsible for the Louvain Petal Integration Center at CERN
- 2004-2005 Initiator and chair of the CMS HLT steering group

Publications

More than 600 papers as member of the CMS and ALEPH collaborations.

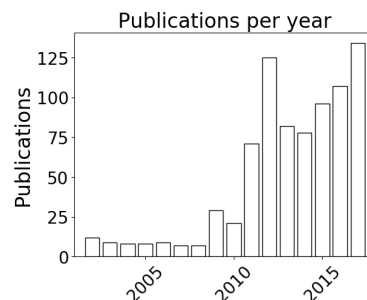
InspireHep profile (February 2018)

Number of published papers: 719

Number of citations: 78001

Citations per paper (average): 108.5

h index: 130



Some of the most representative publications:

- [1] CMS Collaboration, *Search for neutral resonances decaying into a Z boson and a pair of b jets or tau leptons*, Phys. Lett. B 759 (2016) 369; doi:10.1016/j.physletb.2016.05.087.
My group did the analysis and wrote the part on decays into b jets.
- [2] CMS Collaboration, *CMS Tracking Performance Results from early LHC Operation*, Eur.Phys.J.C70:1165-1192,2010; doi:10.1140/epjc/s10052-010-1491-3.
I produced performance results for this milestone paper.
- [3] J. de Favereau et al., *DELPHES 3, A modular framework for fast simulation of a generic collider experiment*, JHEP 1402 (2014) 057; doi:10.1007/JHEP02(2014)057.
I am one of the few authors of this topcite paper (more than 700 citations so far).
- [4] CMS Collaboration, *Evidence for the direct decay of the 125 GeV Higgs boson to fermions*, Nature Physics 10 (2014) 557; doi:10.1038/nphys3005.
We performed the internal cross-check $H \rightarrow b\bar{b}$ analysis for this paper.
- [5] CMS collaboration, *Measurement of the production cross sections for a Z boson and one or more b jets in pp collisions at $\sqrt{s} = 7$ TeV*, JHEP 06 (2014) 120; doi:10.1007/JHEP06(2014)120.
This paper paved the way to the use of that topology for Higgs boson searches. I am the main author.
- [6] CMS Collaboration, *Observation of a new boson at a mass of 125 GeV with the CMS experiment at the LHC*, Phys.Lett. B716 (2012) 30-61; doi:10.1016/j.physletb.2012.08.021
I contributed to the discovery directly (involvement in the Higgs group) and indirectly (Run coordination).
- [7] ALEPH Collaboration, *Search for Higgs bosons decaying to WW in e^+e^- collisions at LEP*, Eur. Phys. J. C49 (2007) 439; doi:10.1140/epjc/s10052-006-0158-6
This is my main analysis work in ALEPH, already in the Higgs sector.
- [8] CMS Collaboration, *CMS technical design report, volume II: Physics performance*, J.Phys. G34 (2007) 995-1579; doi:10.1088/0954-3899/34/6/S01
My prospective study for $WH \rightarrow WWW$ is included in this milestone document.



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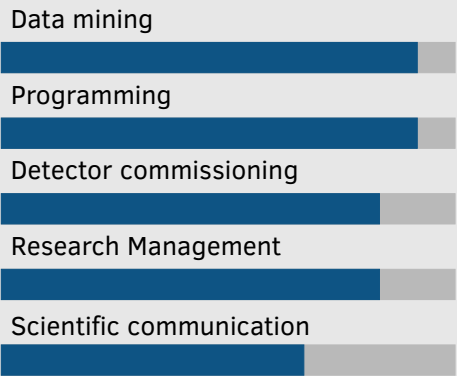
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Supervision

Summer internships

- 2010 Thibaut Lienart, CERN summer student; analysis of the first LHC data and calibration of the CMS tracker.
- 2013 Brieuc Francois, CERN summer student; design of a “PAT” analysis ntuple for the Higgs boson study in CMS.
- 2013 Martin Delcourt, CP3 summer intern; design of a cosmic bench for the test of CMS phase 2 tracker modules.
- 2015 Liliya Milenska, Gilles Perez and Martin Michel, CP3 summer interns; initial developments for the data analysis lab for the Particle Physics course in Master 1.
- 2016 Victor Massart and Julien Touch  que, CP3 summer interns; port of the data analysis lab for the Particle Physics course in Master 1 to the new Open Data 2011 dataset.

Master theses

- 2018 Florian Bury, Application of deep learning to the search for new physics at LHC.
- 2017 Auriane Canesse, Optimization of the search for the associated production of a Z boson and a pseudo-scalar A in the context of a two-Higgs-doublet model.
- 2016 Liliya Milenska, Study of the associated production of a Z boson and a pseudo-scalar A in a boosted topology in the context of a two-Higgs-doublet model.
- 2014 Martin Delcourt, Caract  risation en faisceau d’un prototype de module en vue de l’upgrade du trajectographe de CMS.
- 2013 Alexandre Mertens, Application de techniques de simulation g  n  rique    l’  tude des   v  nements caract  ris  s par deux leptons et deux b-jets dans CMS.

PhD theses

- exp. 2019 Alessia Saggio, The Matrix Element Method and other advanced analysis methods applied to the search for new physics at LHC (expected)
- 2017 Alexandre Mertens, Search for extension of the scalar sector with the CMS detector: the 2HDM alignment limit
- 2016 Adrien Caudron, The final state with two b jets and two leptons at the LHC as a probe of the scalar sector
- 2015 Ludvine C  ard, First measurement of the associated production of a Z boson with b jets at the LHC

Postdocs

- 2010-2014 Tristan du Pree, hired on FSR budget, obtained a FNRS Postdoctoral Researcher position and later a CERN fellowship.
- 2011-2015 Roberto Castello, hired on FSR budget, obtained a FNRS Postdoctoral Researcher position and later a CERN fellowship.
- 2012-2016 Michele Selvaggi, hired on FSR budget, obtained a Research logistic collaborator position and later a CERN fellowship. (FNRS , CERN fellow)
- 2011-2018 Miguel Vidal, hired on IISN budget, obtained a FNRS Postdoctoral Researcher position
- 2015-2018 Olivier Bondu, hired on IISN budget, obtained a FNRS Postdoctoral Researcher position



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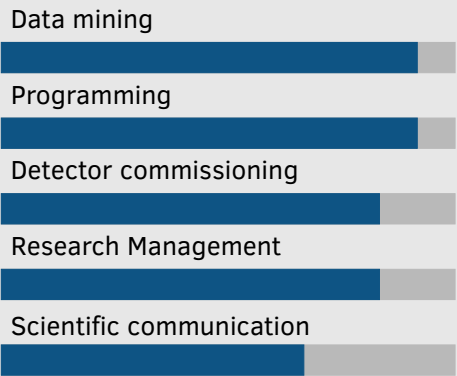
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Participation to juries and committees.

I have been evaluator of the following master theses:

1. Sophie Mathieu (2016-2017), 2. Valentin Goffinet (2016-2017), 3. Thomas Van den Schrieck (2015-2016), 4. Sylvain Vanneste (2015-2016), 5. Carlos Mandeiro (2014-2015), 6. Sébastien Wertz (2013-2014), 7. Brieuc Francois (2012-2013), 8. Manuel Tondeur (2012-2013), 9. Nicolas Pierre (2011-2012), 10. Geoffrey Alexandre (2011-2012), 11. Claude Nuttens (2009-2010), 12. Victor le Maire (2009-2010)

I was member of the jury of the Phd thesis of:

1. Julien Caudron (UCL, 2011), 2. Yohann Tschudi (IPNL, 2011), 3. Lawrence Soung Yee (UCL, 2015), 4. Luca Pernié (ULB, 2015), 5. Lucia Perrini (UCL, 2015), 6. Camille Beluffi (UCL, 2015), 7. Elvira Cervero Garcia (UCL, 2017), 8. Benoit Hespel (UCL, 2017)

I am/was member of the Accompanying Committee for the following Phd theses:

1. Camille Beluffi, 2. Andrey Popov, 3. Lucia Perrini, 4. Claude Nuttens, 5. Benoît Hespel, 6. Jose Zobec, 7. Sébastien Wertz, 8. Georgios Krintiras

Funding ID

I am copromotor of the following major projects:

- 2018-2021 **be.h: The H boson gateway to physics beyond the Standard Model.** Belgian
EOS project in which context I am supervisor of one PhD from October 2018.
- 2017-2019 **CMS phase-2 upgrade** Interuniversity
IISN convention to support the upgrade activities of the CMS experiment at the UCL and the ULB. An extraordinary contribution to the core construction costs was also obtained. 6 promoters, 5.5M€.
- 2016-2021 **Maximising the LHC physics potential by advanced simulation tools and data analysis methods** Interuniversity
IISN convention together with experimental colleagues and theoreticians to develop and maintain tools like Madgraph, Delphes, MoMEMta, etc. 4 promoters, 298k€.
- 2013-2021 **CMS: Physics Beyond the Standard Model** Interuniversity
IISN convention for data analysis activities within the CMS collaboration at UCL. 5 promoters, 2.6M€.
- 2015-2019 **AMVA4NewPhysics** European
ERC ITN network. The goal is to develop advanced statistical learning tools for applications to particle physics problems and for industrial applications. I am supervisor of the UCL ESR. 8 academic partners, 2.4M€.
- 2013-2017 **Fundamental interactions: at the boundary of theory, phenomenology and experiment** Belgian
IAP VII/37 - 12 participating nodes (8 belgian + 4 international partners). At UCL, 12 academics are involved in that project. 4.6M€.
- 2016-2017 **R&D of new particle detection techniques** Interuniversity
IISN convention to support the Research and Development on new particle detection techniques. 400k€.



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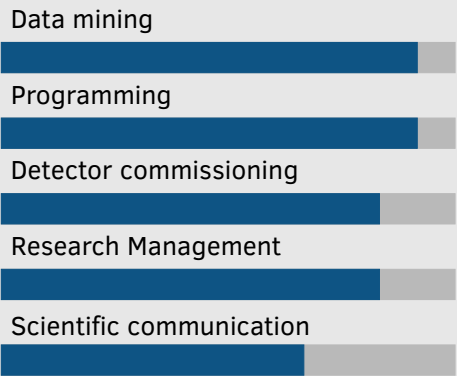
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Conferences, Colloquia, Seminars

Apr 2017	Belgium in the CMS Upgrade RECFA visit to Belgium	Brussels (Belgium)
Mar 2015	CMS: en route for Run2 IIHE Seminar	Brussels (Belgium)
Dec 2015	The CMS Experiment, Technological odyssey and Human adventure Colloquium for the CERN 60th anniversary at Brussels	Brussels (Belgium)
Aug 2014	Detector performance challenges in Run2 Rencontres du Vietnam, Physics at LHC and beyond (plenary)	Quy Nhon (Vietnam)
Apr 2013	DELPHES: A framework for fast simulation of a generic collider experiment Plenary at Monte Carlo for Physics Beyond the Standard Model (7th MC4BSM Workshop)	DESY, Hamburg, Germany
Sep 2007	CMS Tracker commissioning and first operation experience Plenary at the 16th International Workshop on Vertex detectors (VERTEX2007)	Lake Placid, NY, USA
May 2007	Early Standard Model Physics and Early Discovery Strategy in CMS Plenary at the Hadron Collider Physics Symposium 2007 (HCP07)	La Biodola, Isola d'Elba, Italy
Mar 2006	Study of Higgs boson production at LHC near the WW resonance Plenary at the XLirst Rencontres de Moriond - QCD and High En- ergy Hadronic Interactions	La Thuile, Italy
Jul 2005	Search for anomalously coupling and fermiophobic Higgs Bosons HEP2005 Europhysics Conference (parallel)	Lisboa, Portugal
Apr 2004	Looking for a fermiophobic Higgs boson at LEP2 in the WW channel using the ALEPH detector XII International Workshop on Deep Inelastic Scattering (DIS 2004)(parallel)	Strbske Pleso, Slovakia
Feb 2004	Using Neural Networks within ROOT ROOT 2004 Users Workshop	SLAC, USA



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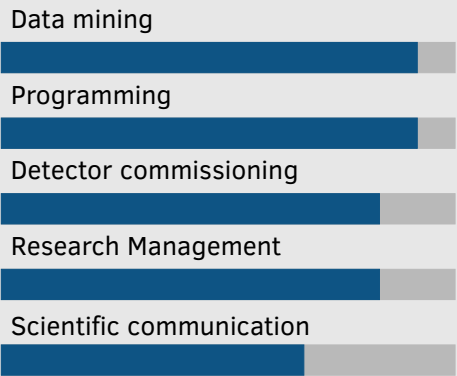
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Other information

Computing

Modern Programming languages: C++, Python, Javascript.

- Promoter and developer of the Delphes and MoMEMta packages, well known in High Energy Physics.
- Contributor of the ROOT package
 - written classes to handle, train and use neural networks
 - written classes to evaluate limits using the “LEP” likelihood-ratio method
- Basic administration of Unix/Linux servers and clusters
 - Introduced CONDOR as batch system in the institute; took care of the installation, configuration and management of the system during my PhD
 - Familiar with LCG2 and GRID infrastructures; Designed and installed a 24-nodes cluster for the UCL CMS Tier-3 in 2003
- Familiar with the large analysis frameworks used in particle physics, and contributed to projects like ALPHA++, ORCA and CMSSW (ALEPH and CMS collaborations)
 - Simulation, reconstruction, trigger, analysis and DAQ.
- Monte Carlo simulation (AlpGen, CompHep, MadGraph, Pythia, Geant4, ...)
- Data analysis (ROOT), Big Data, Machine learning
- SQL and NoSQL databases

Outreach

- Logical continuation of teaching, directed towards a wider audience
- Information and sensitization on the relevance, importance and originality of our work towards:
 - the general public (including the younger ones)
 - the decision-makers (institutional and political)
- Official CERN guide (2006 - 2008)
- Official CMS guide (2008 - 2017)
- Participated to several public events organized by CMS and by UCL
 - Master classes
 - “Universe exhibition”
 - Debates following the screening of “Particle Fever”
 - Colloquium for the “Printemps des sciences”
 - ...
- Interviewed by various media: Science magazine, RTBF TV, NoTele, CMS people
- Academic contact for the website of the institute
- Active on various social networks (twitter, Google+, ...)