

Claudio Pica
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Computational Science
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Curriculum

Claudio Pica, Ph.D.
Languages: Italian (native), English (fluent), French (scholastic), Danish (basic)

Employment

2017/1 - Present **CEO DeiC National HPC center**, SDU
2013/1 - Present **Head of Center**, SDU eScience center
2010/02 - Present **Professor**, CP3-Origins & IMADA, SDU, DK
2013/11 - Present **Member of the national DeiC eScience committee**
2014/10 - 2016/10 **Member of the national board of the Danish Physical Society**
2012/03 - 2013/02 **Board member of the Nordic WLCG (NLCG) Steering Committee**, appointed by DASTI (Danish Agency for Science, Technology and Innovation)
2008/10 - 2010/02 **PostDoctoral R.A.**, University of Edinburgh, UK
2006/11 - 2008/10 **Research Associate**, Brookhaven National Lab, NY, USA
2005/03 - 2006/11 **INFN Research Fellow**, INFN, Pisa, ITALY

Academic Degrees

2002/01 - 2005/12 **Ph.D. in Physics**, University of Pisa, ITALY
1996/09 - 2001/07 **Laurea in Theoretical Physics 110/100 cum Laude**, University of Pisa, ITALY
1996/09 - 2001/12 **Diploma (M.Sc. equiv) in Physics 70/70 cum Laude**, Scuola Normal Superiore, Pisa, ITALY (Earned and maintained a 4-year merit-based scholarship in the most prestigious institution of higher learning in Italy.)

Publication Summary

98 publications in international peer reviewed journals (43) and proceedings of international conferences (55). 10 TopCite 100+, 6 TopCite 50+ papers, over 2800 citations, h-index 29 according to Google Scholar. ~30 invited plenary talks/seminars at international meetings, physics schools and academic institutions. Reviewer for Physical Review D, European Physical Journal C, Physics Letters B and Physical Review Letters. Referee for the European PRACE organization, for access to the largest HPC facilities in Europe.

Grants

2018-2022 Danish PI for the European ITN ETN "EuroPLEx: European network for Particle physics, Lattice field theory and Extreme computing". **Grant: 4.000.000 eur**
2013-2018 Lundbeckfonden fellow 2012. **Grant: 10.000.000DKK (~1.340.000eur)**
2016-2021 Outreach project "Kvantebanditter" funded by the "A.P. Møller og Hustru Chastine Mc-Kinney Møllers" Foundation. **Grant: 4.000.000DKK (~537.000eur)**
2016-2018 PI of the nationale-infrastructure project "National Science AppStore" funded by DeiC (Danish Infrastructure Cooperation) and DEFF (Denmark's electronic research library). **Grant: 1.400.000DKK (~190.000eur)**
2016-2021 PI of the outreach project "Quantum Rascals" funded by the "A.P. Møller og Hustru Chastine Mc-Kinney Møllers" Foundation. **Grant: 4.000.000DKK (~536.000 eur)**
2015-2016 PI of the outreach project "SDU Supercomputing Challenge" 2016 and 2017 funded by the "A.P. Møller og Hustru Chastine Mc-Kinney Møllers" Foundation, Industriens Fond, Knud Højgaards Fond, Tuborg Fondet and the Otto Bruuns Fond. **Grant: 3.725.000DKK (~500.000eur)**
2010-2015 PI of several European PRACE grants for HPC. Total of Grants: **36.8M core*hour (value ~500.000eur)**
2013 Co-applicant for the renewal of the DG Centre of Excellence "CP3-Origins" (director Prof. F. Sannino). **Grant: 40.000.000DKK (~5.300.000eur)**
2013 PI for a DeiC grant for HPC hardware. **Grant: 417.500 DKK (~56.000 eur)**

Selected Outreach

KvanteBanditter, 2016-2021. Four years outreach project. Among other initiative, I co-designed the website which won the gold "Lovie Awards 2018" in the category "Schools & Education" as best European website.

SDU SuperComputing Challenge 2017. January-December 2017, second edition.

"Supercomputers", visit of the "akademiet for talentfulde unge" at SDU, 2016

"Supercomputing & eScience at SDU", Inspire - Educate - Innovate! program at SDU, 2016

SDU SuperComputing Challenge 2016, August 2015-August 2016. Year-long event to challenge young students to solve real-world computational problems from private companies. The event was featured by local newspapers and television.

Natural Science Distinguished Lecture at the Faculty of Science SDU, April 2013.

Interviewed for the national newspaper "Berlingske" (Science section) (<http://www.b.dk/viden/fysikernes-supercomputere-bliver-vildere-og-vildere>)

One of the 2 main speakers of the public lecture series "High School Tour: Angels & Demons" (see <http://cp3-origins.dk/about-cp3/outreach>) for promoting high energy physics in high schools (March and April 2010)

Speaker at the "Art & Science 01" exhibition organized by the SDU Centre for Art and Science, and featured on the local TV2-Fyn (see <http://cp3-origins.dk/a/4686>).

Organization of International Conferences and Workshops

Conference series "Origin of Mass" 2010, 2011, 2013, 2015 and 2016 at SDU and in 2012 in Stockholm.

The 3rd, 4th 6th and 7th "Odense Winter School" series on Geometry and Theoretical Physics. Odense 2010-2014.

"European Twisted Mass Collaboration Meeting & Mini-workshop", Odense 2014.

"Discovering Technicolor" workshop with the ATLAS and CMS collaboration. Odense 2010.

The "Mass 2011 LHC Training School" graduate school sponsored by NordForsk

Employment

Department of Mathematics and Computer Science

Odense M

1. Jan 2024 → present

Head of Section, Professor

Computational Science

1. Jan 2024 → present

Research outputs

Beyond the Standard Model: Charting Fundamental Interactions via Lattice Simulations

Pica, C., 2017, *Proceedings of the 34th Annual International Symposium on Lattice Field Theory*. Proceedings of Science, 20 p. 015. (P o S - Proceedings of Science).

Composite Higgs Dynamics on the Lattice

Pica, C., Drach, V., Hansen, M. R. L. & Sannino, F., 2017, In: EPJ Web of Conferences. 137, 10005.

Conformal Phase Diagram of Complete Asymptotically Free Theories

Pica, C., Rytov, T. A. & Sannino, F., 2017, In: Physical Review D. 96, 7, 14 p., 074015.

Anomalous Dimensions of Conformal Baryons

Pica, C. & Sannino, F., 2016, In: Physical Review D. 94, 7, p. 1-5 071702.

Beta Function and Anomalous Dimensions

Pica, C. & Sannino, F., 2011, In: Physical Review D. 83, 11, 7 p.

UV and IR Zeros of Gauge Theories at The Four Loop Order and Beyond

Pica, C. & Sannino, F., 2011, In: Physical Review D. 83, 3, 035013 .

Confining vs. conformal scenario for SU(2) with 2 adjoint fermions. Mesonic spectrum.

Pica, C., Del Debbio, L., Lucini, B., Patella, A. & Rago, A., 3. Nov 2010, In: PoSLAT. 2010

Technicolor on the Lattice

Pica, C., Del Debbio, L., Lucini, B., Patella, A. & Rago, A., 17. Sept 2009.

Activities

N.K. Nielsen Fest

Pica, C. (Organizer)
5. Nov 2011

Sciencedagen 2011

Pica, C. (Lecturer)
10. Oct 2011

Physical Review D (Journal)

Pica, C. (Peer reviewer)
12. Aug 2011

Physical Review D (Journal)

Pica, C. (Peer reviewer)
2. Aug 2011

Physical Review D (Journal)

Pica, C. (Peer reviewer)
2. Jun 2011

Mass 2011 LHC Training School

Pica, C. (Organizer)
9. May 2011 → 13. May 2011

Origin of Mass 2011

Pica, C. (Organizer)
9. May 2011 → 13. May 2011

Art & Science 01

Pica, C. (Speaker)
30. Mar 2011

't Hooft Nobel Lecture: Black Holes in Elementary Physics

Pica, C. (Other)
2. Nov 2010

3rd Odense Winter School on Geometry and Theoretical Physics

Pica, C. (Organizer)

1. Nov 2010 → 5. Nov 2010

3rd Odense Winter School on Geometry and Theoretical Physics

Pica, C. (Speaker)

1. Nov 2010

Discovering Technicolor

Pica, C. (Organizer)

25. Oct 2010 → 27. Oct 2010

Follow Up Meeting with the Danish National Research Foundation

Pica, C. (Speaker)

14. Oct 2010

CP³-Origins Welcomes the First Year Students

Pica, C. (Organizer)

15. Sept 2010

STRONGBSM Kickoff Meeting

Pica, C. (Speaker)

19. Aug 2010

STRONGBSM Kickoff Meeting

Pica, C. (Organizer)

16. Aug 2010 → 19. Aug 2010

Lattice 2010

Pica, C. (Speaker)

14. Jun 2010 → 19. Jun 2010

Origin of Mass 2010

Pica, C. (Organizer)

3. May 2010 → 7. May 2010

High School Tour: Angels and Demons

Pica, C. (Speaker)

Mar 2010 → May 2010

Press/Media

Danske universiteter klar med fire nye supercomputer-centre

Pica, C.

12/11/2020

1 Media contribution

Danske universiteter med til at bygge Europas største supercomputer

Pica, C.

13/07/2019

1 Media contribution

Dansk supercomputer bliver tilgængelig for flere

Pica, C.

12/11/2020

1 Media contribution

Dansk supercomputer skal booste samfundsværdien

Pica, C.

11/11/2020

1 Media contribution

Forskere får adgang til ny dansk supercomputer

Pica, C.

23/11/2020

1 Media contribution

Kvante Karina hædret i London

Pica, C.

15/11/2019

1 Media contribution

Lettere adgang til supercomputere kan give mere bæredygtigt byggeri

Pica, C.

17/03/2023

1 Media contribution

Lettere adgang til supercomputere rummer store perspektiver for dansk forskningsmiljø

Pica, C.

16/03/2023

1 Media contribution

Mens Danmarks Nvidia-monster leder efter kunder: Sådan fik SDU Europas mest brugte supercomputer

Pica, C.

03/06/2025

1 Media contribution

Mens Danmarks Nvidia-monster leder efter kunder: Sådan fik SDU Europas mest brugte supercomputer

Pica, C.

03/06/2025

1 Media contribution

Ny dansk supercomputer

Pica, C.

26/01/2021

1 Media contribution

Ny dansk supercomputer skaber langt mere samfundsværdi

Pica, C.

11/11/2020

1 Media contribution

Ny dansk supercomputer skaber langt mere samfundsværdi

Pica, C.

11/11/2020

1 Media contribution

Ny dansk supercomputer skaber langt mere samfundsværdi

Pica, C.

11/11/2020

1 Media contribution

Ny dansk supercomputer skaber langt mere samfundsværdi

Pica, C.

11/11/2020

1 Media contribution

Ny dansk supercomputer skaber mere samfundsværdi

Pica, C.

11/11/2020

1 Media contribution

Ny national portal giver danske forskere lettere adgang til supercomputere

Pica, C.

14/03/2023

1 Media contribution

Ny national portal giver danske forskere lettere adgang til supercomputere

Pica, C.

15/03/2023

1 Media contribution

Ny national portal giver danske forskere lettere adgang til supercomputere

Pica, C.

15/03/2023

1 Media contribution

Ny national portal giver danske forskere lettere adgang til supercomputere

Pica, C.

17/03/2023

1 Media contribution

PRM / Ny dansk supercomputer skaber langt mere samfundsværdi

Pica, C.

11/11/2020

1 Media contribution

PRM / Ny dansk supercomputer skaber langt mere samfundsværdi

Pica, C.

11/11/2020

1 Media contribution

PRM / Ny national portal giver danske forskere lettere adgang til supercomputere

Pica, C.

15/03/2023

1 Media contribution

PRM / Ny national portal giver danske forskere lettere adgang til supercomputere

Pica, C.

15/03/2023

1 Media contribution

SDU eScience Center bliver en del af HALRIC konsortiet

Pica, C.

13/04/2023

1 Media contribution

Seks gange dansk guld ved web-EM

Pica, C.

12/10/2018

1 Media contribution

Supercomputer på SDU laver 750.000 milliarder beregninger per sekund

Pica, C.

10/11/2018

1 Media contribution

TV 2 Nyhederne 19.00

Pica, C.

15/11/2019

1 Media contribution

Universitetssamarbejde om supercomputer

Pica, C.

11/11/2020

1 Media contribution

Projects**A.P. Møller og Hustru Chastine Mc-Kinney Møllers Fond - Logimondo**

Pica, C. (Head coordinator)

06/03/2015 → 31/12/2017

Eu - Horizon 2020 - Excellent Science - EOSC-Nordic

Pica, C. (Head coordinator)

01/09/2019 → 31/08/2022

EU – Horizon 2020 - Excellent Science - MSCA Marie Sklodowska-Curie Actions - European network for Particle physics, Lattice field theory and Extreme computing (EuroPLEx)

Pica, C. (Head coordinator)

01/01/2019 → 31/12/2022

EU - Horizon Europe - Smart Energy Digital Innovation Hub (SEDIH)

Pica, C. (Project participant)

01/08/2023 → 31/07/2026

EU - Interreg - HALRIC - Hanseatic Life Science Research Infrastructure Consortium for triple-helix innovation

Pica, C. (Project participant)

01/04/2023 → 30/03/2026

- EUopSTART - Seagrass Based Solutions for Global Challenges

Holmer, M. (Project participant) & Pica, C. (Project participant)

20/02/2019 → 15/01/2020

H2020 - EU HPC - EuroCC@DK

Pica, C. (Project participant)

01/09/2020 → 31/08/2022

Lundbeckfonden - Fellowships - Lundbeck Foundation Junior Group Leader Fellowship - New Fundamental Force of Nature

Pica, C. (Head coordinator)

01/04/2013 → 31/03/2018

Otto Bruuns Fond - SDU Supercomputer Challenge 2017

Pica, C. (Head coordinator)

01/01/2017 → 31/12/2017

Region Syddanmark - Odense Universitetshospital - National Science App Store - 2

Pica, C. (Head coordinator)

01/04/2017 → 31/12/2018

SDU Supercomputer Challenge 2017

Pica, C. (Head coordinator)

01/01/2017 → 31/12/2017

Uddannelses- og Forskningsministeriet – Datainfrastruktur og –services / Data Management by design

Pica, C. (Head coordinator)

01/02/2018 → 31/12/2018

Uddannelses- og Forskningsministeriet - DeIC - National Science App Store

Pica, C. (Head coordinator)

01/08/2016 → 30/06/2018

Uddannelses- og Forskningsministeriet - DeIC - Open science - konkretisering af FAIR

Pica, C. (Head coordinator)

01/09/2018 → 28/02/2019

Uddannelses- og Forskningsministeriet – Forskningsinfrastruktur - CERN-UP - Samarbejdsaftale om forskningsinfrastruktur

Pica, C. (Head coordinator)

01/01/2019 → 31/12/2021

Uddannelses- og Forskningsministeriet - National HPC Type 1

Pica, C. (Project participant)

01/01/2020 → 31/12/2022

Uddannelses- og Forskningsministeriet- National HPC Type 3

Pica, C. (Project participant)

01/11/2020 → 31/12/2022

Uddannelses- og Forskningsministeriet - Projekt 5

Pica, C. (Project participant)

01/11/2020 → 31/12/2022

Uncovering the nature of the Higgs boson

Pica, C. (Head coordinator)

01/01/2014 → 31/12/2016

Teaching Portfolio

Formal education training

I have successfully completed the 2011 "Lecturer Training Program" at SDU.

As part of the training program, I took part in two separate training workshops and underwent about 25 hours of supervision by expert colleagues (both with an internal and one external supervisor) as well as about 15 hours of peer supervision by younger colleagues also attending the training program. Finally the SDU training program requires to carry

out a "Pedagogical Development Project" to be completed with the students of one of the classes I was teaching at the time. The project of my choice was "Activating students of abstract disciplines."

In addition, I took part of the following training and high education courses:

- "PhD supervisor training course"
- "Design Collaborative E-learning Activities for your students"
- "Linking discipline-based research and teaching to benefit student learning"
- "Developing research based teaching"
- "Workshop om prøveformer" (Workshop on testforms)
- "Workshop on digital exams"

Administrative tasks relating to education

As part of the IMADA management group, I take part in discussion related to the organization of the study programs in the department.

I have been responsible for the planning and organization of several courses in the math, applied math, math for economics and physics curricula at SDU (the full list is below), including the first year calculus course for students of mathematics, math-economy and physics. In the past six years, I have organized several PhD/graduate schools:

- the 3rd, 4th 6th and 7th "Odense Winter School" series on Geometry and Theoretical Physics, Odense 2010-2014. The 3rd edition of the school featured Nobel price laureate G. 't Hooft.
- the "Mass 2011 LHC Training School" graduate school sponsored by NordForsk.

When I arrived at CP3-Origins in 2010, together with Prof. F. Sannino to design and set up a successful honor program called "CP3 Genius Program" for talented students in math and physics. During the outreach activity "SDU Supercomputing Challenge", we organized in 2016-2018 a few programming courses (e.g. "programming in Python", "parallel programming in Python") for the students taking part in the event.

Experience of study programmes, supervision and examinations

While employed at the Department of Mathematics and Computer Science (IMADA) at SDU, since 2010, I have been glad to teach all the courses offered to me in four different curricula: pure math, applied math, math for economics and physics.

The complete list of courses and time when I run them is:

- "Hilbert and Banach spaces" MM514/815, 5 ECTS, Fall 2010 and 2011;
- "Quantum Field Theory", 1st part, FY809, 5 ECTS, Spring 2011, 2012 and 2013;
- "Particle Physics", 1st part, FY816, 5 ECTS, Spring 2015;
- "Convex Analysis" MM525, 5 ECTS, Spring 2011;
- "Iterative Methods" MM532, 5 ECTS, Fall 2012, 2013 and 2014;
- "Computational Science" FF505, 8 ECTS, Spring 2013, 2014 and 2016;
- "Calculus for Mathematics", MM536, 10 ECTS, 1st year calculus course, Fall 2015, 2016, 2017, 2018, 2019.

Moreover I run a "Science Year Project" NAT501/507 in Spring 2011, 2012 and 2013. This is a project required for first years students at the Faculty of Science.

Since 2010 I have also been external examiner to several other courses such as: "Classical Mechanics", "Astrophysics", "Advanced Quantum Mechanics", "Solar system and Cosmology", "Introduction to Particle Physics", "Complex Analysis", "Curves and Surfaces", "ODE and geometry", in addition to several Independent Study Activities (ISA).

While at SDU, I have been (co-)supervisor of 9 Ph.D. students, 2 master thesis and 2 bachelor theses.

Teaching philosophy, methods, materials and tools

As a teacher in science, I believe my main goal is to stimulate curiosity in students and give them the tools to think critically and analytically about problems. Curious students are active students, which make the class environment much more vibrant and enjoyable.

This is, I believe, much more important than just provide them with a set of "pre-packaged" tools or solutions, which can result boring to many students, especially the brighter ones.

When teaching abstract math or theoretical physics, I think it is very beneficial to use a "research-based" attitude: present the material following a critical path of discovery, instead of simply stating the final results. I believe this kind of approach stimulates curiosity in students and as such I consider it a real "research-based" teaching.

Another important method I like to use in my teaching is the use of immediate feedback to students, as I encourage a "trial and error" approach to "discover" new topics. I believe this guided process of knowledge construction can be quite effective, as it really engages students.

Although it is not always possible to structure all lectures in this way, I try to use this approach when possible if a new important topic is presented.

While I strongly advocate the use of multimedia presentations and technology in general for outreach or general public lectures, I privilege the use of traditional blackboard presentations during my math and physics courses as my preferred way of discuss the subject with the students. I find blackboard presentations much superior for discussing more advanced and abstract topics in math and physics as opposed to e.g. slides presentations for a number of reasons: writing on the blackboard gives the students more time to follow the teacher which can show in detail all the logical steps of an

argument; the teacher can adjust the speed and argument of presentation to the response of the student in class; it is easier to have active argumentations with the class which can try to suggest alternative approaches and see why and how they fail if not correct. This does not mean that the use of prepared slides and/or multimedia presentations is not very beneficial in some cases. I mainly use them in less advanced classes, where many examples can help the comprehension more than abstract thinking alone, and in introductory classes, especially to motivate the students with “real-life” applications.

For example for the first year calculus course, I wrote all my lecture notes as “Wolfram Mathematica” notebooks which include many interactive illustrations for key concepts, from the simple ones (e.g. the definition of derivative) to more complex (e.g. flux integrals, Stoke’s theorem, etc). By playing with these interactive demonstrations, I feel the students get a better understanding of the topics.

I have received mostly positive evaluations by the students in all the courses I have taught at SDU (not all courses are evaluated though). I happily accept constructive criticisms from the students to improve my courses for the following years. Some comments from the 2016 evaluation of the calculus course: “Godt og professionelt”, “Calculus har været det fag jeg har lært mest i”, “Han gør det godt - Og instruktoren har gjort det virkelig godt med forklaring af materialet!”, “Generelt var kurset rigtig godt, godt tempo og gode eksempler under forelæsningerne.”

My supervisor for the SDU Lecturer Training Program, wrote the following final assessment of my teaching: “Claudio Pica creates a good atmosphere in the lectures where the emphasis is on a coherent presentation of the key ideas of the subject. This is done through well-structured and prepared lessons clearly linked in to the lecture series and the accompanying activities. Claudio Pica makes good use of the blackboard, which is the most appropriate medium for the detailed presentation of the high-level theoretical material in these courses. His approach allows for continual communication with the students and adjustment of the pace.”

Outreach

I enjoy the challenge to introduce research results in my field to young students and to broad audiences. During my stay at SDU I had the opportunity to give several public lectures for the general public and presentations for visiting high-school students. This is list of events at which I was present as a keynote speaker: • “Supercomputers”, visit of the “akademiet for talentfulde unge” at SDU, 2016 • “Supercomputing & eScience at SDU”, Inspire - Educate - Innovate! program at SDU, 2016 • Science day at CP3-Origins, visit from Nyborg Gymnasium, February 2015. • Applied Math at IMADA, Studiepraktik 2014, 2015, 2016. • Natural Science Distinguished Lecture at the Faculty of Science SDU, April 2013. • Slagelse Gymnasium (high-school) visit to CP3-Origins, March 2013 • Interviewed for the national newspaper “Berlingske” (Science section) (<http://www.b.dk/viden/fysikernes-supercomputere-bliver-vildere-og-vildere>) • Visit of Sønderborg Statskole (high-school) to CP3-Origins, May 2013 • Visit of the “Academy for Gifted Students” to CP3-Origins, April 2012 • One of the 2 main speakers of the public lecture series “High School Tour: Angels & Demons”(see <http://cp3-origins.dk/about-cp3/outreach>) for promoting high energy physics in high schools (March and April 2010) • Speaker at the “Art & Science 01” exhibition organized by the SDU Centre for Art and Science, and featured on the local TV2-Fyn (see <http://cp3-origins.dk/a/4686>). • “Science-dagen 2011”, at the Faculty of Science, SDU, on 10 October 2011, to present forefront scientific research to high school teachers.

Recently I am involved as PI for two large outreach activities which received significant funding (in total almost 8M dkk ~ 1M eur) from 5 different private foundations: the “SSC: SDU SuperComputing Challenge” and the “Kvantebanditter” program. For the “Kvantebanditter” program I was responsible for the creation of a web portal and an augmented reality game for smartphones, both of which received the prestigious european awards: both are gold winners for the Lovie awards 2018 and 2019 in the “education” category.

Presenting advanced research to non-specialists is a real challenge and requires appropriate preparation. I try to make all my presentations as clear and enjoyable as possible with a broad use of multimedia tools. My internal supervisor for the SDU Lecturer Training Program, in his final assessment wrote the following in regards to my outreach presentations: “Claudio Pica’s has also presented descriptions of his research to a range of appropriate modern presentation aids. His talks show a flair for presentation of complicated material for interested non-specialists. Claudio Pica’s confident and calm presentation makes good contact with the audience. Using well chosen examples from every day life combined with a precise use of IT equipment Claudio Pica explains complicated ideas and sophisticated connections at high technical level.”