

CURRICULUM VITAE:

CRISTIAN JOANA

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PROFILE:

I am third year PhD student in theoretical physics and cosmology at the University of Louvain, under the supervision of Prof. C. Ringeval (UCLouvain) and Prof. S. Clesse (ULB).

I am involved in the use and development of numerical relativity tools to study the non-linear dynamics and backreactions of the Early Universe. My research focus are in inflation, reheating and formation of primordial black holes.

I am part of the developing team of GRChombo (www.grchombo.com), a open source numerical relativity code that I use for my simulations. I am also a member of the LISA-PBH working group.

In the past, from 2016 to 2019, I engaged in neuroscience research in Prof. S. Gruen lab (INM-6) in the Juelich Research center. I contributed to the data analysis of the Active-Vision project, and a manuscript is currently in progress of publication.

ACADEMIC RECORDS:

- **2019/22** **(Candidate for) PhD in Physics (FRNS - FRIA)**
 at IRMP, CURL, University of Louvain, Belgium
- **2014/16** **Master's degree in Physics, major in QFT and Gauge theories**
 at RWTH Aachen University, Aachen, Germany.
- **2009/13** **Degree (EEES) in Physics, mention in Fundamental Physics**
 at Autonomous University of Barcelona, Catalonia.

SCIENTIFIC GRANTS AND AWARDS:

- **2020** **ICERM visiting grant** (3 months),
 National Science Foundation and ICERM's Federal funds, NSF, USA
- **2019/21** **FRIA grant** (bourse de doctorat),
 Fonds de la Reserche Scientifique, FRS-FNRS, Belgium

RESEARCH EXPERIENCE:

- **2019/22** **(Candidate) PhD in Physics at CURL, University of Louvain (Belgium)**
 Supervisors: **Christophe Ringeval** (UCLouvain), **Sebastien Clesse** (ULB)
 Topic: *Inhomogeneous Early Universe cosmology*
 Keywords: Inflation, Reheating, Primordial black holes, Numerical-GR

- 2016/19 **Research assistant at the Institute of Neuroscience and Medicine (INM-6), Juelich Research Centre (Germany)**
Lab PI: **Sonja Gruen** (FZ-Juelich)
Topic: *Neuronal activity during active visual sensing*
Keywords: Neural data analysis, Macaque electrophysiology, spike-sorting

- 2013/14 **Internship researcher at the National Institute Informatics, Tokyo, (Japan)**
Lab PI: **Tim Byrnes** (currently at NYU Shanghai)
Topic: *Negative Wigner function light from exciton-polariton systems.*
Keywords: Continuous-Variables Quantum Computing, Quantum optics

TEACHING EXPERIENCE:

- 2019/20/21 **Tutor in Quantum Mechanics II** (UCLouvain)
- 2017/18 **Tutor in Computational Neuroscience** (RWTH Aachen)
- 2017 **Tutor in the Advanced Neural Data Analysis '17 school** (FZ-Juelich)

OTHER EDUCATION AND TRAINING:

- 2020 **Advances in Computational Relativity workshop**
at ICERM, Brown University, Providence (USA)

- 2019 **Gravitational wave astronomy summer school**
at ICTS, Bangalore (India)

- 2017 **(Tutor) Advanced Neural Data Analysis 2017 summer school**
at Juelich Research Center, Juelich (Germany)

- 2016 **Workshop ‘Cosmology after Planck: what is next?’**
at Ecole de Physique des Houches (France)

- 2014 **ESI-EMS-IAMP Summer school on Mathematical Relativity**
Erwin Schrödinger Institute, Vienna (Austria)

PERSONAL DETAILS AND SKILLS:

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| Nationality: | Catalan, Spanish |
| Date of birth: | 01-05-1990 |
| Status: | Single |
| Languages: | Native in Catalan and Spanish, Proficiency in English
Intermediate level in French and German. |
| ICT Skills: | Debian GNU/Linux based Operative Systems, Microsoft Windows.
Programming in C/C++ and Python, <i>Mathematica</i> TM , <i>LaTeX</i> |
| Hobbies: | Reading, playing chess, traveling and hiking. |

LIST OF PUBLICATIONS:

1. Joana, C. (2021) "Higgs inflation in full general relativity: Preinflation and preheating with auxiliary field coupling", (*in-progress*)
2. Joana, C., Clesse, S. (2021) "Inhomogeneous pre-inflation accross Hubble scales in full general relativity", Phys. Rev. D 103, 083501 (2021). arXiv:2011.12190
3. Joana, C., van Loock, P., Deng, H., & Byrnes, T. (2016). "Steady-state generation of negative-Wigner-function light using feedback". Phy. Rev. A, 94, 063802 (2016). arXiv:1612.00629

GIVEN AND CONTRIBUTED TALKS:

- *The inhomogeneous pre-inflationary era: A numerical relativity approach*
Cristian Joana, Sebastien Clesse
GRChombo workshop '20, Oxford University, Oxford, UK, 2nd December 2020
- *Graviational waves from the inhomogeneous pre-inflationary era*
Cristian Joana, Sebastien Clesse
Belgian Graviational Wave Seminars, KU-Leuven, Leuven, Belgium 25th November 2020
- *The inhomogeneous pre-inflationary era*
Cristian Joana, Sebastien Clesse
Advances in Computational Relativity, ICERM, Brown University, US, 12th November 2020
- *Layer specific modulation of response latency in V1 under active and passive viewing conditions.*
Junji Ito, Cristian Joana, Yukako Yamane, Pedro Maldonado, Sonja Grün
EITN workshop, Paris, France, 26th November 2019
- *Activity of visual cortex neurons differs between passive stimulation and active free viewing*
Junji Ito, Cristian Joana, Yukako Yamane, Pedro Maldonado, Sonja Grün
ECVP, Leuven, Belgium, 28th August 2019
- *GR-Hydrodynamics (perfect fluid) simulations with GRChombo*
Cristian Joana
GRChombo workshop '19, KCL, London, UK, 11th June 2019
- *Inhomogeneous scalar field dynamics and backreactions in non-conformally flat spacetimes*
Cristian Joana, Sebastien Clesse
GRChombo workshop '19, QMUL, London, UK, 19th February 2019
- *Neural correlates in macaque V1 and IT during active and passive vision*
Cristian Joana, Junji Ito, Yukako Yamane, Pedro Maldonado, Sonja Grün
Universidad de Chile, BNI - Neurosistemas, Santiago de Chile, Chile
- *Steady-state generation of negative Wigner function light with exciton-polaritons*
Cristian Joana, Peter van Loock, Hui Deng, Tim Byrnes
Quantum Manipulations of Atoms and Photons 2015, Shanghai, China, 27th Oct 2015
- *Negative Wigner function distribution light generated by coherent excitation of polaritons*
Cristian Joana, Peter van Loock, Tim Byrnes
WE-Heraeus-Seminar: Continuous Variable Entanglement in Atomic Systems: Fundamentals and Applications, Bad Honnef, Germany, 11th May 2015