CURRICULUM VITAE
OF VALENTINA CESARE

PERSONAL INFORMATION

Full name: Valentina Cesare
Date of birth: May 21st, 1993
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CURRENT POSITION

1. **Fellowship** at Osservatorio Astrofisico di Catania, Istituto Nazionale di Astrofisica (INAF)
   - **Duration:** December 1st 2020 – April 1st 2021
   - **Computational aspects:** Development, support and porting of applications on HPC, HTC, and GPU environments; CHIPP Project (HPC, HTC) user support

EDUCATION

1. **February 2021 (expected): Ph.D. in Physics**
   - **Institution:** University of Turin, Physics Department, Via Pietro Giuria 1, 10125, Turin, Italy
   - **Thesis title:** Dynamics of disk and elliptical galaxies in refracted gravity
   - **Computational aspects:** Modeling of the photometric and kinematic profiles of galaxies with the programming languages C++, C, R, and Python and with the software JAGS and Wolfram Mathematica; data-model comparison exploiting Monte Carlo Markov Chain (MCMC) (implemented with C++ and JAGS) and least-square fitting (implemented with Gnu Scientific libraries) algorithms; analysis of the outputs of these algorithms with Wolfram Mathematica, R, and Python; numerical partial differential equation solving (sequential and parallel with MPI); parallel programming with OpenMP and MPI; usage of containers (Docker); usage of computer clusters and SuperComputers
   - **Supervisor:** Prof. Antonaldo Diaferio
2. **July 2017: Master degree in Physics – curriculum in Theoretical Physics and Astrophysics**
   - Qualification obtained on July 20th 2017 with **110/110 with honors** at the Physics Department of the University of Turin
   - **Thesis title:** Dynamics of disk galaxies in theories of modified gravity
   - **Computational aspects:** Modeling of the kinematic profiles of galaxies with Wolfram Mathematica and C++; data-model comparison exploiting least-square fitting; fast Fourier transforms (FFTW libraries)
   - **Thesis supervisor:** Prof. Antonaldo Diaferio
3. **July 2015: Bachelor degree in Physics**
   - Qualification obtained on July 23rd 2015 with **110/110 with honors** at the Physics Department of the University of Turin
   - **Thesis title:** Magnetohydrodynamic instabilities of astrophysical jets
   - **Computational aspects:** Numerical simulations for the study of the temporal evolution of the (magneto)hydrodynamic instabilities of astrophysical jets with the parallel software Pluto run on the CINECA computing center; visualization of the simulations results with the software VisIt
   - **Thesis supervisors:** Prof. Andrea Mignone and Prof. Silvano Massaglia
4. **June 2012: High school diploma**
   - Qualification obtained on June 29th 2012 with 96/100 at Liceo Scientifico Carlo Cattaneo

SCIENTIFIC INTERESTS

Dynamics of galaxies, modified gravity, standard gravity, galaxy surveys, clusters of galaxies, cosmology, data-model comparison, MCMC implementation, least-square fitting, Partial Differential Equation solving, C++ programming, parallel computing, machine learning and big data

SUMMARY OF THE SCIENTIFIC ACTIVITY

I am currently working, as a research fellow, at the Osservatorio Astrofisico di Catania, on the study of optimal methodologies for the development, support and porting of astrophysics applications related to Gaia space mission on HPC, HTC, and GPU environments. As part of this work, I am also supporting the users of the computer cluster of the observatory within the CHIPP Project (HPC, HTC).

During my Ph.D., I investigated the dynamics of the disk galaxies in the DiskMass Survey with a new theory of modified gravity, Refracted Gravity (RG), which does not resort to dark matter. I estimated, with a MCMC method, the free parameters of the model from the rotation curves and the vertical velocity dispersions of these galaxies. The theory properly describes the kinematic profiles of these galaxies, with mass parameters in agreement with the observations, and the asymptotic limits of the radial acceleration relation. The results of this work are presented in "Dynamics of DiskMass Survey galaxies in refracted gravity", published in Astronomy & Astrophysics.

I parallelized the code that I wrote in C++ to model the dynamics of disk galaxies with OpenMP. This program is publicly available on GitHub at the link https://github.com/alpha-unito/astroMP and the paper where this code is described, "Practical Parallelization of Scientific Applications", is published in the refereed proceedings of the PDP 2020 conference. I have worked on an extension of this project, "Practical Parallelization of Scientific Applications with OpenMP, OpenACC and MPI", that I submitted to the Journal of Parallel and Distributed Computing. I performed both works about parallel computing in collaboration with Prof. Marco Aldinucci and his team, at the Computer Science Department of the University of Turin.

I also modeled, always with RG, the root-mean-square velocity dispersions of stars and globular clusters of three elliptical E0 galaxies in the SLUGGS and the ATLAS^{3D} surveys, with spherical Jeans analysis. Preliminary results might support RG and they are collected in a paper in preparation for Astronomy & Astrophysics.

I also collaborated to a review about cold dark matter problems on small scale, "Dark Matters on the Scale of Galaxies", published in a special issue of *Universe*, a peer-reviewed journal issued by MDPI.

REFEREED SCIENTIFIC PUBLICATIONS
1. **Published**
    a. Cesare V., Diaferio A., Matsakos T., and Angus G., 2020, "Dynamics of DiskMass Survey galaxies in refracted gravity", Astronomy & Astrophysics, 637, A70
    b. Cesare V., Colonnelli I., and Aldinucci M., 2020, "Practical Parallelization of Scientific Applications", in Proc. of 28th Euromicro Intl. Conference on Parallel, Distributed and Network-Based Processing (PDP) (Västerås, Sweden: IEEE), 376-384
    c. de Martino I., Chakrabarty S. S., Cesare V., Gallo A., Ostorero L., and Diaferio A., 2020, "Dark Matters on the Scale of Galaxies", *Universe*, 6, 107
2. **Submitted**
    a. Aldinucci M., Cesare V., Colonnelli I., Martinelli A. R., Mittone G., Cavazzoni C., and Drocco M., 2020, "Practical Parallelization of Scientific Applications with OpenMP, OpenACC and MPI", submitted to Journal of Parallel and Distributed Computing
3. **In preparation**
    a. Cesare V., Diaferio A., and Matsakos T., "The dynamics of three nearby E0 galaxies in refracted gravity", in preparation for Astronomy & Astrophysics

KNOWN LANGUAGES
1. **Italian:** mother tongue
2. **English:** fluent (written and spoken). First Certificate in English (Council of Europe Level B2) (Date of Examination: March 2011, Date of Issue: May 23rd, 2011)

SKILLS
1. Good knowledge of programming language C++, in particular in the following fields:
    o MCMC implementation
    o Partial Differential Equation solving
    o Usage of Gnu Scientific libraries (good), Boost libraries (good), and FFTW libraries (medium level)
    o Parallel programming with OpenMP
    o Checkpointing logic
2. Good knowledge of programming language C

3. Quite good knowledge of MPI and basic knowledge of other parallelization techniques (CUDA and OpenACC)
4. Good knowledge of Wolfram Mathematica
5. Good knowledge of the software JAGS for Bayesian analysis
6. Good knowledge of programming language R
7. Medium knowledge of programming language Python
8. Basic knowledge of GPU programming
9. Operating systems: MacOS, Linux, Windows
10. Good knowledge of Latex
11. Good knowledge of Word, Power Point and Excel
12. Usage and administration of computer clusters and SuperComputers
13. Usage of containers and Virtual Machines
14. Machine learning and big data: Keras, TensorFlow and Spark
15. Usage of the software Pluto for (magneto)hydrodynamic simulations
16. Usage of the software VisIt for visualization and graphical analysis

ATTENDED CONFERENCES AND SCHOOLS WITH TALKS AND POSTERS
1. "Cosmology from Home 2020", virtual conference, August 24th – September 4th, 2020, https://www.cosmologyfromhome.com **(talk)**
2. "28th Euromicro International Conference on Parallel, Distributed and Network-Based Processing" (PDP 2020), virtual conference (organized in Västerås, Sweden), March 11th – 13th, 2020, http://www.pdp2020.com **(talk + session chair)**
3. "UNIVERSUM", Milan (Italy), April 3rd – 5th, 2019, http://universum.to.infn.it **(talk)**
4. "3rd South American Dark Matter workshop (ICTP-SAIFR)", virtual conference, December 2nd – 4th, 2020, https://www.ictp-saifr.org/dmw2020/ **(poster)**
5. "MATERA OSCURA – DARK MATtER(A) – Cosmology and dark matter within galaxies and clusters", Matera (Italy), September 2nd – 6th, 2019, https://sites.google.com/inaf.it/astromatera2019 **(poster)**
6. "XII Tonale Winter School in Cosmology", Passo del Tonale (Italy), December 10th – 14th, 2018, http://www.cosmostat.org/events/past-events/trr33winterschool2018 **(poster, classified at the third position)**

OTHER ATTENDED CONFERENCES
1. "UNIVERSUM", Bologna (Italy), April 11th – 13th, 2018, http://universum.to.infn.it
2. "53rd Rencontres de Moriond – Cosmology 2018", La Thuile (Italy), March 17th – 24th, 2018, http://moriond.in2p3.fr/cosmo/2018/

OTHER ATTENDED SCHOOLS
1. "Introduction to Python Programming", Rome (Italy), at CINECA Rome Offices, October 1st – 3rd, 2019, https://eventi.cineca.it/en/hpc/introduction-python-programming/roma-20191001 (Dr. Sergio Orlandini and Dr. Francesco Salvadore)
2. "Introduction to Scientific and Technical Computing in C", Rome (Italy), at CINECA Rome Offices, September 23rd – 25th, 2019, https://eventi.cineca.it/en/hpc/introduction-scientific-and-technical-computing-c/roma-20190923 (Dr. Stefano Tagliaventi and Dr. Isabella Baccarelli)
3. "2nd Italian Astrostatistics School", Milan (Italy), June 24th – 28th, 2019, http://iaa.mi.oa-brera.inaf.it/IAA/secondAstroStatisticsSchool.html
4. "Emergence and organization of life", Bardonecchia (Italy), June 20th – 21st, 2019, https://dott-scm.campusnet.unito.it/do/avvisi.pl/ShowFile?_id=w2uk;field=allegato;key=01EvjONva3c7MU2Dh9E9NI5LeLiT5LCXA;t=6304
5. "International School of Space Science – Course on Space Astrometry For Astrophysics", L'Aquila (Italy), June 3rd – 7th, 2019, http://www.cifs-isss.org
6. "Summer School on Large-Scale Structure", Berlin (Germany), July 23rd – 27th, 2018, https://wwwmpa.mpa-garching.mpg.de/~fabians/LSSschool.html
7. "Hands-on multi-probe mass measurements in galaxy clusters", Milan (Italy), June 18th – 21st, 2018, https://sites.google.com/site/clusterschool2018/home
8. "11th TRR33 Winter School in Cosmology", Passo del Tonale (Italy), December 10th – 16th, 2017, http://darkuniverse.uni-hd.de/view/Main/WinterSchool17

ATTENDED WEBINARS/ONLINE COURSES/WORKSHOPS
1. "NVIDIA AI Technology Centre Italy "explained"", online webinar organized by NVIDIA, CINI, and CINECA, November 26th, 2020, (Dr. Giuseppe Fiameni, Dr. Frédéric Parienté, Dr. Marco Rorro, Dr. Massimiliano Guarrasi)
2. "Introduction to new accelerated partition of Marconi, for users and developers", online course organized by CINECA, November 24th, 2020, https://eventi.cineca.it/en/hpc/introduction-new-accelerated-partition-marconi-users-and-developers (Dr. E. Rossi, Dr. I. Baccarelli, and Dr. A. Marani)
3. "Occam Workshop VIII", University of Turin, Competence Centre for Scientific Computing, Physics Department, Italy, April 9th 2019 (Dr. Sergio Rabellino and Dr. Claudio Mattutino)

COURSES ATTENDED AT THE PHYSICS DEPARTMENT DURING THE PH.D.
1. "Introduction to Parallel Programming with MPI", 12 hours (Prof. Andrea Mignone)
2. "Big Data Science and Machine Learning", 10 hours (Dr. Federica Legger and Dr. Sara Vallero)
3. "High energy astrophysics", 10 hours (Prof. Francesco Massaro and Prof. Attilio Ferrari)
4. "Particle Dark Matter", 20 hours (Prof. Nicolao Fornengo)
5. "Introduction to Radio Interferometry and ALMA", 12 hours (Prof. Elisabetta Liuzzo)
6. "The Cherenkov detectors for particle and astroparticle physics", 16 hours (Dr. Umberto Tamponi)
7. "Chemo-dynamical evolution of the Milky Way", 12 hours (Prof. Alessandro Spagna)
8. "Search and characterization for extrasolar planets", 16 hours (Prof. Alessandro Sozzetti)
9. Machine Learning Journal Club about TensorFlow

COURSES ATTENDED AT OTHER DEPARTMENTS DURING THE PH.D.
1. "Parallel and distributed computing systems", April-May 2019, 48 hours, University of Turin, Computer Science Department (Prof. Marco Aldinucci)

RELEVANT COURSES ATTENDED AT THE PHYSICS DEPARTMENT DURING THE MASTER DEGREE
1. "Numerical Algorithms for Physics", 48 hours (Prof. Giovanni Pollarolo)
2. "Cosmology", 48 hours (Prof. Antonaldo Diaferio)
3. "Astrophysics Laboratory", 48 hours (Prof. Silvano Fineschi)
4. "General relativity", 48 hours (Prof. Nicolao Fornengo)
5. "Fundamentals of Astrophysics: Stars and Milky Way", 48 hours (Prof. Antonaldo Diaferio)
6. "Fundamentals of Astrophysics: Galaxies and Cosmic Structures", 48 hours (Prof. Luisa Ostorero)

NON-SCIENTIFIC PUBLICATIONS
1. Cesare V., "Il mondo dei Wongless – volume secondo: Le battaglie di Seconda Morte", April 2020, https://ilmiolibro.kataweb.it/libro/fantascienza/537979/il-mondo-dei-wongless-4/
2. Cesare V., "Oltre l'orizzonte dell'ordinario", poem written for the literary competition "Graffiti Metropolitani – 2ª edizione" which arrived in the first hundred and was published in the book "100 poesie", Puntoacapo Edizioni, June 2019
3. Cesare V., "Il mondo dei Wongless – volume primo: Gli attacchi dei Landix", December 2015, https://ilmiolibro.kataweb.it/libro/fantascienza/214318/il-mondo-dei-wongless-3/

DRIVING LICENCE: Yes

Place and date:

Signature: