EDA GJERGO, Ph.D.

+86(153)2717-3735 ⋄ eda.gjergo@gmail.com
http://www.hep.anl.gov/egjergo/

EMPLOYMENT

Wuhan University — October 2019 - Present
Postdoctoral Scholar — *Wuhan, China*

Università degli Studi di Trieste — 2015 - 2019
Research Assistant — *Trieste, Italy*

Argonne National Laboratory — 2011 - 2015
Co-op and Junior Team Member — *Chicago, IL*

Sperling & Kupfer — 2007
Popular Science Co-writer — *Milan, Italy*

EDUCATION

Università degli Studi di Trieste — Thesis defense: Feb 15th 2019
Doctor of Philosophy in Physics — *Trieste, Italy*

· Thesis Title: Dust Evolution in Galaxy Cluster Simulations
· National Institute for Astrophysics (INAF) fellowship

Illinois Institute of Technology — Degree conferred on: May 2014
Bachelor of Science in Applied Mathematics — *Chicago, IL*

· International Scholarship

Illinois Institute of Technology — Degree conferred on: May 2014
Bachelor of Science in Physics — *Chicago, IL*

· International Scholarship

United World College of the Adriatic — Degree conferred on: May 2008
International Baccalaureate Diploma — *Duino, Italy*

· Italian Ministry of Foreign Affairs Full Scholarship (3.5% acceptance rate)

RESEARCH INTERESTS

Galactic chemical evolution, dust modeling, cosmological simulations, interstellar and intracluster medium, supernova cosmology, dark energy models.

RESEARCH AND WORK EXPERIENCE

Wuhan University — October 2019 - Present
Postdoctoral Scholar — *Wuhan University*

· I have developed a detailed, modular, and flexible galactic chemical evolution code which tracks the abundance of all stable isotopes in galaxies of varying morphologies. I am presently in the debugging phase.

- Elements from Carbon to Zinc are primarily enriched through contributions from AGB, Supernovae Type Ia, and Supernovae Core Collapse (SNCC), as it has been extensively investigated in literature. For such elements, I include these 3 enrichment channels in my code.
- For the treatment of heavy elements – beyond the iron-peak – on top s-process contributions from updated AGB and SNCC yield tabulations, I include r-process elements. To achieve the aim, I introduced novel rate computations of Neutron Star Mergers, Collapsars, neutrino-driven winds, and Magnetohydrodynamic SN jets, along with their corresponding yields which, to date, have never been used in chemical evolution modeling.
- Two papers are in preparation: the code presentation paper and the heavy elements production paper.

Osservatorio Astronomico di Trieste February 2019 - September 2019
Research Assistant *Trieste, Italy*

· I employed analytical methods to compute dust abundances in galaxy clusters at low-to-intermediate redshift, by means of sophisticated chemical evolution models.

- Through the use of luminosity functions, I confirmed that chemical evolution models are consistent with identifying spiral galaxies as the main sources of dust in galaxy clusters.
- I've shown that minor galaxies or filamentary structures $\sim$ 1 dex smaller than the break of the Schechter functions cannot be major sources of galaxy cluster dust.

Università degli Studi di Trieste November 2015 - January 2019
Doctor Philosophiae in Physics *Trieste, Italy*

· I adapted a one-zone dust evolution model to cosmological zoom-in simulations of galaxy clusters.

- My work is the first ever implementation of dust evolution within cosmological simulations of galaxy clusters.
- I converted the theoretical dust evolution model of Hirashita (2015) into a numerical algorithm written in `C`. I embedded this algorithm into GADGET-3, a private simulation code which runs Tree-Particle-Mesh dynamics, smoothed particle hydrodynamics, radiative cooling, star formation and feedback, AGN feedback, and chemical evolution.
  - I tested the consistency of our dust distribution against other common dust distribution models. I verified that our method falls within a small margin of the predictions by said models.
  - I tested a handful of dust production methods into the simulation, including a novel stoichiometry-preserving one (adopted as fiducial production), because it is representative to first order of the characteristic chemical makeup of astrophysical dust in stellar envelopes and dense environments.
  - I investigated the impact of different chemical evolution yields on dust abundances.
  - I included and tested thermal sputtering as the main destruction mechanism in the Intracluster Medium.
  - I became comfortable with running and editing complex parallel codes designed for supercomputers.
- The work appeared in the journal *Monthly Notices of the Royal Astronomical Society*. It was presented at ESO (Garching, Germany), and in several Italian venues.
- I compared the output of our simulation to observational data:

  - The simulated dust abundances are in agreement with local galaxy data, including galaxies of low-metallicity.
  - The simulation slightly underproduces dust masses compared to Planck SED observations at low-to-intermediate redshift. I am currently solving the cause of the discrepancy, but in the paper the problem was approached by relaxing the sputtering timescale.
- I developed a post-processing analysis package written in `Python` to extract and manipulate the simulation's data across cosmic history. The package will be fully accessible to the group and can be customized beyond the end of my PhD program.
  - I wrote an algorithm to trace the evolution history of individual gas particles, as well as special subsets of the simulated particles across cosmic time.
  - I wrote automated python scripts to submit my post-processing routines to the supercomputer's queue, on top of the standard queuing procedure.
  - I learned about special structures which form in smoothed particle hydrodynamical simulations, such as Kaufmann blobs, and the bona fide gas arising from ram pressure stripping. I verified that the sites of dust evolution are not numerical artefacts, but are consistent with the physics we aimed to simulate.

· I analyzed the Spectral Energy Distribution (SED) and the IRX-β relation of simulated high redshift galaxies. I imposed *SPace Infrared telescope for Cosmology and Astrophysics* (SPICA) specifications on flux threhsolds and passbands to the post-processing radiative transfer analysis of *MUlti-Phase Particle Integrator* (MUPPI) cosmological zoom-in simulations of galaxies.

Argonne National Laboratory September 2011 - June 2015
Junior Team Member *Argonne, IL*

· Worked on the forecast of cosmology constraints for the Dark Energy Survey (DES) through the photometric selection of Type Ia supernovae, and aided to the coding the analysis framework of upcoming observations.

- Published in the journal *Astroparticle Physics*, and was presented at the April 2012 APS Meeting, as well as the 221^{st} AAS 2013 Meeting.
- Contributed to the coding of an improved Figure of Merit (FoM), first advocated by the Dark Energy Task Force, which is a Fisher Matrix quantification of the impact of data sets on cosmology parameters.
- Improved the accuracy of the FoM by including the systematic error for core collapse supernovae.

· Initiated a preliminary study of the six optical ugrizy4 filters for the Large Synoptic Survey Telescope (LSST), and their impact on supernova science.

- Provided, on behalf of the DESC supernova group, the filter analysis of the candidate filter vendors able to meet LSST's specifications. The study played a major role in the vendor choice by the LSST committee.
- Explored the effects of ripple amplitude, tapering, leakage of the filters and host-galaxy prior to photo-z supernovae studies.
- Presented our results at the LSST / Dark Energy Science Collaboration (DESC) Meeting in Pittsburgh.
- Represented the LSST project with this work at the 223^{rd} AAS Meeting.

· Explored alternatives to vacuum energy.

- Selected a model for quintessence and a model for modified gravity, and evaluated the constraints to three supernova data sets. Presented our results as a poster at the AAS 222^{nd} Meeting,
- Was awarded with the 2013 Chambliss Astronomy Achievement Student Award for the work.

· Communicated science to a range of audiences, from experts to high school students.

- Presented monthly research progress during the LSST Supernova Science Working group webinars in 2013.
- Explained peer-reviewed cosmology papers during weekly journal clubs at Argonne National Lab.
- Coached new students in the use of the Linux operating system. Taught background knowledge on cosmology, big bang theory, supernovae as standard candles, and cosmic microwave background.
- Co-wrote, co-produced, and hosted 11 Youtube videos on cosmology for the general audience. `http://www.youtube.com/TheCosmicWeb`, and presented this material to 4 classes of high school students.

Illinois Institute of Technology June 2010 - August 2011
Independent study *Chicago, IL*

· Independent reading of a variety of peer-reviewed papers, and attended weekly seminars of the IIT Meshfree Methods group.
· The topics included the MOND paradigm, the Saari conjecture, dark matter models, functional analysis, and positive definite kernels.

Sperling & Kupfer, branch of Mondadori July 2006 - April 2007
Co-author of Così parlano le stelle *Milan, Italy*

· Co-authored a best-seller book for the general public on the fundamental forces of physics, with renowned Italian astrophysicist Margherita Hack. `https://amzn.to/2Kj0FwV`
· Won *Frascati Scienza: La scienza per tutti*, 2010, awarded for communicating science to the general public. The book was selected for this award jointly by 4 National Institutes of Physics in Italy.
· In May ′07 the book ranked #10 in the national bestseller list across all categories, and #2 for the non-fiction category.
· Invited to present the book in many venues across Italy, including Milan, Florence, Rome, and Trieste.

Summer Science Program June 2007 - August 2007
Research Project Student *Ojai, CA*

· Determined the orbit of a near-earth asteroid from scratch: from data collection with both photographic plates and CCD optical images on 11" and 14" telescopes respectively, to the computation of the asteroid's orbit using spherical trigonometry and numerical differentiation on Python. Submitted observations to the Minor Planet Center.
· Conducted additional research on Messier Objects and Jupiter's satellites. Coded a VPython model of the Solar System.
· Sponsored by the California Institute of Technology, Stanford University, Harvey Mudd College, UCLA, and NASA's Jet Propulsion Laboratory. Competitive admission with a ∼17% rate of acceptance.
· `http://www.summerscience.org/home/index.php`

PUBLICATIONS

The MAGPI Survey – science goals, design, observing strategy, early results and theoretical framework 2021
Foster C., et al. *The MAGPI Collaboration*

· Accepted by the Publications of the Astronomical Society of Australia.

On the Origin of the Galaxy Cluster Dust at low to intermediate redshift. 2020
Gjergo Eda, Matteucci Francesca, Palla Marco, Lacchin Elena, Biviano Andrea
Osservatorio Astronomico di Trieste INAF, Università di Trieste, Institute Nazionale di Fisica Nucleare (INFN)

· Monthly Notices of the Royal Astronomical Society, Volume 493, Issue 2, p.2782-2792.

Dust Evolution in Galaxy Cluster Simulations June 2018
Gjergo Eda, Granato Gian Luigi, Murante Giuseppe, Ragone-Figueroa Cinthia, Tornatore Luca, Borgani Stefano.
Osservatorio Astronomico di Trieste INAF, Università di Trieste, Instituto de Astronomia Teorica y Experimental (IATE), Consejo Nacional de Investigaciones Cientificas y Tecnicas de la Republica Argentina (CONICET), Observatorio Astronomico, Universidad Nacional de Cordoba

· Monthly Notices of the Royal Astronomical Society, Volume 479, Issue 2, p.2588-2606.

Analytic photometric redshift estimator for Type Ia supernovae from the Large Synoptic Survey Telescope June 2015
Wang Yun, Gjergo Eda, Kuhlmann Stephen
Argonne National Laboratory, California Institute of Technology, University of Oklahoma

· Monthly Notices of the Royal Astronomical Society, Volume 451, Issue 2, p.1955-1963.

Type Ia supernovae selection and forecast of cosmology constraints for the Dark Energy Survey February 2013
Gjergo Eda, Duggan Jefferson, Cunningham John, Kuhlmann Stephen, Biswas Rahul, Kovacs Eve, Bernstein Joseph, Spinka Harold
Argonne National Laboratory, Illinois Institute of Technology, Loyola University Chicago

· Astroparticle Physics, Volume 42, p. 52-61.

REPORTS

Filter Study for LSST using supernovae simulations and photo-z host galaxy bias 2014
Gjergo Eda, Kuhlmann Stephen, Gilmore D. Kirk, Kessler Richard
Argonne National Laboratory, Illinois Institute of Technology,
Kavli Institute for Cosmological Physics, SLAC National Accelerator Laboratory *AAS 223 Poster*

· Honorable Mention for the AAS Chambliss Student Achievement Award

Comparison of Supernova Data Sets with Modified Gravity and Dark Energy Models 2013
Pedersen Keith, Gjergo Eda, Shylnov Yurii, Kuhlmann Steve
Argonne National Laboratory, Illinois Institute of Technology *AAS 222 Poster*

· Winner of the AAS Chambliss Student Achievement Award
· `http://aas.org/posts/news/2013/06/congratulations-aas-222-chambliss-student-award-winners`

Cosmology Biases in the Analysis of Future Supernova Surveys 2013
Stanwyck Lynn, Gjergo Eda, Kuhlmann Stephen, Biswas Rahul, Kovacs Eve
Argonne National Lab, Illinois Institute of Technology, Johns Hopkins University *AAS 222 Poster*

Type Ia Supernovae Selection and Forecast of Cosmology Constraints for the Dark Energy Survey 2012
Gjergo Eda, Duggan J., Cunningham J., Kuhlmann S., Biswas R., Kovacs E., Bernstein J. P., Spinka H.
Argonne National Laboratory, Loyola University Chicago, Illinois Tech *AAS 221 Poster*

Uncertainties in Core Collapse Supernovae Simulations 2012
Duggan, Jefferson; Cunningham, J.; Kuhlmann, S.; Biswas, R.; Kovacs, E.; Spinka, H.
Argonne National Laboratory, Loyola University Chicago, Illinois Tech *AAS 221 Poster*

TECHNICAL TALKS

MAGPI Busyweek June 2021
Participant and Oral Presenter *Webinar*

· `https://magpisurvey.org/`

HydroSim Meeting September 13-16, 2016
Participant and Oral Presenter *Trieste, Italy*

· `https://indico.ict.inaf.it/event/440/contributions/`

LSST-DESC Collaboration Meeting December 4-6, 2013
Participant and oral presenter *Pittsburgh, PA*

· `https://indico.bnl.gov/conferenceDisplay.py?confId=691`

LSST DESC SN Working Group June, July, August, September, October, November 2013
Participant and presenter *Restricted 1-hour webinar*

· Presenter of filter studies for LSST using supernovae simulations and photo-z host galaxy bias.

DESSN Workshop July 15-19, 2013
Participant *KICP at the University of Chicago, Chicago, IL*

· `https://cdcvs.fnal.gov/redmine/projects/des-sn/wiki/DESSN_Worshop_at_UofC_KICP`

CLASSES

Classical Mechanics September 2020
Invited Lecturer *Wuhan University, China*

· Two-Hour class on the hydrostatic equilibrium in stars, and on the Virial theorem for undergraduate students enrolled in a Classical Mechanics course at Wuhan University. I prepared homework and solutions as well as in-class activities.

Introduction to Astrophysics April 2017, April 2018
Invited Lecturer *University of Trieste, Italy*

· Two-Hour class on general relativity and cosmology for undergraduate students enrolled in the Introduction to Astrophysics course at the University of Trieste.

Yerkes Observatory High School Summer Program July 29, 2013
Invited Lecturer *Yerkes Observatory, WI*

· Hour-long seminar on cosmology (big bang theory, DM, DE, and CMB) for high school students selected to the program.
· `http://prezi.com/1ytyie0rvdtb/?utm_campaign=share&utm_medium=copy`

SEMINARS

The Galactic Chemical Evolution of Heavy Elements Jan 12, 2022
Invited Speaker *GW NEXT 22 online conference, Kavli Institue at PKU, Beijing, China*

· 45-minute introduction designed for early-career gravitational wave scientists.

The Galactic Chemical Evolution of Heavy Elements May 28, 2021
Invited Speaker *NAO group meeting, Beijing, China*

· Hour-long seminar introducing LAMOST observers to galactic chemical evolution.

On the Origin of Dust at low-to-intermediate Redshifts November 2020
Invited Speaker *Kavli Institue at PKU, Beijing, China*

· Hour-long seminar on my PhD work as well as 2020 publication.

Dust Evolution in Galaxy Cluster Simulations December 2019
Invited Speaker *Beijing Normal University, China*

· Hour-long seminar on my PhD work.

Third International Workshop on recent LHC results and related topics October 10-12, 2018
Invited Speaker *Faculty of Natural Sciences, University of Tirana, Albania*

· Hour-long seminar on cosmology and cosmological simulations, presented to an audience of CERN researchers and Albanian graduate students.

Second International Workshop on recent LHC results and related topics Semptember 26-27, 2016
Invited Speaker *Faculty of Natural Sciences, University of Tirana, Albania*

· Hour-long seminar on dark matter and dark energy frontiers, presented to an audience of CERN researchers and Albanian graduate students.

SKILLS

Languages	(native) Italian, English, Albanian, (studying/elementary) Chinese
Computing	Mathematica, MATLAB, Octave, ROOT, Maple,
Astronomy codes	GADGET-2/3, CosmoMC, SNANA, SNCosmo
Programming	**Python**, Fortran90/77, C, IDL
OS	Linux, macOS, Microsoft Windows
Editor/Misc.	Emacs, Vi, SVN, TotalView, Anaconda.
Markup	HTML/CSS, LaTeX

AWARDS

• National Institute of Astrophysics (INAF) Fellowship (2015-2018)

• Winner of the Chambliss Astronomy Achievement Student Award for the American Astronomical Society, Summer 2013.

• Honorable Mention for the Chambliss Astronomy Achievement Student Award for the American Astronomical Society, Winter 2014.

• College of Science and Letters Dean's List for excellent scholarly achievement. (Spring 2010, Fall 2014).

• IIT Undergraduate Research Day Award, 2^{nd} place, 2011.

• IIT SIAM Math Problem Competition Award, 2010.

• Best Seller, Italy, Summer 2007, 10^{th} place nationwide and 2^{nd} place in the non-fiction category, for the book *Così parlano le stelle*.

• Winner of *Frascati Scienza: La scienza per tutti*, 2010, awarded for *Così parlano le stelle*.

• 2-year merit based full scholarship for the United World College of the Adriatic (3.5% rate of admission in Italy, academic year 2006-2008).

• 1^{st} place winner of the *Concorso Liceale di Scrittura in Astronomia dell'Osservatorio di Arcetri*, 2006.

• Participated in the Regional Olympiads in Mathematics, Friuli-Venezia-Giulia Region, Italy, 2007.

• Participated in the Regional Olympiads in Physics, Friuli-Venezia-Giulia Region, Italy, 2007.

• Participated in the Regional Olympiads in Mathematics, Toscana, Italy, 2005.

• Participated in the National Olympiads in Astronomy, Italy, 2004.

TALKS

Interstellar Physics and Chemistry January, 2022
Online Participant and Oral Presenter *Zhuhai, China*

· `https://ism.dust.fan/ism2021/`

Origin of Elements and Cosmic Evolution: From Big-Bang to Supernovae and Mergers December, 2019
Participant and Oral Presenter *Beihang University, Beijing, China*

· `http://oece2019.csp.escience.cn/`

The Milky Way 2019: LAMOST and Other Leading Surveys October, 2019
Participant and Oral Presenter *YiChang, China*

· `http://mw2019.csp.escience.cn/dct/page/65585`

Italian Cluster II Sept 10-13, 2018
Participant and Oral Presenter *Naples, Italy*

· `https://sites.google.com/view/cluster2/`

Early Stages of Galaxy Cluster Formation July 17-21, 2017
Participant and Oral Presenter *Garching, Germany*

· `https://www.eso.org/sci/meetings/2017/GCF2017/program.html`

Beyond the Solar Neighborhood January 22-27, 2017
Participant and Oral Presenter *Sexten, Italy*

· `http://adsabs.harvard.edu/abs/2017bsne.confE..25G`

23rd Annual Argonne Symposium November 1, 2013
Participant and Oral Presenter *Argonne, IL*

· Website: http://www.dep.anl.gov/p_undergrad/ugsymp/
· Presentation: http://prezi.com/opbnxxw0syr1/?utm_campaign=share&utm_medium=copy

23rd Midwest Relativity Meeting October 25-27, 2013
Participant and Oral Presenter *University of Wisconsin-Milwaukee, Milwaukee, WI*

· Meeting's website: http://www.gravity.phys.uwm.edu/conferences/mwrm2013/index.html
· Talk (Presented by Eda Gjergo): http://tinyurl.com/23RelativityMtgMilwaukeeGjergo
· Talk (Presented by Yurii Shylnov):http://tinyurl.com/23RelativityMtgMilwaukeeShylno

KICP Supernova Hub Workshop March 2012
Participant and oral presenter *Kavli Institute of the University of Chicago, Chicago, IL*

· Technical talk on "Photometric Identification of Supernova"
· Talk: http://kicp-workshops.uchicago.edu/SNphotID_2012/depot/talk-gjergo-eda.pdf

POSTERS AND MISCELLANEOUS CONFERENCES

Italian Cluster I Feb 27 - March 1, 2017
Participant and Poster Presenter *Turin, Italy*

· https://sites.google.com/view/cluster1/

KROME Computational school September 19-21, 2016
Participant *Florence, Italy*

· http://www.kromepackage.org/bootcamp/index.php

ICTP Workshop on Large-Scale Structure June 2016
Participant *Trieste, Italy*

· http://indico.ictp.it/event/7630/

ICTP Summer School of Cosmology June 2016
Participant and Poster Presenter *Trieste, Italy*

· http://indico.ictp.it/event/7626/

Lucchin school 2016 May 2016
Participant *Naples, Italy*

· http://eventi.na.astro.it/en/scuola-lucchin/

Santa Fe Cosmology Workshop July 1-19, 2013
Participant and oral presenter *Santa Fe, NM*

· http://press3.mcs.anl.gov/santa-fe-cosmology-workshops/sf13-main/
· Presentation: http://prezi.com/ayvf8jzx3p9y/?utm_campaign=share&utm_medium=copy.

Chicago Area Undergraduate Research Symposium March 2013
Oral Presenter *Chicago, IL*

· Event's website: http://www.caurs.com/
· Poster and Presentation to be found on my website, referenced on the first page's header.

AAS 221st Meeting January 2013
Participant and poster presenter *Long Beach, CA*

· http://aas.org/files/resources/aas_221_program_book.pdf

ICTP Summer School of Cosmology July 2012
Participant and poster presenter *Trieste, Italy*

· Poster can be found on my website, referenced on the first page's header.
· `http://cdsagenda5.ictp.trieste.it/full_display.php?ida=a11178`

ICTP Workshop on Large-Scale Structure July 2012
Participant *Trieste, Italy*

· `http://cdsagenda5.ictp.trieste.it/full_display.php?ida=a11314`

Chicagoland and Midwest 1-Day Dark Matter Workshop April 6^{th} 2012
Participant *Fermilab, Batavia, IL*

· `http://www.hep.anl.gov/byrum/DM/ChicagolandDM.htm`

APS April Meeting April 2012
Oral presenter *Atlanta, GA*

· Optimization of Type Ia Supernovae Selection, Photometric Typing, and Cosmology Constraints
· Talk: `http://meetings.aps.org/Meeting/APR12/Event/169557`