

Galaxies Models Group Global Wokshop II December 19-20, 2024



Agencia I+D+i
Agencia Nacional de Promoción
de la Investigación, el Desarrollo
Tecnológico y la Innovación

Image Credit:

NASA, ESA, CSA, STScI, galaxies take the shape of a colorful beaded mask that sits above the nose. The galaxy at left, IC 2163, is smaller, taking up a little over a quarter of the view. The galaxy at right, NGC 2207, takes up half the view, with its spiral arms reaching the edges. IC 2163 has a bright orange core, with two prominent spiral arms that rotate counter clockwise and become straighter towards the ends, the left side extending almost to the edge. Its arms are a mix of pink, white, and blue, with an area that takes the shape of an eyelid appearing whitest. NGC 2207 has a very bright core. Overall, it appears to have larger, thicker spiral arms that spin counter clockwise. This galaxy also contains more and larger blue areas of star formation that poke out like holes from the pink spiral arms. In the middle, the galaxies' arms appear to overlap. The edges show the black background of space, including extremely distant galaxies that look like orange and red smudges, and a few foreground stars.

<https://www.flickr.com/photos/nasawebbtelescope/54107357754/in/album-72177720313923911>

Contents

About	4
Rationale	4
Organizing committee	4
Timetable	5
Thursday, 19 of December	5
Friday, 20 of December	5
List of Abstracts – Talks	6
Thursday 19th	6
Friday 20th	7
List of Participants	8
Useful Information	9
Institutions	10

About

Rationale

We are entering a golden era in the exploration of the galaxies across cosmic times. The advent of different cutting-edge observational facilities (e.g. the James Webb Space Telescope -JWST-) is expected to provide unprecedented new information of galaxy systems, not only in the Nearby Universe but also towards the epoch of reionization.

Since Galaxies Models Group (GMG) is a research group focused on the study of galaxy formation and evolution since the early Universe until present times, we need to be prepared for these new exciting times. We have a vast expertise in the use of novel and sophisticated theoretical models, numerical simulations and statistical techniques. Given the current international context, the design of strategies to contribute with our expertise to the new observational challenges is crucial.

The main goal of this second GMG extended meeting is to foster plausible endeavours to tackle the study galaxy evolution with upcoming observations, e.g., by developing suitable models and analysis methodology. In this sense, this meeting aims at strengthening the use of different tools and techniques required for GMG group activities, such as R, Visual Studio Code, and Convolutional Neuronal Networks.

The meeting will also encompass enough time for the exchange of ideas, recent results, and brainstorming for the successful achievement of our goals. New strategies will be also designed to encourage the interaction between our group and the community.

Organizing committee

Lic. Yamila Bufarratto
Dr. María Emilia De Rossi
Dr. María Soledad Nakwacki
Lic. María Candela Zerbo

Timetable

CT: Contributed Talk

Thursday, 19 of December

08:55-09:00		Presentation	
09:00-12:00	CT	Dr. María Emilia De Rossi IAFE-FCEyN-UBA-CONICET	Galaxies Models Group in 2024: achievements, current challenges and strategies for the future
12:00-13:00		Lunch	
13:00-14:00	CT	Dra. María S. Nakwacki FCEyN-UBA	R programming language for astrophysics
14:00-14:20		Coffee	
14:20-16:00	CT	Dra. María S. Nakwacki FCEyN-UBA	R programming language: hands on
16:00-16:10		Closing session remarks	

Friday, 20 of December

08:55-09:00		Presentation	
09:00-11:30	CT	Lic. Lucas J. Zenocratti UNLP-CONICET	Convolutional neural networks: Theory
11:30-11:45		Coffee	
11:45-13:15	CT	Lic. Ramiro Santamaria IAFE-FCEyN-UBA-CONICET	Convolutional neural networks: Practice
13:15-14:00		Lunch	
14:00-14:50	CT	Lic. M. Candela Zerbo UNLP-IAFE-FCEyN-UBA-CONICET	First steps in Visual Studio Code
14:50-15:10		Coffee	
15:10-16:00	CT	Lic. M. Candela Zerbo IAFE-FCEyN-UBA-CONICET	First steps in GitHub
16:00-16:10		Coffee	
16:10		Farewell	

List of Abstracts – Talks

Thursday 19th

Galaxies Models Group in 2024: achievements, current challenges and strategies for the future

Dr. María Emilia De Rossi^{1,2}

CT

¹ Facultad de Ciencias Exactas y Naturales, UBA, Argentina

² Instituto de Astronomía y Física del Espacio, CONICET-UBA, Argentina

We are a research group focused on the study of galaxy formation and evolution since the early Universe until present times. We use theoretical models and cosmological simulations to provide clues about the origin of observed galaxies in the real Universe. At the moment, we are nine members: three PhDs in Physics, four PhD students and two graduates in Physics. During 2024, our group has been very active, having accomplished many achievements, such as the undergraduate thesis dissertations of two group members, different publications in scientific journals, several presentations (talks and posters) in national and international scientific events, contrubutions to outreach activities and participation in international collaborations. We also ignaugurated a Jounal Club, which is a new space for discussing research articles relevant for our research. Besides, we continued with other group activities such as our group colloquia, and we share different news through our Web Page and social networks.

In this interactive talk, we will discuss such achievements and how they can be improved in the future. We will also analyse our future challenges in the current international context, specially, considering the advent of observational facilities that have already started providing unprecedented information since the epoch of reionization to the Local Universe. As always, we will discuss about plausible methods to use our research to generate a positive impact on society.

Introduction to the R programming language and its application to astrophysics

*Dra. María Soledad Nakwacki*¹

CT

¹ Facultad de Ciencias Exactas y Naturales, UBA, Argentina

R is widely used free software for statistics and data analysis. It has a wide variety of statistical and visualization techniques, and can be easily extended by installing solidly theory-based and well-documented packages. Due to the enormous amount of data available (observed and/or simulated) open to use in the astrophysical data ecosystem, R turns out to be an ideal tool, although its use is not so widespread. In this mini-course I will show the R programming language step by step, from its installation, through its structure to examples of different applications in astrophysics.

Friday 20th

Convolutional neural networks: a brief introduction

Lic. Lucas J. Zenocratti^{1,2} & *Lic. Ramiro Santamaria*³

CT

¹ Facultad de Ciencias Astronómicas y Geofísicas, Universidad Nacional de La Plata, La Plata, Argentina

² Instituto de Astrofísica de La Plata, CONICET-Universidad Nacional de La Plata, La Plata, Argentina

³ Departamento de Física, Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Ciudad Autónoma de Buenos Aires, Argentina

Among the numerical techniques included in Deep Learning, convolutional neural networks (CNN) constitute one of the most powerful tools currently used in image detection, classification and segmentation. In this Workshop, the general ideas behind the architecture, implementation and uses of these tools will be shown, focusing mainly on image classification. Although a very brief introduction to CNNs and their applications will be seen, the concepts to be developed can be adapted to complex and sophisticated situations, making it possible to use these tools in a wide variety of applications and problems.

First steps with Visual Studio Code & GitHub

Lic. Candela Zerbo^{1,2,3}

CT

¹ Facultad de Ciencias Astronómicas y Geofísicas, UNLP, Argentina

² Facultad de Ciencias Exactas y Naturales, UBA, Argentina

³ Instituto de Astronomía y Física del Espacio, CONICET-UBA, Argentina

This introductory workshop is designed for those who want to use Visual Studio Code as an integrated development environment (IDE) to program in Python and explore key productivity tools, such as Jupyter Notebook and GitHub.

In the first part, we will learn how to download and install Visual Studio Code, configure an efficient workspace, and create virtual environments to manage project-specific libraries. We will put these concepts into practice by running an example script that generates interactive and exportable 3D graphics in HTML format. Additionally, we will explore how VSC can integrate with other programming languages, opening up possibilities for future projects.

The second part will take us to the world of GitHub, where we will explain what it is, how it works, and the basic commands to manage version control. We will configure VSC to work together with GitHub and create a personal repository where we will store the developed scripts. Finally, we will put the concepts learned into practice, uploading and updating the virtual repository to reinforce the workflow.

List of Participants

Yamila Danela Bufarrato	Departamento de Física, FCEN-UBA, Instituto de Astronomía y Física del Espacio, CONICET-UBA, Argentina
María Emilia De Rossi	Facultad de Ciencias Exactas y Naturales, UBA, Argentina; Instituto de Astronomía y Física del Espacio, CONICET-UBA, Argentina
Salvador Esteban Grimozzi	Facultad de Ciencias Exactas y Naturales, UBA, Argentina; Instituto de Astronomía y Física del Espacio, CONICET-UBA, Argentina
Leandro Daniel López	Departamento de Física, FCEN-UBA, Argentina
María Soledad Nakwacki	Facultad de Ciencias Exactas y Naturales, UBA, Argentina
Ramiro Santamaría	Departamento de Física, FCEN-UBA, Argentina
María Cecilia Tomasini	Departamento de Física, FCEN-UBA, Argentina
Lucas J. Zenocratti	Facultad de Ciencias Astronómicas y Geofísicas, Universidad Nacional de La Plata, La Plata, Argentina; Instituto de Astrofísica de La Plata, CONICET-Universidad Nacional de La Plata, La Plata, Argentina.
María Candela Zerbo	Facultad de Ciencias Astronómicas y Geofísicas, UNLP, Argentina; Facultad de Ciencias Exactas y Naturales, UBA, Argentina; Instituto de Astronomía y Física del Espacio, CONICET-UBA, Argentina

Useful Information

Workshop activities will be held entirely virtually.

The link for Thursday 19th and Friday 20th **talks** will be sent to participants by e-mail prior to the event.

Institutions

The GMG is part of IAFE, it acknowledges support from PICT-2021-GRF-TI-00290 of AGENCIA I+D+i (Argentina).



**GALAXIES
MODELS
GROUP
SIMULATIONS**



Agencia I+D+i

Agencia Nacional de Promoción
de la Investigación, el Desarrollo
Tecnológico y la Innovación

