Galaxies Models Group
Global Workshop III
November 25-27, 2025

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GALAXIES
MODELS
GROUP
SIMULATIONS

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https://science.nasa.gov/missions/hubble/hubble-captures-swirling-galactic-trio/&ved=2ahUKEwign_nC3YCRAxWGppUCHQOzLAYQFnoECBoQAQ&usg=AOvVaw2rE6K-xGPogLA1GRvz-w0u

Galaxies Models Group Global Workshop III
November 25-27, 2025, Instituto de Astronomía y Física del Espacio
Ciudad Autónoma de Buenos Aires
Argentina

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About

Rationale

We are entering a golden era in the exploration of galaxies across cosmic times. The advent of different cutting-edge observational facilities (e.g. the James Webb Space Telescope -JWST-, the EUCLID mission) has already started providing unprecedented new information of galaxy systems, not only in the Nearby Universe but also towards the epoch of reionization. The vast amount of information generated by the new galaxy surveys will require the use of efficient artificial intelligence techniques for its robust analysis.

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 exciting times. Our research group includes members with vast expertise in the use of novel and sophisticated theoretical models, numerical simulations, data science and statistical techniques. Given the current international context, the design of strategies to contribute with our knowledge to the current observational challenges is crucial.

The main goal of this third GMG extended meeting is to foster plausible endeavors to tackle the study of galaxy evolution with current and upcoming observations, e.g., by developing suitable models and analysis methodology. Additionally, we plan to discuss plausible paths to adapt our analysis tools so that they can cover broader fields of application. In this sense, this meeting aims at strengthening the use of different tools and techniques required for GMG activities, such as the handling of state-of-the-art cosmological simulations and astrophysical applications of machine learning. We will also get insights into the role of machine learning methods in the industry. 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

Dr. María Emilia De Rossi
Lic. Salvador Esteban Grimozzi
Dr. María Soledad Nakwacki
Dr. María Cecilia Tomasini

Timetable

CT: Contributed Talk

Tuesday, November 25th

14:00-14:05	**Presentation**		
14:05-16:05	CT	**Dr. María Emilia De Rossi** IAFE-FCEyN-UBA-CONICET	Galaxies Models Group in 2025: achievements, current challenges and strategies for the future
16:05–16:20	**Break**		
16:20-17:20	CT	**Dr. Lucas J. Zenocratti** UNLP-UNNOBA	Introduction to the IllustrisTNG simulations - Part 2
17:20–17:30	**Closing session remarks**		

Wednesday, November 26th

08:55-09:00	**Presentation**		
09:00-10:45	CT	**Dr. María Soledad Nakwacki** FCEyN-UBA	Prediction of temporal series applied to fuel consumption
10:45-14:00	**Coffee & Lunch**		
14:00–15:00	CT	**Lic. Salvador E. Grimozzi** IAFE-FCEyN-UBA-CONICET	The Random Forest method and its applications in simulated galaxies data - Theory
15:00-15:15	**Break**		
15:15-16:15	CT	**Lic. Salvador E. Grimozzi** IAFE-FCEyN-UBA-CONICET	The Random Forest method and its applications in simulated galaxies data - Hands-on
16:15-16:30	**Break**		
16:30-17:15	CT	**Lic. Leandro D. López** IAFE-FCEyN-UBA	An astronomical journey from the Milky Way to the most distant galaxies: Results from JWST in 2025
17:15-17:30	**Break**		
17:30–17:50	**Round table**		
17:50-18:00	**Closing remarks for online sessions**		

Thursday, November 27th

11:00-11:10	**Arrival**		
11:10-11:20	**Group photo**		
11:20-13:20	CT	**Meeting lunch**	Pabellón $0 + \infty$
13:20–13:30	**Farewell**		

List of Abstracts – Talks

Tuesday, November 25th

Galaxies Models Group in 2025: achievements, current challenges and strategies for the future

Dr. María Emilia De Rossi[1,2] **CT**

[1] Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Argentina
[2] Instituto de Astronomía y Física del Espacio, CONICET–UBA, Argentina

Galaxies Models Group (GMG) is an emergent research team, founded in 2021. GMG is focused on providing clues about the origin of observed galaxies in the real Universe. To achieve these goals, we compare observational data with predictions from cosmological simulations, applying, e.g., data science techniques. At the moment, GMG includes nine members with expertise in diverse relevant fields, such as theoretical physics, numerical simulations, data science, and the history of science, among others.

During 2025, GMG has been very active, having accomplished many achievements, such as the PhD thesis dissertation of one group member, different publications in scientific journals and proceedings, presentations (talks and posters) in national and international scientific events, contributions to outreach activities and participation in different international collaborations. Some members of GMG have also been actively developing teaching activities in different Universities. Besides, we continued with our regular group activities, such as our Group Colloquia, Journal Club, and maintenance of our Web Page and social networks. We also inaugurated a new series of meetings focused on learning how to handle and analyse new cosmological simulations, which are relevant for our research.

In this interactive talk, we will discuss our past 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 plausible methods to use our research to generate a positive impact on society.

Introduction to the IllustrisTNG simulations - Part 2

Lic. Lucas J. Zenocratti[1,2] **CT**

[1] Facultad de Ciencias Astronómicas y Geofísicas, Universidad Nacional de La Plata, La Plata, Argentina
[2] Departamento de Ciencias Básicas y Experimentales, Universidad Nacional del Noroeste de la provincia de Buenos Aires, Argentina.

In this second session of the "Introduction to IllustrisTNG Simulations" workshop, we will explore with some detail the on-line Jupyter Lab environment available to users registered in the IllustrisTNG database. Some auxiliary functions and scripts defined by default will be presented, to begin analyzing the available data generated by the IllustrisTNG simulation suite. Special emphasis will be placed on how to read the simulation catalogs for halos, subhalos, and particles, describing in general terms how these catalogs are structured. Towards the end of the session, some (asynchronous) hands-on activities will be presented, allowing participants to begin putting the tools discussed into practice.

Wednesday, November 26th

Prediction of temporal series applied to fuel consumption

Dr. María Soledad Nakwacki[1] **CT**

[1] Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Argentina

In the context of applications of Machine Learning to real-life problems, the prediction of fuel consumption is tackled. In the competitive oil and gas industry, one of the main challenges is getting insights from historical data to anticipate the required production to accurately satisfy the demand, thus reducing costs and increasing profit. In this work, I will explore the application of machine learning models, namely LSTM and XGboost to historical fuel data to predict fuel consumption minimizing the MAPE (mean absolute percentage error) performance metric.

The Random Forest method and its applications in simulated galaxies data

Lic. Salvador Esteban Grimozzi[1,2] **CT**

[1] Departamento de Física, Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Ciudad Autónoma de Buenos Aires, Argentina
[2] Instituto de Astronomía y Física del Espacio, CONICET–UBA, Argentina

In the first part of this workshop, I will introduce and describe the random forest method along with its variants and some optimization and validation techniques. During the second part, I will provide the group with a python script, so that we can use the random forest method in a set of data from hydrodynamical cosmological simulations.

An astronomical journey from the Milky Way to the most distant galaxies: Results from JWST in 2025

Lic. Leandro Daniel López[1] **CT**

[1] Departamento de Física, Facultad de Ciencias Exactas y Naturales, UBA, Argentina

I will review the latest discoveries of the JWST during 2025 regarding galaxy formation and evolution across cosmic times. I will discuss different observational findings obtained from very high redshifts to the Local Universe, including the Milky Way. During the round table, I will encourage our group members to analyse the possibility of tackling different amazing research challenges during 2026, considering the recent observational results presented before. We will debate how these observational discoveries fit into current physical models and how we can apply our expertise to contribute to their interpretation. In particular, we will discuss the capabilities of our current research tools (e.g. numerical simulations, machine learning techniques) to address diverse open problems in Extragalactic Astronomy and Cosmology.

List of Participants

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Salvador Esteban Grimozzi	Departamento de Física, Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Argentina; Instituto de Astronomía y Física del Espacio, CONICET–UBA, Argentina
Leandro Daniel López	Departamento de Física, Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Argentina
María Soledad Nakwacki	Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Argentina
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María Candela Zerbo	Facultad de Ciencias Astronómicas y Geofísicas, Universidad Nacional de La Plata, Argentina; Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Argentina; Instituto de Astronomía y Física del Espacio, CONICET–UBA, Argentina

Useful Information

Workshop activities will be held virtually during November 25th and November 26th. Onsite activities will be held on November 27th.

The link for November 25th and November 26th **talks** will be sent to participants by e-mail prior to the event.

Institutions

The GMG is part of IAFE.