PABLO VILLANUEVA DOMINGO
PHD IN PHYSICS & DEEP LEARNING SCIENTIST

I obtained my **PhD in theoretical physics** at the University of València, Spain, researching **deep learning** techniques in cosmology and astrophysics. During my PhD, I led international collaborations, published scientific articles and presented the results in multiple seminars. Currently, I am applying Graph Neural Networks in the autonomous driving project CARLA as **deep learning scientist**.

CONTACT

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- Pablo Villanueva Domingo
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SKILLS

💻 Computation

Programming languages
Python, C, C++, C#, Fortran, SQL, HTML/CSS, Javascript

General software
Mathematica, LaTeX, MATLAB, Git, Unity

Data analysis
Numpy, SciPy, Pandas, Networkx

Visualization
Matplotlib, Seaborn, Plotly, Gnuplot

Data scraping
Beautiful Soup, Tweepy

🤖 Machine learning

ML libraries
PyTorch, TensorFlow/Keras, PyTorch Geometric, Scikit-learn

Neural Nets experience
Graph Neural Nets (GNNs), Convolutional Neural Nets (CNNs), U-Nets, Generative Adversarial Nets (GANs), Long short-term memory (LSTM)

Fields
Computer vision, Natural Language Processing, Reinforcement Learning

See my work in ML and programming at
https://pablovd.github.io/codes

💬 Soft skills

Communication
Public speaking, writing skills

Project management
Collaboration, teamwork, initiative, organization

Problem solving
Logical reasoning, lateral thinking, creativity, data modeling

🔤 Languages

Spanish	Mother tongue
Catalan	Mother tongue
English	Fluent
Portuguese	Basics

💼 WORK HISTORY

● **Deep Learning Scientist**
📅 Jan. 2022- Now | 📍 Computer Vision Center - Universitat Autònoma de Barcelona
Autonomous driving project CARLA

● **Research assistant**
📅 Jun. 2021- Dec. 2021 | 📍 Instituto de Física Corpuscular - Universitat de València
Técnico superior de apoyo a la investigación, CIDEGENT/2018/019, CPI-21-108

● **PhD fellowship**
📅 Oct 2016 - Mar. 2021 | 📍 Instituto de Física Corpuscular - Universitat de València
FPI Severo Ochoa, Ref. SEV-2014-0398-16-3

● **Research introduction fellowship**
📅 May-Oct. 2016 | 📍 Instituto de Física Corpuscular
Iniciación a la investigación Severo Ochoa

🎓 EDUCATION

● **PhD in Physics, *cum laude***
📅 2016-2021 | 📍 Instituto de Física Corpuscular - Universitat de València

● **Master in Advanced Physics**
📅 2015-2016 | 📍 Universitat de València

● **Bachelor of Physics**
📅 2011-2015 | 📍 Universitat de València

As well as multiple schools and courses in data science, machine learning, computational tools and physics, which can be found at https://pablovd.github.io/talks.pdf

✈ RESEARCH STAYS

I have led several international research collaborations, visiting universities from different countries:

📅 Nov.- Dec. 2019 | 📍 3 weeks at Service de Physique Théorique, Université Libre de Bruxelles, Brussels, Belgium.

📅 Sep.- Oct. 2019 | 📍 1 month at Department of Astrophysical Sciences, Princeton University, New Jersey, USA.

📅 Sep.- Nov. 2018 | 📍 2 months at Kavli IPMU, University of Tokyo, Japan.

📅 Jun.- Aug. 2017 | 📍 2 months at Fermi National Accelerator Laboratory (Fermilab), Illinois, USA.

🏆 AWARDS

📅 Dec. 2016 | 1st prize in the *XXVII edición del Premio Rotary al Fomento del Trabajo Experimental en Física* for the physics experiment design *Medida del brillo superficial límite de imágenes con corrientes de marea*.

📇 TALKS

I have given **7 seminars** at the universities of Princeton (USA), Tokyo, Nagoya (Japan), Brussels and València; as well as **8 talks** in conferences, meetings and schools.
A complete list can be found at https://pablovd.github.io/talks.pdf These are some of my last talks:

● *Machine Learning at galactic and cosmological scales*
📅 Nov. 17 2021 | 📍 Instituto de Física Corpuscular | Video and slides

● *Weighing the Milky Way and Andromeda with Graph Neural Networks*
📅 Nov. 4 2021 | 📍 *CAMELS meeting*, online, organized by the Center for Computational Astrophysics, Flatiron Institute, New York

● *Constraining Primordial Black Hole scenarios with 21 cm cosmology*
📅 Oct. 14 2019 | 📍 Department of Astrophysical Sciences, Princeton University, USA

📖 SELECTED PUBLICATIONS

I have published **16 scientific articles** in high impact journals based on my research on cosmology and astrophysics. The full list of publications can be found in my INSPIRE profile P.Villanueva.Domingo.1. Among them, I have applied **deep learning** methods in the following works:

● *Weighing the Milky Way and Andromeda with Artificial Intelligence*
Pablo Villanueva-Domingo, Francisco Villaescusa-Navarro, Shy Genel, Daniel Anglés-Alcázar, Lars Hernquist, Federico Marinacci, David N. Spergel, Mark Vogelsberger and Desika Narayanan
📅 Nov. 2021 | 📖 2111.14874
The total masses of the Milky Way and Andromeda galaxies are predicted using AI for the first time, via Graph Neural Networks.

● *Inferring halo masses with Graph Neural Networks*
Pablo Villanueva-Domingo, Francisco Villaescusa-Navarro, Daniel Anglés-Alcázar, Shy Genel, Federico Marinacci, David N. Spergel, Lars Hernquist, Mark Vogelsberger, Romeel Dave and Desika Narayanan
📅 Nov. 2021 | 📖 2111.08683
Graph Neural Networks in PyTorch Geometric are trained in simulations to infer the mass of dark matter halos.

● *Removing Astrophysics in 21 cm maps with Neural Networks*
Pablo Villanueva-Domingo and Francisco Villaescusa-Navarro
📅 Jan. 2021 | 📖 The Astrophysical Journal, 907(1):44, 2021; 2006.14305
The cosmic density field is predicted from maps of distribution of hydrogen training a U-Net in PyTorch.

⚙️ OUTREACH & ADDITIONAL WORK EXPERIENCE

📅 Feb. 2021 | Outreach video about the astronomer Sandra M. Faber within the project *Pioneras - Recordando a Lise Meitner*.

📅 2020 - Now | Journal referee for Monthly Notices of the Royal Astronomical Society (MNRAS). See reviews in my Publons profile

📅 Jun. 2019 | Member of the local organizing committee of the Invisibles19 Workshop at València and Invisibles19 School at Laboratorio subterráneo de Canfranc (LSC)

📅 2016-2017 | Collaboration in the organization of the outreach event *Feria-Concurso Experimenta*, València.

👥 REFERENCES

● Dr. Olga Mena Requejo
🏠 Instituto de Física corpuscular, CSIC | ✉️ omena@ific.uv.es
● Dr. Francisco Villaescusa Navarro
🏠 Center for Computational Astrophysics, Flatiron Institute, New York | ✉️ villaescusa.francisco@gmail.com
● Dr. Sergio Palomares Ruiz
🏠 Instituto de Física corpuscular, CSIC | ✉️ Sergio.Palomares.Ruiz@ific.uv.es
● Dr. Laura Lopez Honorez
🏠 Université Libre de Bruxelles, Vrije Universiteit Brussel | ✉️ llopezho@ulb.ac.be