

## Alfred Castro-Ginard



### Title

Gaia keeps on delivering: expanding the open cluster population with EDR3

### Abstract

The huge improvements in the precision of the published data in Gaia EDR3, particularly for parallaxes and proper motions, has given a push to the detection of new open clusters in the Milky Way. In this talk, I will revise our methodology to search for open clusters, and how it has been adapted to a Big Data environment to analyse hundreds of millions of stars looking for relations and patterns among them. The application of the method to Gaia EDR3 has resulted in the discovery of 664 new open clusters, which, added to the 646 found in our previous searches in Gaia DR2, represent about 50% of the known open cluster population. I will also revise how this updated open cluster catalogue, with estimated astrophysical parameters, can provide insights about the structure and evolution of our Galaxy, particularly focusing on the spiral arms.

# ALFRED CASTRO-GINARD

Leiden Observatory, Leiden University. Niels Bohrweg 2, 2333CA Leiden, Netherlands

◇ acastro@strw.leidenuniv.nl ◇

---

## Experience

- **Postdoctoral Researcher** – Leiden Observatory 2021 - 2024
  - **Postdoctoral Researcher** – University of Barcelona 2021
- 

## Education

- **PhD *cum laude*, Astronomy and Astrophysics** 2017 - 2021  
University of Barcelona  
Thesis:  
Detection, characterisation and use of open clusters in a Galactic context in a Big Data environment.  
Advisors: Dr Xavier Luri and Dr Carme Jordi
  - **Postgraduate, Data Science and Big Data** 2017 - 2018  
University of Barcelona
  - **MS, Astrophysics and Relativity** 2015 - 2016  
University of the Balearic Islands
- 

## Selected papers

- HUNTING FOR OPEN CLUSTERS IN *Gaia* EDR3:  
664 NEW OPEN CLUSTERS FOUND WITH **OCFINDER**. 2021  
**Castro-Ginard, A.**, Jordi, C., Luri, X., [and 6 others].  
A&A, submitted.
  - MILKY WAY SPIRAL ARMS FROM OPEN CLUSTERS IN *Gaia* EDR3. 2021  
**Castro-Ginard, A.**, McMillan, P.J., Luri, X., [and 7 others].  
A&A, vol. 652, A162.
  - HUNTING FOR OPEN CLUSTERS IN *Gaia* DR2: 582 NEW OCS IN THE GALACTIC DISC. 2020  
**Castro-Ginard, A.**, Jordi, C., Luri, X., [and 8 others].  
A&A, vol. 635, A45.
  - HUNTING FOR OPEN CLUSTERS IN *Gaia* DR2: THE GALACTIC ANTICENTRE. 2019  
**Castro-Ginard, A.**, Jordi, C., Luri, X., [and 2 others].  
A&A, vol. 627, A35.
  - A NEW METHOD FOR UNVEILING OPEN CLUSTERS IN *Gaia*. NEW NEARBY OPEN CLUSTERS CONFIRMED BY DR2. 2018  
**Castro-Ginard, A.**, Jordi, C., Luri, X., [and 4 others].  
A&A, vol. 618, A59.
  - Bibliometry: 33 refereed papers (5 as first author),  
ORCID: 0000-0002-9419-3725, 20<sup>th</sup> December 2021
- 

## Summary of talks

- 1 invited talk at AMNH (American Museum of National History)
- 6 invited seminars/colloquia:
  - Universidad Complutense de Madrid (Spain)
  - University of the Balearic Islands (Spain)

- Lund Observatory (Sweden)
  - Universidad Diego Portales (Chile)
  - Universidad Autónoma de México - Ensenada
  - Universidad Autónoma de México - México DF
  - 7 conference talks
  - 6 contributed posters
- 

### **Professional activities**

- **SOC**, Co-chair: Star clusters: The *Gaia* Revolution
  - **LOC**:
    - COST, Milky Way size galaxy formation and high-performance computing
    - Apache Spark Empowerment
    - Week of Weave, Galactic Archaeology meeting
    - Course on Big Data with Apache Hadoop and Apache Spark
  - **Reviewer for**:
    - Astronomy and Astrophysics (A&A)
    - Monthly Notices of the Royal Astronomical Society (MNRAS)
    - Astronomy and Computing
    - Astrophysics and Space Sciences
- 

### **Teaching and Mentoring**

Master Thesis (co-)supervised:

- Matthijs van Groeningen: Open cluster automatic membership determination
  - Rick Dullaart: Determination of astrophysical parameters in open clusters
  - Kutay Nazli: Phase-space analysis of open clusters in a star-forming complex in the Sagittarius arm
  - Maria Balaguer Prat: The outskirts of open clusters with Gaia and Weave
  - Jordi Peralta Dolz: Application of convolutional neural networks for the classification of open clusters
  - Master courses:
    - Experimental techniques in particle physics and astrophysics
    - Big Science, Big Data in Astronomy
  - Bachelor in Physics:
    - Astronomy
    - Observational Astronomy
  - University program *Universitat de l'experiència*:
    - Astronomy and Meteorology
- 

### **Research Merits**

- Refereed papers highlighted by Astronomy and Astrophysics
  - Castro-Ginard et al. 2020, A&A, vol. 654, A45
  - Romero-Gómez, M. et al. 2019, A&A, vol. 627, A150
- Astronomy and Astrophysics Cover Figure
  - Cantat-Gaudin, T. et al. 2020, A&A, vol. 640, A1. Figure 7.

### Computer Skills

- MareNostrum at the Barcelona Supercomputing Centre (BSC)  
High performance computing cluster among the world's Top500
- GDAF (*Gaia* Data Analysis Framework)  
Big Data cluster based on Apache Spark and Apache Hadoop.
- GPU-based cluster  
4 GPU's NVidia RTX 2080Ti Founder with 11 Gb RAM GDDR6.

### Programming Languages

- Python
- PySpark
- Fortran
- Mathematica
- $\LaTeX$

### Astronomy general software

- TOPCAT
- STILTS
- ADQL

### OS

- MacOSX
- Linux
- Windows

### LANGUAGES

Catalan: Native

Spanish: Native

English: Advanced