Luminosity functions of nearby young open clusters

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Objective

1. Revise cluster memberships using Gaia EDR3/DR3 data

2. Study the evolution of luminosity function with time due to gradual evaporation of low-mass stars

Data

Gaia EDR3 (DR3): coordinates, parallaxes, proper motions and radial velocities
Bailer-Jones et al. 2021: Distances

48 clusters

Young (<1Gyr) nearby (<500pc) open clusters with |b|>10deg

Benchmark clusters

IC 2602 (50 Myr), Pleiades (120 Myr) and Hyades (650 Myr)

Membership selection

Astrometric and kinematic selection (5D or 6D if radial velocity available) with the Perryman et al. 1998 method:

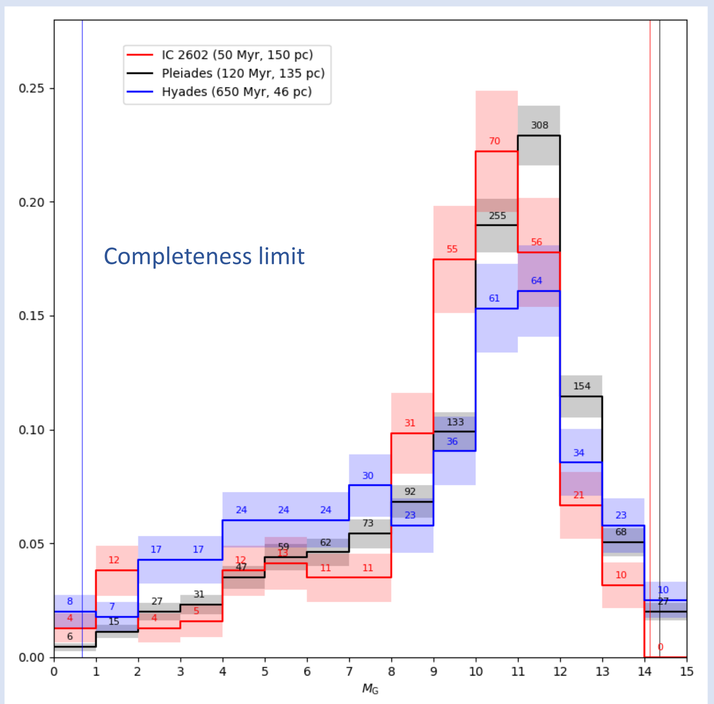
1. Prepare initial members, estimate their mass and determine cluster barycenter and systemic velocity

2. Compute the difference between the transverse and radial velocities of the cluster and Gaia candidates (z)

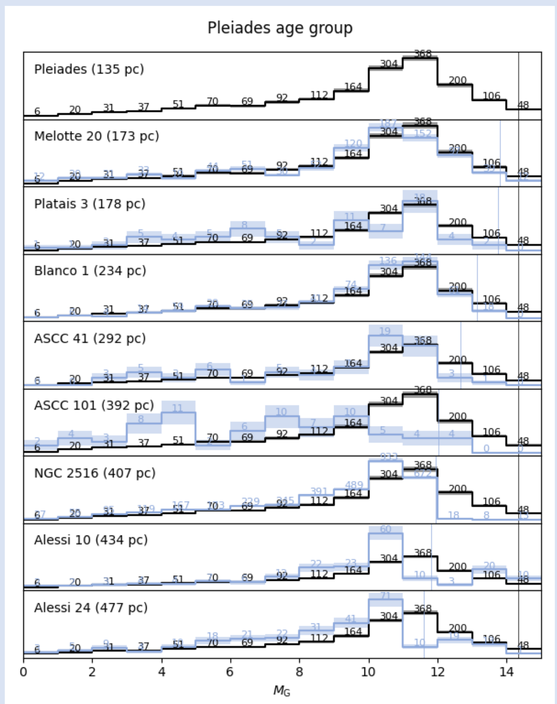
3. Combine the cluster velocity covariance matrix with the covariance matrices of candidate stars Σ and determine parameter $c = z^T \Sigma^{-1} z$ that measures the consistency of stellar velocity with the cluster motion

4. Bound reliable cluster members: Stars located within one tidal radius from the cluster center

Luminosity functions



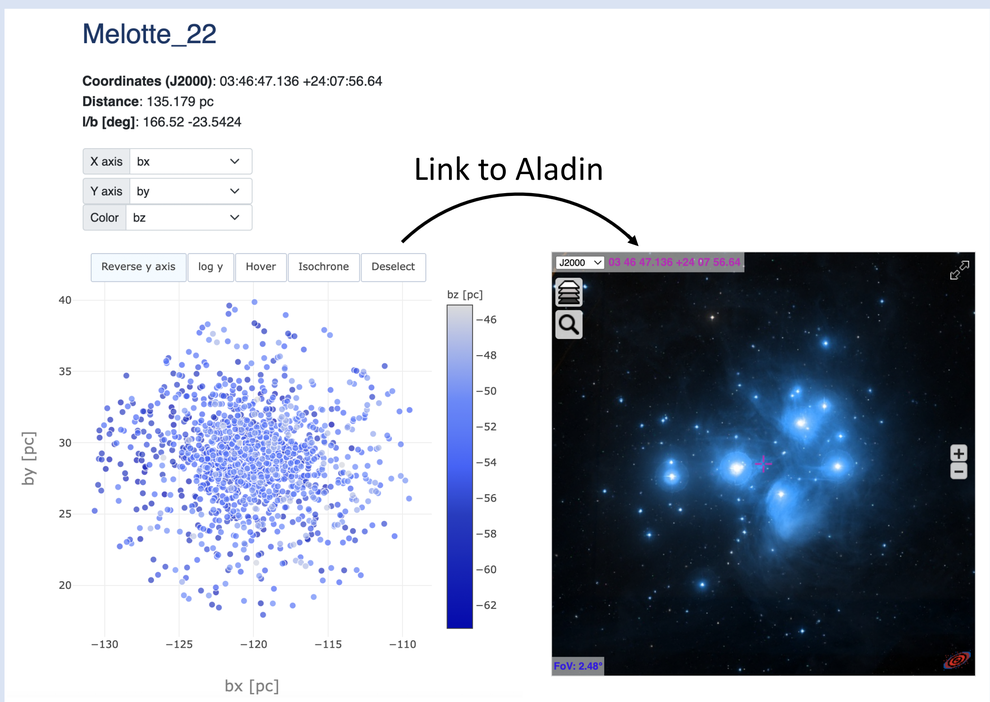
A comparison of the luminosity functions shows a relatively low number of low-mass stars in Hyades than Pleiades, most likely due to their evaporation. The peak in IC 2602 is shifted to higher luminosities due to the pre-main sequence stage of its low-mass stars. Luminosity functions are normalized to the total number of stars.



We split clusters into three age groups with respect to the benchmark clusters and plot their histograms of absolute magnitudes.
The similarity of luminosity functions in young clusters with the same age indicates a universal formation mechanism within 500pc.

Interactive website

http://research.iac.es/proyecto/gaiaclusters



COMING SOON

We present cluster members in interactive plots including colour-magnitude diagrams and 3D distributions.
Plots are linked to Aladin.

Contact
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On the job market

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