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Taking the census of star clusters in the Milky Way (poster pitch)

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With the advent of Gaia and its all-sky accurate astrometry and photometry for almost two billion sources, a broad interest in open clusters (OCs) has resurged, having become the subject of active research.

While in pre-Gaia times, there were two main reference catalogues of open clusters (Dias et al. 2002, and Kharchenko et al. 2013), the wealth of Gaia data together with recent developments in machine learning techniques, availability of open source software, compute power, and a new generation of researchers trained in these methods has brought an explosion of reported OC discoveries. These reported discoveries are usually published in catalogues, in which the cross-identification with previously known OCs is done with various degrees of rigour, leading to “discoveries” of clusters that were in fact known and other situations illustrated in this contribution.

Indeed, it is a delicate task to cross-identify OCs, which are often sparse and discrete stellar groups with irregular shapes, different sizes, and without clear boundaries. The universally employed method of relying on a reported cluster centre and (highly uncertain) radius for cross-identification is clearly not producing high-quality compilations of OCs. Moreover, nowadays when hardly a month passes without the publication of a new catalogue of reported discoveries, it has become extremely hard to veto and integrate new discoveries into a carefully curated compilation of all known OCs.

To address the issues above, we present a framework being developed for cross-identifying OCs and for building a master list of the known OCs and candidates. Noting that OCs are defined by their members, we develop member-based approaches for cross-identification instead of employing cluster coordinates and radii-based matches. To support the storage and analysis of the growing number of catalogues, we have built a system of two databases. The first is a data warehouse with the original tables of clusters and/or members from the literature (most of which are automatically retrieved from the CDS), and whose formats, fields and other descriptors are quite heterogeneous. The other one is our primary analysis database where cluster identifiers, parameters and stellar memberships are stored in a structured and homogeneous way, allowing an easy integration and analysis of new catalogues as they arrive. In addition to the generated master list, statistical reports are generated which can be used for tuning the matching criteria. Finally, the framework supports optional filters for validating/checking the reality of catalogued OCs.

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