Mapping the cognitive structure of astrophysics combining different levels of organization: a citation and journal based approach

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By clustering the direct citation network of the Astro Data Set (publications in 59 astrophysical journals between 2003-2010) with the infomap algorithm we obtain 22 clusters of documents that we interpret as 'topics' in the field of astrophysics. Upon investigation of those document clusters we find that we can group topics by shared features of a ranked list of the most characteristic journals within each document cluster. This journal based grouping of topics seems to correspond to sub-disciplines within the field. We generate a cognitive map of the field using a topic affinity network that shows what topics are disproportionally well connected (by citations) to other topics and then overlay the journal based grouping of topics. The resulting map highlights a high-level organization of the field by sub-discipline and observational distance of the research object from Earth.