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### **A Knowledge Framework for Smart Discovery of Planetary Defense Resources**

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### **ABSTRACT**

Near Earth Objects (NEO) pose a low probability – high consequence threat to Earth's biosphere. As such, an effective planetary defense against potentially

hazardous objects must be an international effort. Currently, there are a plethora of NEO-related resources available world-wide, both from interested organizations and internationally-renowned planetary scientists. This is the good news. The problem stems from the resulting big data and a distinct lack of a coherent and quality information system to be used for efficient NEO mitigation.

In this research effort, a planetary defense knowledge discovery engine is proposed to better assist the development and integration of a NEO responding system. Specifically, we have implemented an organized information framework with: 1) the development of a semantic knowledge base, which provides a structure for relevant information. It has been developed by the implementation of domain-specific web crawling and natural language processing techniques, which allows us to collect and store the most relevant structured information on a regular basis; 2) the development of a knowledge discovery engine, which allows for the efficient retrieval of information from the knowledge base through improve search ranking, recommendation, and semantic reasoning. The knowledge discovery engine has been built on the top of Elasticsearch, an open source full-text search engine, as well as cutting-edge machine learning ranking and recommendation algorithms.

This proposed framework is expected to benefit the Planetary Defense community by providing discovery and easy access to the knowledge and expert opinion within the international community, and maximizing the linkage between different organizations, scientists, engineers, decision makers, and citizens.