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Astro-COLIBRI: A Comprehensive Platform for Real-Time Multi-Messenger Astrophysics

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The detection of transient phenomena such as Gamma-Ray Bursts (GRBs), Fast Radio Bursts (FRBs), stellar flares, novae, and supernovae—alongside novel cosmic messengers like high-energy neutrinos and gravitational waves—has transformed astrophysics in recent years. Maximizing the discovery potential of multimessenger and multi-wavelength follow-up observations, as well as serendipitous detections, requires a tool that rapidly compiles and contextualizes relevant information for each new event. We present Astro-COLIBRI, an advanced platform designed to meet this challenge.

Astro-COLIBRI integrates a public RESTful API, real-time databases, a cloud-based alert system, and userfriendly clients (a website and mobile apps for iOS and Android). It processes astronomical alerts from multiple streams in real time, filtering them based on user-defined criteria and placing them in their multi-wavelength and multi-messenger context. The platform offers intuitive data visualization, a quick summary of relevant event properties, and an assessment of observing conditions at numerous observatories worldwide.

In this contribution, we will highlight the key features of Astro-COLIBRI, describe its architecture and data resources, and showcase real-world applications. As examples we will illustrate its role in the search for highenergy gamma-ray counterparts to high-energy neutrinos, GRBs, and gravitational waves, demonstrating its impact on time-domain astrophysics.

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