2° Forum della Ricerca Sperimentale e Tecnologica

SKAVA: SKA Visual Analytics

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ABSTRACT

The SKA Visual Analytics (**SKAVA**) project aims to develop an **integrated framework** for enabling **efficient discovery and access** to SKA data, offering **advanced visual analytics** features.

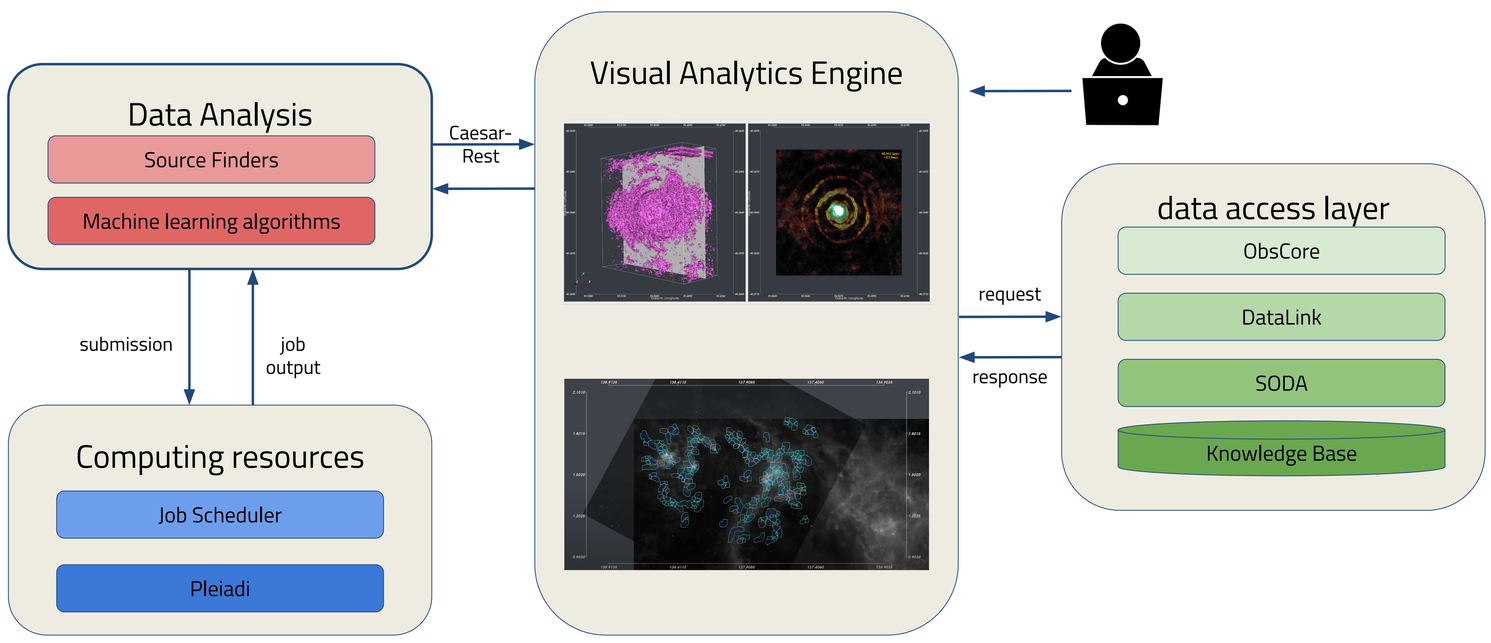
The SKAVA framework will support astronomers in **extracting** valuable scientific **information** from the SKA **Big Data** distributed across the different sites of the SKA Regional Centers (SRC), minimizing latency in accessing them. Additionally, it will **integrate** cutting-edge **algorithms** and **visualization** techniques, including modern d**eep learning models**, to enable effective **exploration**, **analysis**, and interactive **visualization** of complex datasets.

By enhancing the accessibility and usability of large-scale astronomical data, SKAVA will streamline the research process, helping scientists to uncover hidden patterns and correlations within the data.

ARCHITECTURE

SKAVA integrates **high-performance computing**, **machine learning** and data **visualization** to tackle the challenges of Big Data in radio astronomy. Use cases collected from astronomers guide SKAVA's development, ensuring practical tools for SKA research. The architecture integrates key components, as shown in the block diagram:

- **Data Access Layer**: Provides streamlined access to distributed SKA datasets, ensuring **efficient retrieval** and handling of vast amounts of data.
- **Visual Analytics Engine:** Supports **dynamic**, real-time exploration and **visualization** of multi-dimensional data, enabling astronomers to interactively analyze complex datasets.
- **Machine Learning Models**: Automates the **extraction** of features and patterns from observational data, facilitating faster and more accurate insights.



CONCLUSION

SKAVA is poised to enhance how astronomers work with SKA data, providing **advanced tools to visualize, analyze, and interpret Big Data** more effectively. Through the integration of modern algorithms and visualization techniques, SKAVA offers a powerful and **scalable framework** for exploring astronomical datasets. Continuous improvements, guided by use cases, ensure the framework remains practical and adaptable to the needs of the scientific community, supporting deeper insights and discoveries in radio astronomy.

VISUAL ANALYTICS ENGINE

The core of the **SKAVA Visual Analytics Engine** is based on the **VisIVO Framework** (Visualization Interface for the Virtual Observatory), a sophisticated toolset designed for multi-dimensional data analysis. Developed and maintained by the Astrophysical Observatory of Catania, VisIVO offers an advanced visual analytic environment that allows astronomers to explore and interpret vast, complex datasets with ease.

VisIVO provides:

- **Multi-Dimensional Analysis**: The ability to visualize and correlate multiple types of data, such as 2D intensity images and 3D molecular spectral cubes, enabling a deeper understanding of the underlying physical processes.
- **Interactive Exploration**: Dynamic interaction with data, allowing users to zoom, rotate, and manipulate visualizations in real time, enhancing the discovery of patterns and relationships.
- **Scalability**: Efficient handling of large-scale datasets, making it well-suited for the extensive data generated by the SKA.

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