# Project Overview

- **VIRTUOSO:** **Virtual Reality Tools for Understanding Scientific Observations**

- **Duration:** **12 months**

- **Partners:** **SCIRE, UNICUSANO**

- **Location:** **ROMA**

The project focuses on immersive and interactive big data visualization, aiming to develope **advanced virtual reality tools** to enhance the understanding of **scientific observations**, particularly in astrophysics and geophysics.

# Project Overview

**Advanced visualization systems** for big data coming from scientific research, in particular in the astrophysics and geophysics fields, with the development of an advanced **Virtual Reality laboratory** for remote and immersive rendering

**Analysis of the needs of researchers** in the specific research field for the processing of input data and the return of outputs

Set up of the **advanced visualization and immersive interaction applications** to encourage current research and the birth of new insights and descriptive models, the **experimental development of hardware and software tools**.

**Collaboration** with national and international research bodies

# Current Trends in Visualization

## Interactive 3D visualization

Interactive 3D visualization allows researchers to explore complex scientific data in virtual environments, providing intuitive insights into multidimensional datasets.

## Integration of multi-source data

Visualization tools are increasingly capable of integrating data from multiple sources, enabling researchers to analyze observational, theoretical, and simulated data together.

## Remote collaboration capabilities

Virtual reality platforms are developing advanced features for remote collaboration, allowing researchers to work together in real-time on shared datasets, regardless of location.

## AI-driven analysis

Artificial intelligence and machine learning are being integrated into visualization systems to assist researchers in identifying patterns and suggesting analytical approaches.

# Technical Objectives, Methodologies and Solutions

### Analysis of researchers' needs

The project will begin with a thorough analysis of the needs of researchers in astrophysics and geophysics, ensuring the tools developed meet their specific requirements.

### Setup of advanced visualization and immersive interaction laboratory

A state-of-the-art laboratory will be established to support the development and testing of immersive visualization tools, providing a collaborative environment for researchers.

### Development of experimental hardware and software tools

The project will involve the development of experimental hardware and software tools, designed to enhance the visualization and analysis of scientific data.

# Technical Objectives, Methodologies and Solutions

## Experiment design and validation

Experiments will be designed and validated to test the effectiveness of the visualization tools, ensuring they meet the highest scientific standards.

## Requirements analysis

The project will employ rigorous requirements analysis to ensure the tools developed are aligned with the needs of the scientific community.

## Peer review and reproducibility

The project will emphasize peer review and reproducibility, ensuring that the tools and methodologies developed can be widely adopted and validated by the scientific community.

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Centro Nazionale di Ricerca in HPC,
Big Data and Quantum Computing

# Technical Objectives, Methodologies and  Solutions

## Enhance understanding of astrophysical and geophysical phenomena

The project aims to enhance the understanding of complex astrophysical and geophysical phenomena through advanced visualization tools.

## Provide interactive environments for data exploration

Researchers will have access to interactive virtual environments that facilitate the exploration and analysis of complex scientific data.

## Foster new scientific insights and descriptive models

The project will foster new scientific insights and the development of descriptive models, advancing knowledge in astrophysics and geophysics.

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# Technical Objectives, Methodologies and Solutions

## VIRTUOSO LABORATORY

- HW:
- High performance graphics and computing system to manage VR/AR simulations, VR Viewer, Tracking system, stereo monitor

- SW:
- Open Source: Unreal engine, Unity,
- Commercial SW: STAR-CCM+, Ansys Fluent

# Involved Staff and new recruitments

- **Full Professors**

- **Associate Professors**

- **Researchers**

- **Ph.D**

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# Timescale, Milestones, SAL

| | | DURATION | |
|---|---|---|---|
| | | **Start month** | **End month** |
| **Activity A - SCENARIO ANALYSIS** | | | |
| Task A.1 – Study of the state of the art | | 1 | 3 |
| Task A.2 – Needs analysis | | | |
| | | | |
| **Activity B - LABORATORY SET UP** | | | |
| Task B.1 – Configuration | | 4 | 6 |
| Task B.2 – HW Acquisition | | | |
| | | | |
| **Activity C - EXPERIMENTAL DEVELOPMENT** | | | |
| Task C.1 – Data import | | 7 | 9 |
| Task C.2 – Application development | | | |
| | | | |
| **Activity D - PUBLICATION OF RESULTS** | | | |
| Publications on international journals | | 10 | 12 |
| Participation to seminars and conferences | | | |
| | | | |

# Contacts

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## THANK YOU FOR ATTENTION

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