



Elettra Sincrotrone Trieste

Trieste, October 17, 2024

Elettra Sincrotrone Trieste Launches Advanced Digital Assistant: Artificial Intelligence in Support of Research

Elettra Sincrotrone Trieste has announced the launch of ElettraBot, an innovative digital assistant based on artificial intelligence, designed to support researchers using the beamlines and laboratories of Elettra and FERMI. The first prototype has been successfully implemented for the TwinMic beamline, named TwinBot.

This beamline, one of the 28 beamlines at the Italian synchrotron located in Trieste, specializes in X-ray microscopy, offering sub-micrometric spatial resolution. Thanks to its ability to combine transmission imaging and X-ray spectroscopy, TwinMic enables multidisciplinary studies ranging from biology to materials science. Its main applications include studying nanoparticle accumulation in cells and understanding chemical mechanisms related to asbestos in human tissues.

TwinBot represents a significant innovation in basic research, providing immediate and intuitive access to the technical and experimental information offered by the TwinMic beamline. Leveraging

artificial intelligence, TwinBot provides real-time responses to inquiries made in natural language, facilitating the preparation of proposals and experiments. TwinBot provides quick and accurate answers, significantly enhancing their operational efficiency, therefore researchers no longer need to spend long hours manually searching through technical documents.

This tool has the potential to be extended to other beamlines and services at Elettra, further strengthening the scientific ecosystem of the institution. No other synchrotron has yet adopted similar technology for these purposes, making TwinBot a unique innovation. The project not only positions Elettra at the forefront of integrating artificial intelligence into scientific infrastructures but also establishes new standards for supporting basic research.

Artificial intelligence is not limited to automating repetitive tasks, it goes far beyond that: it analyzes large volumes of data, identifies complex patterns, and can contribute to generating new insights that lead to innovative hypotheses, often based on extensive datasets or complex models that are difficult to analyze manually. This radically changes research methods, allowing scientists to focus more on creative and analytical aspects. Thus, artificial intelligence is rapidly becoming an essential element of modern scientific research, with applications that extend well beyond automation.

The recent 2024 Nobel Prizes in Physics and Chemistry highlight how AI plays a fundamental role in analyzing complex data and discovering new knowledge. The capability of AI to identify hidden patterns and accelerate experimental processes is particularly evident in cutting-edge laboratories like Elettra Synchrotron.



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Here, innovative technologies such as TwinBot demonstrate how AI can optimize the management of information relevant to experimental work, improving the efficiency and precision of research efforts. In the fields of chemistry and physics, AI enables scientists to concentrate on the more creative and analytical aspects of research, freeing them from repetitive tasks and increasing their capacity to explore new frontiers of knowledge. TwinBot illustrates how AI can become a catalyst for innovation, assisting researchers in tackling issues that were previously inaccessible.

With this innovative project in the sector, Elettra takes an interesting step forward in the evolution of technologies applied to science. ElettraBot with TwinBot represents a new frontier in the use of AI in support of research, merging efficiency and innovation to provide researchers with tools that facilitate scientific progress.

- [1] <https://www.nobelprize.org/prizes/physics/2024/press-release/>
[2] <https://www.nobelprize.org/prizes/chemistry/2024/press-release/>



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L. 19 ottobre 1999 n. 370

