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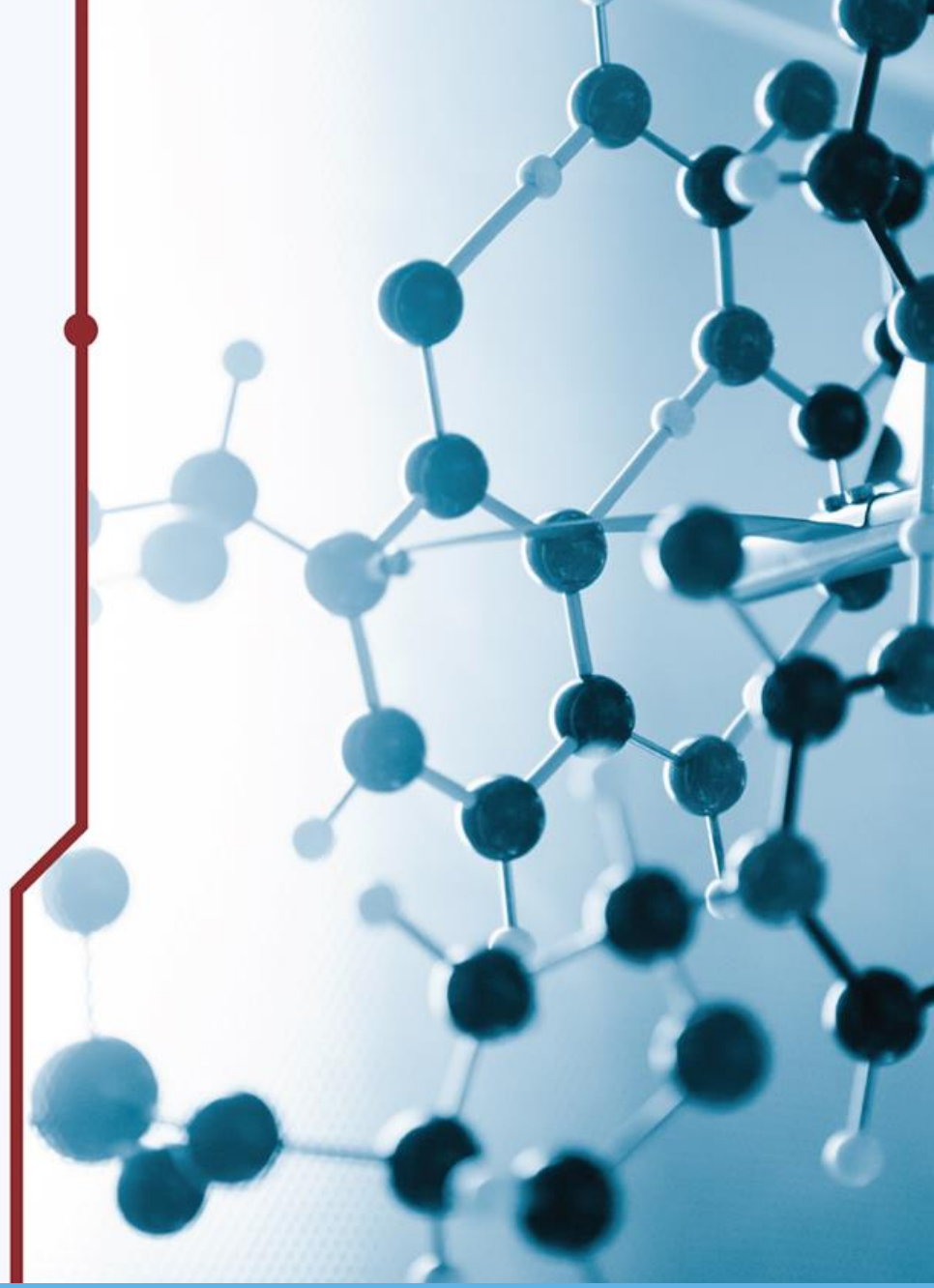
REsearch INfrastructures FOR Citizens in Europe

WP 7
Access to astronomical/scientific performance: an opportunity for multiple learning



WEBINAR

October 16, 2020, 15:00 CEST

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Astronomy (and Sciences in general) as a professional field, only benefits those that can cope with the performance styles currently available.

Anyone may develop a disability and currently this population has no way to perform a real contribution to the Science.

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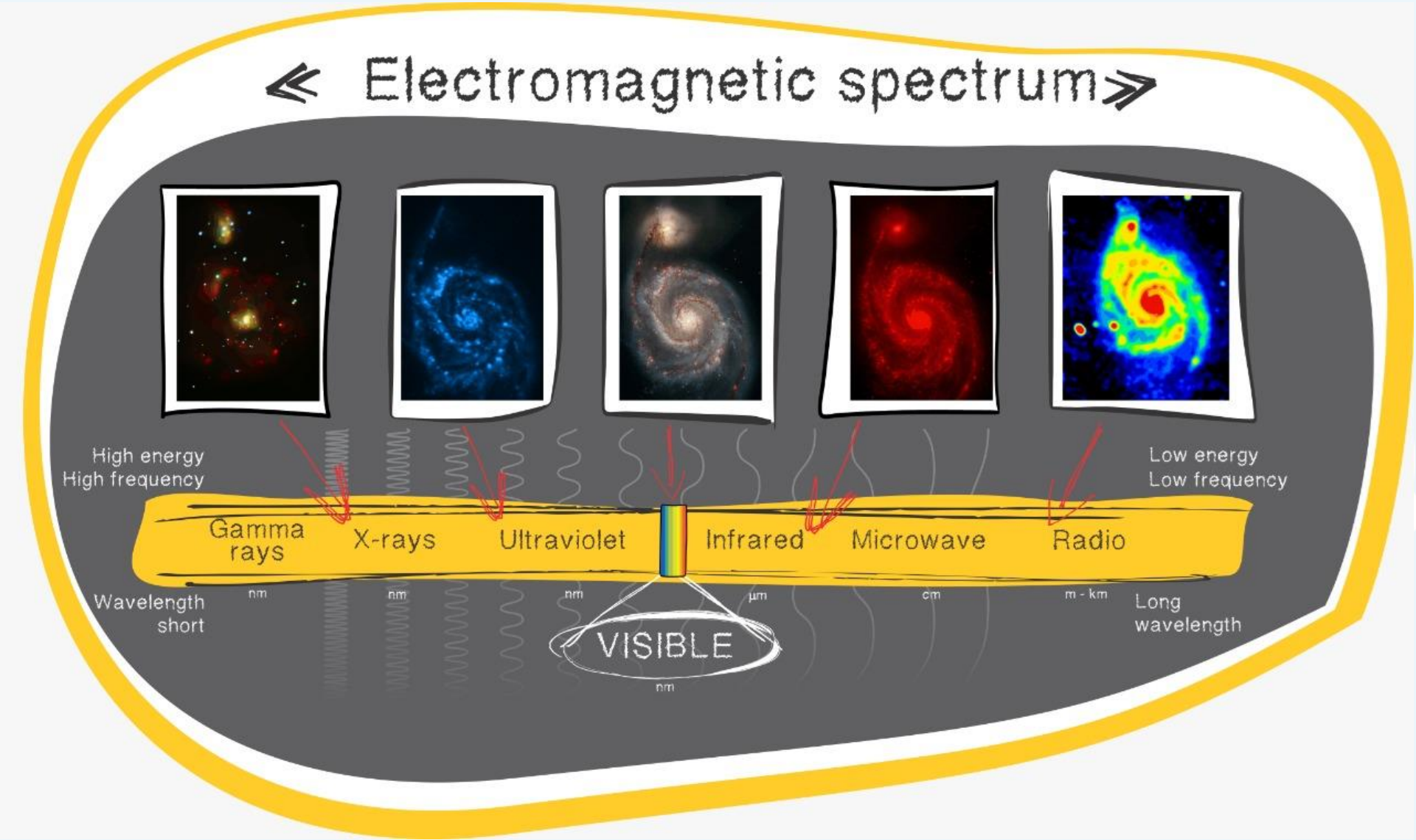
Almost all that we know about the Universe is not in the visible region

The Astrophysics multi-wavelength and multimessenger opened a new window to the Cosmos



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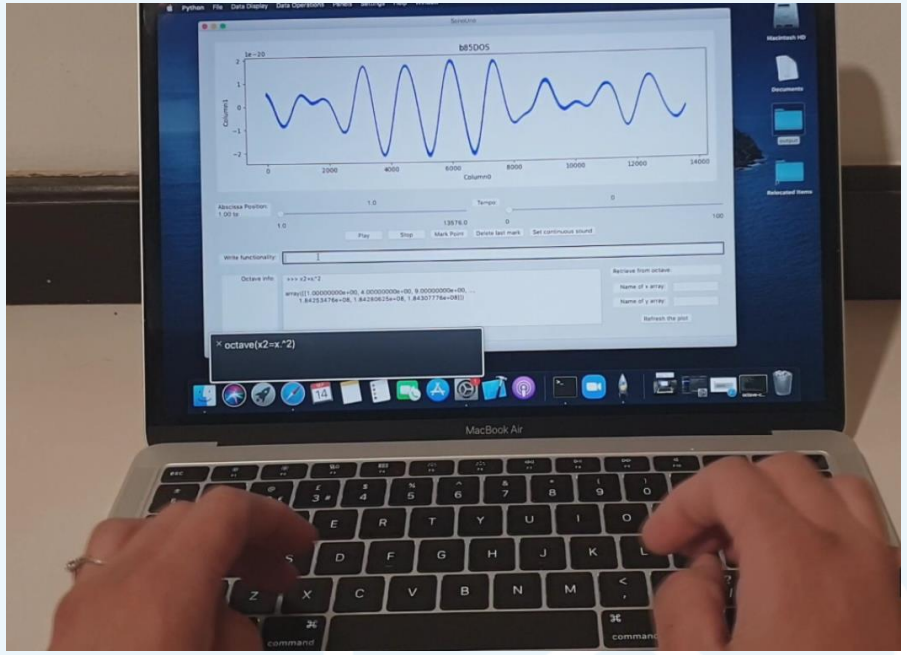
Participation in the regular stream of performance has to be taken into account from the beginning in the development agenda (https://www.un.org/)

Big Data drives all inclusive aspects of social and human development.

Regardless, it appears that international efforts have been limited entirely to developing packages that address big data visualization.



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A preliminary study showed that some of the programs available to sonify large data sets and symmetrically display the graph are not accessible according to ISO 9241-171: 2008.
(Guidance on software accessibility)

We present a User Centred approach to develop data analysis and data retrieval tools that will permit people with other sensory styles to explore scientific data and make science
(Based on theoretical frameworks established from attention mechanism and coping strategies of people with visual disabilities and focus group analysis)

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Jesse Leaman


Wanda Díaz-Merced


Aszia Baicouchi


Jeffrey Cooke

Garry Foran

Gonzalo de la Vega


Johanna Casado

This proposal integrates multidisciplinary and interdisciplinary astronomers, engineers, software designers, educators, disability specialists, neurologist, sociologists, both able and disabled.

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Considerations for the new design:

1. Accessibility to scientific data, from the Earth or with instruments on board satellites (available in databases).

2. Creation of a human-computer interface suitable for the access, collection, sonification and analysis of astrophysical data.

3. Test the efficiency, usefulness and effectiveness of the resource in different cultural settings.

4. Develop the paradigm for training researchers and interested citizen scientists to start using new techniques.

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sonoUno main characteristics

- Use of sound as a complement to visualization.
- A user-centered design from the start allows to combine accessible features with the necessary scientific efficiency.
- Completely open source and cross-platform.
- Aims to eliminate the barriers presented by current technologies for people with sensory and motor disabilities.
- Allows to improve the work with different styles of data exploration by leading scientists.

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INPUT	SonoUno DISPLAY	OUTPUT
• Two column file (csv or txt) • Sound (in consideration) • H5 data • FITS	• Visual plot • Sound of the plot • Marks on the data • Grid with the data • All functionalities	• Sound • Plot • Plotted data • Marked points

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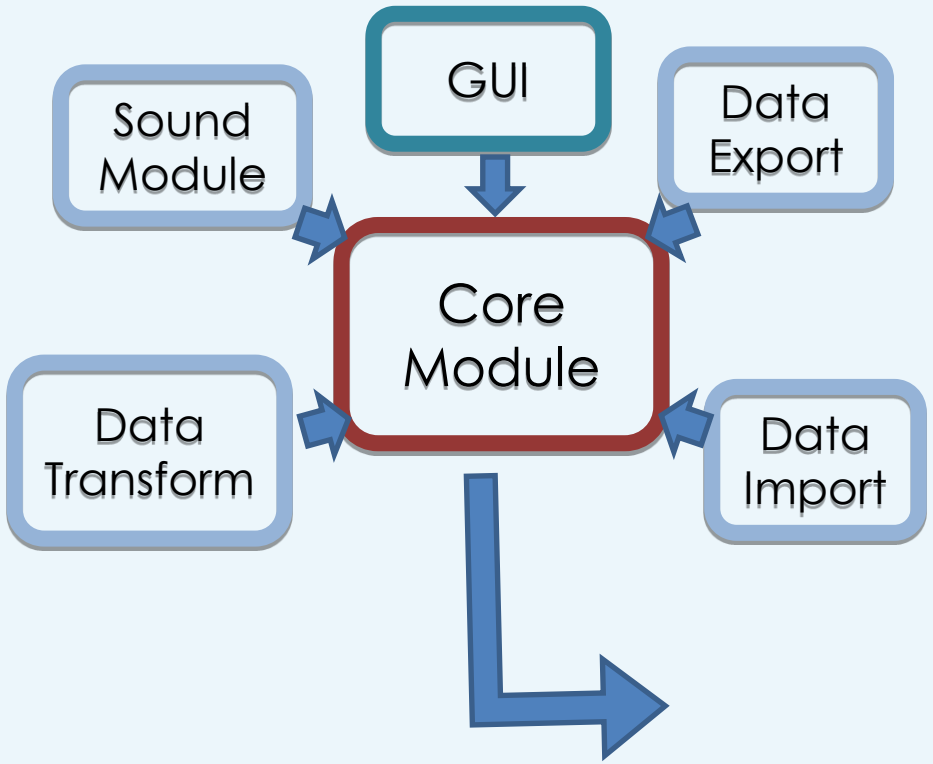
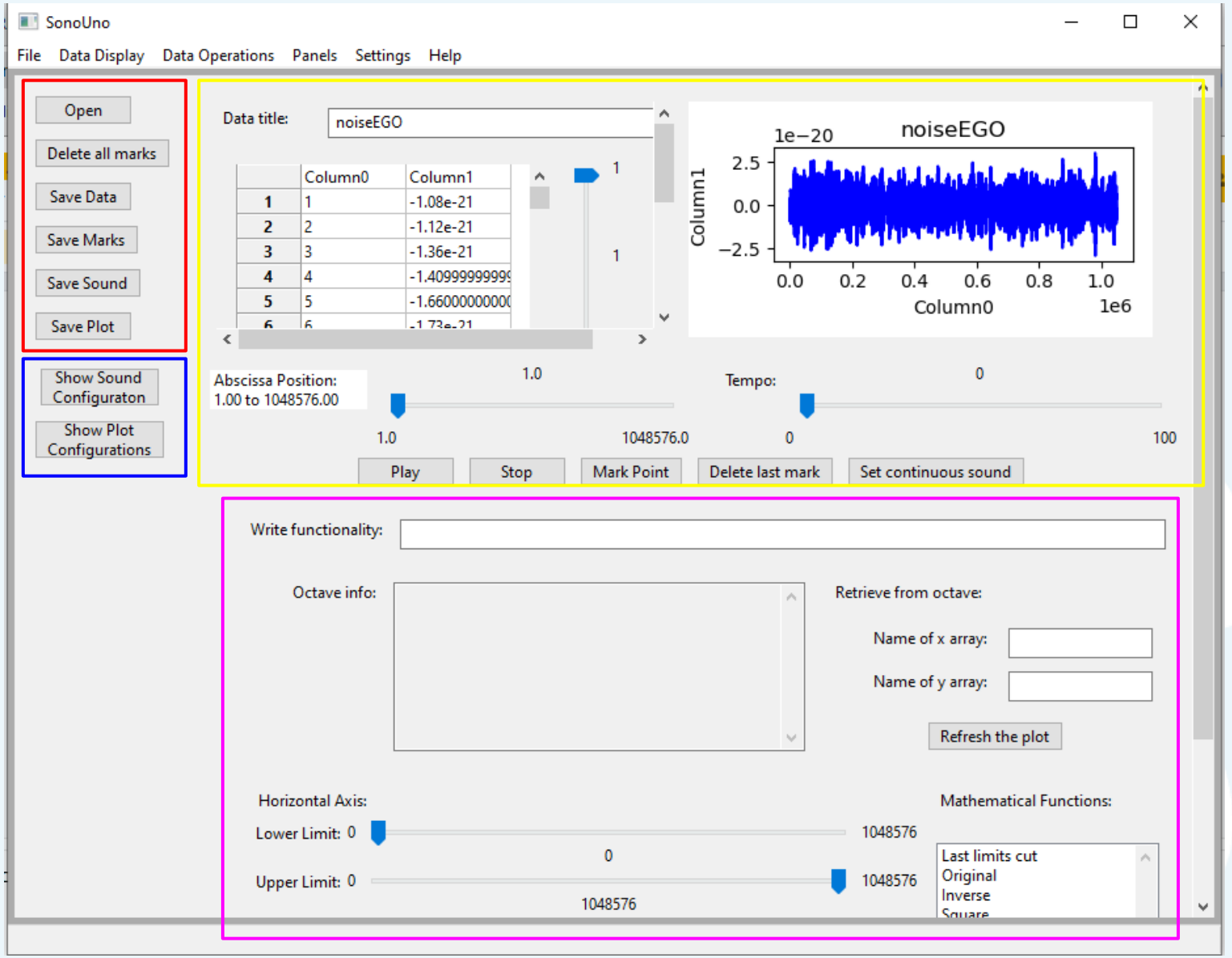
Modular design





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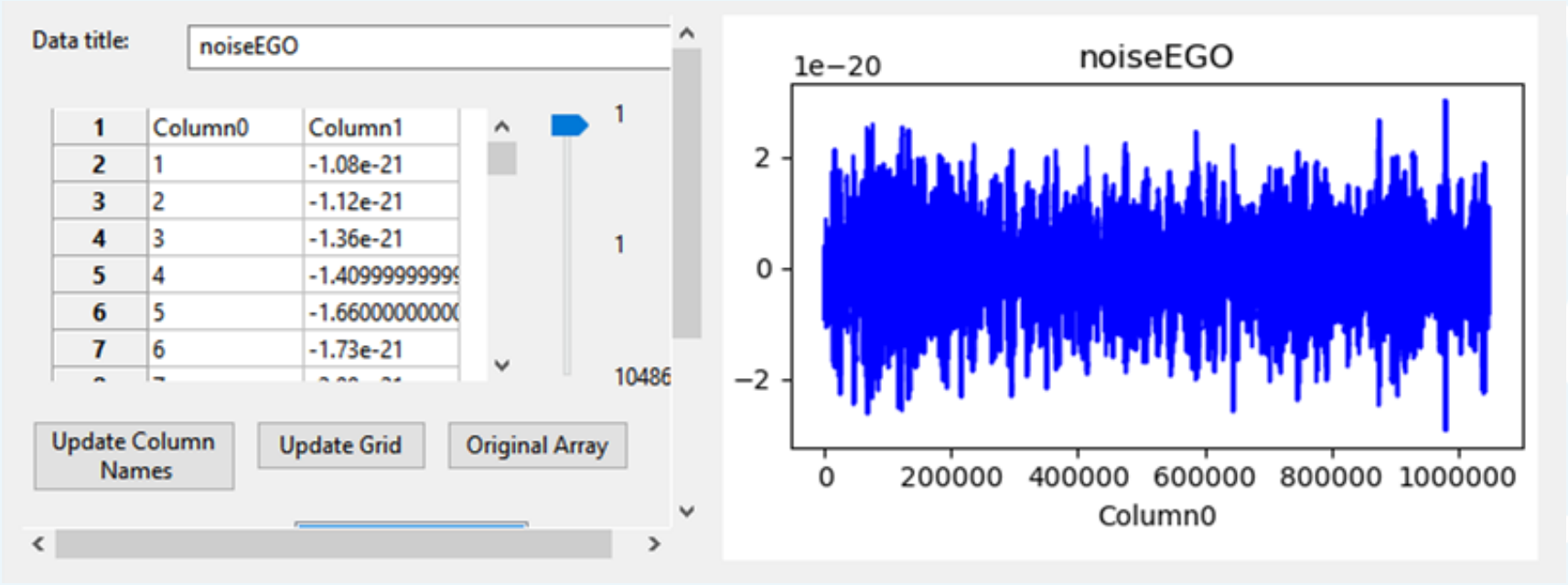
SonoUno allows for the input of large datasets

Input of data with a million of rows has been tested.



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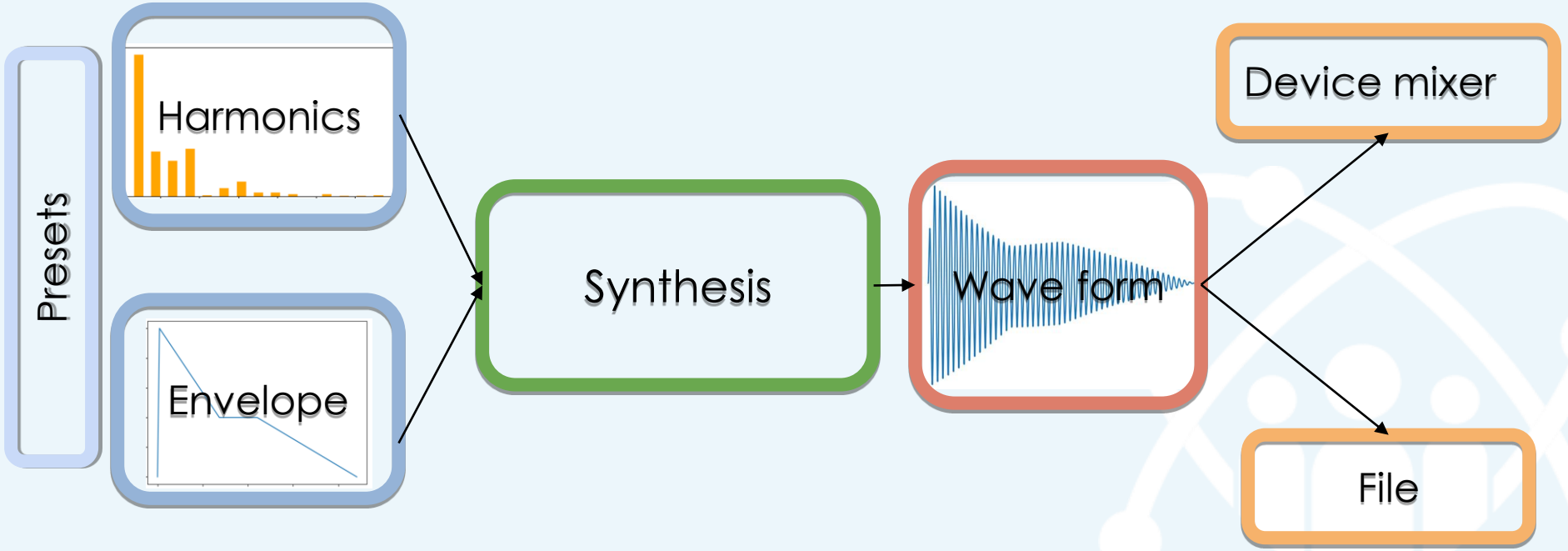
SonoUno sound synthesis module

Wave synthesis allows for arbitrary frequencies and timing, and also altering the sound at will.



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The exchanges with the users determined the engineering of the algorithm leading to a modular design and the deployment that the sonoUno has today.

- [...] It was very easy to change the way things sounded, easy to choose something that I like the sound of that works for me. [...]

- [...] the circumstances where you are working with people that have, literally, no vision, it's quite valuable because it's give you access to something that you otherwise wouldn't have access to [...]

- [...] I have more confidence and freedom as well, I felt like I was a lot more able to access the bitly data that I want to do.

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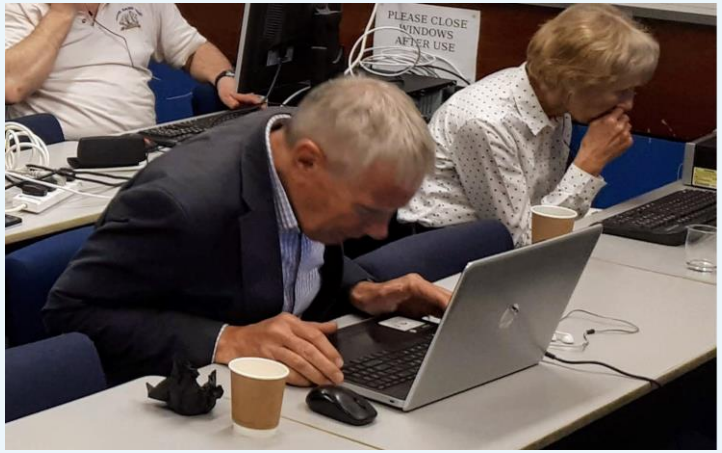
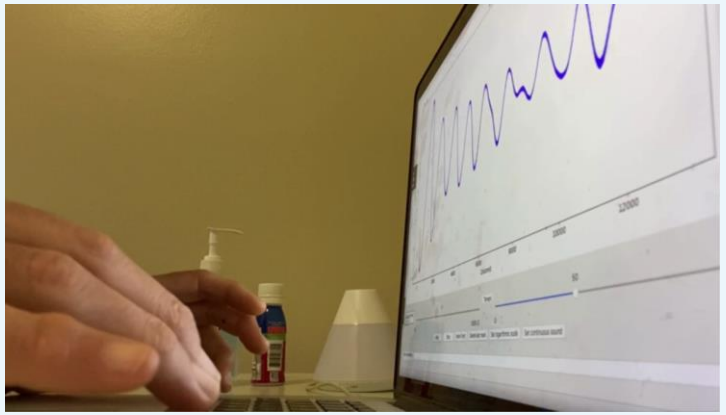
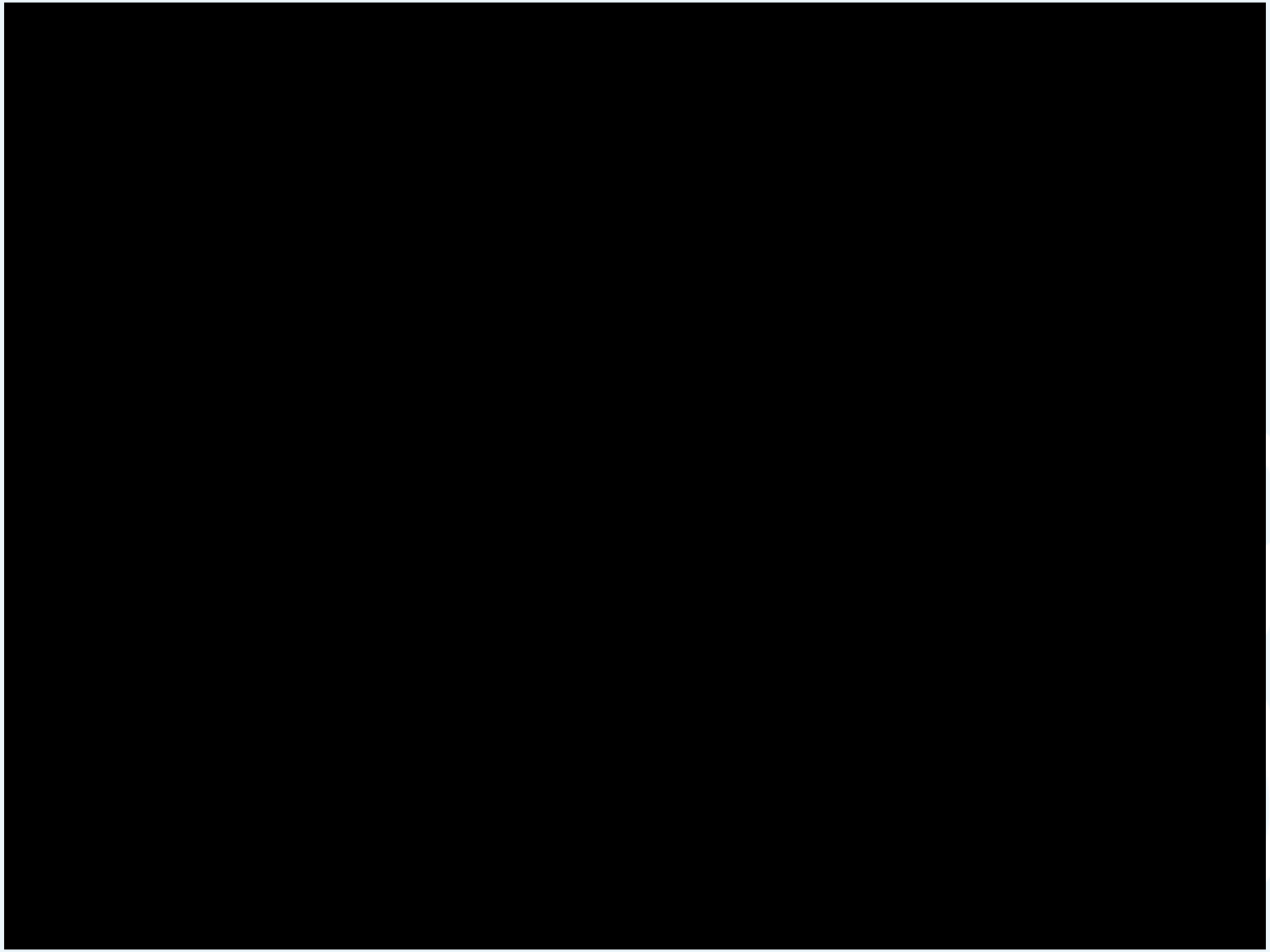
SonoUno in action





https://pypi.org/project/sonoUno/



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The future: adopting the technique

- Force nations to carry out honest assessments, about the gap between what organisations report as achieved and the quality of participation of the disabled.
- Systematise a report format where national science organisations will have to evidence the UCD development of their prototypes and databases.
- Recognise multi-sensorial exploration as valid study of the data.
- Stimulate funding agencies to ensure that the proposals funded include people with disabilities and other diversities.

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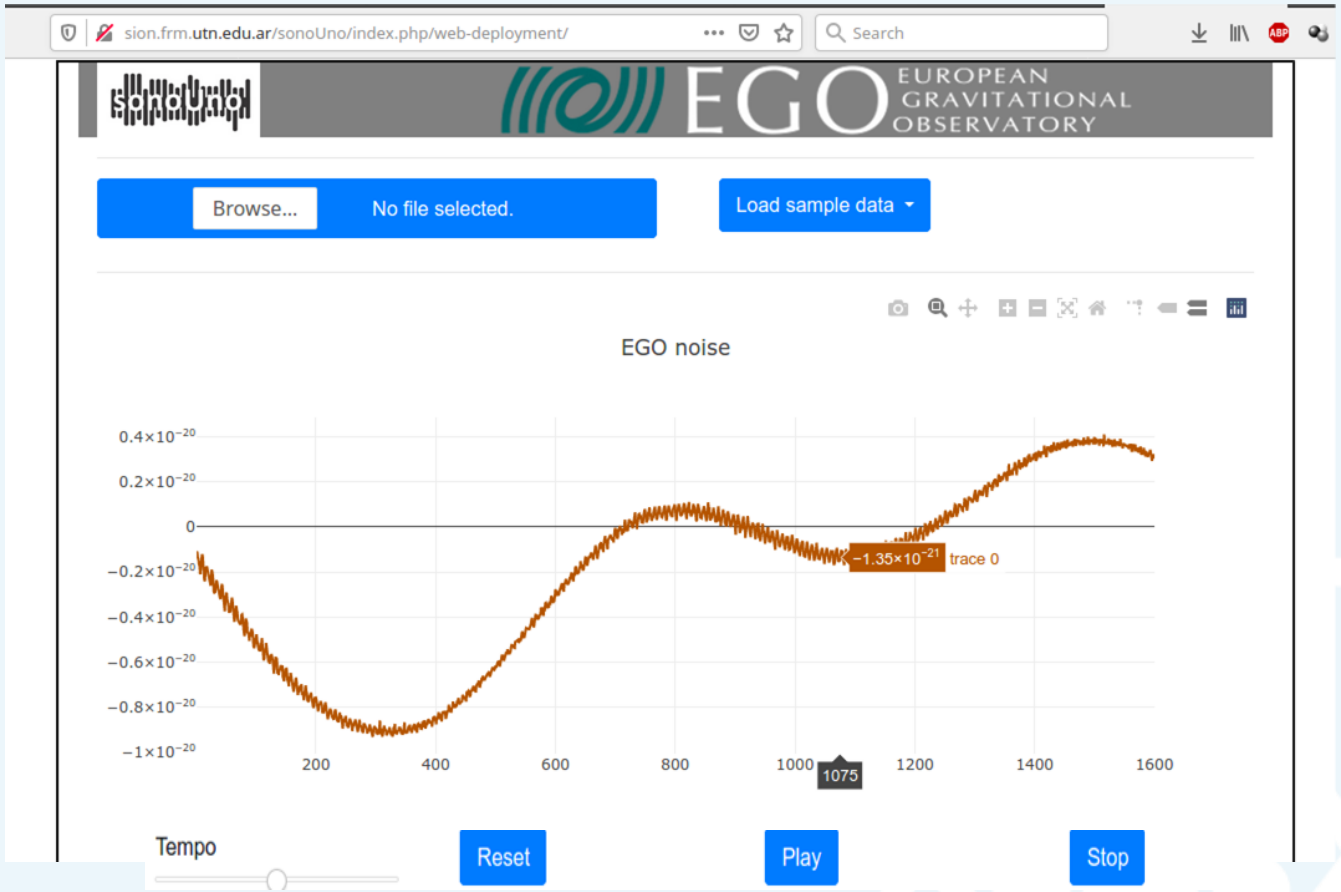
The future: benefits

- Increase the abilities to identify signatures in the information.
- Bring peoples with disabilities to the field.
- Increase the amount of scientific discoveries.



One goal: to enhance the work of the scientists accepting different data exploration styles, more perspectives and experiences.

It is time to Mainstream those that historically have been completely left out of the scientific research field, increasing their enterprising spirit.

This kind of approach will motivate the emergence of a humanistic metric and a model of competition that will generate more inclusiveness.

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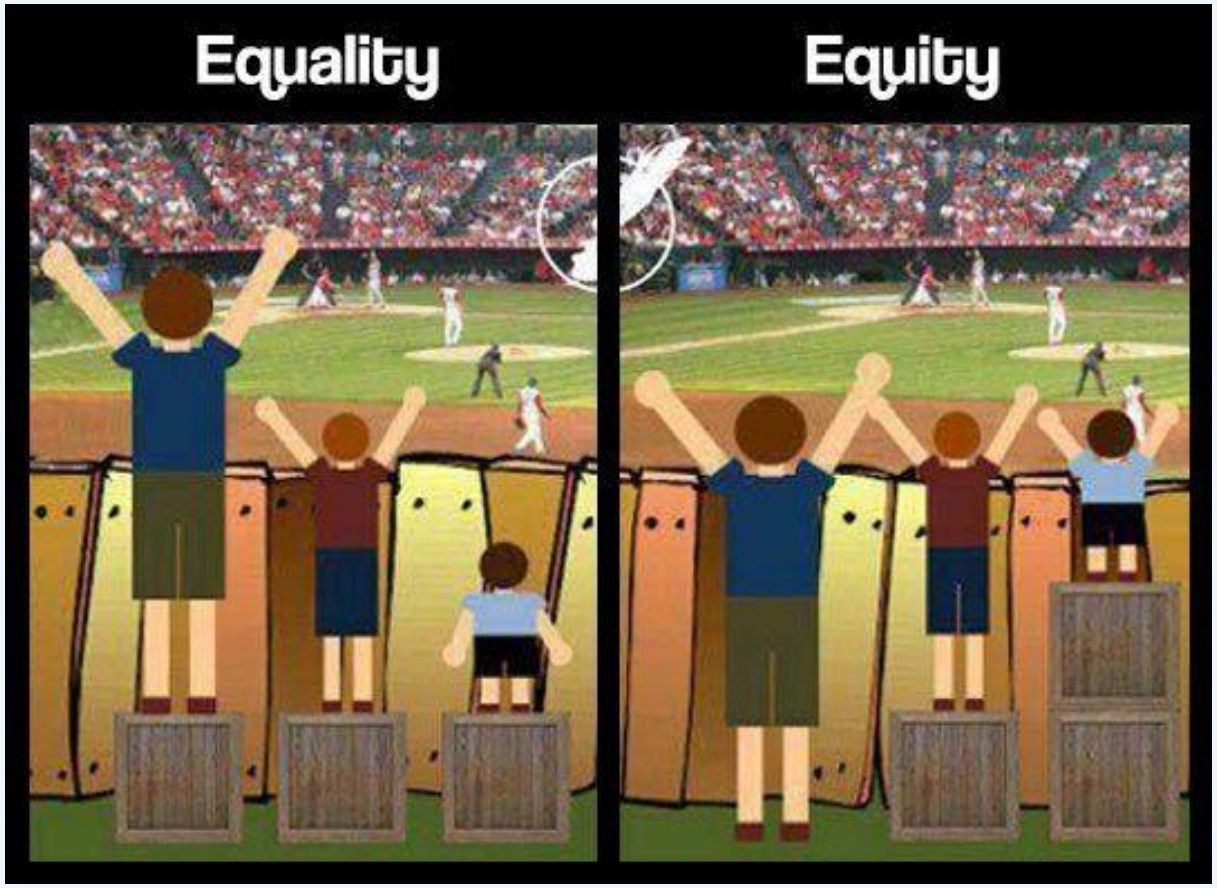
The Human Development Report of 2015 for the UN says:

**"A critical human deprivation is:
not to use, misuse or under-use the deep human potential for human development enhancing work"**



The cause of the inequity was addressed.

The systemic barrier has been removed.

Courtesy Advancing Equity and Inclusion: A guide for municipalities, City for All Women Initiative (CAWI), Ottawa

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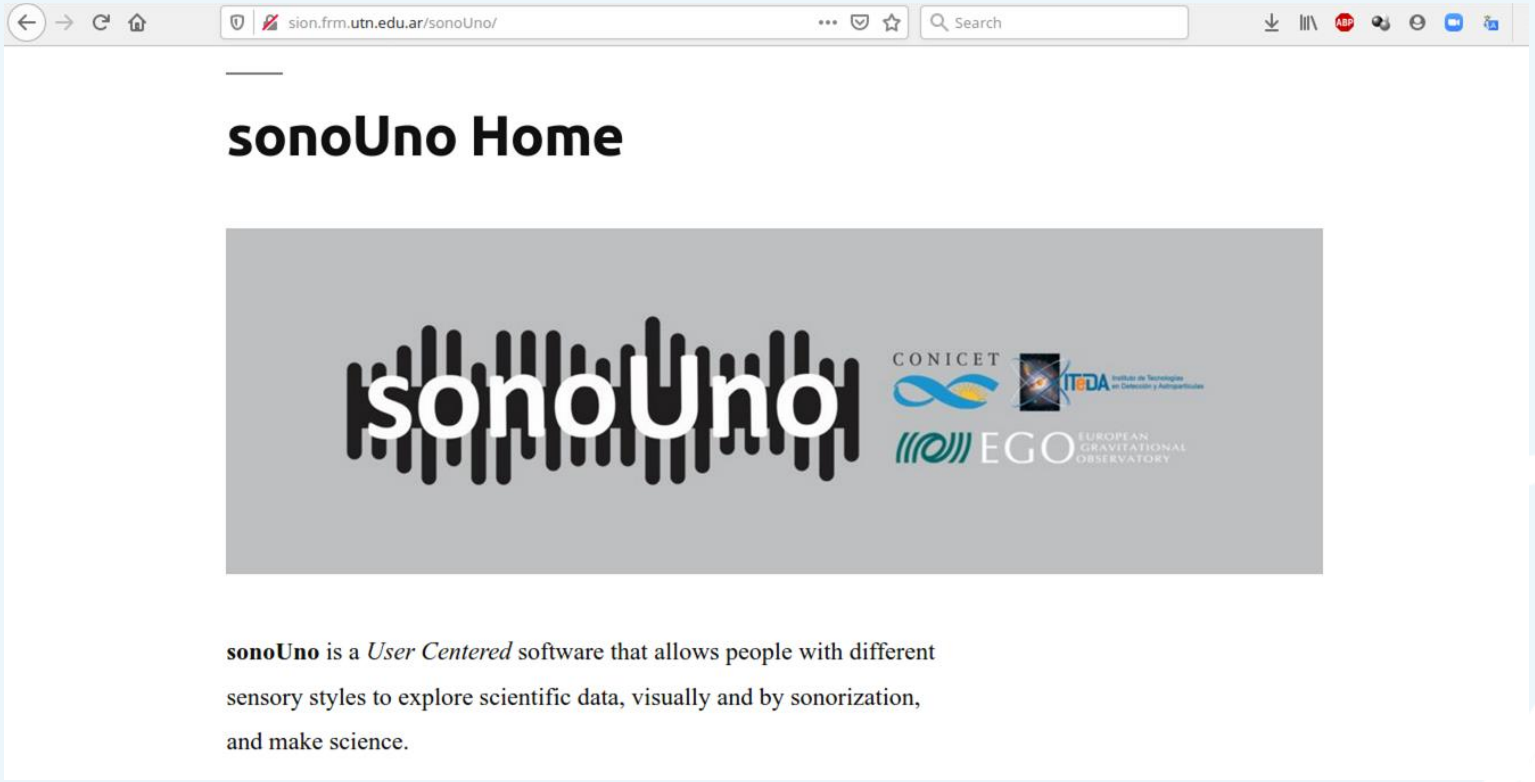

Thank you for your attention