Prisma: una nuova opportunità per la Citizen Science

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What is Citizen Science?

- Working Definition: A form of collaboration where members of the public participate in scientific research to meet real world problems.

- Also defined, albeit less commonly, as:
  - the engagement of nonscientists in true decision-making about policy issues that have technical or scientific components.

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REQUISITI

Una grande mole di dati da analizzare, specie in modo standardizzato o standardizzabile, che richiederebbe risorse o tempi scala non compatibili con gli obiettivi del progetto

La condivisione di dati o di pacchetti di dati tramite la rete Internet

La predisposizione di algoritmi o di software capaci di svolgere il lavoro di analisi dei dati in modalità automatica o di effettuare attività di training nei confronti dei partecipanti al progetto

“Appealing” del progetto di ricerca (o degli enti scientifici coinvolti) nei confronti del grande pubblico

VANTAGGI

Il cittadino si sente coinvolto in prima persona nella ricerca e in diretto contatto con il mondo scientifico e le sue problematiche

Vantaggi didattici

“Alfabetizzazione Scientifica”
Capire “il metodo scientifico”, come vengono realizzati i risultati scientifici

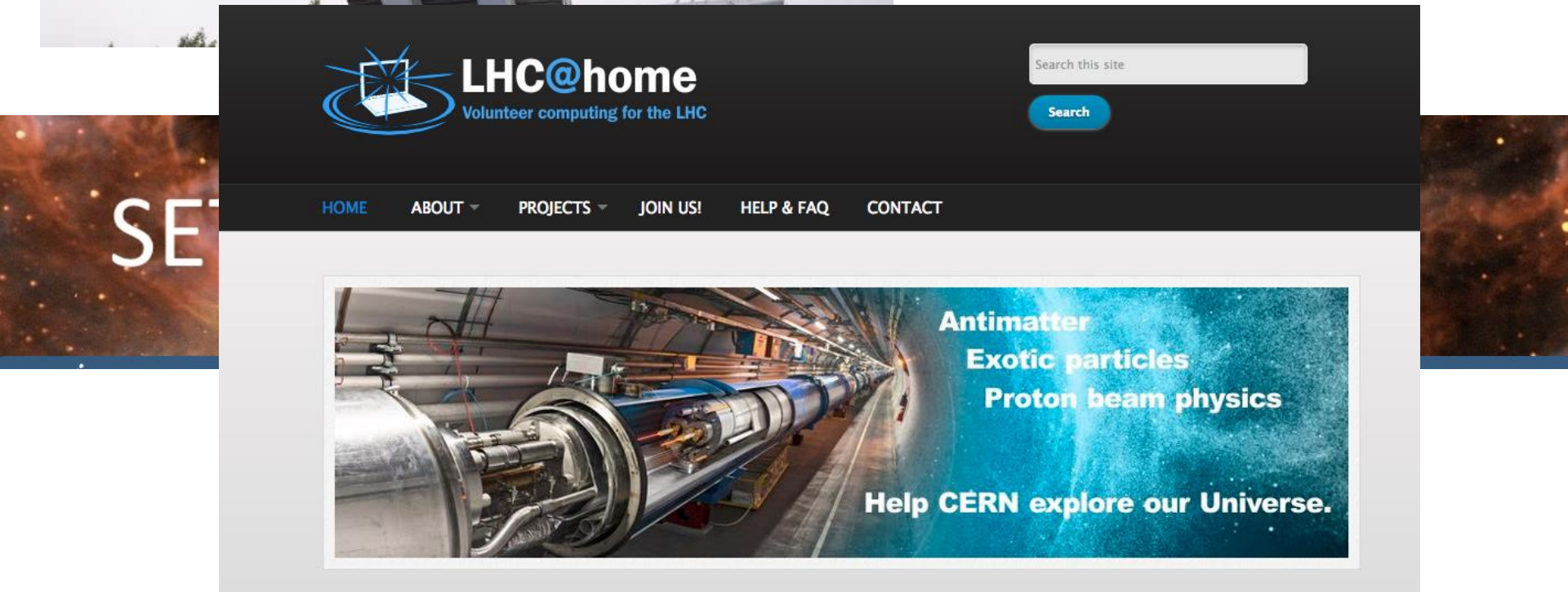
Vantaggi “politici”

Maggiore consapevolezza del valore della Scienza nella società
Miglioramento della visibilità delle organizzazioni verso chi le finanzia

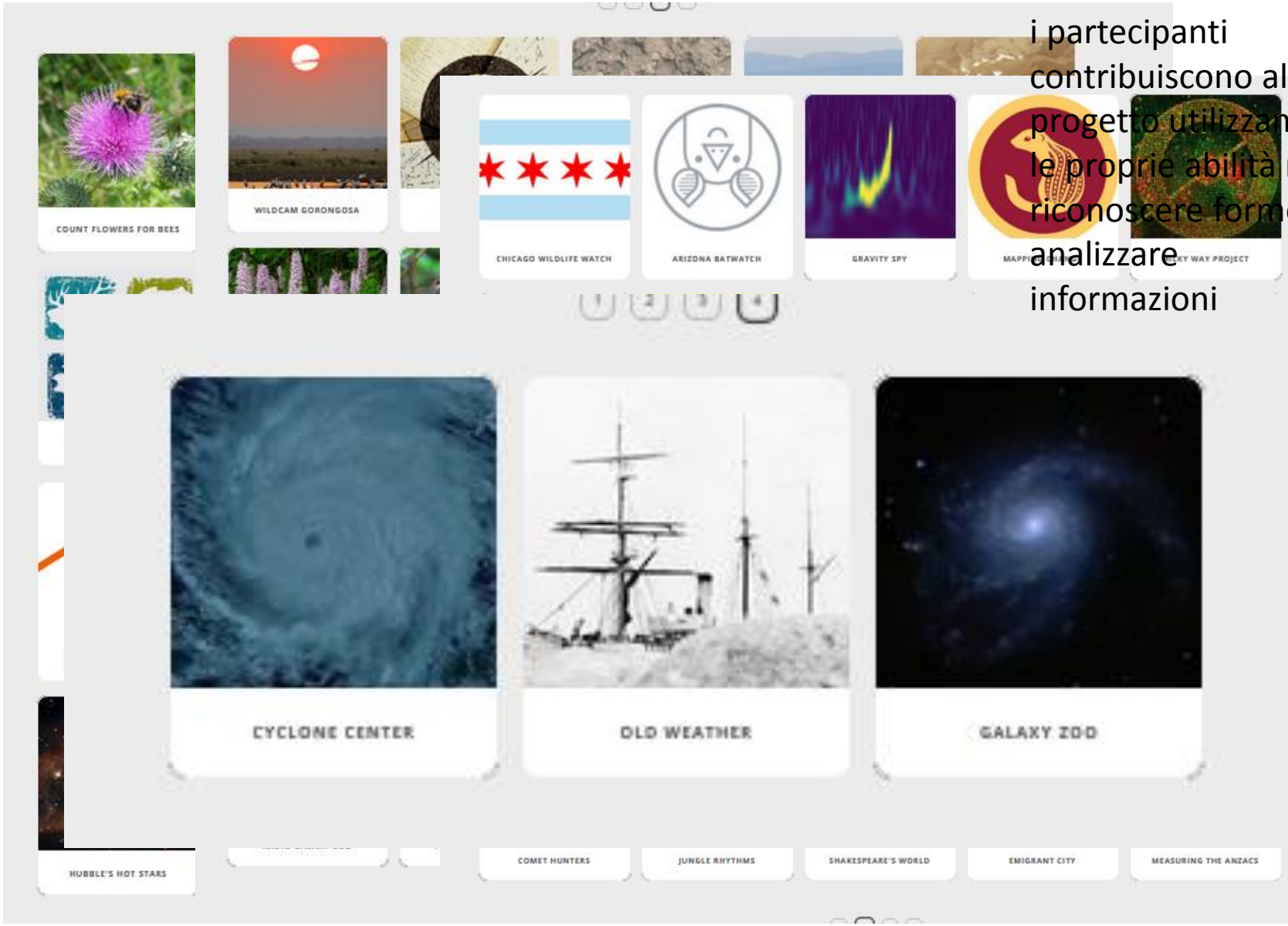
Molti enti ci si sono tuffati!

Citizen Science “passiva”

i partecipanti mettono a disposizione una risorsa (ad esempio il proprio pc, il proprio cellulare o uno spazio del proprio cortile) per effettuare delle rilevazioni in automatico mediante sensori appositi o analisi di dati in background tramite i propri dispositivi



Citizen Science “attiva” (da ZooUniverse)



i partecipanti contribuiscono al progetto utilizzando le proprie abilità nel riconoscere forme o analizzare informazioni

ZOONIVERSE

Experience a privileged glimpse of the distant universe as observed by the SDSS, CTIO and VST.

Classify

GAMA Invert

Examples Restart

Note: Please always classify the galaxy in the centre of the image.

SHAPE

Is the galaxy simply smooth and rounded, or does it have features?

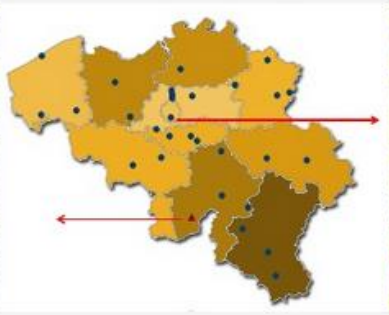

Smooth


Features


Star or artifact

Context

BRAMS (Belgian RAdio Meteor Stations) is a Belgian network of radio receiving stations using forward scattering to detect and characterize meteoroids falling into the Earth's atmosphere.


A dedicated transmitter/beacon (red triangle on the map above) is located in the south of Belgium and emits toward the zenith a pure sine wave at a frequency of 49.97 MHz and with a total power of 150 Watts. The incident radio wave is reflected on the ionized trail left behind the meteoroid when it falls into the atmosphere. About 30 receiving stations (blue dots in the image above) are spread all over Belgium and record radio signals reflected off meteor trails (hereafter called meteor echoes). Pictures of the transmitter and of one receiving antenna (located in Uccle) are visible respectively in the left/right parts of the image above.

Radio observations have two main advantages over optical ones : 1) data can be recorded 24h a day and do not depend on weather conditions, 2) they are sensitive to meteoroids with lower masses that do not produce any visible light but are much more numerous.

Every day a huge amount of data is produced by the BRAMS network with thousands of meteor echoes registered, which requires the use of automatic detection algorithms. BRAMS radio data are usually presented as images (called spectrograms, see definition below) and automatic detection algorithms try to detect specific shapes associated with meteor echoes. However, none of them can perfectly mimic the human eye which stays the best detector.

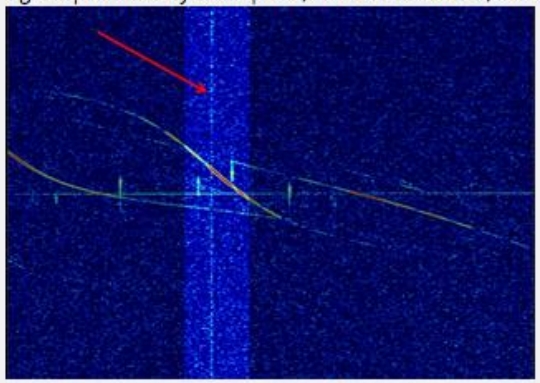
With this Radio Meteor Zoo project we focus on meteor showers, which are mainly due to dust particles released on its orbit by a comet when it approaches the Sun. The Perseids around August 12 are a well-known example of a meteor shower. During a meteor shower, many radio meteor echoes display complex shapes in BRAMS data and automatic detection algorithms struggle to detect them correctly. This is where the Radio Meteor Zoo volunteers come in. You can help us a lot by identifying meteor echoes during meteor showers.

Your meteor detections will be used to provide activity curves (number of meteors per time period, moment of peak activity , ...), to estimate the mass index of the meteor shower (which is a measure of how particle masses are distributed: a high mass index indicaties more mass in smaller particles while a low mass index refers to more mass in larger particles), to calculate meteor fluxes, to compute trajectories of meteoroids using data from multiple BRAMS receiving stations, ...

Below more details are provided about meteoroids, meteor showers, forward scattering of radio waves and BRAMS data.

The BRAMS data

- Broad-band interference which appears vertical and spans the whole 200 Hz range. These are not meteor echoes. They are produced by local interference nearby the receiving station (e.g. signals produced by a computer, an electrical switch, ...or lightnings). An example is given below.



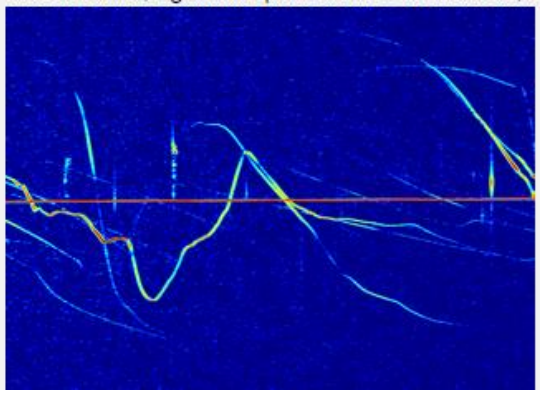
Broad-band interferences are usually short-lived but can also sometimes last longer as in the example below.

- Airplanes usually appear as thin lines that usually have an inverse S-shape. The following example has 7 airplanes.

Importance of citizen science participants

BRAMS data are saved every 5 minutes. With approximately 30 stations in the BRAMS network, more than 8000 spectrograms are created every day. This requires automatic detection algorithms for meteor echoes. Some have been developed but they are struggling either to detect underdense meteor echoes when many airplane echoes superimpose, or to detect the complex overdense meteor echoes. The (trained) human eye is still the best detector in these cases. As mentioned above, during meteor showers, many overdense meteor echoes occur and so we request the help of many eyes from citizen science participants. Your help is invaluable!

But sometimes, e.g. when a plane makes a sudden turn, more complicated shapes can occur.



DIFFICOLTA’

1) Organizzare e omogeinizzare i dati che devono essere di accesso veloce, semplice e in formati conosciuti al grande pubblico

2) “Training” semplice, diretto e prestabilito

3) Monitoraggio dei risultati e caratterizzazione statistica dei risultati

Molte cose in comune con i progetti di alternanza Scuola-Lavoro degli Enti di ricerca e Associazioni Astronomiche!

PRISMA

… e PRISMA?

Più ovvio: ricerca (attiva) sul campo del meteorite

Vedi progetto Vigie-Ciel
di FRIPON

Ma anche: partecipazione (passiva) nella raccolta dei dati del passaggio delle meteore

Da implementare:
Attività di addestramento a riconoscere i meteoriti

Bisogna mostrare i reperti in un gran numero (per esempio) di Scuole (notevole sforzo organizzativo)

PRISMA

DA DISCUTERE

Vogliamo usare i dati delle camere e distribuirli?

Come, dove, con che modalità?

Che tipo di dati possiamo distribuire?

Approccio francese, approccio italiano o italo-francese?

In pratica, ora che abbiamo le camere, facciamole fruttare al massimo!!

PRISMA

IL FUTURO TOCCA A NOI