IVOA Newsletter - February 2021

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IVOA Newsletter Editors: Deborah Baines, Bruce Berriman, Jamie Anne Budynkiewicz, Theresa Dower, Giulia Iafrate, Shanshan Li, Simon O'Toole, Yihan Tao.

The International Virtual Observatory Alliance (IVOA) was formed in June 2002 with a mission to facilitate the international coordination and collaboration necessary for the development and deployment of the tools, systems and organizational structures necessary to enable the international utilization of astronomical archives as an integrated and interoperating virtual observatory. The IVOA now comprises 20 VO programs from Argentina, Armenia, Australia, Brazil, Canada, Chile, China, Europe, France, Germany, Hungary, India, Italy, Japan, Russia, South Africa, Spain, Ukraine, the United Kingdom, and the United States and an inter-governmental organization (ESA). Membership is open to other national and international programs according to the IVOA Guidelines for Participation. You can read more about the IVOA and what we do at http://ivoa.net/about/.

What is the VO?
The Virtual Observatory (VO) aims to provide a research environment that will open up new possibilities for scientific research based on data discovery, efficient data access, and interoperability. The vision is of global astronomy archives connected via the VO to form a multiwavelength digital sky that can be searched, visualized, and analyzed in new and innovative ways. VO projects worldwide working toward this vision are already providing science capabilities with new tools and services. This newsletter, aimed at astronomers, highlights VO tools and technologies for doing astronomy research, recent papers, and upcoming events.

IVOA NEWS

The International Virtual Observatory Alliance in 2020

A paper by Berriman et al. (2020) submitted to the Proceedings of ADASS XXX describes "The International Virtual Observatory Alliance (IVOA) in 2020" (https://arxiv.org/abs/2012.05988).

The paper emphasizes the achievements and impact of the IVOA in the international astronomy community in 2020, and covers the following topics: use of IVOA protocols for data discovery by archives and data centers; deployment of VO-compliant data access, visualization and analysis tools; time-domain and multi-messenger astronomy; professional outreach; and education and public outreach. The paper concludes with a section on the IVOA's prospects for 2021 and beyond.

Northern Fall Interoperability Meeting Overview
Janet Evans and Patrick Dowler

The Northern Fall Interop meeting was held Nov 17-19, 2020 via Zoom with 213 registered participants from all around the globe. The meeting organization was similar to that of our May Interop virtual meeting. We used Zoom as our shared remote service, and Etherpad for live notes and questions. We kept presentations to a single thread (no parallel sessions) and saved a good amount of the time for input and discussion. Sessions were recorded and posted so that if you missed a session you can go back and view it. Here is the link if you are interested in session videos: (https://www.canfar.net/storage/list/pdowler/ivoa/virtual2020b). We worked to schedule sessions with reasonable times during the day for 2 of the 3 sessions a day in any one time zone.

There was a call put out for community led presentations. The meeting web page supported abstract submission for presentation consideration. Contributions at this Interop were 10-12 minutes in length with additional time for Q&A. The other half of the sessions were led by the IVOA Working Groups (WG) and Interest Groups (IG) and focused on core topics related to status and discussion of current technical coordination group efforts. The community presentations were folded into WG/IG sessions and provided a nice balance between contributed and core topics.

The Applications (Apps) WG focused on the software used to access VO services and data with presentations that included MOC 2.0 status, interoperability development in the AAS WWT, a VOTable topics review, and protocols for handling file-oriented catalog data. Data Access Layer (DAL) WG sessions focused on current efforts including DALI, ADQL, ConeSearch, DataLink, and ObsVisSAP. The audience was updated with the latest status, and attendees were invited to contribute and get involved. The DataModel (DM) WG sessions provided status of ongoing efforts including ObsLocTAP, MANGO – a model for Source Data, and the Measurements, Coordinates, and Transform models progress, along with ProvTAP feedback from the community. The Grid and Web Services (GWS) WG aims to define the use of grid technologies and web services within the VO context. The focus of their sessions were on authorization protocols and applications. In collaboration with the Theory IG, a session on science platforms was also hosted. The Registry WG with a focus on discoverability and bibliographical tracking for VO-compatible data and services, held a session that focused on upgrading the VO publishing registry. In addition, in a joint session with the Semantics Working Group, a discussion of the latest

vocabularies were presented. The IVOA addresses a wide range of topics for interoperability that are aimed toward ease of data use for the astronomy community.

The Closing Plenary and presentation from the TCG chair Pat Dowler, reminded the audience of the Technical Coordination Group (TCG) and their role in the IVOA. The TCG is made up of Chairs and Vice-Chairs of working groups, interest groups, and committees. They are tasked with building consensus in the WG and community, assure coordination between WG/IG & the Committee for Science Priorities (CSP), liaison with the IVOA executive committee, and support committee roles in the IVOA documents and standards process. TCG membership has a 3 year term with a possible 1 year extension. Members of the astronomical community are welcome to get involved in the IVOA and to consider a role in the TCG.

Here are several links to get involved:

IVOA Website	https://www.ivoa.net/	Place to start
IVOA Wiki pages	https://wiki.ivoa.net/	Collaboration area
Main Mailing List	interop 'at' ivoa.net	IVOA community list
All Mailing Lists	https://www.ivoa.net/members/	Identifies email lists for all WG/IG, CSP & Exec.
Slack	https://ivoa.slack.com/	Collaboration slack channel
Github	https://github.com/ivoa	Collaboration development/new ideas
Github	https://github.com/ivoa-std	Standard document development

The IVOA meeting followed a very busy ADASS meeting where many of the IVOA members also participated. We thank all who participated in the second Virtual Interop meeting and encourage you to continue to participate in the efforts of the IVOA through the working group and interest group email discussions and by engaging with the IVOA.

More information: https://wiki.ivoa.net/twiki/bin/view/IVOA/InterOpNov2020

SCHOOLS AND WORKSHOPS

International Symposium "Astronomical Surveys and Big Data 2"
Areg Mickaelian, Meline Asryan

The International Symposium "Astronomical Surveys and Big Data 2" (ASBD-2) was held on 14-18 September 2020. Because of the COVID-19 pandemic, this year the summer school was held online. This was the 2nd such meeting organized by the Byurakan Astrophysical Observatory (BAO); the 1st in 2015 with participation of astronomers and computer scientists. This time, also astronomers and computer scientists participated, in total 91 participants from 24 countries.

During the meeting, large astronomical surveys were reviewed and discussed, a tribute was given to Markarian and other important surveys, the future of astronomical research by joint efforts of astronomers and computer scientists were discussed. 12 invited and 30 contributed talks were given and 11 posters were presented.

Among the invited speakers of the symposium, there were Areg Mickaelian (Director of BAO), Fabio Pasian (Italy), Markus Demleitner (Germany), Oleg Malkov (Russia), co-founder of Astroinformatics Ashish Mahabal (USA), Chair of the International Virtual Observatory Alliance (IVOA) Chenzhou Cui (China), Alain Sarkissian (France) and others. The Proceedings of the Symposium will be published in the refereed journal Communications of BAO (ComBAO) Vol. 67, Issue 2, Dec 2020.

The 7th Byurakan International Summer School (7BISS)
Areg Mickaelian, Meline Asryan

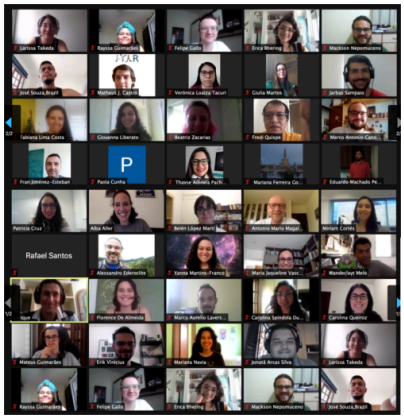
The 7th Byurakan International Summer School (7BISS) for Young Astronomers on "Astronomy and data Science" was held on 7-11 September 2020. Because of the COVID-19 pandemic, this year the summer school was held online. 50 young astronomers and 12 lecturers from 21 countries participated in 7BISS. Moreover, an opportunity was created for the public sector to take part in the school as listeners.

In the framework of the school, participants had 15 lectures and 11 practical tutorial sessions on Astronomical Surveys, Digitization of astronomical data, Astronomical Catalogues, Databases and Archives, Astrostatistics and Astroinformatics, Big Data in Astronomy and Virtual Observatory tools. Among the famous lecturers were IAU Vice-President Ajit Kembhavi (India), co-founder of Astroinformatics Ashish Mahabal (USA), Chair of International Virtual Observatory Alliance (IVOA) Chenzhou Cui, Fabio Pasian (Italy), Markus Demleitner (Germany), Oleg Malkov (Russia) and others.

At closing, 3 participants who stood out with their presentations were nominated. They were Marta Obolentseva from Saint Petersburg State University (Russia), Maria Babakhanyan Stone from University of Turku (Finland) and Vanesa Ramírez from Leiden University (The Netherlands). It should be noted, that the winners were chosen as a result of the votes given by the lecturers and the participants. The Byurakan Summer School once again proved the importance of Astronomy in the development of Data science and e-Science.

All the presentations are available online: https://www.bao.am//meetings/meetings/SS2020/programme.html.

The Spanish Virtual Observatory Schools
Miriam Cortés



The Spanish Virtual Observatory (SVO) has large experience organizing VO schools: 25 within the last eleven years at a national and international level.

During the last months, and in the context of the pandemic situation, we have made a large effort to make these schools "virtual". In November and December 2020, three virtual schools were conducted: two of them as extracurricular courses for MSc students at the Universidad Complutense de Madrid and Universidad Autónoma de Madrid with 15-20 participants each (similar to previous editions), and a third one in partnership with the Sociedade Astronômica Brasileira (SAB) as a capaciting building program with around 60 participants.

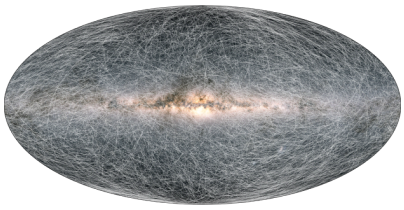
The platforms employed to carry out these schools were zoom and a Slack workspace. Also the whole programme was adapted to the constraints imposed by remote teaching. The experience gained as well as the positive feedback gathered from the participants have encouraged us to continue with this model aiming at reaching a broader audience.

More information: SVO schools.

Access more scientific usage tutorials here

VO APPLICATIONS AND IMPLEMENTATION HIGHLIGHTS

Gaia Early Data Release 3 available through VO applications

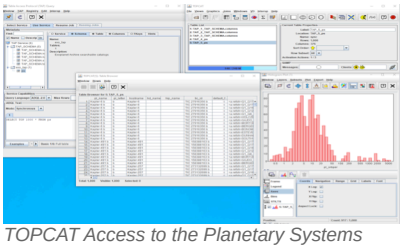


Gaia's stellar motion for the next 400 thousand years. Credit: ESA/Gaia/DPAC, CC BY-SA 3.0 IGO. Acknowledgement: A. Brown, S. Jordan, T. Roegiers, X. Luria, E. Masana, T. Prusti and A. Moitinho.

The Gaia Early Data Release 3 (EDR3) was successfully released on 3 December 2020. Gaia EDR3 contains detailed information on more than 1.8 billion sources, detected by the Gaia spacecraft. This represents an increase of more than 100 million sources over the previous data release (Gaia DR2), which was made public in April 2018. Gaia EDR3 also contains colour information for around 1.5 billion sources, an increase of about 200 million sources over Gaia DR2. As well as including more sources, the general accuracy and precision of the measurements has also improved.

Gaia EDR3 data is available from the ESA Gaia Archive, from the Gaia partner data centres: Centre de Données astronomiques de Strasbourg (CDS), ASI Space Science Data Center (SSDC), Astronomisches Rechen-Institut (ARI) and Institut für Astrophysik Potsdam (AIP), from VO Tools such as Aladin, TOPCAT and VOSA, from VO enabled tools such as ESASky and from the specifically developed Python Astroquery Gaia module.

The VO-orientation of the Gaia archive and partner archives and services is the result of many years of involvement of ESA and the Gaia partner data centres in the IVOA, and of the contributions through the Gaia Data Processing and Analysis Consortium (DPAC) of many partners and experts. As shown by Gaia DR2 and EDR3, VO technologies are now "release proven" (i.e. can accept very large peak loads) and combine reliability with functionality, making them an attractive option for future missions and projects.



TOPCAT Access to the Planetary Systems Table at Exoplanet Archive via the Archive TAP service.

nexsciTAP version 1.0

NExScI has released Version 1.0 of the source code for nexsciTAP, a Python-based server that complies with the International Virtual Observatory Alliance (IVOA) Table Access Protocol (TAP).

Version 1.0 includes connections to Oracle and SQLite3. nexsciTAP underpins queries to the NASA Exoplanet Archive, the Keck Observatory Archive (KOA) and the NEID archive. Both synchronous and asynchronous queries have been tested with three commonly used TAP clients: PyVO, TAPPlus (TAP+) and TOPCAT as well as with shell scripts using wget. Future releases will include support for PostgreSQL and SQLServer, and continuous integration.

The code is available at https://github.com/Caltech-IPAC/nexsciTAP (BSD 3-clause license) and the documentation at https://caltech-ipac.github.io/nexsciTAP/.

SOME RECENT PAPERS ABOUT VO-ENABLED SCIENCE

Featured Science Publication

Active deep learning method for the discovery of objects of interest in large spectroscopic surveys
Škoda, P.; Podsztavek, O.; Tvrdík, P.

A&A (2020) Volume 643, A122
Context. Current archives of the LAMOST telescope contain millions of pipeline-processed spectra that have probably never been seen by human eyes. Most of the rare objects with interesting physical properties, however, can only be identified by visual analysis of their characteristic spectral features. A proper combination of interactive visualisation with modern machine learning techniques opens new ways to discover such objects.
Aims. We apply active learning classification methods supported by deep convolutional neural networks to automatically identify complex emission-line shapes in multi-million spectra archives.
Methods. We used the pool-based uncertainty sampling active learning method driven by a custom-designed deep convolutional neural network with 12 layers. The architecture of the network was inspired by VGGNet, AlexNet, and ZFNet, but it was adapted for operating on one-dimensional feature vectors. The unlabelled pool set is represented by 4.1 million spectra from the LAMOST data release 2 survey. The initial training of the network was performed on a labelled set of about 13 000 spectra obtained in the 400 Å wide region around Hα by the 2 m Perek telescope of the Ondřejov observatory, which mostly contains spectra of Be and related early-type stars. The differences between the Ondřejov intermediate-resolution and the LAMOST low-resolution spectrographs were compensated for by Gaussian blurring and wavelength conversion.
Results. After several iterations, the network was able to successfully identify emission-line stars with an error smaller than 6.5%. Using the technology of the Virtual Observatory to visualise the results, we discovered 1013 spectra of 948 new candidates of emission-line objects in addition to 664 spectra of 549 objects that are listed in SIMBAD and 2644 spectra of 2291 objects identified in an earlier paper of a Chinese group led by Wen Hou. The most interesting objects with unusual spectral properties are discussed in detail.
DOI: 10.1051/0004-6361/201936090

Refereed Publications

The full list of refereed publications from July 2020 to January 2021 can be found at the following list, curated by the Spanish Virtual Observatory.

More Ways to Find VO-related Publications

All ADS links mentioning the "virtual observatory" in the abstract.

All refereed publications mentioning the "virtual observatory" in the abstract.

VO CALENDAR

May 2021 - IVOA Interoperability Meeting
Online
The International Virtual Observatory Alliance (IVOA) semi-annual Interoperability meetings provide an opportunity for discussion and development of virtual observatory standards and VO-based applications, and are open to those with an interest in utilizing the VO infrastructure and tools in support of observatory operations and/or astronomical research. The Northern Spring 2021 IVOA Interoperability meeting will be a Virtual Conference.

28 June - 2 July 2021 - EAS Annual Meeting 2021
Online
The European Astronomical Society (EAS) Annual Meeting (formerly known as EWASS) has more than 25 years of tradition and it has imposed itself as the largest conference for European astronomy. In addition to plenary sessions and the award of prestigious prizes, the conference hosts many symposia held in parallel, as well as special sessions and meetings. After the shift to an EAS 2020 virtual meeting, EAS 2021 should have been held physically in Leiden, The Netherlands. Due to the uncertain COVID-19 situation in Europe and the world, the meeting has (again) been moved to a virtual meeting. IVOA affiliated institutions will have lunch sessions demonstrating tools and services such as VizieR, Aladin, ESO archives and services, ESA archives, and other VO data access interfaces. Attendees may learn more about the data and services provided by those institutions and have virtual discussions with the scientists and developers.

Northern Fall 2021 - ADASS XXXI
Cape Town, South Africa
This annual Astronomical Data Analysis Software and Systems (ADASS) conference, held in a different location each year, is a forum for astronomers, computer scientists, software engineers, faculty members and students working in areas related to algorithms, software and systems for the acquisition, reduction, analysis, and dissemination of astronomical data. The ADASS XXXI program will include invited talks, contributed papers, display sessions, tutorials, computer demonstrations, and special interest (“Birds of a Feather” or BoF) meetings.