



# Virtual Observatory Resources for Education and Teaching

Chenzhou Cui

Chinese Virtual Observatory (China-VO)

National Astronomical Data Center (NADC)

National Astronomical Observatories, Chinese Academy of Sciences (NAOC)

# Contents

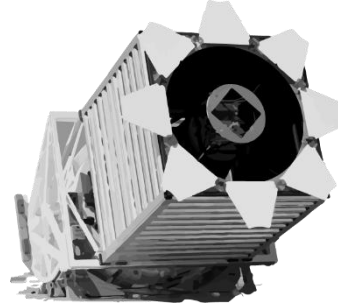
- Virtual Observatory (VO) and IVOA
- VO Resources
  - IVOA website and wiki pages
  - Curriculums and Tutorials
  - Schools, Meetings and Workshops
- Astroinformatics Resources
- Lessons Learned and Summary



# Astronomy: a Data-driven Science

- TBs era

- 2dFGRS
- SDSS
- LAMOST
- Gaia

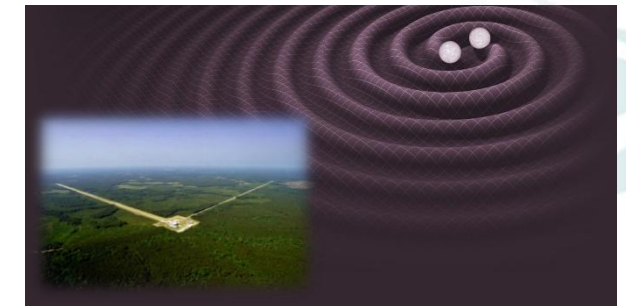


- PBs to EBs era

- FAST/FASTA
- SKA
- Vera Rubin Observatory LSST
- Euclid
- ...



- Astronomy is entering an era of big data where the **data sets are too large to download** and analyze using users' own facilities.



# The Idea of **Virtual Observatory**

## Vision of the VO:

- The Web is *transparent*. The goal of the Virtual Observatory is to achieve the same feeling for astronomical data - that it is all available to explore in a single transparent system.
- Astronomical datasets, tools, services should work seamlessly together.
- The VO allows astronomers to interrogate multiple data centers in a seamless and transparent way, provides new powerful analysis and visualization tools within that system, and gives data centers a standard framework for publishing and delivering services using their data.
- Like the World Wide Web, the VO is not a fixed system, but rather a *way of doing things*.

*Virtual Observatory (VO) is a data-intensively online astronomical research and education environment, taking advantages of advanced information technologies to achieve seamless, global access to astronomical information.*

*-- my words*

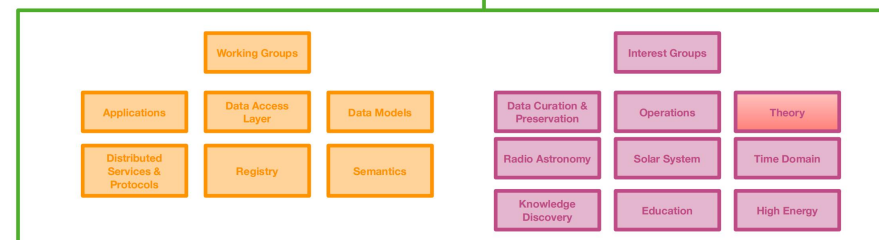
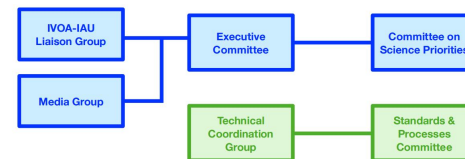
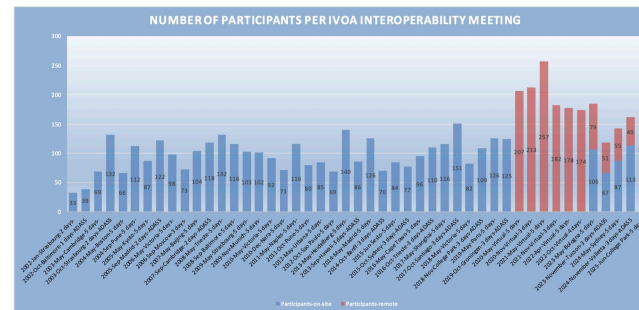




# International Virtual Observatory Alliance

- An organisation that debates and agrees the technical standards that are needed to make the VO possible, A focal point for VO aspirations, a framework for discussing and sharing VO ideas and technology.

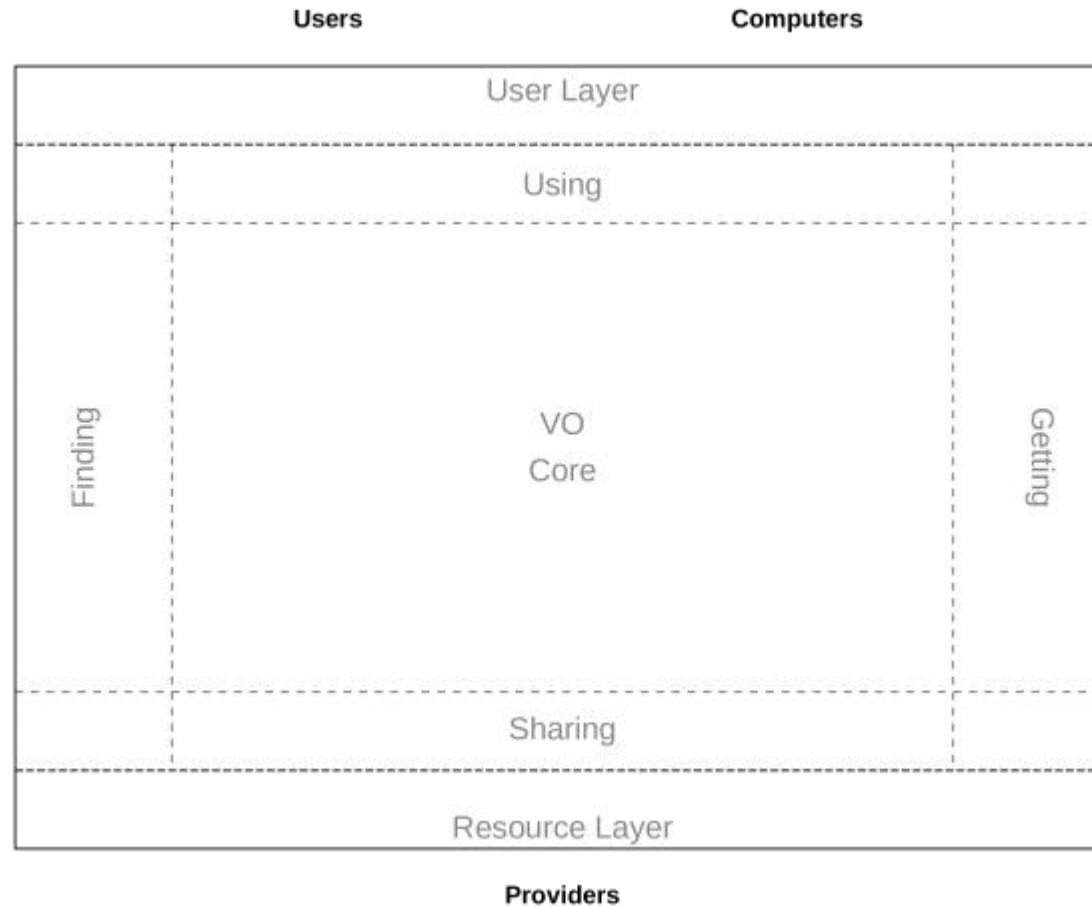
- Created in 2002
- Currently 23 member VO projects
- 6 Working Groups, 8 Interest Groups
- 2 Interoperability meetings per year
  - May & Oct/Nov with ADASS
- ~ 46 interoperability standards



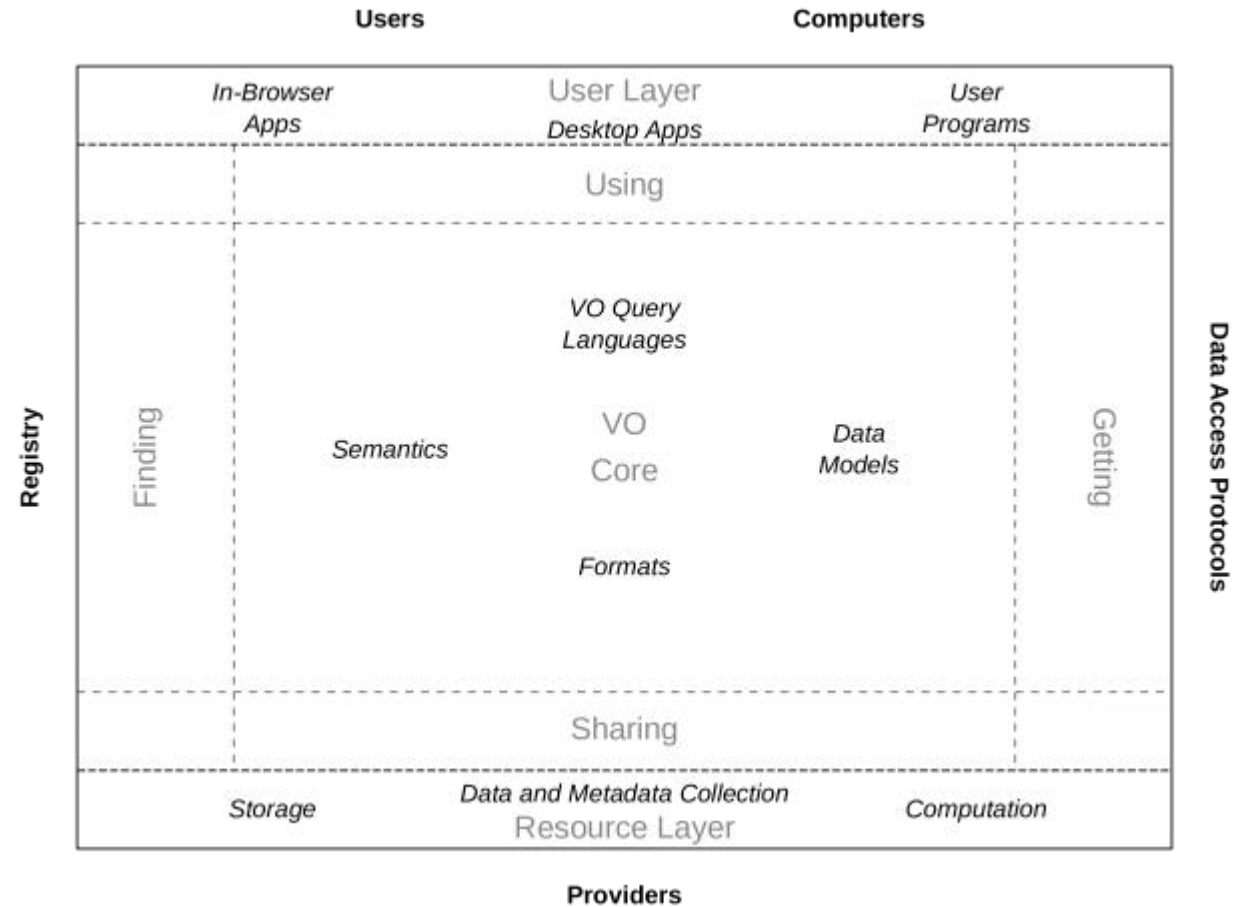
IV Regional Astronomical Summer School (4RASS) , BAO,  
Armenia



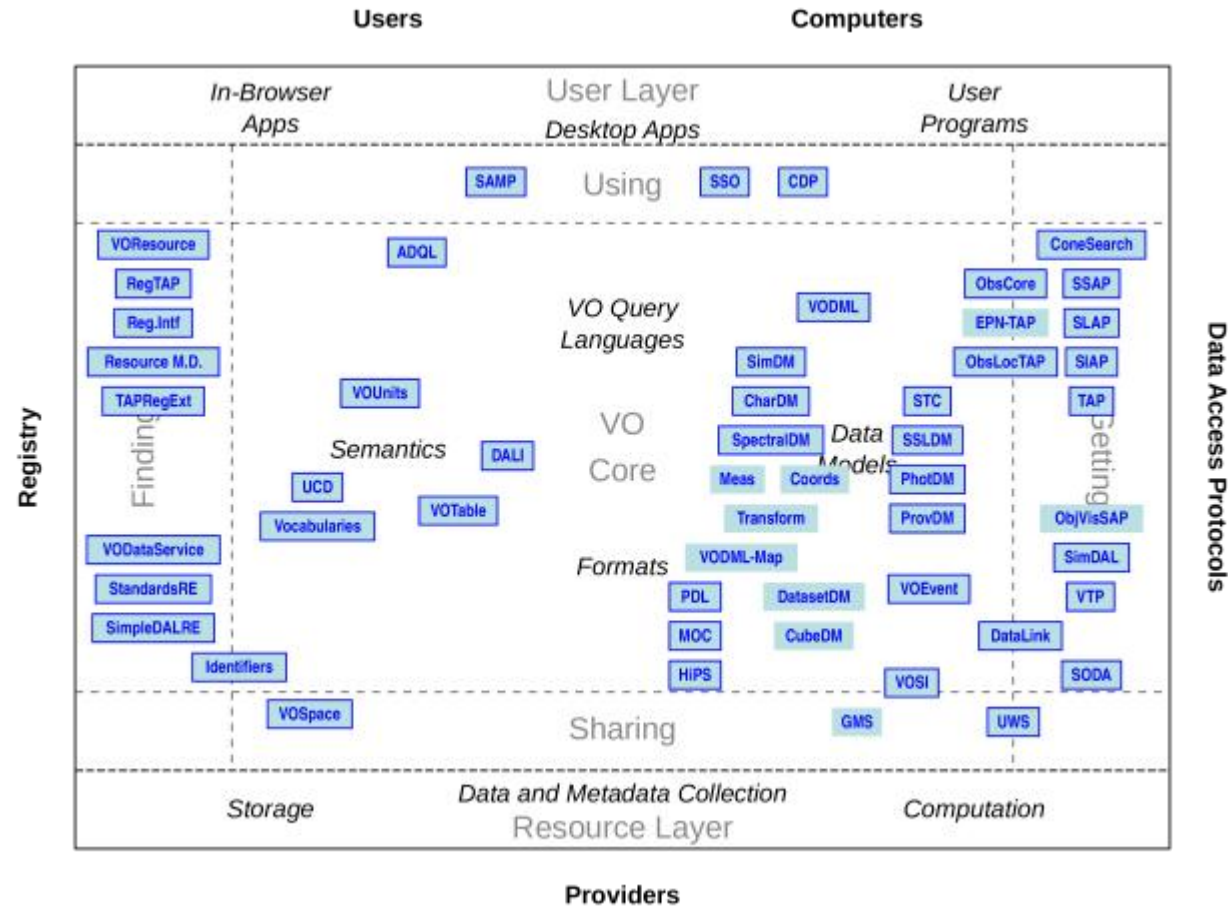
# IVOA Architecture Level 0



# IVOA Architecture Level 1



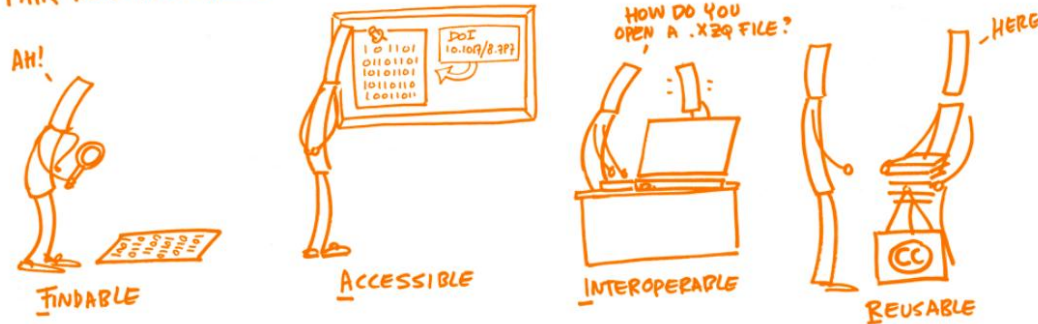
# IVOA Architecture Level 2



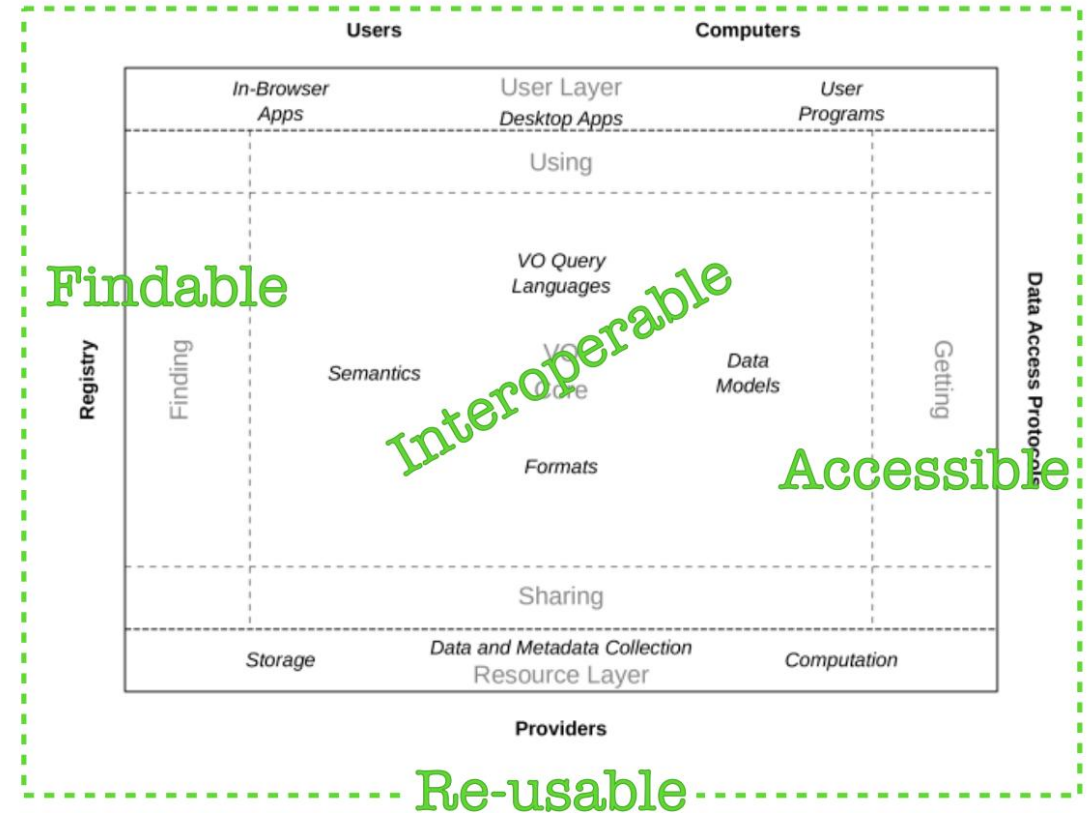
# IVOA Architecture – FAIR Data

The Virtual Observatory has been FAIR from the beginning!

## FAIR DATA PRINCIPLES



<https://www.fosteropenscience.eu/learning/assessing-the-fairness-of-data/>





# IVOA Website and Wiki Pages

<https://www.ivoa.net/>

INTERNATIONAL VIRTUAL OBSERVATORY ALLIANCE

[Home](#)[Astronomers](#)[Deployers](#)[Members](#)[About](#)


The Virtual Observatory (VO) is the vision that astronomical datasets and other resources should work as a seamless whole. Many projects and data centres worldwide are working towards this goal. The International Virtual Observatory Alliance (IVOA) is an organisation that debates and agrees the technical standards that are needed to make the VO possible. It also acts as a focus for VO aspirations, a framework for discussing and sharing VO ideas and technology, and body for promoting and publicising the VO.

To learn more about the IVOA as an organisation, read the **"About"** section.

To learn more about the VO from a user's point of view, including how to find VO tools and services, read the **"Astronomers"** section. There is also a page about the VO for students and the public.


To learn how to publish VO services, or write VO-compatible software, start by reading the **"Deployers/Developers"** section.

Internal IVOA discussions are publicly viewable in the **"Members"** section.




**IVOA NEWS**  
March 2022 Issue of the IVOA Newsletter


**UPCOMING MEETINGS**  
IVOA November 2025 Interoperability Meeting  
14-16 November 2025, G rlitz (Germany)

**For Astronomers**

Getting Started / Using the VO  
VO Glossary / VO Applications  
IVOA newsletter / VO for Students & Public  
☞☞☞

**For Deployers/Developers**

Intro to VO Concepts /  
IVOA Standards / Guide to  
Publishing in the VO / Technical  
Glossary  
☞☞☞

**For Members**

IVOA Calendar / Working Groups/  
Twiki / Documents in Progress /  
Mailing Lists / IVOA Roadmap  
☞☞☞

## IVOA Events

### Upcoming:

Next Interoperability Meeting	14-16 November 2025 - Goerlitz - <a href="#">program</a> & <a href="#">website</a>
Next Exec meeting	10 September 2025 @ 13:00 UTC (vconf)
Next TCG meeting	25 September 2025 @ 20:00 UTC (vconf)

### By year:

						2025	2024	2023	2022	2021
2020	2019	2018	2017	2016	2015	2014	2013	2012	2011	
2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	
2000										

### Main topics:

<ul style="list-style-type: none"><li><a href="#">Who is Who?</a></li><li><a href="#">Documents and Standards</a></li></ul>	<ul style="list-style-type: none"><li><a href="#">Events</a></li><li><a href="#">Training Materials</a></li></ul>	<ul style="list-style-type: none"><li><a href="#">Exec Reports &amp; Minutes</a></li><li><a href="#">Mailing Lists</a></li></ul>	<ul style="list-style-type: none"><li><a href="#">Technical Coordination Group</a></li><li><a href="#">VO Glossary</a></li></ul>
<b>Working Groups:</b>			
<ul style="list-style-type: none"><li><a href="#">Applications</a></li><li><a href="#">Semantics</a></li></ul>	<ul style="list-style-type: none"><li><a href="#">Data Access Layer</a></li><li><a href="#">Registry</a></li></ul>	<ul style="list-style-type: none"><li><a href="#">Data Model</a></li></ul>	<ul style="list-style-type: none"><li><a href="#">Grid &amp; Web Services</a></li></ul>
<b>Interest Groups:</b>			
<ul style="list-style-type: none"><li><a href="#">Theory</a></li><li><a href="#">Education</a></li></ul>	<ul style="list-style-type: none"><li><a href="#">Time Domain</a></li><li><a href="#">Operations</a></li></ul>	<ul style="list-style-type: none"><li><a href="#">Data Curation &amp; Preservation</a></li><li><a href="#">Radio Astronomy</a></li></ul>	<ul style="list-style-type: none"><li><a href="#">Knowledge Discovery in Databases</a></li><li><a href="#">Solar System</a></li></ul>
<b>Other Groups / Committees:</b>			
<ul style="list-style-type: none"><li><a href="#">Standing Committee on Standards &amp; Processes</a></li><li><a href="#">Standing Committee on Science Priorities</a></li><li><a href="#">MediaGroup</a></li></ul>		<ul style="list-style-type: none"><li><a href="#">Liaison Committee</a></li><li><a href="#">InterOp Programme Organising Committee</a></li><li><a href="#">IAU-IVOA Liaison Committee</a></li></ul>	

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Armenia

# IVOA Education Interest Group

TWiki > [IVOA Web](#) > [IvoaTCG](#) > [IvoaEducation](#) (2024-11-17, ShanshanLi)

## IVOA Interest Group in Education (Edu IG)

### Contents

- ↓ [IVOA Interest Group in Education \(Edu IG\)](#)
- ↓ [Rationale](#)
- ↓ [Terms of reference](#)
- ↓ [Ideas](#)
- ↓ [Mailing lists](#)
- ↓ [Related links](#)
- ↓ [Development repository](#)
- ↓ [Resources and tutorials](#)

<https://wiki.ivoa.net/twiki/bin/view/IVOA/IvoaEducation>

Your contributions are welcome!

IVOA Note



*International  
Virtual  
Observatory  
Alliance*

## Educational Resources in the Virtual Observatory

Version 1.0

18-03-12

TWiki > [IVOA Web](#) > [IvoaTCG](#) > [IvoaEducation](#) > [EduResourcesTutorials](#) (2025-05-06, AdaNebot)

## Existing IVOA Education Resources and Tutorials

- ↓ [Existing IVOA Education Resources and Tutorials](#)
- ↓ [VO tutorials](#)
- ↓ [Tutorials in English](#)
- ↓ [Graduate level](#)
- ↓ [Education and outreach level](#)
- ↓ [Non-English tutorials](#)
- ↓ [Graduate level](#)
- ↓ [Education and outreach level](#)
- ↓ [Education resources](#)
- ↓ [Resources in English](#)
- ↓ [Non-English resources](#)
- ↓ [Astroinformatics Courses](#)
- ↓ [Useful links](#)

### Contents

- [1 Introduction](#)
- [2 Registering Texts](#)
  - [2.1 Use Cases](#)
  - [2.2 A Document Registry Extension](#)
  - [2.3 DocRegExt in RegTAP](#)
  - [2.4 An Example DocRegExt Record](#)
  - [2.5 A versioned repository for tutorials](#)
- [3 A Curated Registry for Education](#)
  - [3.1 Educational vs. Professional Resources](#)
  - [3.2 ContentLevel granularity issue](#)
  - [3.3 Curating the Edu Registry](#)
- [A ContentLevel values summary](#)

# IVOA Newcomers

- Starting point and materials to start grabbing the basics of the IVOA and the VO world
  - **Part 1 of the tutorial**
    - will introduce to some of the VO standards following a multimessenger use case from the user's perspective.
  - **Part 2 of the tutorial**
    - will show selected steps of the 1st part tutorial from the perspective of the dataprovider. The question here is: what does it need from the perspective of a dataprovider to enable the user experience of part 1 ?
- <https://wiki.ivoa.net/twiki/bin/view/IVOA/IVOANewcomers>
- [https://hendhd.github.io/ivoa\\_newcomers/](https://hendhd.github.io/ivoa_newcomers/)

## Welcome to the IVOA newcomer session!

[View on GitHub](#)



Title: **The National Virtual Observatory: Tools and Techniques for Astronomical Research**

Volume: 382 Year: 2007 View this Volume on ADS

Editors: Graham, Matthew J.; Fitzpatrick, Michael J.; McGlynn, Thomas A.

Synopsis: **Note: An additional figure was inserted in the electronic version. Therefore page numbers beyond page 450 in this version are greater by 2 than in the printed volume.**  
In 2004, 2005, and 2006, the US National Virtual Observatory development project presented Summer Schools in Aspen, Colorado. During these week-long programs, presentations and tutorials were presented on all aspects of the Virtual Observatory.

ISBN: 978-1-58381-327-0 eISBN: 978-1-58381-328-7



Open  
Access

- 59 chapters, 3 appendixes, published by ASP in 2007

Prologue: The Virtual Observatory—A New Environment for Astronomical Research

Section 1. An Introduction to VO Tools

Section 2. Science with the Virtual Observatory

Section 3. Technologies and Protocols

Section 4. Discovering and Registering Resources in the VO

Section 5. Accessing Data in the VO

Section 6. Publishing Data in the VO

Section 7. Foundation Technologies

In 2004, 2005 and 2006, the US National Virtual Observatory development project presented Summer Schools in Aspen, Colorado. This volume is a collection of the Summer School lectures and tutorials. These materials are still relevant.

[http://www.aspbooks.org/a/volumes/table\\_of\\_contents/?book\\_id=420](http://www.aspbooks.org/a/volumes/table_of_contents/?book_id=420)

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## THE NATIONAL VIRTUAL OBSERVATORY: TOOLS AND TECHNIQUES FOR ASTRONOMICAL RESEARCH



NATIONAL VIRTUAL OBSERVATORY

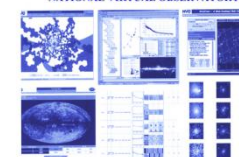


Edited by  
Matthew J. Graham, Michael J. Fitzpatrick  
and Thomas A. McGlynn



## 虚拟天文台 天文学研究的工具与技术

[英] Matthew J. Graham  
[英] Michael J. Fitzpatrick 编著  
[英] Thomas A. McGlynn  
崔茂州 等译 赵永红 校



中国科学技术出版社

Published in  
Chinese in 2010



Science Software

Scientific Papers

Scientific Tutorials

Education

PREVIOUS VERSIONS OF TUTORIALS HERE

INTERACTIVE JUPYTER NOTEBOOKS

## PREVIOUS TUTORIALS

## Abell 1656: The Coma Cluster of galaxies:

- ▼ Apr 2019: [Tutorial](#)
- ▼ Jan 2017: [Tutorial](#)
- ▼ Jun 2014: [Tutorial](#)
- ▼ Mar 2011: [Tutorial](#), [step-by-step](#) and [more expanded presentation](#)

## Discovery of Brown Dwarfs mining the 2MASS and SDSS databases:

- ▼ Dec 2019: [Tutorial](#)
- ▼ Apr 2019: [Tutorial](#)
- ▼ Nov 2017: [Tutorial for ASTERICS VO School Nov 2017](#), [corresponding Script](#)

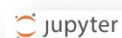
<https://www.euro-vo.org/scientific-tutorials/>

## SCIENTIFIC TUTORIALS

PREVIOUS VERSIONS OF TUTORIALS HERE

INTERACTIVE JUPYTER NOTEBOOKS

TUTORIALS	DESCRIPTION	Link
<a href="#">Abell 1656: The Coma Cluster of Galaxies</a>	This tutorial uses the advanced VO functionalities of Aladin (interactive sky atlas), TOPCAT (tools to work on catalogs) and Cassis (interactive spectrum analyzer) to study interactively the Coma cluster of galaxies. The user can visualize the Coma cluster of galaxies and build a subset of these galaxies with Aladin. With TOPCAT, they can analyze this subset. Finally, they can study an HST power spectrum with Cassis.	<a href="#">Jupyter Notebook</a>
<a href="#">Discovery of Brown Dwarfs mining the 2MASS and SDSS databases</a>	This tutorial uses the advanced VO functionalities of Aladin (interactive sky atlas) to find brown dwarfs in the 2MASS and SDSS surveys. The user learns about the filtering, cross-matching and visualization functions, the implementation of scripts in Aladin and many more Aladin features to identify brown dwarfs in these surveys. This tutorial has been last updated for the first ESCAPE "Science with interoperable data school", previous versions of this tutorial repeated the same discovery steps with TOPCAT and STILTS. For this tutorial you will need a <a href="#">parameter</a> and <a href="#">script</a> file.	<a href="#">Jupyter Notebook</a>
<a href="#">The CDS tutorial</a>	This tutorial describes the basis of the VO program hosted at CDS. The three major VO programs are described: SIMBAD (astronomical database), VizieR (catalog service) and Aladin (interactive sky atlas). The user gets familiar with the programs while 1) searching for the galaxy NGC4039 through the CDS portal to get direct access to SIMBAD, VizieR and Aladin, 2) comparing the sky coverage between SDSS and GALEX surveys using Aladin and 3) selecting interacting galaxies with Aladin.	<a href="#">Jupyter Notebook</a>
<a href="#">Determination of stellar physical parameters using VOSA</a>	This tutorial uses the advanced VO functionalities of VOSA (VO Sed Analyzer) and TOPCAT to determine empirically the masses and radii of stars surrounded by planets. The user needs to register to get access to the functionalities of VOSA (online tool). They can then upload a list of objects to study, build their SEDs and analyze them (by fitting models). Using the interoperability between VOSA and TOPCAT, the user can compare the empirical values obtained with VOSA to those published in papers.	
<a href="#">Accessing and cross matching big datasets with ADQL</a>	This tutorial allows the user to get familiar with ADQL (Astronomical Data Query Language) and TAP (Table Access Protocol) through using GAIA data. ADQL and TAP are widely used in VOs to handle large datasets that cannot be handled locally.	



Files Running Clusters

Select items to perform actions on them.

Upload New

<input type="checkbox"/>	0	/ Notebooks	Name	Last Modified	File size
<input type="checkbox"/>		..		seconds ago	
<input type="checkbox"/>		Data		23 days ago	
<input type="checkbox"/>		images		23 days ago	
<input type="checkbox"/>		Abel1656_The_Coma_Cluster_of_Galaxies.ipynb		23 days ago	35.7 kB
<input type="checkbox"/>		Discovery_of_Brown_Dwarfs_mining_the_2MASS_and_SDSS_databases.ipynb		23 days ago	17.2 kB
<input type="checkbox"/>		HighEnergy-tutorial.ipynb		23 days ago	4.63 MB
<input type="checkbox"/>		HiPS_and_MOC.ipynb		23 days ago	22.3 kB
<input type="checkbox"/>		The_CDS_tutorial.ipynb		23 days ago	10.4 kB
<input type="checkbox"/>		The_CDS_tutorial_extended.ipynb		23 days ago	15.1 kB



# EuroVO for education



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[ita](#) / [eng](#) / [ger](#)

Usage examples aim at familiarizing the user with Aladin and Stellarium and at stimulating further interest and activities in astronomy. Usage examples are in the form of pedagogic modules consisting of two main parts. The first part presents a typical astronomical problem with a short introduction and a description of the solution found by astronomers, or, in some cases, an expanded treatment of the problem. The second part is a step-by-step guide to the commands needed to reach the solution of the problem with Aladin or Stellarium. Some of our usage examples include exercises that are proposed for teachers' activities in the classroom. Solutions are provided separately.

## Astronomical Infrastructure for Data Access

- 1. The sky - *basic***   
Within this use case you discover the celestial coordinates allowing you to point and/or find a given star in the sky. You also learn how to use coordinate systems in order to learn the effects of Earth's rotation and revolution on the celestial sphere. Special topics are constellations and light pollution, both important for a basic appreciation of the night sky.
- 2. The stars - *intermediate***   
Within this use case you discover the basic observational parameters of stars, color and magnitude. These observational parameters are counterparts of the main physical parameters temperature and luminosity. By selecting stars on the sky you build the Hertzsprung-Russell diagram that shows the relation between color and magnitude, a milestone in the history of our understanding of how stars work and evolve.
- 3. The shape of galaxies - *basic***   
Within this use case you discover the shapes of galaxies and their classification according to the Hubble diagram. You are offered sequences of galaxies with different morphologies and are asked to order them. The morphological classification of galaxies is still in use even if we have discovered that the Hubble diagram "per se" has no direct physical or evolutionary meaning. Besides introducing the main shapes of galaxies, the use case offer a demonstration of the classification process, a fundamental tool of astronomers.  
\* download a galaxy set: [hubble\\_1.zip](#), [hubble\\_2.zip](#), [hubble\\_3.zip](#), [hubble\\_4.zip](#)

- 4. The Pleiades open cluster - *advanced*** 

- EuroVO for education is a project developed within the framework of the EuroVO with the aim of diffusing EuroVO data and software to the public, in particular students, teachers and astronomy enthusiasts.
- Usage examples are in the form of pedagogic modules consisting of two main parts. The first part presents a typical astronomical problem with a short introduction and a description of the solution found by astronomers, or, in some cases, an expanded treatment of the problem. The second part is a step-by-step guide to the commands needed to reach the solution of the problem with Aladin or Stellarium.
- The EuroVO resources are now maintained and upgraded/updated by VObs.it at INAF-OA Trieste.

<http://vo-for-education.oats.inaf.it>

# Tutorial: "Calculating the Redshift of Galaxies"

Derian Jesús Dorado-Daza has been working with translation (to Spanish) and updating some tutorials for VO Education. He used CASSIS for updating the tutorial "Calculating the Redshift of Galaxies"

Teaching/Learning Goal: "The overall goal of this tutorial is to compare the spectra of different galaxies, calculate their redshifts and hence search for evidence of the expansion of the Universe."

## Tools and Services from VO:

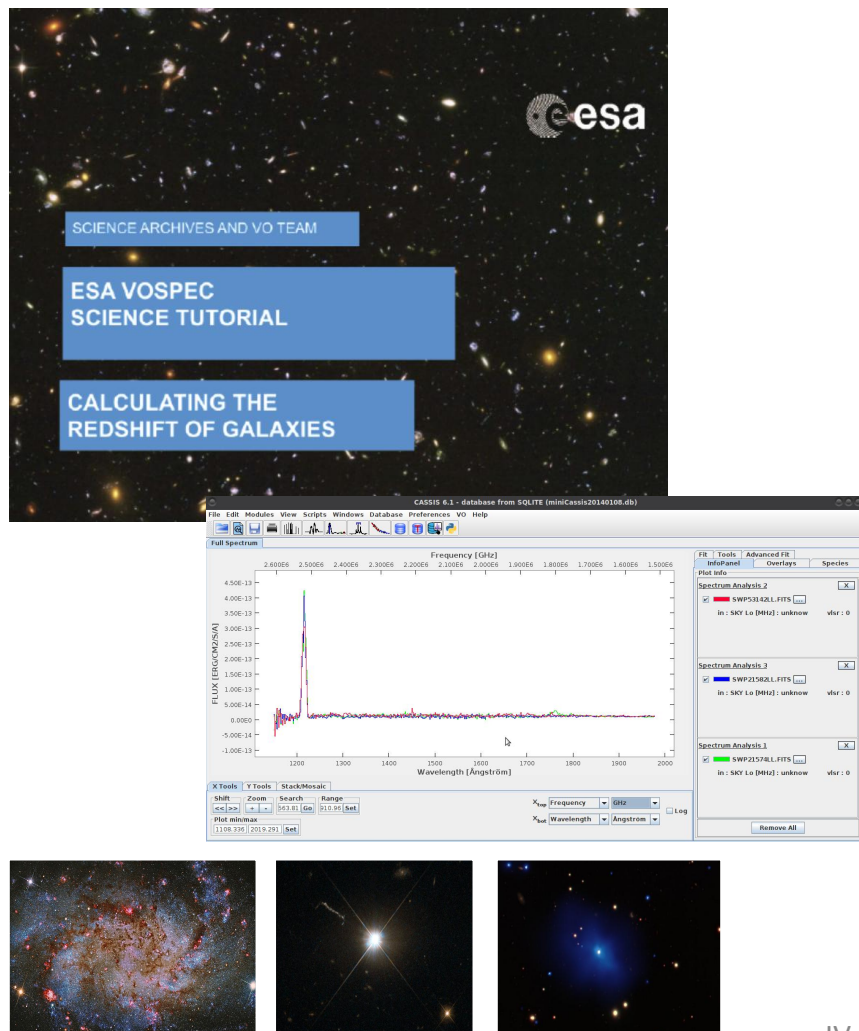
- **CASSIS:** This tool allows the query, download and analysis of spectra from different databases and services, using protocols and communication standards established in the framework of the Virtual Observatory.
- **NIST Atomic Spectra Database Service:** Database for radiative transitions and energy levels in atoms and atomic ions, for the most of the known chemical elements.
- **NASA/IPAC Extragalactic Database (NED):** Database of multiwavelength data for extragalactic objects, providing a systematic, ongoing fusion of information integrated from hundreds of large sky surveys and tens of thousands of research publications
- **Topcat:** Widely known tool for analysis, manipulation and visualization of astronomical source catalogues and other tables.

## Acknowledgments:

- Tutorial created by Phil Furneaux (Lancaster University) and Deborah Baines (Science Archives Team scientist - ESA).
- The tutorial is based on analysis carried out with the CASSIS software (<http://cassis.irapomp.eu>; Vastel et al. 2015 <http://adsabs.harvard.edu/abs/2015sf2a.conf..313V>). CASSIS has been developed by IRAP-UPS/CNRS.

This tutorial can be found online at: <http://vo-for-education.oats.inaf.it/>

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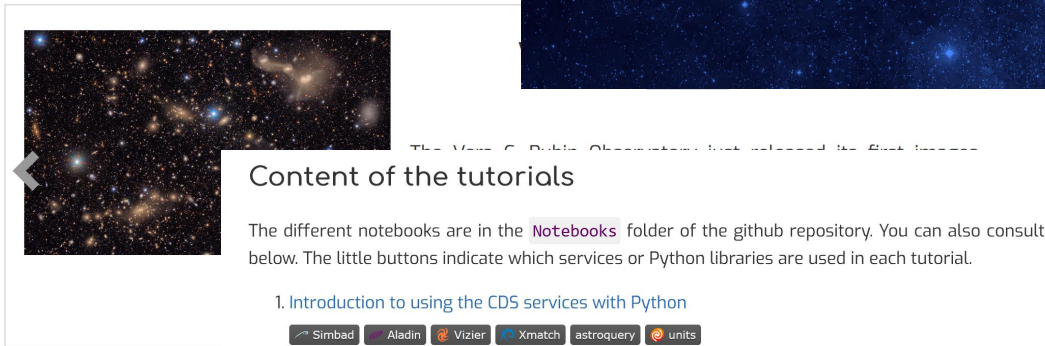


Courtesy of Derian Jesus Dorado-Daza, [derianjesus@gmail.com](mailto:derianjesus@gmail.com)





Key numbers		
20,156,875	SIMBAD objects	
26,603	VizieR catalogs	
1,346	HIPS	
39,250	MOCs	
452,319	biblio. references	
25,949	acronyms	



## Content of the tutorials

The different notebooks are in the **Notebooks** folder of the github repository. You can also consult them as webpages by clicking on their titles in the list below. The little buttons indicate which services or Python libraries are used in each tutorial.

### 1. Introduction to using the CDS services with Python

We show how to call Simbad, Aladin Lite, VizieR and X-match in a Jupyter Notebook.

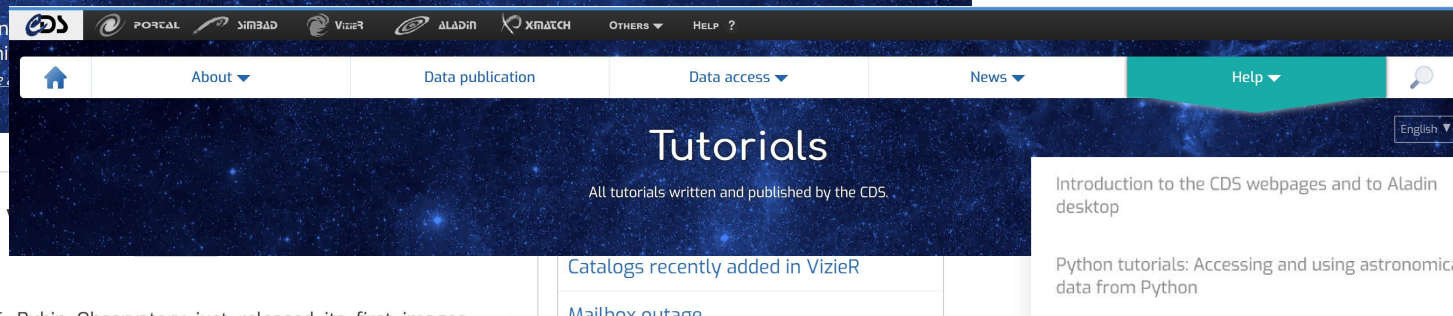
### 2. First steps with the Multi-Order Coverage data structure

We explore Arp's Catalog of peculiar Galaxies and extract the galaxies explored both in the SDSS and GALEX surveys by using MOCs. This tutorial highlights two python modules for querying data: [astroquery](#) and [pyvo](#).

### 3. The Simple Spectral Access Protocol to explore Abel 1656

This tutorial focuses on the Coma Cluster of Galaxies. In particular, we search for redshift information of galaxies in the spatial vicinity of the cluster centre. To get this information we get catalogues with measured redshifts and a spectrum, from which we measure a redshift. It uses the Simple Spectral Access (SSA) protocol of the virtual observatory.

### 4. Combining the CDS services to study gamma-ray and high energy spectral bands



Introduction to the CDS webpages and to Aladin desktop

Python tutorials: Accessing and using astronomical data from Python

How to use the tutorials

## Content of the tutorials

Video tutorials

Introducing the Aladin stack

Aladin SIMBAD pointer tutorial

HIPS tutorials

ADASS Tutorial

OV-France tutorial

PDF tutorials

Visualizing starlight polarization maps with Aladin

SIMBAD introduction tutorial

Use of VO tools for education

<https://cds.unistra.fr/help/tutorials>

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## Enseñando Astronomía con el Observatorio Virtual

Si haces uso de los recursos disponibles en esta página, te agradeceríamos que nos lo hicieras saber escribiendo a: [esm@cab.inta-csic.es](mailto:esm@cab.inta-csic.es)

!!! Muchas gracias!!!

### Casos prácticos Euro-VO

En esta página podéis encontrar enlaces a una serie de prácticas de Astronomía (marco de los proyectos [Euro-VO](#) y [SVO](#)).

El objetivo de estas prácticas es que el alumno use datos reales de archivos en s una misma estructura: tras una breve descripción del caso científico y de las h metodología de análisis.

### Relación de casos prácticos (actualizados a julio de 2023)

- Título: "El diagrama H-R del cúmulo de las Pléyades". (.docx) (.pdf)
- Título: "Distancia a Andrómeda". (.docx) (.pdf)
- Título: "Distancia a la Nebulosa del Cangrejo". (.docx) (.pdf)
- Título: "La Secuencia de Hubble". (.docx) (.pdf)
- Título: "Confirmación de una Supernova en la Galaxia NGC4995". (.docx) (.pdf)
- Título: "Movimiento propio de la estrella de Barnard". (.docx) (.pdf)

### Casos prácticos del Máster de Astronomía y Astrofísica de la Universidad Int

### Education

#### PhD Thesis

- Title: Integración de archivos y herramientas radioastronómicas en la arquitectura del Observatorio Virtual
  - Author: Juan de Dios Santander Vela
  - Instituto de Astrofísica de Andalucía -CSIC, Granada, Spain
  - Supervisors: Lourdes Verdes-Montenegro, Enrique Solano
  - Date: May 2009
  - Mark: Sobresaliente "cum laude"

#### Master Thesis

- Title: "Identificación y caracterización de objetos ultrafríos en los cartografiados J-PLUS y J-PAS".
  - Author: David López Justo
  - Affiliation: Universidad Internacional de Valencia
  - Supervisor: Miriam Cortés Contreras, Enrique Solano Márquez
  - Year: 2019-2020
  - Mark: Sobresaliente 9
- Title: "Técnicas de Visión Artificial e Inferencia Bayesiana aplicada a imágenes multirango de campos cosm
  - Author: María José Márquez Sánchez
  - Affiliation: Dpt. Inteligencia Artificial ETSI Informática - UNED
  - Supervisor: Luis Manuel Sarro
  - Year: 2008-2009
  - Mark: Matrícula de Honor (10/10)
- Title: "Evaluation of unsupervised clustering algorithms for variable stars data".
  - Affiliation: Dpt. Inteligencia Artificial ETSI Informática - UNED
  - Supervisor: Luis Manuel Sarro
  - Year: 2008-2009
  - Details: Authorship and mark preserved in fulfilment of the Spanish Data Protection Law. The manuscript is available in the repository of the Spanish Data Protection Law.
- Title: "Identificación y caracterización de enanas marrones de tipo T utilizando una metodología de Observa
  - Author: Miriam Aberasturi Vega
  - Affiliation: LAEX-CAB / INTA-CSIC.
  - Supervisor: Enrique Solano
  - Year: 2008-2009
  - Mark: 8.5 / 10

### Proyecto fin de carrera



### SVO Meetings

#### Tutorial\_Altair (PDF)

#### XX aniversario SVO (18 junio 2024)

#### Talleres on-line

- Aladin: visualización y análisis de imágenes y catálogos.
  - [Youtube](#) (en español)
  - [Local file](#) (en español)
  - [Tutorial](#). (in English)
- TOPCAT: Manejo de tablas en el Observatorio Virtual
  - [Youtube](#) (en español)
  - [Tutorial](#) (in English).
- VOSA: Estimación de parámetros físicos mediante el ajuste de distribuciones espectrales de energía ([Youtube](#) (en español)

#### Escuelas SVO

- XXV Escuela SVO. IAA. Granada. Noviembre 2025
- XXIV Escuela SVO. Programas de Máster y Doctorado en Astrofísica. Noviembre 2024
- XXIII Escuela SVO (VIII VO School). Federación de Asociaciones Astronómicas de España. Noviembre 2023
- I Escuela I latinoamericana (VII Virtual VO School) Marzo 2023

<https://svo.cab.inta-csic.es/main/index.php>

IV Regional Astronomical Summer School (4RASS) , BAO,  
Armenia

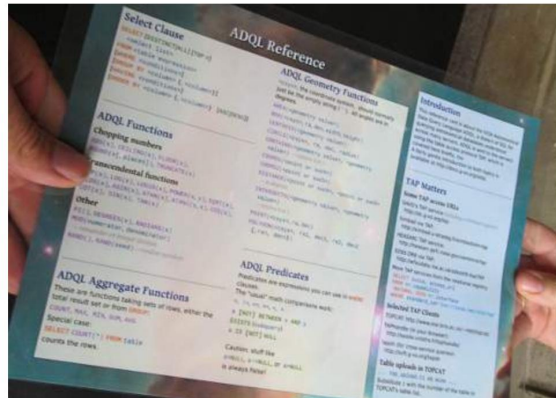


## Hand-Outs/Tutorials:

- [Astronomical Data Query Language \(ADQL\) Reference Card](#)
- [ADQL Hands-on Course](#)
- [GAVO Tutorials](#)

The [ADQL Reference Card \(pdf\)](#) briefly gives an overview of the SQL dialect used in the VO. It is most useful when used with a more gentle course, e.g., our [short ADQL course](#).

We're handing out nice and shiny copies of these at conferences, VO days and similar events:



The material is distributed under the Creative Commons Attribution (CC-BY) license. If you change the [document source](#) (currently Scribus 1.4), please feed back your changes (or inquire about SVN access).

### Mini-Tutorials

Here we collect our mini-tutorials for download which we present occasionally e.g. at VO-Meetings. Longer versions can also be used for VO-Days and workshops.

Need more explanations? Searching for more demos? Please contact us via [vo@ari.uni-heidelberg.de](mailto:vo@ari.uni-heidelberg.de).

- [add-pms.pdf](#) - Crossmatch with *TOPCAT* and TAP
- [astrometric-calib-aladin.pdf](#) - Astrometric calibration using *Aladin*
- [gavo\\_plates.pdf](#) - Image discovery with *Aladin 10* (and a bit of what to do with discovered images)
- [registry-data-discovery.pdf](#) - Data discovery with the registry
- [topcat-aladin-together.pdf](#) - *TOPCAT* and *Aladin* working together
- [pyvo.pdf](#) - Astropy and the VO
- [simulations.pdf](#) - Accessing simulation databases and visualising results with *TOPCAT*
- [simulations-short-dachs.pdf](#) - A shorter version, using a subset of the data in DaCHS, accessing the data directly from *TOPCAT* using TAP and ADQL
- [simulations-teachers.pdf](#) - Another simulations tutorial, adjusted for a teacher-workshop. Deals with density fields and dark matter halos. Includes instructions for plotting with *Gnuplot*, in case *TOPCAT* is not available.
- [rave.pdf](#) - Downloading and viewing RAVE data with *TOPCAT* and *Aladin*; Filter for *Aladin*: [RAVE-Map-Aladin.ajs](#)
- [Using TAP to access Gaia gog data](#)
- [Compute Redshifts of Quasars Using Splat VO - Downloads](#)
- [uwsintro.pdf](#) - First steps for interacting with a UWS web service from the command line to retrieve data from a database. Uses [httpie](#) and/or [uws-client](#).

Here is a HTML rendition of the notes for a

It's allowed to cut-and-paste the queries...

Also, there's a [PDF version](#) that you can print

The queries and problems in the text are supplied

## ADQL: Contents

- [ADQL and TAP](#)
- [Data Intensive Science](#)
- [A First Query](#)
- [Why SQL?](#)
- [Relational Algebra](#)
- [SELECT for real](#)
- [SELECT: ORDER BY](#)
- [SELECT: what?](#)
- [SELECT: WHERE clause](#)
- [SELECT: Grouping](#)
- [SELECT: JOIN USING](#)
- [SELECT: JOIN ON](#)
- [Geometries](#)
- [DISTANCE](#)
- [Subqueries](#)
- [Common table expressions](#)
- [TAP: Uploads](#)
- [Almost real world](#)
- [TAP: the TAP schema](#)
- [Data Discovery 1: the registry](#)
- [Data Discovery 2: use ADQL](#)
- [TAP: Async operation](#)
- [Simbad](#)
- [Onward](#)

<https://www.g-v-o.org/pmwiki/About/Services>



## VOTT: Virtual Observatory Text Treasures

VOTT is a formatted list of educational/outreach texts on using the VO: use cases, tutorials, courses, and such. VOTT contains material for all settings, from pre-school to graduate. It is generated from the documents known to the VO Registry.



Material for school and outreach use ("general public").



More advanced material suitable for, say, advanced high school students or amateur astronomers.



material targeted at university students and researchers wanting to learn about the VO.

Sort by: ● Author ● Min. Content Level ● Date Checked

<https://dc.g-vo.org/VOTT>



Freistetter, F.

### Distance of the Andromeda galaxy

Within this use case for high school students and advanced amateurs you measure the linear distance of the Andromeda Galaxy following the steps of the astronomers who first measured it, climbing an important step of the so-called cosmic distance ladder. The use case requires the identification of variable stars of the Cepheid class and the determination of the relation between their period and their intrinsic luminosity.

[ en ] [ it ] [ de ] [ es ] [ fr ] [ jp ]



Demleitner, M.

### The GAVO VO Puzzlers

The GAVO puzzlers are little training problems solvable by standard VO techniques (data discovery, SIAP, Cone Search, TAP). They assume some familiarity with common astronomical concepts (they were originally given out during meetings of the German Astronomische Gesellschaft) but are designed to be solvable using common, standard tools and in reasonable time. Solutions are also given.

[ en ]



Demleitner, M.; Heintz, H.

### A Short Course on ADQL

This is a course on the Virtual Observatory's main query language ADQL (short for Astronomical Data Query Language), which is a SQL dialect standardised so users do not have to learn new languages each time they want to use a new resource. We also introduce the basic aspects of the Table Access Protocol TAP, which

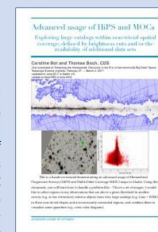


Bot, C.; Boch, T.

### Advanced Usage of HiPS and MOCs

This course introduces advanced usage of Hierarchical Progressive Surveys (HiPS) and Multi-Order Coverage (MOC) maps in Aladin. Using this document, you will learn how to handle a problem like: "I have a set of images. I would like to select regions in my observations that are above a given threshold in another survey (e.g. at low extinction), retrieve objects from very large catalogs (e.g. Gaia + WISE) in these non-trivial shapes and not-necessarily-connected regions, and combine them to visualise some quantities (e.g. color color diagram)."

[ en ]



## GAVO Puzzlers

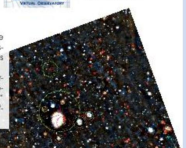
Every year, several hundred astronomers congregate in a city in Germany or Austria for the annual meeting of the Astronomische Gesellschaft. GAVO is there, too, and since 2014 we've always brought a prize with us (usually soft and fuzzy). That prize went to someone (drawn at random, of course) who could solve The Puzzler 46" a little, hopefully entertaining, astronomy-inspired problem solvable using VO tools.

Here are the puzzlers from the last years 46" and some proposed solutions (don't spoil it for you by peeking at these too soon). Of course, no prizes are to be won any more. But you'll probably still learn something about the VO by trying these.

### The 2024 Köln AG GAVO Puzzler

Can You See Through A Galaxy Cluster?

Galaxies are extended objects. And they come quite densely when they group in larger clusters. So: How much of what is behind them is obscured by the galaxies in a cluster? Let's look at the Virgo cluster, which proposition of the 1-degree circle around M87 is obscured by galaxies, where we define "obscured" as "covered by a circle of four 2-magnitude half-light radii around an extended object"?



With our great 70 cm x 140 cm board showing photos in front of M87, there is a computer at our booth you can use to solve the puzzle with all recommended software installed. At our booth, about 15 minutes into the coffee breaks on Tuesday and Wednesday, we will give a hint - every time a new one. Plus, of course, we'll always have to help with VO problems of all kinds, including this one.

Puzzler for 2024

...[hints](#) that (hopefully) help you solve the puzzler...

...and a [proposed solution](#)

### The 2023 Berlin AG GAVO Puzzler



The Astrophysical Virtual Observatories (AVOs) have been created in a number of countries, available databases and current observing material as a collection of interoperating data

# ArVO – Armenian Virtual Observatory

## Meetings and Events:

- 7<sup>th</sup> Byurakan International Summer School (7BISS), 07-11.09.2020, Byurakan, Armenia
- Astronomical Surveys and Big Data 2 (ASBD-2), 14-18.09.2020, Byurakan, Armenia

**7<sup>th</sup> Byurakan International Summer School for Young Astronomers**  
“Astronomy and Data Science”  
7-12 September 2020, Byurakan (Armenia)

The School is the 7th of Byurakan International Summer School (BISS) series founded in 2006 and being held once every 2 years, one of the most important and regular astronomical summer/winter schools in the world. According to the analysis of the IAU Division C (Education, Outreach and Heritage), BISS is among the top 3 astronomical schools in the world (together with IAU ISYAs and Vatican schools, VOSS), as well as the NDON-OPTICON schools are among the best ones.

List of Lecturers	Main Topics	Scientific Organizing Committee (SOC)
Mashoor Ahmad Salami Abdard (UAE) Ivan Andronov (Kazant) Chen Zhou Cui (China) Markus Demleitner (Germany) Davide Elia (Italy) Ajit Kembhavi (India) Ashish Mahabal (USA) Oleg Malkov (Russia) Areg Micaelian (Armenia) Elena Mikhaylovna (Armenia) Fabio Pasian (Italy) Amin Sarkisyan (France)	Astronomical Surveys Data Reduction and Analysis Digitization of astronomical data Astronomical Catalogues, Archives and Databases Big Data in Astronomy Data Science Astrostatistics and Astroinformatics Virtual Observatories	Areg Micaelian (Armenia, Chair) Markus Demleitner (Germany) Chen Zhou Cui (China) Ajit Kembhavi (India) Andy Lawrence (UK) Ashish Mahabal (USA) Oleg Malkov (Russia) Masatoshi Chiba (Japan) Fabio Pasian (Italy) Amin Sarkisyan (France) David Schade (Canada)

Local Organizing Committee (LOC)
Hayk Abrahamyan (Chair) Gor Mikayelyan (Co-Chair) Naira Aratyan (Secretary) Derenik Andriasyan Hasmik Andriasyan Daniel Bagdasaryan Sona Farnsanyan Arus Harutyunyan Gayane Kostanyan Geghen Mkoyan Anahit Samoyan Andranik Sogoyan

**Organizers and Sponsors**

**Contacts**  
Address: Byurakan Astrophysical Observatory (BAO), Byurakan 0213, Aragatsotn province, Armenia  
E-mail: [asbd2@bao.am](mailto:asbd2@bao.am), [gor.mikayelyan@bao.am](mailto:gor.mikayelyan@bao.am), [nayagyanyan@gmail.com](mailto:nayagyanyan@gmail.com) (Naira Aratyan)  
Web: <https://www.bao.am/meetings/meetings/SS2020/>

**Astronomical Surveys and Big Data 2**  
14-18 September, 2020, Byurakan, Armenia

The International Symposium Astronomical Surveys and Big Data 2 (ASBD-2) will take place on 14-18 September 2020. This will be the 2<sup>nd</sup> such meeting, we had a very successful meeting ASBD in 2016 with participation of astronomers and computer scientists. We combined astronomers and computer scientists with heavy involvement of astronomical surveys, catalogs, archives, databases and VOs.

Invited Speakers	Main Topics	Scientific Organizing Committee (SOC)
Mashoor Al Wardat (United Arab Emirates) Chen Zhou Cui (China) Magdus Demleitner (Germany) Davide Elia (Italy) Ashish Mahabal (USA) Oleg Malkov (Russia) Areg Micaelian (Armenia) Fabio Pasian (Italy) Kaushtubh Vaghmare (India)	Astronomical Surveys Data Reduction and Analysis Digitization of astronomical data Astronomical Catalogues, Archives and Databases Big Data in Astronomy Data Science Astrostatistics and Astroinformatics Virtual Observatories	Areg Micaelian (Armenia, Chair) Markus Demleitner (Germany) Chen Zhou Cui (China) Ajit Kembhavi (India) Andy Lawrence (UK) Ashish Mahabal (USA) Oleg Malkov (Russia) Masatoshi Chiba (Japan) Fabio Pasian (Italy) Amin Sarkisyan (France) David Schade (Canada)

Local Organizing Committee (LOC)
Gor Mikayelyan (Chair) Naira Aratyan (Secretary) Hayk Abrahamyan Derenik Andriasyan Hasmik Andriasyan Daniel Bagdasaryan Sona Farnsanyan Arus Harutyunyan Gayane Kostanyan Geghen Mkoyan Anahit Samoyan Andranik Sogoyan

**Organizers and Sponsors**

**Contacts**  
Address: Byurakan Astrophysical Observatory (BAO), Byurakan 0213, Aragatsotn province, Armenia  
E-mail: [asbd2@bao.am](mailto:asbd2@bao.am), [gor.mikayelyan@bao.am](mailto:gor.mikayelyan@bao.am), [nayagyanyan@gmail.com](mailto:nayagyanyan@gmail.com) (Naira Aratyan)  
Web: <https://www.bao.am/meetings/meetings/ASBD2/contacts.html>

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Introductory Session
Registration is closed
List of Participants
Deadlines
Contacts

## Programme

All times are in Armenia Standard Time (GMT+4)

- Presentation, - Record, - Movie

### 07 September 2020, Monday

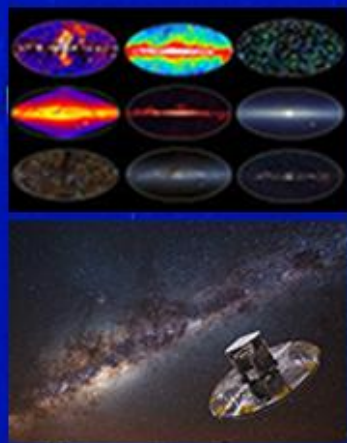
- 10:00-10:30 **Official opening of 7BISS: Welcome, Introductory Session**
- 10:30-11:30 **Areg MICKAELIAN (BAO, Armenia): Viktor Ambartsumian and Byurakan Astrophysical Observatory**
- 11:30-12:00 Coffee break
- 12:00-13:00 **Fabio PASIAN (INAF, Italy): Open Data, FAIR principles, and the Virtual Observatory**
- 13:00-13:30 **Markus DEMLEITNER (UH, Germany): Virtual Observatory Techniques With A View To Gaia Spectroscopy: The Byurakan Objective Prism Spectra**
- 13:30-14:00 Meet your fellows

- 11:40-12:00 **Yuri PROTSYUK (Ukraine) [CT]: Catalogs of celestial bodies from digitized photographic plates of the Ukrainian Virtual Observatory Archive**
- 12:00-12:20 **Daria DOBRYCHEVA (Ukraine) [CT]: Machine Learning techniques for automated classification of galaxies into five classes by visible shape**
- 12:20-12:40 Coffee/tea break
- 12:40-13:20 **Areg MICKAELIAN (Armenia) [IT]: BAO plate archive project: digitization, electronic database and scientific usage**
- 13:20-14:00 **Fabio PASIAN (Italy) [IT]: Evolving the VO from interoperable data collections to an integrated system of services for data-intensive science**
- 14:00-15:20 Lunch break
- 15:20-15:40 **Monica SORAISAM (USA) [CT]: ANTARES: Brokering alerts in real-time in the Big-Data era**
- 15:40-16:00 **Aritra GHOSH (USA) [CT]: Galaxy Morphology Network (GaMorNet): A Convolutional Neural Network used to study morphology and quenching in ~100,000 SDSS and ~20,000 CANDELS galaxies**
- 16:00-16:20 **Casmir OBASI (Nigeria/Chile) [CT]: The Confirmation of Two New Bulge Globular Clusters in the Milky Way: NewGL FSR19 and FSR25**
- September 18, Friday**
- SESSION 5, Chair: Oleg MALKOV**
- 11:00-11:40 **Chen Zhou CUI (China) [IT]: Virtual Observatory, from Idea to Research Mode**
- 11:40-12:20 **Areg MICKAELIAN (Armenia) [IT]: The Armenian Virtual Observatory (ArVO)**
- 12:20-12:40 Coffee/tea break
- 12:40-13:20 **Markus DEMLEITNER (Germany) [IT]: Resurrecting the DFBS into the VO**
- 13:20-13:40 **Irina VAVILOVA (Ukraine) [CT]: Machine Learning techniques for binary morphological classification of SDSS-galaxies and their problem point**
- 13:40-14:00 **Anjali Shivani Reddy THADISINA (India) [CT]: Detection of Asteroids using Machine learning technique**
- 14:00-15:20 Lunch break



International Symposium  
*"Astronomical Surveys and Big Data 3"*

15-19 September 2025, Byurakan, Armenia



## IV REGIONAL ASTRONOMICAL SUMMER SCHOOL

### *“Astronomy and Data Science”*

8-12 September 2025, Byurakan, Armenia

<https://www.bao.am/meetings/meetings/4RASS/>

IV Regional Astronomical Summer School (4RASS) , BAO,  
Armenia



## VO講習会2015如月

- 開催日 : 2015年2月26日(木)、27日(金) (両日とも10:00~17:00)
- 参加申込締切 : 2015年2月12日(木)
- 旅費補助申請締切 : 2015年1月26日(月)
- 会場 : 国立天文台三鷹キャンパス 南棟二階共同利用室 (〒182-8601 東京都三鷹市 5-1-8 国立天文台)
- 講師 : 白崎 裕治 (国立天文台 天文データセンター)  
川口 俊宏 (国立天文台 天文データセンター)  
川崎 渉 (国立天文台 チリ観測所)

## VO講習会2014睦月

### Announcement

### Announcement

- [final circular](#)
- [2nd circular](#)
- [1st circular](#)

### プログラム

一日目 2/26 (木)		
10:00 - 10:20	VO概論	白崎 <a href="#">pptx pdf</a>
10:20 - 11:50	JVOポータル利用法(前半)	白崎 <a href="#">pptx pdf</a>
11:50 - 13:00	昼休み	
13:00 - 13:30	JVOポータル利用法(後半)	白崎
13:30 - 14:30	Vissage利用法	川崎 <a href="#">ppt pdf</a>
14:30 - 15:00	休憩	
15:00 - 15:40	VOツール利用法 (TOPCAT)	白崎 <a href="#">pptx pdf</a>
15:40 - 16:20	VOツール利用法 (Aladin)	川口
16:20 - 17:00	VOツール利用法 (Specview)	白崎 <a href="#">pptx pdf</a>

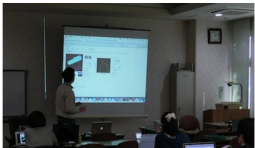


日程: 2014年1月27日(月)、28日(火)  
応募締切: 2014年1月17日(金)  
会場: 国立天文台三鷹キャンパス

- [1st circular](#)
- [講習会参加者への連絡](#)

### プログラム

1月27日 (月)		
10:00 - 10:20	VO概論	白崎
10:20 - 11:50	JVOポータル利用法	白崎
11:50 - 13:00	昼休み	
13:00 - 13:30	ALMAWebQL利用法	江口
13:30 - 14:30	Vissage利用法	川崎
14:30 - 14:50	休憩	
14:50 - 17:20	VOツール利用法	TOPCAT: 小宮 Aladin: 江口 Specview: 小宮



日本語

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JVO Portal

JVO Project

We are ...

- promoting Database Ast
- developing JVO Portal
- developing system to an

 <-- Let's try JVO Portal

[help\\_desk@jvo.nao.ac.jp](mailto:help_desk@jvo.nao.ac.jp)

Current status of JVO portal

News

2025-03-16

Nearly 200 million spectral data were added to the JVO crawler database.

2024-09-09

NRO FITS Archive is now operational. This archive contains FITS images collected through open-access NRO 45 m telescope. These data are available via the CASA/pipeline.

English

ホーム

JVOについて

資料

研究成果

VOツール

VO講習会

リンク

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JVOポータル

アクセス統計

内部連絡

VO講習会

これまでに開催した講習会等の資料を公開しています。

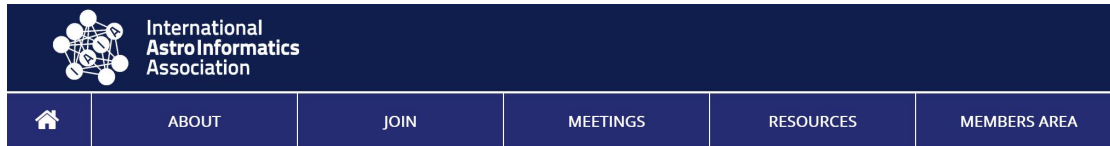
VO講習会2015如月	2015年2月26日〜27日	JVOポータル・VOツールの使用法、ユースケース実習。
VO講習会2014睦月	2014年1月27日〜28日	JVOポータル・VOツールの使用法、ALMAデータ取得法、ユースケース実習。
VO講習会2013春	2013年3月25日〜26日	JVOポータル・VOツールの使用法、ユースケース実習。
VO講習会2012秋	2012年9月27日〜28日	JVOポータル・VOツールの使用法、ユースケース実習。
VO講習会2012	2012年3月26日〜27日	JVOポータル・VOツールの使用法、ユースケース実習。
VO講習会2010@京都大学	2010年9月27日〜28日	JVOポータルサイトの使用法・VOツールの使用法の講習。
VO講習会2010	2010年1月25日〜27日	JVOポータルサイトの使用法・VOツールの使用法の講習。
VO夏の学校2006		VOサービスの立ち上げ方。JVOポータル・VOツールの使用法。

<http://jvo.nao.ac.jp/voschool.html>

IV Regional Astronomical Summer School (4RASS), BAO, Armenia



# Resources for Astroinformatics



## Useful Links and Resources

This compilation will grow. Feel free to [suggest additions](#).

[General Data Science And Astroinformatics](#) - Other Portals And Compilations Of Useful Links, And Virtual Observatory Services.

[Software Resources And Links](#) - Code Depositories And Libraries, And Useful Web Services.

[Learning Resources](#) - Online Classes, Tutorials, And Books.

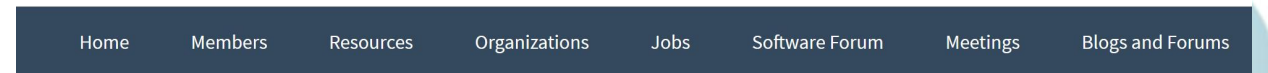
[Astroinformatics Literature](#) - ArXiv Explorer, And The Reviews And Papers Of Interest.

[Funding Opportunities](#) - Links To Some Relevant Calls For Proposals From Various Agencies.

<http://astroinformatics.info/resources>



## Astrostatistics and Astroinformatics Portal



- **On-line courses**
- You are here: [Home](#) / [Resources](#) / On-line courses
- A vast array of courses in statistics and computational methods are available online. Some have fixed schedules and charge tuition, others are flexible and free. We list a selection of these courses here. Listing does not imply any assurance or approval by ASAIP.
- The Astrostatistics and Astroinformatics Portal (<https://asaip.psu.edu>) is a new Web site serving the cross-disciplinary communities of astronomers, statisticians and computer scientists.

<https://asaip.psu.edu/resources/on-line-courses/>



# Astrostatistics and Astroinformatics Portal

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You are here: [Home](#)

## Welcome to ASAIP

The Astrostatistics and Astroinformatics Portal (<https://asaip.psu.edu>) is a new Web site serving the cross-disciplinary scientists. It is intended to foster research into advanced methodologies for astronomical research, and to promote the WWW public is welcome to read materials in ASAIP. Use the navigation bar above, or the search box at the top of the page.

The ASAIP provides searchable abstracts to Recent Papers in the field, several discussion Forums, various resources and access to various Web resources such as on-line courses, books, jobs and blogs. The site will be used for publishing research results and for promoting the field.

## Software tutorials

You are here: [Home](#) / [Resources](#) / Software tutorials

On-line resources, particularly for R and Python, for statistical analysis and programming.

### Introduction to R programming

Series of 21 ~4-minute video tutorials on R programming by Google Developers.

### Software carpentry

Software Carpentry's mission is to help scientists and engineers get more research done in less time and with less pain by teaching them basic lab skills for scientific computing. The organization provides short 2-day workshops worldwide to teach modern software skills.

<https://asaip.psu.edu/>

## On-line courses

You are here: [Home](#) / [Resources](#) / On-line courses

A vast array of courses in statistics and computational methods are available online. Some have fixed schedules and charge tuition, others are flexible and free. We list a selection of these courses here. Listing does not imply any assurance or approval by ASAIP.

### Coursera: Data-driven Astronomy

Science is undergoing a data explosion, and astronomy is leading the way. Modern telescopes produce terabytes of data per observation, and the simulations required to model our observable Universe push supercomputers to their limits. To analyse this data scientists need to be able to think computationally to solve problems. In this course you will investigate the challenges of working with large datasets: how to implement algorithms that work; how to use databases to manage your data; and how to learn from your data with machine learning tools. The focus is on practical skills – all the activities will be done in Python 3. Course content includes: discovering pulsars in radio images, managing data and algorithms, SQL queries, regression, machine learning classification. The course is created by The University of Sydney AU.

### Employment advice from the AAS

Advice from the AAS The American Astronomical Society Committee on Employment encourages astronomers who seek positions in industry to learn more statistics and informatics.

### Statistics.com

Starting in 2003, the Institute for Statistics Education now offers over a hundred courses through the Web site Statistics.com. A typical course is 4-5 weeks in duration, costs around \$400, and is taught by an author of a major textbook or monograph. We list here courses related to astrostatistics in the areas of: training in the R software environment; Bayesian methodology; and general statistical modeling.



## Ay 119: Astroinformatics - Spring 2025

*Open to everyone interested - students from any field are welcome.*



### Instructors:

- George Djorgovski [djorgovski]
- Ashish Mahabal [ashish]
- Matthew Graham [mjg]
- Santiago Lombeda [santiago]
- [name] at caltech dot edu

<https://sites.astro.caltech.edu/ay119/>

<https://sites.astro.caltech.edu/~george/ay119/>

## Ay 119: Methods of Computational Science - Spring 2016

*Open to everyone interested - students from any field are welcome.*

This class is offered in a *flipped classroom mode*: all lectures and other materials are available on-line.

Caltech

Department of Astronomy

[Read this first: how it will work \(pdf\)](#)

Discussion sessions: Wednesdays, 10-11 am PDT [Zoom link](#) [code=]

[Facebook discussion group](#)

Schedule by the week:

- The Week of March 29: George: Introduction
  - [George's lecture about the Astronomy Data Landscape](#), from the KISS short course
  - Alternative/supplementary viewing: [George's introductory lecture "Exploring the Data Landscape" slides \(pdf\)](#) [Note: a lot of repetition from the previous link]
  - Explore the [IAIA resources page](#)
  - Explore the past [Astroinformatics conferences](#). Most have videos and slides on YouTube
  - [FB Astroinformatics page](#)
- The Week of April 5: Ashish: Best Programming Practices
  - Watch Ashish's lectures [here](#), but note some [updates](#).
  - [Assignment](#)
  - Dataset for the assignment: [dsfp\\_ztf\\_feats.npy](#)
  - [Software Carpentry on Github](#)
- The Week of April 12: Matthew: Regression and Bayesian Statistics
  - Regression: [Video](#) [login with your Caltech credentials] \* [slides \(pdf\)](#)
  - Bayesian Statistics: [Video](#) [login with your Caltech credentials] \* [slides \(pdf\)](#)
  - Exercises: [Python notebook](#)
  - Optional: for a frequentist perspective watch Amy Braverman's lectures [here](#)





[Return to search](#)

## Astronomy

Term : Spring 2025

Catalog Year : 2024-2025

# AST 520 - Astroinformatics: Big Data In Astronomy

**Description:** This course provides training in the fundamentals of astroinformatics: applying "big data" techniques to research topics in astronomy. Course material will include case studies of astroinformatics projects that exist presently and that are coming in the future; tutorials in computational approaches; exposure to relevant statistical approaches; and training in creating informatics research topics. The course will conclude with a term project in which students will apply the skills they have learned to existing data sets. Letter grade only.

Units: 3

No sections currently offered.

**Prerequisite:** Admission to Astronomy and Planetary Science PhD

## AST 520 - Astroinformatics: Big Data In Astronomy

tion  
ourse provides training in the fundamentals of  
formatics: applying "big data" techniques to  
h topics in astronomy. Course material will  
e case studies of astroinformatics projects that  
esently and that are coming in the future;  
ls in computational approaches; exposure to  
t statistical approaches; and training in  
g informatics research topics. The course will  
de with a term project in which students will  
he skills they have learned to existing data  
tter grade only. Class Notes: - NAUFlex: In  
and Remote. This class is delivered  
onously with a mix of in-person and remote  
ssions. Students and faculty meet at specific  
with some students participating in-person at  
ed physical locations and other students  
ating remotely. Enrollment Requirements:  
isite: Admission to Astronomy and Planetary  
e PhD.

Recent Professors

[Chadwick Trujillo](#)

Open Seat Checker

[Get notified when AST 520 has an open seat](#)

Schedule Planner

[Add AST 520 to your schedule](#)

Recent Semesters

Spring 2021, Spring 2019

Offered

TuTh

Avg. Class Size

15

Avg. Sections

1

<https://catalog.nau.edu/Courses/course?courseId=011813&term=1251>



**BE BOLD. Shape the Future.**  
**New Mexico State University**  
NMSU Astronomy

# Astronomy 630: Astrostatistics

## • General Information

**Instructor:** [Jon Holtzman](#)

**Class Times:** Tuesday and Thursday, 10:30 - 11:15

**Location:** AY 119

• [Syllabus](#) for Spring 2020

• [Lecture notes](#) ([PDF](#))

## Software toolkits

- [scikit-learn](#) (Python)
- [astro-ml](#) (Python)

<http://astronomy.nmsu.edu/holtz/a630/index.html>

<http://astronomy.nmsu.edu/holtz/>

*Astr 630 Class Notes – Spring 2024*

1

## ASTRONOMY 630

Numerical and statistical methods in  
astrophysics

## CLASS NOTES

Spring 2024

Instructor: Jon Holtzman



# University of Belgrade Faculty of Mathematics

## Bachelor studies - Astronomy and Astrophysics

### Module Astrominformatics

- The studies last **4 years** and have the extent of **240 ECTS**
- This Study Program became active since the 2015/16. school year

#### 4th Year

7th Semester			
Course name	No. of hours	ECTS	
1. Relational Databases	2+3	6	
2. Computer Graphics	2+3	6	
3. Solar System Dynamics	3+2	6	
4. A course from optional block AI2	2+0	3	
5. Probability	2+3	6	
6. Seminar paper	0+0+2	2	
8th Semester			
Course name	No. of hours	ECTS	
1. Planetary Astronomy	2+3	5	
2. A course from optional block AI3	2+3	5	
3. A course from optional block AI4	2+2	5	
4. Astronomical Data Processing 2	2+2	5	
5. A course from optional block AI5	2+2	5	
6. Statistics	2+3	6	
Total	51	60	

#### 3rd Year

5th Semester			
Course name	No. of hours	ECTS	
1. Operating Systems	3+2	6	
2. Rational Mechanics 1	2+3	6	
3. Ephemeris Astronomy 1	2+3	6	
4. Astronomical Data Processing 1	3+2	6	
5. Introduction to Numerical Mathematics	2+3	6	
6th Semester			
Course name	No. of hours	ECTS	
1. Practical Astronomy	2+3	6	
2. Artificial Intelligence	2+3	6	
3. Introduction to Celestial Mechanics	3+2	6	
4. A course from optional block AI1	2+3	6	
5. Stellar Astronomy	3+2	6	
Total	50	60	

#### 1st Year

1st Semester		
Course name	No. of hours	ECTS
1. Programming 1	3+3	
2. Introduction to Computer Organization and Architecture 1	3+2	
3. Discrete Structures 1	3+2	
4. Linear Algebra and Analytic Geometry	3+3	
5. General Astronomy 1	2+2+1	
2nd Semester		
Course name	No. of hours	ECTS
1. Programming 2	3+3	
2. Introduction to Computer Organization and Architecture 2	3+2	
3. Discrete Structures 2	3+2	
4. Analysis 1	3+3	
5. General Astronomy 2	2+2+1	
Total	54	

#### 2nd Year

3rd Semester		
Course name	No. of hours	ECTS
1. Data Structures and Algorithms	3+2	
2. Introduction to Web and Internet Technologies	3+2	6
3. General Astrophysics 1	2+2+1	6
4. Geometry	3+2	6
5. Analysis 2	3+2	6
4th Semester		
Course name	No. of hours	ECTS
1. Design and Analysis of Algorithms	3+2	6
2. Object-Oriented Programming	3+2	6

#### Optional block AI1

	Course name	No. of hours	ECTS
1.	Programming Language Paradigms	3+2	6
2.	Positional Astronomy	2+3	6

#### Optional block AI2

	Course name	No. of hours	ECTS
1.	English Language 1	2+0	3
2.	Computer Science and Society	2+0	3

#### Optional block AI3

	Course name	No. of hours	ECTS
1.	Basic software tools in astronomy	2+3	5
2.	Theoretical Astronomy	2+3	5
3.	Introduction into Theory of Relativity and Cosmology	2+3	5

#### Optional block AI4

	Course name	No. of hours	ECTS
1.	Stellar Systems Dynamics	2+2	5
2.	Ephemeris Astronomy 2	2+2	5
3.	Practical Methods of Astronomical Observations	2+2	5

#### Optional block AI5

	Course name	No. of hours	ECTS
1.	Introduction to Astrobiology	2+2	5
2.	Teaching Methodology in Mathematics and Computer Science	2+2	5

<http://www.matf.bg.ac.rs/eng/cp/33/bachelor-studies---astronomy-and-astrophysics-p--module-astrominformatics--p/>



# S3 – Astroinformatics – Astrostatistics and Machine Learning in Astronomy

Univ. Belgrade  
Prof Dr. A. Kovačević

Learning Outcomes:

Univ. Belgrade  
Prof Dr. A. Kovačević

**Astroinformatics – Astrostatistics and Machine Learning in Astronomy**  
(S3, elective, 6 ECTS)

Knowledge and Understanding:

Applying Knowledge and Understanding:

Prerequisites

**Astroinformatics – Astrostatistics and Machine Learning in Astronomy**  
(S3, elective, 6 ECTS)

This course will address following learning priorities: Communication, Critical Thinking, Information Literacy, Self-Directed Learning, and Technology Use. Upon completion of this course, students will be able to handle and apply tools and techniques for processing large data in their original research areas as well as for eventual applications in the space industry.

**Astroinformatics** is an interdisciplinary field of study involving the combination of astronomy , data science , informatics , and information / communications technologies. The primary focus of this course is on the world wide distributed collection of digital astronomical databases, image archives, and research tools used for analyzing these astronomical observations.

All lectures and tutorials are designed to equip student to with a wide range of IT tools that are essential for the modern astronomer. These include programming, Unix scripting, database construction and use, internet technologies and data mining. Most sessions are interactive. The advantage of this is that students can continue to use all the software (e.g. scripting, databases etc) that they have been working on.

Experience with Anaconda Python, SciPy, NumPy, as well as GitHub would be preferred, but is not required.

-Large collection of images analysis: i.e. application of kernel convolution for detection of satellite galaxies of the Milky Way – Databases: Dark Energy Survey, LSST, SDSS – Specific tools for processing and mining data: Data Lab, World

<https://www.master-mass.eu/s3-astroinformatics-astrostatistics-and-machine-learning-in-astronomy/>

IV Regional Astronomical Summer School (4RASS) , BAO,  
Armenia

# Data Mining & Exploration

We make science  
discovery happen

- **Tutors:** Massimo Brescia and Stefano Cavuoti
- The course of Astroinformatics of the **Master's Degree** in Physics of the University Federico II, is the first course of Astroinformatics in Europe and will address the methodological and technological challenges posed by the scientific exploitation of massive data sets produced by the new generation of telescopes and observatories. Astronomy, which already was at the forefront of Big Data science with exponentially growing data volumes and data rates, is now entering the petascale regime at optical, infrared and radio wavelengths. Astronomy is truly becoming data-driven in the ways that are both quantitatively and qualitatively different from the past. The data structures are not simple, and the procedures to gain astrophysical insights are not obvious, but the informational content of the modern data sets is so high that archival research and data mining are not merely profitable, but practically obligatory, since researchers who obtain the data can only extract a small fraction of the science that is enabled by it.
- The Course gives 8 credits but is also included into the PhD curriculum in Physics of the University Federico II.

<http://dame.oacn.inaf.it/astroinformatics.html>

## Course of Astroinformatics

### PhD and M. Sc. in Physics - University Federico II of Naples

DAME Home	▶
DAME Software Services	▶
DAME Science Cases	▶
DAME Publications	▶
DAME Education & Lectures	▶
Who's who in DAME	▶

<b>News</b>
The Course will start on November 6, 2018
.....
<u><a href="#">Course list of questions for oral examination</a></u>
.....
<u><a href="#">Physics courses notices</a></u>
.....
<u><a href="#">F2 Magazine article on Astroinformatics</a></u>
.....

#### Lectures - Download

- **Tutor lectures:**
  - Lesson 1 - E-Science and Data Warehouse
  - Lesson 2 - Data in Astronomy and use of Virtual Observatory
  - Lesson 3 - Database management
  - Lesson 4 - Introduction to MySQL
  - Lesson 5 - Introduction to Python
  - Lesson 6 - Supervised Machine Learning part I
  - Lesson 7 - Supervised Machine Learning part II
  - Lesson 8 - Supervised Machine Learning part III
  - Lesson 9 - Curse of dimensionality
  - Lesson 10 - Supervised Machine Learning part IV
  - Lesson 11 - Fuzzy Logic
  - Lesson 12 - TDA
  - Lesson 13 - Unsupervised Machine Learning
  - Lesson 14 - Fundamentals of C/C++
  - Lesson 15 - Lecture on Deep Learning
  - Lesson 16 - Lecture on Data Mining examples for galactic Physics
  - Lesson 17 - Lecture on Neural Gas applied to galactic extinction
- **General Stuff:**
  - Python exercise - material
  - Python exercise - L5 material
  - Python exercise - Python script on KNN
  - C/C++ exercises - Code examples
  - Neural Gas videos - examples



## Courses



### Universidad de Chile

Santiago, Chile



## Astroinformática

AS4501-1 - Otoño 2025



Historial



Horario



Integrantes



Material Do...



Novedades



Presentación

## Historial



**Presentacion** 28 de Julio a las 10:10 hrs.  
Francisco Forster Buron



**Nota Final** 28 de Julio a las 10:10 hrs.  
Francisco Forster Buron



**Presentación final (Fecha entrega: 23/07/2025)** 23 de Julio a las 10:22 hrs.  
Francisco Forster Buron

<https://www.u-cursos.cl/ingenieria/2025/1/AS4501/>

[https://github.com/phuijse/courses\\_notebooks](https://github.com/phuijse/courses_notebooks)

## AS4501 - Astroinformatics

Number of Credits	6
Offering Department	Faculty of Physical and Mathematical Sciences
Course Teacher	Francisco Förster, Valentino González
Language of Instruction	English
First Day of Class	Aug 31, 2020
Last Day of Class	Dec 21, 2020
Course Component	Lecture
Mode of Teaching	Synchronous
Meeting Time	M
Time Zone	S

**Astroinformatics**  
**Course Code: AS4501**  
**Faculty of Physical and Mathematical Sciences**  
**University of Chile**

### Topics:

- 1. Statistics for astronomy:** relevant distributions, parametric and non-parametric statistics, classical and Bayesian inference.
- 2. Astronomical data:** sources of errors, data acquisition, basic principles of databases, applications to astronomical data
- 3. Machine learning:** density estimation, classification metrics, false positives and negatives, F1-scores, ROC curves, confusion matrices, data balancing, supervised and unsupervised classification, regression.
- 4. Temporal and spatial analysis:** stochastic processes, autocorrelation, autoregressive models, periodic variability, Fourier transform, wavelets and periodograms, spatial analysis, spatial correlation, tessellations, Gaussian process interpolation
- 5. High performance computing (HPC):** basic principles of HPC, queue management and pipelines, massive data processing
- 6. Group project:** problem identification, bibliographic search, identification of relevant variables, work methodologies, planning and distribution of tasks, data analysis, statistical analysis and physical interpretation, presentation.

## Machine-learning notebooks

Jupyter notebooks on machine-learning algorithms. These are supplementary material for the AS4501 "Astroinformatics" and EL4106 "Computational Intelligence" courses at Universidad de Chile.

- 1. Neural networks:** pure-numpy multilayer perceptron (MLP), tensorflow MLP and Bayesian MLP with PyMC3
- 2. Support vector machines:** C-SVM, nu-SVM and one-class SVM using scikit-learn
- 3. Boosting with decision trees:** Decision trees, Adaboost and Gradient boosting using scikit-learn
- 4. Bagging with decision trees:** Decision trees, Bagging and Random Forest using scikit-learn
- 5. Self organizing maps:** Color clustering through SOM using Somoclu

Requirements will vary between notebooks. Incomplete list of dependencies:

- Python 3 (not tested with Python 2)
- Numpy
- Tensorflow
- PyMC3
- Theano
- Scikit-learn
- Somoclu

IV Regional Astronomical Summer School (4RASS) , BAO,  
Armenia





Instituto de Astrofísica  
de Canarias • IAC

## XXX Canary Islands Winter School of Astrophysics

La Laguna, Tenerife, Spain - 4-10 November 2018

# Big Data analysis in astronomy

The primary aim of this XXX Winter School is to educate the next generation of astronomers in analysis techniques that can be used to digest the gigantic amounts of data that will be produced by the next generation of telescopes and surveys.

The eBook contains a summary with the contents given by each one of the lectures (named as **Lectures notes**), followed by the recorded talks (**Lecture #**) and the slides used for them (**Lecture slides**). References, tutorials, and suggestions for additional reading are also included.

<http://research.iac.es/winterschool/2018/pages/book-ws2018.php>

### eBook XXX Winter School: summaries, talks, references, and tutorials

This webpage contains the materials needed to follow the lectures given during the school.

It contains a summary with the contents given by each one of the lectures (named as *Lectures notes*), followed by the recorded talks (*Lecture #*) and the slides used for them (*Lecture slides*). References, tutorials, and suggestions for additional reading are also included.

 [Foreword and Acknowledgements](#)  
from the Organizers

#### General overview on the use of machine learning techniques in astronomy

By: **Prof. S. George Djorgovski**, *Caltech, Division of Physics, Mathematics and Astronomy*

[Personal webpage](#)

[Lectures notes \(PDF\)](#)



#### **Lecture 1:** [A broad intro into astroinformatics in the context of data science](#)

 [Lecture slides](#)

- Transformation of science driven by computing and information technology.
- From Virtual Observatory to Astroinformatics and beyond.
- Methodology transfer in data science.

#### **Lecture 2:** [Data visualization](#)

#### Challenges

By: **Prof. Mario Juric**, *University of Washington*

[Personal webpage](#)

[Lectures notes \(PDF\)](#)

This series discusses data challenges and solutions in forthcoming large astronomical surveys. It covers the topic broadly, but with additional focus on Large Synoptic Survey Telescope (LSST) as the largest ground-based survey of the next decade, and the Zwicky Transient Facility (ZTF) the closest time-domain precursor to LSST which is operating today.



#### **Lecture 1:** [The Era of Big Data: How Large Surveys are Changing Astronomy](#)

 [Lecture slides](#)

#### **Lecture 2:** [Image Processing: Turning Petabytes of Data into Terabytes of Information](#)

 [Lecture slides](#)

#### **Lecture 3:** [Gone in 60 Seconds: The Challenges of Real-Time Astronomy](#)

 [Lecture slides](#)

#### Machine Learning: Unsupervised

By: **Dr. Dalia Baron**, *School of Physics and Astronomy, Tel-Aviv University*

[Personal webpage](#)

[Lectures notes \(PDF\)](#)



#### **Lecture 1:** [Introduction: the differences between supervised and unsupervised learning and their effect on our scientific methodology](#)

 [Lecture slides](#)

#### **Lecture 1:** [Clustering algorithms](#)

#### **Lecture 2:** [Clustering algorithms](#)

 [Lecture slides](#)

#### **Lecture 2:** [Decision Trees and Random Forests](#)

 [Lecture slides](#)

#### **Lecture 3:** [Dimensionality reduction algorithms](#)

#### **Lecture 4:** [Dimensionality reduction algorithms](#)

 [Lecture slides](#)

# China-VO Annual Meetings

会议日程		
时间		
11月21日(周三)		
18:00-20:00		
11月22日(周四)		
上午第一节		
08:30-09:00		
09:00-09:10		
09:10-09:40		
09:40-10:10		
上午第二节		
10:10-10:30		
10:30-11:00		
11:00-12:00		
12:00-12:30		
12:30-14:00		
下午第一节		
14:00-14:20		
下午第二节		
14:00-14:20		

时间		
11月27日(周三)	13:00-	
18:00-20:00	晚餐 (	
11月28日(周四)	地点:	
上午第一节	主席:崔	
08:30-09:00	现场注	
09:00-09:10	开幕致	
09:10-09:40	先进天	
09:40-10:10	合影/	
上午第二节	主席:盛	
10:10-10:30	开放科	
10:30-11:00	国家天	
11:00-12:00	国台V	
12:00-12:30	嘉宾论	
12:30-14:00	午餐 (	
下午第一节	主席:庄	
14:00-14:20	智慧计	
14:20-14:40	机器学习在天文数据分析处理中的应用 (陶一寒, 国家	
14:40-15:00	嘉宾论坛一: 如何促进机器学习在天文数据分析中的应	
15:00-15:20	午餐 (品味餐厅)	
下午第一节	主席:季凯帆 (云南天文台)	
15:20-15:40	阿里人的天文情结 (张戈, 阿里云)	

<http://www.china-vo.org/events.html>

## China-VO Related Meetings

Upcoming:

- Astroinformatics and China-VO 2025, Nov. 26-30, 2025, Haikou, Hainan

Past:

- Astroinformatics and China-VO 2024, Nov. 26 - 30, 2024, Xinchang, Zhejiang
- Astroinformatics and China-VO 2023, Oct. 10 - 14, 2023, Renhuai, Guizhou
- Astroinformatics and China-VO 2022, Apr. 19 - 23, 2023, Guilin, Guangxi
- Astroinformatics and China-VO 2021, Jul. 18 - 22, 2022, Lijiang, Yunnan
- China-VO and Astroinformatics 2020, Nov. 25- 29, 2020, Xiamen, Fujian
- China-VO and Astroinformatics 2019, Nov. 27- Dec. 01, 2019, Daqing, Heilongjiang
- China-VO and Astroinformatics 2018, Nov. 21- 25, 2018, Jingdezhen, Jiangxi
- China-VO and Astroinformatics 2017, Nov. 28- Dec. 02, 2017, Dali, Yunnan
- IVOA Interop. Spring 2017, May 14-19, 2017, Shanghai, China
- China-VO and Astroinformatics 2016, Sep. 26-30, 2016, Urumqi, Xinjiang
- China-VO and Astroinformatics 2015, Nov. 26-30, Tianshui, Gansu
- China-VO and Astroinformatics 2014, Nov. 26-30, 2014, XinChang, Zhejiang
- China-VO and Astroinformatics 2013, Nov.13-17, 2013, Ya'an, SiChuan
- China-VO and Astroinformatics 2012, Nov.28 to Dec. 2, 2012, Yichang
- China-VO and Astroinformatics 2011, November 9-13, Guiyang
- The 2nd WWT Teacher Training, July 22-26, Huhhot
- China-VO 2010, Nvo. 24-28, Lijiang Yunnan
- China-VO 2009, Nov. 26-28, Chongqing
- China-VO 2008, Nov. 27-30, TaiYuan
- China-VO 2007, Nov. 19-21, Guangzhou
- Astronomical Data Analysis Software & Systems XVII, 23-26 September 2007, London, UK
- IVOA Interoperability Meeting. May 14-18, 2007. Beijing, China
- China-VO 2006. Nov. 29 to Dec. 3, 2006
- IVOA Interoperability Meeting. Sep. 18-22, 2006. Moscow, Russia
- The 20th International CODATA Conference. 2005.10.23-25, Beijing, China
- IAU GA 26th. August 14-25, 2006. Prague, Czech
- IVOA Interoperability Meeting. 14-19 May, 2006. Victoria, Canada
- China-VO 2005, Nov. 25-27, 2005. Weihai, Shandong
- ADASS XV and IVOA Interoperability Meeting. October 2-7. San Lorenzo de El Escorial, Spain
- IVOA Interoperability Workshop in Kyoto, May 16-20, 2005
- China-VO Internal Concentrated Study, 7-18 March 2005, Beijing
- 3rd China-VO national workshop, December 2004: Wuhan, China
- ADASS XIV, 24-27 October 2004: Pasadena, California, USA
- IVOA Interop Meeting, 27-29 September 2004: Pune, India
- Astronomical Telescopes and Instrumentation 2004, 21-25 June 2004: Glasgow, Scotland United Kingdom
- IVOA Small Projects Meeting 2003, 26-28 November 2003: Beijing, China
- The Second National VO Meeting, 25-26 September 2003: Beijing, China
- IAU XXV, 13-26 July 2003: Sydney, Australia



<https://nadc.china-vo.org/?&locale=en>





中国科学院大学  
University of Chinese Academy of Sciences

# Astroinformatics by China-VO @ UCAS

## Course Outline

- ❑ Lecture 1: Introduction to VO and Astroinformatics (I)
- ❑ Lecture 2: Introduction to VO and Astroinformatics (II)
- ❑ Lecture 3: Fundamental Technologies
- ❑ Lecture 4: Fundamentals of Astronomical Scientific Data
- ❑ Lecture 5: Fundamentals of Astronomical Scientific Data: Hands-on Practice
- ❑ Lecture 6: VO Architecture and Specifications
- ❑ Lecture 7: VO Resources and Services
- ❑ Lecture 8: VO Resources and Services: Hands-on Practice
- ❑ Lecture 9: VO Data Access and Applications
- ❑ Lecture 10: VO Data Access and Applications: Hands-on Practice
- ❑ Lecture 11: Astronomical Data Visualization and Visual Analytics
- ❑ Lecture 12: How to Build a Data-Driven Research Project
- ❑ Lecture 13: Big Data and Data Science
- ❑ Lecture 14: AI and Machine Learning: DL&ML
- ❑ Lecture 15: AI and Machine Learning: LLMs
- ❑ Lecture 16: Student Project Presentations
- ❑ Lecture 17: Final Open-Book Exam



## Course history

- Spring, 2024
- Spring, 2025
- Fall, 2025





中央大學天文研究所

Graduate Institute of Astronomy, NCU

## AS6095 "Astroinformatics" for Academic Year 2023

This is the web page for the course "Astroinformatics" offered at Institute of Astronomy, National Central University from Sep/2023 to Jan/2024.

### Important!

#### Class on 23/Sep/2023

We do not have a class on 23/Sep/2023. Instead, we discuss about the date/time of a supplementary class on

#### Class on 25/Sep/2023

We start the class at 17:00 on 25/Sep/2023.

#### Class on 02/Oct/2023

We go back to the original time-slot on 02/Oct/2023. We start the class at 09:00 on 02/Oct/2023.

### 1. Basic information

- Course name in English: "Astroinformatics"
- Course name in Chinese: "天文資訊分析"
- Instructor: Kinoshita Daisuke
- Classroom: S4-914

# Astroinformatics

— About this course —

Kinoshita Daisuke

Institute of Astronomy, National Central University

11 September 2023

[https://s3b.astro.ncu.edu.tw/ai\\_202309/](https://s3b.astro.ncu.edu.tw/ai_202309/)

# Beautiful Data



## Beautiful Data: Introduction to Practical Data Science

Spring 2024

Instructor: Alex Szalay

TA: Sanjana Sekhar

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**Class times:** MW 15:00-16:15

**Class location:** Bloomberg 464

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Send mail to

- [Alex Szalay](#),
- [Sanjana Sekhar](#), Office hours TBD

<http://www.sdss.jhu.edu/~szalay/>

### Remote classes:

Classes will be held *live at the usual class times*. Here are links to the powerpoint of the class, and some additional reading material:

Class	Date	Presentation	Video
01	Jan 22	<a href="#">pptx</a>	
02	Jan 24	<a href="#">pptx</a>	<a href="#">mp4</a>
03	Jan 29	<a href="#">pptx</a>	<a href="#">mp4</a>
04	Jan 31	<a href="#">pdf</a>	<a href="#">mp4</a>
05	Feb 12	<a href="#">pdf</a>	<a href="#">mp4</a>
06	Feb 14	<a href="#">pdf</a>	<a href="#">mp4</a>
07	Feb 19	<a href="#">pdf</a> , <a href="#">pdf</a>	<a href="#">mp4</a> , <a href="#">mp4</a>
08	Feb 26	<a href="#">pdf</a>	<a href="#">mp4</a> , <a href="#">mp4</a>
09	Feb 28	<a href="#">pdf</a>	<a href="#">mp4</a>
10	Mar 04	<a href="#">pdf</a>	<a href="#">mp4</a>
11	Mar 06	<a href="#">pdf</a>	<a href="#">mp4</a>
12	Mar 11	<a href="#">pdf</a>	<a href="#">mp4</a>
13	Mar 13	<a href="#">pdf</a>	<a href="#">mp4</a>
15	Mar 25	<a href="#">pptx</a>	<a href="#">mp4</a>
16	Mar 27	<a href="#">pptx</a>	<a href="#">mp4</a>
17	Apr 1	<a href="#">pptx</a>	
18	Apr 03	<a href="#">pptx</a>	
19	Apr 10	<a href="#">pptx</a>	



# Lessons Learned and Conclusion

- Tutorials and courses are very useful.
- Keep materials up-to-date is a big challenge.
- AI is very helpful for information collection, but must be used carefully.





# Data-driven Astronomy EPO

<https://wiki.ivoa.net/twiki/bin/view/IVOA/EduResourcesTutorials>