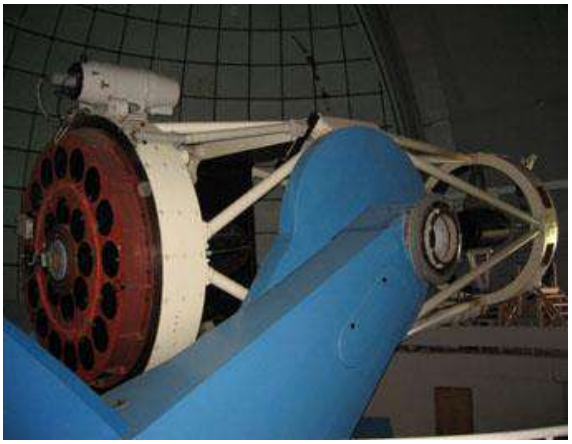
International Symposium

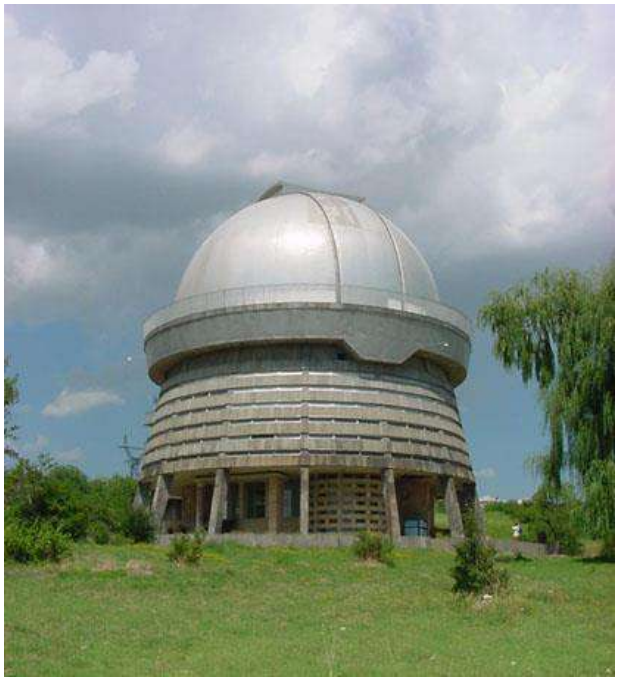
Astronomical Surveys and Big Data 2 (ASBD-2)

BYURAKAN ASTROPHYSICAL OBSERVATORY,

ARMENIA 14-18
September



ABSTRACT BOOK



Invited Speakers

- Mashhoor Al-Wardat (University of Sharjah , United Arab Emirates)
- Chenzhou Cui (NAOC and IVOA , China)
- Markus Demleitner (Universität Heidelberg , Germany)
- Davide Elia (INAF-IAPS , Italy)
- Ashish Mahabal (California Institute Of Technology , USA)
- Oleg Malkov (Institute of Astronomy , Russia)
- Areg Mickaelian (Byurakan Astrophysical Observatory , Armenia)
- Fabio Pasian (INAF - OATrieste, Italy)
- Kaustubh Vaghmare (Persistent Systems Ltd., India)

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- Chenzhou Cui (China)
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- Oleg Malkov (Russia)
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- BYURAKAN ASTROPHYSICAL OBSERVATORY
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- Byurakan Astrophysical Observatory
- Armenian Astronomical Society
- Armenian Virtual Observatory (ArVO)
- South West and Central Asia Regional Office of Astronomy for Development
- Viktor Ambartsumian International Science Prize
- National Academy of Sciences of the Republic of Armenia
- Science committee of the Republic of Armenia

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Program

Invited Talk [IT]: 40 mins including questions

Contributed Talk [CT]: 20 mins including questions

Posters [P]: 3 mins

September 14, Monday

Session 1. Chair: *Areg Mickaelian*

11:00-11:20 Welcome and Opening Session

11:20-12:00 **Areg Mickaelian [IT]**: *Surveys for active galaxies: discovery and studies*

12:00-12:20 **Maria Stone Babakhanyan [CT]:** *What GAMA reveals about low-redshift QSO environments*

12:20-12:40 *Coffee/tea break*

12:40-13:20 **Areg Mickaelian [IT]**: *Big Data in Astronomy: Surveys, Catalogs, Databases, and Archives*

13:20-13:40 **Xiao-Wei Duan [CT]:** *Detecting shock waves in RR Lyrae using a large sample of spectra in SDSS and LAMOST*

13:40-14:00 **Sarang Shah [CT]:** *Analysis of Gravitational Microlensing Event: OGLE-2018-BLG-0380*

14:00-15:20 *Lunch break*

15:20-15:40 **Elena Nikoghosyan [CT]:** *Properties of ISM in two star-forming regions*

15:40-16:00 **Grigol Gogoberidze [CT]:** *Uncertainties of the solar wind in-situ velocity measurements*

16:00-16:20 **Bidzina Shergelashvili [CT]:** *Class of discontinuous solar wind solutions*

September 15, Tuesday

SESSION 2. *Chair:* Elena Nikoghosyan

11:00-11:40 **Mashhoor Al-Wardat [IT]**: *Extracting Data of Binary Stars from different Catalogs*

11:40-12:00 **Kamo Gigoyan [CT]:** *Late-Type Stars Found In The Digitized First Byurakan Survey Database*

12:00-12:20 **Gayane Kostandyan [CT]:** *Investigation of Faint Galactic Carbon Stars from the First Byurakan Spectral Sky Survey. IV. A GAIA DR2 Data*

12:20-12:40 *Coffee/tea break*

12:40-13:00 **Thomas Venville [CT]:** *Detecting Transient and Variable Sources Without Temporal Information*

13:00-13:20 **Naira Azatyan [CT]:** *Stellar population in two star-forming regions*

13:20-13:40 **Vivek Kumar Jha [CT]:** *A comparative study of Narrow and Broad line Seyfert galaxies using SDSS*

13:40-14:00 **Haik Harutyunian [CT]:** *Observational Data Related to the Largest Galaxies of the Universe: What they Tell?*

14:00-15:20 *Lunch break*

15:20-15:40 **Grigol Gogoberidze [CT]:** *Temperature spectra in the solar wind turbulence*

15:40-16:00 **Gulsun Dumbadze [CT]:** *Solar active regions long-period oscillations*

16:00-16:20 **Elena Philishvili [CT]:** *Case study on identification and classification of small-scale flow patterns in flaring active region*

16:20-16:40 **Tahere Parto [CT]:** *INT monitoring survey of Local Group dwarf galaxies: Star formation history and chemical enrichment*

September 16, Wednesday

SESSION 3. *Chair:* Marcus Demleitner

11:00-11:40 **Davide Elia [IT]**: *The census of far-infrared clumps in the whole Galactic plane*

11:40-12:00 **Ivan Andronov [CT]:** *Astroinformatics: Statistically Optimal Approximations of Near-Extremal Parts with Application to Variable Stars*

12:00-12:20 **Tigran Movsessian [CT]:** *Narrow band survey of star-forming regions*

12:20-12:40 *Coffee/tea break*

12:40-13:20 **Kaustubh Vaghmare [IT]**: *Big Data: Behind the Scenes*

13:20-13:40 **Mohammad Mardini [CT]:** *Comprehensive Chemo-dynamical Analysis of LAMOST J1109+0754*

13:40-14:00 **Susanna Hakopian [CT]:** *Exploring the Subsamples of SBS Galaxies: Cumulative Statistics*

14:00-15:20 *Lunch break*

15:20-16:00 **Oleg Malkov [IT]**: *Modern astronomical surveys for parameterization of stars and the interstellar medium*

16:00-16:20 **Evgeny Mikhailov [CT]:** *Biermann battery mechanism and its role in the evolution of astrophysical magnetic fields*

16:20-16:40 **Martin Moyano [CT]:** *HzRG ionization cones analysis*

September 17, Thursday

SESSION 4. *Chair:* Ivan ANDRONOV

11:00-11:40 **Ashish Mahabal [IT]**: *The power of archives in the era of machine learning*

11:40-12:00 **Irina Vavilova [CT]:** *Catalogs of celestial bodies from digitized photographic plates of the Ukrainian Virtual Observatory Archive*

12:00-12:20 **Daria Dobrycheva [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 [IT]**: *BAO plate archive project: digitization, electronic database and scientific usage*

13:20-14:00 **Fabio Pasian [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 [CT]:** *ANTARES: Brokering alerts in real-time in the Big-Data era*

15:40-16:00 **Aritra Ghosh [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 [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 **Chenzhou Cui [IT]**: *Virtual Observatory, from Idea to Research Mode*

11:40-12:20 **Marcus Demleitner [IT]**: *Resurrecting the DFBS into the VO*

12:20-12:40 *Coffee/tea break*

12:40-13:20 **Areg Mickaelian [IT]**: *The Armenian Virtual Observatory (ArVO)*

13:20-13:40 **Irina Vavilova [CT]:** *Machine Learning techniques for binary morphological classification of SDSS-galaxies and their problem point*

13:40-14:00 **Anjali Shivani Reddy Thadisina [CT]:** *Detection of Asteroids using Machine learning technique*

14:00-15:20 *Lunch break*

15:20-16:00 **Poster Session**

Andreasyan Derenik [P]: *Far-infrared study of IRAS18316-0602 star-forming region*

Azatyan Naira [P]: *Runaway stars in Vel OB1 association*

Beradze Sophia [P]: *Photometric observations of Massive stars*

Dididze Grigol [P]: *Comparative analysis of solar radio bursts before and during CME propagation*

Hakopian Susanna [P]: *Detailed Studies of Radiogalaxy Mrk1032*

Kazantseva Liliya [P]: *Multiple asteroid systems from the UkrVO archive's digitized photographic plates*

Rah Maria [P]: *Stellar spectra analysis of giant stars: ARCTURUS*

Taani Ali [P]: *How do you hunt the observational data?*

Taefi Aghdam Sima [P]: *From Evolved Stars to the Formation and Evolution of NGC 6822*

Vasylenko Maksym [P]: *Restoring of Zone of Avoidance by direct and indirect methods*

Sanli Şeyma Ceren [P]*: Necessity of Joint Tools of GRB Catalogs*

16:00-16:30 **Summary and Closing**

Invited talks [IT]

1. Extracting Data of Binary Stars from different Catalogs

Mashhoor Al-Wardat, Abdallah Hussein
(**Affiliation:** University of Sharjah, United Arab Emirates, **E-mail:** malwardat@sharjah.ac.ae)

Since the number of Binary and Multiple stars exceeds 50% of the total number of stars in the Galaxy, it is important to find a suitable way to deal with their data and catalogs. We are presenting different ways to reach and extract data of close visual binary stars from Gaia DR2 and other catalogs like Hipparcos, Multiple Star Catalog (MSC), the Fourth Catalog of Interferometric Measurements of Binary Stars, the Sixth Catalog of Orbits of Visual Binary Stars, Galactic Dust Reddening and Extinction, and other related catalogs.

2. Virtual Observatory, from Idea to Research Mode

Chenzhou Cui
(**Affiliation:** NAOC and IVOA, China, **E-mail:** ccz@bao.ac.cn)

The Virtual Observatory (VO) is the vision that astronomical datasets and other resources should work as a seamless whole. It is also a data-intensively online astronomical research and education environment, taking advantage of advanced information technologies to achieve seamless, global access to astronomical information. Many projects and data centers worldwide are working towards this goal. 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. Chinese Virtual Observatory (China-VO) is the national VO project in China initiated in 2002 by the Chinese astronomical community leading by National Astronomical Observatories, CAS. In the talk, I will give a brief introduction about the idea of VO, an overview of the IVOA and current status the China-VO

3. Resurrecting the DFBS into the VO

Markus Demleitner, Areg Mickaelian
(**Affiliation:** Universität Heidelberg, Zentrum für Astronomie, Germany, **E-mail:** msdemlei@ari.uni-heidelberg.de)

The Digital First Byurakan Survey has digitized and processed about 1700 hundred photographic plates from the objective prism surveys conducted in Byurakan by Benjamin Markarian and collaborators in the 1960ies and 1970ies. After digitization, a custom web service was built and operated first in Rome, then in Trieste. However, as astronomical data systems and standards

evolved, it became desirable to update the data and build standards-compliant, Virtual Observatory services from it.

4. The census of far-infrared clumps in the whole Galactic plane

Davide Elia
(**Affiliation:** INAF-IAPS, Italy, **E-mail:** davide.elia@inaf.it)

To study early phases of star formation, an even exhaustive knowledge for a handful of well-studied sources or regions is not sufficient to produce a possible "universal" recipe. In this respect, statistical studies, based on observations of many thousands of sources both in continuum and line emission over a wide spectral range, are essential both to suggest or to confirm general trends, and to provide large numbers of candidates for possible follow-up observations. This is the role of large surveys of the Galactic plane, which also produces a fundamental picture of connections among large-to-small scale structures in the interstellar medium. In this way, a view of the entire Milky Way as a whole star-forming entity can be obtained, and compared with the global star formation properties of external galaxies. In this talk I will illustrate how physical properties of clumps in the Galactic plane, as estimated in the first instance from far-infrared photometry only, allow us, in themselves, to recognize global evolutionary trends. In particular, I'll discuss the results of the Hi-GAL survey, separately for the inner and the outer Galaxy. I'll also discuss the distance bias on the estimate of the derived physical parameters. Finally, I will show how all this information can be combined to infer global properties of star formation in the Milky Way.

5. Modern astronomical surveys for parameterization of stars and interstellar medium

Oleg Malkov
(**Affiliation**: Institute of Astronomy, Russia, **E-mail:** malkov@inasan.ru)

Stellar classification is based on the spectral characteristics, and studies of stellar spectra provide us with the information about temperature, gravity, luminosity, and other parameters. However, the high-resolution spectra, required for detailed parametrization of stars, can be obtained, within a reasonable exposure time, only for relatively bright objects. Meanwhile, in the process of construction of large modern sky surveys, multicolour photometric observations have been (and continue to be) conducted for tens and hundreds of millions of objects. With the tools developed to combine the data from these surveys, and the algorithms for determining stellar parameters from combined photometry, it is possible to solve the problems typical for spectroscopic studies. The main modern multicolour surveys (2MASS, GALEX, SDSS, UKIDSS, IPHAS, Pan-STARRS, DENIS, WISE and others) will be analyzed in the presentation. Problems of cross-identification of objects in these surveys will be discussed, as well as their identification with large surveys, which

are providers of astrometric (Gaia) and spectral (LAMOST) information. The identification results will be presented, which allow not only to parameterize stars but also to determine the interstellar extinction in order to build a three-dimensional map of the absorption in the Galaxy.

6. The power of archives in the era of machine learning

Ashish Mahabal
(**Affiliation:** California Institute Of Technology, United States, **E-mail:** aam@astro.caltech.edu)

Astronomy archives have been continually growing larger with diverse sky surveys covering different parts of the vast parameter space of observability. Better imaging capabilities have meant that it has become possible to discover fast-changing and fast-moving objects more easily, as the recent discoveries of FRBs and a Vatira indicate. The drive to these real-time discoveries and required rapid follow-up have in turn resulted in better and well-tuned machinery. We will provide an overview of the Zwicky Transient Facility (ZTF) Data Release 3 (DR3) and show how machine learning can work wonders with real-time data as well as large archives with examples from asteroids, to variables, to extra-galactic objects. While machine learning has flourished spectacularly we will also caution on using it blindly and discuss some precautions to take as we move towards even bigger discovery spaces.

7. Surveys for active galaxies: discovery and studies

Areg Mickaelian
(**Affiliation:** Byurakan Astrophysical Observatory, Armenia, **E-mail:** aregmick@yahoo.com)

Active galaxies and particularly the Active Galactic Nuclei (AGN) are the most interesting and important objects of the extragalactic astronomy. Their studies provide keys to galaxy formation, evolution, energetic resources, radiation mechanisms, and cosmology. Extragalactic studies started at the beginning of the 20th century and very soon, active galaxies were revealed that significantly increased the importance of such studies. Most of the discoveries and physical understanding of galaxies came due to studies of active galaxies. Surveys for active galaxies and particularly AGN provide homogeneous samples of such objects for all further studies. Viktor Ambartsumian was the first to introduce the understanding of the activity of galactic nuclei and since the 1950s, the Byurakan Astrophysical Observatory (BAO) has been one of the main centers for surveys and studies of active galaxies. Markarian, Arakelian and Kazarian galaxies are well-known, as well as Shahbazian compact groups of compact galaxies. Our projects since the late 1980s are focused on multiwavelength search and studies. First Byurakan Survey (FBS or Markarian Survey) Blue Stellar Objects (BSOs), Byurakan-IRAS Galaxies (BIG), optically identified ROSAT FSC sources and NVSS/FIRST radio sources provided thousands of new AGN and Starburst (SB) galaxies for further observations and studies. Fine analysis of emission line spectra was carried out using spectral line decomposition software to establish true profiles and

calculate physical parameters for the emitting regions, as well as to study the spectral variability of these objects. The multiwavelength approach allowed revealing many new AGN and SB and obtaining a number of interesting relations using their observational characteristics and physical properties. Multiwavelength Spectral Energy Distribution (SED) may reveal the true physical differences and classification of such objects.

8. Big Data in Astronomy: Surveys, Catalogs, Databases, and Archives

Areg Mickaelian

(**Affiliation:** Byurakan Astrophysical Observatory, Armenia, **E-mail:** aregmick@yahoo.com)

The Universe is the main source for Big Data, given their volumes, variety, and velocity of accumulation. Thus, Astronomy is the main science responsible for accumulation, storage and analysis of Big Data later to be used for many inter- and multi-disciplinary sciences. A review of astronomical surveys (especially all-sky and large area ones), catalogues, databases and multiwavelength archives is given. Recent large astronomical surveys and resulting catalogues during the last 20 years accumulated vast amounts of data over the whole range of electromagnetic spectrum from γ-ray to radio. All-sky and large area astronomical surveys and catalogues include Fermi-GLAST (Acero et al. 2015) and INTEGRAL (Bird et al. 2010) in γ-ray, ROSAT (Voges et al. 1999; 2000) in X-ray, GALEX (Bianchi et al. 2011) in UV, SDSS (Aguado et al. 2019) and several POSS1/2 based catalogs (APM, MAPS, USNO, and GSC) in the optical range, 2MASS (Cutri et al. 2003; Skrutskie et al. 2006) and AllWISE (Cutri et al. 2013) in near and mid infrared (NIR/MIR), IRAS (IRAS 1988; Moshir et al. 1990) and AKARI (Ishihara et al. 2010; Yamamura et al. 2010) in mid and far infrared (MIR/FIR), NVSS (Condon et al. 1998) and FIRST (Helfand et al. 2015) in radio and many others, as well as most important surveys giving optical images (DSS, SDSS), variability (GCVS, NSVS, ASAS, Catalina) and spectroscopic (FBS, SBS, Case, HQS, HES, SDSS, CALIFA, GAMA) data. Future huge projects are expected, such as the Gaia Space Observatory survey of our Galaxy (DR2 is available) and LSST wide-field telescope sky survey. Overall understanding of coverage along with the whole wavelength range and comparisons between various surveys are given: galaxy redshift surveys, QSOs, radio, Galactic structure, and Dark Energy surveys. Present astronomical archives and databases contain billions of objects, both Galactic and extragalactic, and the vast amount of data on them allow new studies and discoveries. A review of the most important archives and databases is also given. Astrophysical Virtual Observatories (VO) use available databases and current observing material as a collection of interoperating data archives and software tools to form a research environment in which complex research programs can be conducted.

9. BAO plate archive project: digitization, electronic database, and scientific usage

Areg Mickaelian, G. A. Mikayelyan, G. M. Paronyan, G. R. Kostandyan, K. S. Gigoyan, M. V. Gyulzadyan

(**Affiliation:** Byurakan Astrophysical Observatory, Armenia, **E-mail:** aregmick@yahoo.com)

Astronomical plate archives are a source of variability, proper motion and other studies. Byurakan Astrophysical Observatory (BAO) plate archive consists of 37,500 photographic plates and films, obtained with 2.6m telescope, 1m and 0.5m Schmidt telescopes and other smaller ones during 1947-1991. The famous Markarian Survey (or the First Byurakan Survey, FBS) 2000 plates were digitized in 2002-2007 and the Digitized FBS (DFBS, www.aras.am/Dfbs/dfbs.html) was created. New science projects have been conducted based on this low-dispersion spectroscopic material. In 2015-2018, we have run a project on the whole BAO Plate Archive digitization, creation of electronic database and its scientific usage. The scanning of the plates is almost over and at present, we work on the creation of the database, electronic archive and interactive sky map. The Armenian Virtual Observatory (ArVO, www.aras.am/Arvo/arvo.htm) will accommodate all new data. The project runs in collaboration with the Armenian Institute of Informatics and Automation Problems (IIAP). The final result, the electronic database and online interactive sky map, will be used for further research projects. Many new variables, transients, and high proper motion stars are expected, as well as thousands of known variables will be studied having a large amount of observing data obtained in Byurakan.

10. The Armenian Virtual Observatory (ArVO)

Areg Mickaelian, H. V. Astsatryan, A. V. Knyazyan, G. A. Mikayelyan
(**Affiliation:** Byurakan Astrophysical Observatory, Armenia, **E-mail:** aregmick@yahoo.com)

The Astrophysical Virtual Observatories (AVOs) have been created in a number of countries using their available databases and current observing material as a collection of interoperating data archives and software tools to form a research environment in which complex research programs can be conducted. Among all these data, a large spectroscopic database for all objects will be especially useful. The Armenian Virtual Observatory (ArVO) has been created to utilize the Digitized First Byurakan Survey (DFBS) as an appropriate spectroscopic database, as well as all Armenian astronomical archives. ArVO is a project of the Byurakan Astrophysical Observatory (BAO) in collaboration with the Armenian Institute of Informatics and Automation Problems (IIAP) aimed at the construction of a modern system for data archiving, extraction, acquisition, reduction, use and publication. ArVO is the Armenian contribution to the International Virtual Observatories Alliance (IVOA). One of the ArVO's main tasks is to create and utilize a global Spectroscopic Virtual Observatory, which will combine data from DFBS and other low-dispersion spectroscopic databases (HQS, HES, etc.), as well as provide the first understanding on the nature of any object up to B=18. The ArVO project includes the creation of a database of digitized FBS spectra and its integration in AVOs, creation of a user interface with full access to all DFBS data as well as all existing data from other databases. ArVO is a platform to tackle with the astronomical data and provide services based on the standards developed by IVOA. We introduce ArVO data services, which enables to manage different data resources and provide the uniform data access interface for users, as well as web services for cross-matching and spectra extraction. Special

attention is paid to the data sharing and collaboration with the international astrophysical databases.

11. Evolving the VO from interoperable data collections to an integrated system of services for data-intensive science

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The Virtual Observatory (VO) represents a successful international enterprise providing interoperability of data collections, and thus allowing the possibility of multi-frequency and multi-messenger research. The Big Data era astrophysics has stepped into requires an evolution of the VO concept in order for scientists to perform data-intensive research. This new concept needs data centres to provide, besides data access, personal user storage and computing resources - and the international community to adapt and evolve the VO standards to support this new paradigm.

12. Big Data: Behind The Scenes

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The word 'big data' has become one of the most used words in today's climate of a data driven environment. Be it research or economics, data has taken the center stage and for a good reason. But what exactly does 'big data' mean? How 'big' is 'big'? What does it mean to say that we are dealing with 'big data'? In this talk, the speaker will explain what 'big data' means and the nature of technological challenges associated with storing big data, processing it and mining it. The speaker will provide a brief outline of the solutions to the various problems, which rely on the distributed data processing and management paradigm. This will naturally lead to an understanding of the most popular big data solution ecosystem - Hadoop.

Contributed talks [CT]

1. *Astroinformatics: Statistically Optimal Approximations of Near-Extremal Parts with Application to Variable Stars.*

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The software MAVKA is described, which is was elaborated for statistically optimal determination of the characteristics of the extrema of 1000+ variable stars of different types, mainly eclipsing and pulsating. The approximations are phenomenological, but not physical. As often, the discovery of a new variable star is made on time series of a single-filter (single-channel) data, and there is no possibility to determine parameters needed for physical modeling (e.g. temperature, radial velocities, mass ratio of binaries). The criterion of the best accuracy of the time of extremum is used. Besides classical polynomial approximation "AP" (we limited the degree of the polynomial from 2 to 9), there are realized symmetrical approximations (symmetrical polynomials "SP", "wall-supported" horizontal line "WSL" and parabola "WSP", restricted polynomials of non-integer order based on approximations of the functions proposed by Andronov (2012) and Mikulasek (2015) and generally asymmetric functions (asymptotic parabola "AP", parabolic spline "PS", generalized hyperbolic secant function "SECH" and "log-normal-like" "BSK"). This software is a successor of the "Observation Obscurer" with some features for the variable star research, including a block for "running parabola" "RP" scalegram and approximation. Whereas the RP is oriented on the approximation of the complete data set. MAVKA is pointed to parts of the light curve close to extrema (including total eclipses and transits of stars and exoplanets). The functions for wider intervals, covering the eclipse totally, were discussed in 2017Ap.....60...57A . Global and local approximations are reviewed in 2020kdbd.book..191A . The software is available at http://uavso.org.ua/mavka . We have analyzed the data from our own observations, as well as from monitoring obtained at ground-based and space (currently, mainly, TESS) observatories. It may be used for signals of any nature.

2. *Stellar population in two star-forming regions*

Naira Azatyan, E. Nikoghosyan, H. Harutyunian, D. Baghdasaryan, D. Andreasyan
(**Affiliation:** Byurakan Astrophysical Observatory, Armenia, E-mail: nayazatyan@gmail.com)

Young embedded stellar clusters are important laboratories for understanding star formation process and early stellar evolution because they contain a statistically significant sample of stars

formed from the same parental interstellar matter. The development of infrared observational astronomy provides a unique opportunity to study embedded young stellar objects, including prestellar objects, i.e., the early stages of star formation. Our research focuses on the stellar content of two star-forming regions. The first one is the molecular cloud which includes G45.12+0.13 and G45.07+0.13 UCHII regions around IRAS19111+1048 and 19110+1045 sources, respectively. Based on infrared photometric data, we identified a rich stellar population, which includes 570 young stellar objects with different evolutionary stages from starless cores to Class II. The distribution of selected YSOs shows that there are two dense subgroups in the vicinity of the IRAS sources. The study of the parameters of the stellar objects from different samples (from subgroups and not included in them) showed that there is a certain difference between them and based on the age distribution, it can be assumed the stellar objects belonging to dense subgroups are at later evolutionary stages than other objects in the star-forming region. The second one is an elongated molecular cloud, which includes five stellar subgroups around IRAS 05184+3635, 05177+3636, 05168+3634, 05162+3639, and 05156+3643 sources. We identified 260 candidates of YSOs within the radii of subregions around five IRAS sources with different evolutionary stages from starless cores to Class II. The local distribution of identified YSOs in the molecular cloud frequently shows elongation and subclustering. According to the values of the slopes of the K luminosity functions, the age of the subregions can be estimated at 0.1–3Myr.

3. What GAMA reveals about low-redshift QSO environments

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Galaxy And Mass Assembly (GAMA) Spectroscopic Survey of about 300,000 galaxies is used to compare properties of low-redshift QSO environments with environments of inactive (normal) galaxies.

4. Machine Learning techniques for automated classification of galaxies into five classes by visible shape

Daria Dobrycheva, Vladislav Khramtsov, Maksym Vasylenko, Irina Vavilova, Andrii Elyiv
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We present Machine Learning techniques for automated classification of galaxies into five classes by visible shape (completely rounded, rounded in-between, smooth cigar-shaped, edge-on, and spiral) using a convolutional neural network. Our dataset contains ~310000 SDSS-galaxies from DR9 with unknown morphological types at z

5. *Solar active regions long-period oscillations*

Gulsun Dumbadze, G. Dumbadze, B.M. Shergelashvili, S. Poedts, T.V. Zaqarashvili, M. Khodachenko, and P. De Causmaecker
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The long-period (≥ 2 hours) oscillations of the active regions (ARs) have been studied. The investigation is based on an analysis of time series built from SDO/HMI magnetograms and represents the case study of several typically structured ARs. The time series of AR characteristic parameters have been measured and recorded by using the image moment calculation method. Four different methods of spectral analysis were applied: analysis of fast Fourier transform (FFT) spectra; analysis of rebinned FFT spectra; analysis of a combination of FFTs of the autocorrelation function and fitting of the signal with sine functions of different amplitude, period and phase for sequential subtraction of these sinusoidal parts from the signal corresponding to outlying spectral peaks being above the chi-square noise level; and windowing the FFT spectra. The data processing and analysis showed that there are some sequences of periods that may give the spectra which can have a signature of standing oscillations.

6. *Late – Type Stars Found In The Digitized First Byurakan Survey Database*

Kamo Gigoyan
(**Affiliation:** Byurakan Astrophysical Observatory, Armenia, **E-mail:** kgigoyan@bao.sci.am)

The Second Edition Of The “Revised And Updated Catalogue of The First Byurakan Survey Of Late – Type Stars" contains many-sided data available for 1471 objects from the modern astronomical catalogues. The Catalina Sky Survey (CSS) and ASAS-SN variability database phase-dependent light curves, and high-quality photometric data provided by data release 2 of the Gaia mission, are analyzed to estimate the physical parameters for FBS oxygen-rich (O – rich) Giants and Asymptotic Giant Branch (AGB) stars. For near 1100 O-rich Giants and AGB stars, color-color, color–absolute magnitude, also (WRP, BP-RP – WKs, J-Ks) vs. Ks diagrams are considered.

7. *Uncertainties of the solar wind in-situ velocity measurements*

Grigol Gogoberidze, S.C. Chapman (Warwick), B. Hnat (Warwick), M. Dunlop (Rutherford-Appleton Laboratory)
(**Affiliation:** Ilia State University, Georgia, **E-mail:** grigol_gogoberidze@iliauni.edu.ge)

We propose a general, instrument-independent method to estimate the uncertainty on velocity field measurements direct from the data. We apply developed method to the data measured by

3DP instrument on the WIND spacecraft and show that proper treatment of the plasma measurement uncertainties has a significant influence on the physical interpretation of the solar wind observations. The work is supported by the Shota Rustaveli National Science Foundation grant FR-18-19964.

8. Temperature spectra in the solar wind turbulence

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We study in-situ measurements of the solar wind plasma parameters performed by the Spektr-R spacecraft. An apparent contradiction is found between the temperature spectra derived from the Spektr-R data and the temperature spectra predicted theoretically. To resolve this contradiction, we show that the temperature fluctuations can be correctly estimated from the Spektr-R data only if the mean temperature is isotropic. Since the mean temperature in the solar wind is usually anisotropic, the derived fluctuations appear to be pseudo-temperature rather than temperature. These pseudo-temperature fluctuations are driven by the high-amplitude magnetic fluctuations in Alfvén waves rather than the fluctuations of temperature or thermal velocity. That is why their amplitudes are usually significantly larger than the amplitudes of authentic temperature fluctuations. This work is supported by Shota Rustaveli National Science Foundation grant FR-18-19964.

9. Galaxy Morphology Network (GaMorNet): A Convolutional Neural Network used to study morphology and quenching in ~100,000 SDSS and ~20,000 CANDELS galaxies

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We examine morphology-separated color-mass diagrams to study the quenching of star formation in ~100,000 (z~0) Sloan Digital Sky Survey (SDSS) and ~20,000 (z~1) Cosmic Assembly Near-Infrared Deep Extragalactic Legacy Survey (CANDELS) galaxies. To classify galaxies morphologically, we developed the Galaxy Morphology Network (GaMorNet), a convolutional neural network that classifies galaxies according to their bulge-to-total light ratio. GaMorNet does not need a large training set of real data and can be applied to datasets with a range of signal-to-noise ratios and spatial resolutions. GaMorNet's source code as well as the trained models have been made public (http://www.astro.yale.edu/aghosh/gamornet.html). We first trained GaMorNet on simulations of galaxies with a bulge and a disk component and then transfer learned using ~25% of each dataset to achieve misclassification rates of

10. Exploring the Subsamples of SBS Galaxies: Cumulative Statistics

Susanna Hakopian
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A comprehensive study of seven field samples of SBS galaxies is our key to a better understanding of the nearby Universe. At this stage of the work, we focused on the exploration of star-formation processes in different morphological types of star-forming galaxies. With the number in about 350, they compose about 80% in the seven samples. The main material for scientific analysis is the data on individual galaxies, obtained from slit- and integral-field spectral observations in combination with available from astroarchives information, and, by using these, the data on samples of galaxies, in the form of cumulative statistics. Some of the results to be presented.

11. Observational Data Related to the Largest Galaxies of the Universe: What they Tell?

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In the realm of galaxies, ones called cD galaxies are the largest. These galaxies have some unique physical properties, which make these objects mysterious. Therefore, since their classification as a separate type researchers applied colossal efforts for understanding their physical nature and constructing credible scenarios describing their formation. The very fact of their location in the gravitational well of clusters of galaxies made extremely attractive the idea of their growth in expense of other galaxies through the galactic “cannibalism”. However, the difficulties arising due to this mechanism made this scenario ineffective and required involving other ideas and corresponding mechanisms. We are examining here the evolution of ideas on the cD galaxies origin. With the main ideas on the subject, implemented since the very beginning of research of these colossi, we discuss a completely new idea, viewing these galaxies as generators of the clusters. In other words, in this scenario all the galaxies belonging to the given cluster formed owing to the recurrent mass ejections from the central galaxy. The physical mechanism regulating this process is based on the consequences of the interaction between the dark energy and baryonic matter, gradually increasing the mass of the baryonic Universe.

12. A comparative study of Narrow and Broad line Seyfert galaxies using SDSS

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The Sloan Digital Sky Survey (SDSS) offers a unique opportunity to understand the properties of a large number of active galaxies based on their optical spectral. We present the results of a statistical study using SDSS spectra; done on a carefully selected sample of Broad-line and Narrow-line Seyfert galaxies. We explore the possible reasons behind the asymmetry observed in the emission lines originating from the Broad Line Region (BLR) by cross-correlating the observed asymmetry with various other optical parameters such as the Eddington ratio, black hole mass and bolometric luminosities for the entire sample. We find some highly asymmetric emission line profiles in both the type of galaxies. Initial results suggest that the highly accreting NlSy1 don't form a subclass on their own based on the correlations obtained between various parameters.

13. Investigation of faint galactic carbon stars from the first Byurakan spectral sky survey. IV A Gaia DR2 data

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The second Gaia data release(Gaia DR2) data are used to analyze and estimate some important parameters for 127 carbon(C) type stars(56 are late N-type Asymptotic Giant Branch (AGB) C stars, 71 are early-type CH giants) detected on the First Byuraka Spectral Sky Survey (FBS) low – resolution (lr) spectral plates. Gaia DR2 G broadband magnitudes are in the range $9.4 < G < 18.2$ mag. for FBS C stars. Radial velocities (RV) are available for 75 C stars out of 127. For 9 objects RV is greater than 200 km/s. Absolute magnitudes in V – band are estimated for 18 FBS C stars, having luminosity data, from which 17 are CH – giants. They are MV≤in the range between $-3.5 < +0.5$ mag. For FBS 1918+869 absolute magnitude MV = -3.4±0.2mag, which is typical for N-type AGB C stars. Having distance estimations, the Hertzsprung – Russell diagram (HRD, or color – absolute magnitude diagram) was constructed for C stars. All FBS detected C stars are giants and AGB stars in the Galactic Halo. They are not far than 14 kpc from the Sun and 8kpc from the Galactic plane.

14. Comprehensive Chemo-dynamical Analysis of LAMOST J1109+0754

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We present a comprehensive chemo-dynamical analysis of the LAMOST J1109+0754, a bright (V = 12.8), and extremely metal-poor ([Fe/H] = −3.17) star, with a strong r-process enhancement ([Eu/Fe] = +0.94±0.12), based on the 7-D measurements supplied by Gaia and the chemical composition derived from high-resolution (R ∼ 110,000) and high signal-to-noise (S/N∼60) optical spectrum obtained by the 2.4 m Automated Planet Finder Telescope at Lick Observatory. We derive chemical abundances of 31 elements (from lithium to thorium). The abundance ratios ([X/Fe]) of light-elements (Z < 30) suggest a massive Population III progenitor in the 13.4-29.5 M⊙ mass range. The heavy-element (30 < Z < 90) abundance pattern of J1109+075 agrees extremely well with the scaled Solar r-process signature. We explore the kinematic history of this star with a less idealized and more realistic time-varying Galactic potential that was constructed based on a simulated Milky-Way analogue taken from the Illustris-TNG simulation. Using this novel approach, we investigate the orbital evolution of J1109+0754 around a Milky Way-like galaxy. This orbital evolution along with the peculiar abundances patter of J1109+0754 implies that our star is likely belong to a dissolving dwarf galaxy positioned at about ∼ 60 kpc from the center of the Galaxy ∼ 6 - 7 Gyr ago.

15. Biermann battery mechanism and its role in evolution of astrophysical magnetic fields

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The magnetic fields of different astrophysical objects, such as galaxies, stars, accretion discs etc play a significant role in the description of different processes. Now we have observational data about magnetic fields in the Milky Way which is based on Faraday rotation measurements for radiowaves from about 2000 pulsars and 40000 extragalactic sources. Also now there are wide possibilities of studying magnetic fields of another galaxies, which is done on modern radio telescopes. From the theoretical point of view, the magnetic fields are explained using the dynamo theory. It describes the exponential growth of the field which is caused by the transition of the energy of the turbulent motions to the magnetic energy. However, it is necessary to explain the seed field which can be increased by dynamo. One of the possible mechanisms is connected with the Biermann battery process, which is connected with different masses and the same values of the electric charge for protons and electrons which can pass through the medium in the galaxy. To describe this mechanism, it is necessary to solve the equations for these particles and find the field induced by the battery effect. We find numerically the spatial structure for different

cases and give the estimates for different galaxies. Also, we discuss the possibility of the battery mechanisms to study magnetic effects near in AGN. They can be useful to describe the field in accretion disc surrounding it, especially at the inner boundary which could be very important.

16. Narrow band survay of star-forming regions

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The main goal of this survey is to search and to study the areas of active star formation in our Galaxy, which will primarily include the detection and study of eruptive objects and outflow processes as the main indicators of such activity. Among them are Herbig-Haro (HH) objects, collimated outflows, comet-like reflection nebulae, as well as eruptive stars of very rare types: fuors, exors, uxors. Observations are performed with 1m Schmidt telescope of Byurakan Observatory equipped with CCD detector (liquid-cooled 4K X 4K Apogee matrix providing 0.868 arcsec/px resolution and 1 square degree field of view. During the survey 5 wide-band (u,g,r,i,z SDSS) and 3 narrow-band ($\Delta\lambda$ = 100 A, λc=6560A, 6760A, 5000A) filters were used. As a first attempt, the observations of R-associations Mon R1 and Mon R2 in the Monoceros constellation were performed. 20 new HH knots were discovered in Mon R1 and Mon R2; some of them represent collimated outflow systems. Especially newly discovered giant outflow system HH 1196 with a total length of about 1.2pc should be noted (Movsessian et. al, 2020). In the Mon R2 field, we discovered the curved-shape outflow, which belongs to very rare type of irradiated jets, i.e. the jets from low-mass stars, embedded within HII regions near the sources of soft UV-radiation (O'Dell et al. 1993, Bally et al. 1998, 2000). We plan to significantly expand the list of HH objects by using the high quantum efficiency of the system and the telescope's high focal ratio (F/2), which allows detecting low surface brightness objects.

17. HzRG ionization cones analysis

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HST photometric images are combined with Las Campanas long-slit spectra in order to analyze the morphology, chemical composition, temperature, and kinematics of a HzRG. The 6 HST images reveal a double cone morphology around a hidden AGN in 6 different wavelength rest frame, from the infrared to the UV. The available spectra span the nucleus and an important region on the cones, show emission and no absorption lines and they were used to estimate the contribution from the continuous and the emission lines in the HST images on the whole cones and nucleus. We calculated the emission line ratios in every position and made diagnostic diagrams. In addition, we used the EW to determine the temperatures and densities. Besides, the spectra reveal motion in the line of sight composed of rotation and radial movements after subtracting the redshift, with a cone approaching us and the other moving away from us. We compare these motions with the Bertola rotation curve (1991) and other literature models. In

addition, four of the HST images reveal in the Southern cone a semicircular structure which seems have been formed in a symmetrical explosion. We calculated the morphology of this structure by assuming different inclinations with respect to the sky plane and determined the most probable inclination.

18. Properties of ISM in two star-forming regions

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The development of far-infrared observational astronomy, in particular, Herschel Infrared Galactic Plane Survey provides a wealth of data in the domain where the dust surrounding young stellar objects (YSOs) peaks, as well as a unique opportunity to study embedded YSOs, including prestellar objects, i.e., the early stages of star formation. Our research focuses on two of star-forming regions. The first one is the molecular cloud, which includes G45.12+0.13 and G45.07+0.13 UCHII regions. Using the Modified blackbody fitting on Herschel images obtained in four bands: 160, 250, 350, and 500 micron, we determined the distribution of N(H2) hydrogen column density and Td dust temperature. The maps of N(H2) and Td show that UCHII regions clearly stand out against the general background of the molecular cloud with a relatively low density (from $1.0x10^{23}$ to $3.0x10^{23}$ cm^{-2}) and significantly higher temperature (up to 80 K), what is fully consistent with the basic concept of UCHII regions about the presence of a hot, high mass stellar source and stellar wind, which leads to the blowing out of matter. The second one is the elongated star-forming region, which includes five stellar subgroups around IRAS 05184+3635, 05177+3636, 05168+3634, 05162+3639 and 05156+3643 sources. Here, on the contrary, the N(H2) is noticeably higher (from $1.0x10^{23}$ to $5.0x10^{23}$ cm^{-2}) than in the surrounding molecular cloud and the Td does not exceed 25 K. In addition, in both areas, we were able to identify about 20 gravitationally bound starless cores or prestellar objects.

19. The confirmation of two new bulge globular clusters in the Milky way: NewGL FSR19 and FSR25

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We use deep near-IR photometry of the VISTA Variable in the Via Lactea (VVVX) survey in combination with Two Micron All Sky Survey (2MASS) and Gaia DR2 catalog to confirm the physical nature of the candidate globular clusters (GCs) FSR19 and FSR25, which is located in the galactic bulge. We estimate a reddening E(J-Ks)=0.40 mag, E(B-V)=0.86 mag, and E(BP-RP)=1.0 mag. And determine their red-clump distances D=6.50 Kpc for FSR19 and D=6.70 Kpc for FSR25. We also derived their integrated luminosities functions M_k=-7.96 mag and M_k=-8.80 mag for FSR19 and FSR25 respectively. The near-IR color-magnitude diagrams reveal a well-defined sub-giant and red giant branch in all cases. The comparison with theoretical isochrones yields a mean metallicity of [Fe/H]= -0.50 dex and -0.60 dex and age of t~ 11 Gyr for FSR19 and FSR25

respectively. Finally, we also estimate the structural parameters of these two new clusters. We determined core-radius (R_c) of 2.50 and 1.50 and tidal radius (R_t) of 4.90 and 6.00 for FSR19 and FSR25 respectively. These are new low-luminosity (M_v=-6.00 for FSR19 and -5.00 for FSR25) GC found in the central bulge of the Milkyway.

20. INT monitoring survey of Local Group dwarf galaxies: Star formation history and chemical enrichment

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Small telescope surveys that perform dedicated observations are still important, particularly in studying bright objects in the nearby universe. There are many questions regarding the formation and evolution of galaxies in the universe that can be answered by studying the Local Group (LG) dwarf galaxies. LG offers a unique site for studying dwarf galaxies with various physical characteristics such as different morphology, mass, and a wide range of metallicity. In this regard, by employing the 2.5m Isaac Newton Telescope (INT) in La Palma, We conducted a survey in nine epochs to identify Long-Period Variable (LPV) stars, namely Asymptotic Giant Branch (AGB) and Red Super Giant (RSG) stars. In this survey, we consider a sample of 55 dwarf galaxies of LG, including 22 satellites of Andromeda galaxy, 20 satellites of Milky Way galaxy, and some isolated and transient galaxies, all visible in the northern sky. To investigate the evolution of galaxies, we construct the star formation history (SFH), using the LPV stars population. LPV stars are at the final stage of their evolution, and their brightness fluctuates on timescales between 100 to 1300 days. To obtain LPV's amplitude, we construct the relation between the birth mass and luminosity using stellar evolution models (Marigo et al. 2017), then we employ the method that first introduced and successfully applied to the M33 galaxy by (Javadi et al. 2011). Since the AGB stars formed at different times, by studying their radial distribution, and their mass-loss rate, we can learn about the formation of structures in galaxies, and the feedback process in dwarf galaxies. In this paper, we present a series of results from the Local Group dwarf galaxies survey.

21. Case study on identification and classification of small-scale flow patterns in flaring active region

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We propose a novel methodology to identity flows on the solar surface and classify their velocities as either supersonic, subsonic, or sonic. Our methodology consists of three parts. First, an algorithm is applied to the Solar Dynamics Observatory (SDO) image data to locate and track flows, resulting in a trajectory of each flow over time. Thereafter, the differential emission measure (DEM) inversion method is applied to the six AIA channels along the trajectory of each flow in order to estimate its background temperature and sound speed. Finally, we classify each flow as supersonic, subsonic or sonic by performing a hypothesis test on whether the flow's velocity is larger, smaller or equal to the background sound speed. Eighteen plasma flows are detected, nine of which are classified as supersonic, five as subsonic, and four as sonic. Out of all these cases, four flows cannot be strictly ascribed to and vice versa. We label them as a subclass of transonic flows. The proposed methodology provides an automatic and scalable solution to identify small-scale flows and to classify their velocities as either supersonic, subsonic or sonic. It can be used to characterize the physical properties of the solar atmosphere. The observationally detected flows in the complex structure of the active region magnetic loops from AIA images can be analyzed in combination with the other high-resolution observational data and be used for the development of the theoretical grounds describing the physical conditions responsible for the formation of the detected types of flow patterns.

22. Analysis of Gravitational Microlensing Event: OGLE-2018-BLG-0380

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We present the analysis of the microlensing event OGLE-2018-BLG-0380, that was observed towards the galactic bulge in the microlensing season of 2018. The light curve of this event had two prominent peaks and a third bump towards the decreasing side of the light curve. The conventional method of grid search failed to give any solutions that can explain the light curve. So we performed a heuristic analysis of the light curve and found that the binary lens orbital motion explains the third perturbation. This is the highest orbital motion ever detected in a microlensing event. Since the event hastE~9 days, we did not detect orbital parallax. We also investigated the occurrence of the event by binary lens and binary source. However, the binary lens and single-lens model is preferred by a significant probability. The Bayesian analysis of the galactic model priors that is constrained by the measured angular motion prefers the bulge location of the lens system by 91%. We find that the lens is comprised of an $84.55+40.02-31.83 M_J$ brown dwarf orbiting a $0.27+0.15-0.10 M_{Sun}$ mass host at a distance of 7.18+0.90−0.94kpc. The projected separation between them is 0.85+0.11−0.11AU. However, we also find that $(K.E./P.E.)\perp=0.91+0.16-0.32$which indicates a loosely bound system of a high mass brown dwarf or a very low mass star orbiting an M-dwarf in the galactic bulge.

23. Class of discontinuous solar wind solutions

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A new class of one-dimensional solar wind models is developed within the general polytropic, single fluid hydrodynamic framework. The particular case of quasi-adiabatic radial expansion with a localized heating source is considered. We consider analytical solutions with continuous Mach number over the entire radial domain while allowing for jumps in the ow velocity, density, and temperature, provided that there exists an external source of energy in the vicinity of the critical point which supports such jumps in physical quantities. This is substantially distinct from both the standard Parker solar wind model and the original nozzle solutions, where such discontinuous solutions are not permissible. We obtain novel sample analytic solutions of the governing equations corresponding to both slow and fast wind.

24. ANTARES: Brokering alerts in real-time in the Big-Data era

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LSST is poised to open up new avenues in almost all fields of astronomy, particularly in time-domain astronomy, by going deeper, faster, and wider in panchromatic passbands. Taming its expected onslaught of data is one of the biggest data challenges in astronomy. Up to 10 million alerts per night are expected, hidden in which will be rare time-critical events requiring immediate follow-up. ANTARES is an automated software system, called alert-broker, that will sift through this barrage of data and select events that are deemed high-priority by the community. It is online, connected to the public alert stream of the ZTF survey, and performing real-time alert filtering. In this talk, I will describe the various features of the ANTARES system, development efforts to scale to LSST, and how the community needs to be involved

25. Detection of Asteroids using Machine learning technique

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My paper starts with the question many of us wonder 'What if an Asteroid hit Earth?' The answer depends on how big an asteroid is in terms of dimension- Let's say an asteroid of baseball ground hits earth, which can completely erase a busy city. Most of the asteroids are detected by Satellites, Probes and telescopes with large aperture length. Mostly large Telescopes from the earth are used for tracking main belt asteroid but what if it gets out of sight from researchers or Scientists; it might take away people's life. In this paper, I introduced machine learning to detect the asteroid with more than 60 percent of efficiency. The famous Scientist Stephen Hawking wrote in his last book that 'Asteroids are great threatened to the planets'. Machine learning is one of the best predictive methods without explicitly giving any external command. This paper is published in national conference in the Machine learning journal, which is awarded as the winner of that conference. I attempt to use machine learning in the replacement of Astrometrica software with Pan-Starr Telescope real-time Fits file data which is located in Hawaii, USA, Now I wrote another in continuation of my previous paper, where I am able to achieve more than previous work taking Gaussian graph in consideration. Always there may not be a possibility of recognizing the asteroid with the human eye but machine learning with good test code can actually ease the detection with more efficiency. Machine learning can be implemented with many softwares like R, JavaScript but I choose Python with pandas, nunpy, matpy libraries with one more important astronomical library 'astropy' to work on fits file. Anaconda with python 3.7.1 version jupyter notebook, I obtained the same result as Astrometrica report.

26. Catalogs of celestial bodies from digitized photographic plates of the Ukrainian Virtual Observatory Archive

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The Ukrainian Virtual Observatory (UkrVO) database is compiled from observations conducted in 1898-2011 at observational sites of 8 Ukrainian observatories with about 50 instruments. Now the UkrVO archive covers about 40,000 astroplates, from which 15,000 are digitized at three observatories: Main Astronomical Observatory of the NAS of Ukraine (MAO NASU), Mykolaiv Astronomical Observatory, and Astronomical Observatory of the Taras Shevchenko National University of Kyiv (http://gua.db.ukr-vo.org). The digitizing of astroplates has been performed using EpsonTM and MicrotekTM commercial scanners with 16-bit gray levels and resolution of 1200 dpi. Digitized images are stored in TIFF and FITS formats. Images of all objects registered on plates were processed using the advanced software complex for CCD images processing MIDAS/ROMAFOT in the LINUX environment. Additional software modules developed and implemented at the MAO NASU provide both the digitized images processing and the final products as the catalogues of positions and stellar magnitudes of all the registered objects. Also, the UkrVO archive contains about 50,000 spectra astronegatives obtained in 1960-1995, mostly with variable stars. Their classification and systematization are in progress. The processing of the

digitized Northern Sky Survey (FON project) observations resulted in a few catalogues of coordinates and B-magnitudes for more than 19 million stars and galaxies from the FON-Kyiv part and more than 13 million stars and galaxies from the FON-Kitab part. Besides, based on these data, two catalogs for more than 5,000 positions and B-magnitudes of asteroids were compiled. Now, in cooperation with Gissar Astronomical Observatory (Dushanbe, Tajikistan), we prepare similar catalogs based on the digitized observations of the third part (1985-1992) of the FON project. The digitized data on the open star clusters in UBVR color bands obtained at the Baldone observatory (Latvia) were used to enhance the FON project. The developed methods of the digitization, image processing, and plate reduction with the latest catalogues as a reference, allowed us to achieve the maximum accuracy of coordinates and magnitudes of objects available for this photographic material (for example, the mean internal errors of the FON-Kyiv catalog are σRA,DEC = 0.23″ and σB = 0.14m for all objects up to 16^m5). Other digitized data of photographic observations stored in UkrVO archives formed the basis of several Solar System Bodies positional catalogs. The compiled catalogs of 90 positions and B-values of Pluto, 1500 positions of satellites of Saturn, Jupiter, Uranus, and Neptune are available on the UkrVO website at http://ukr-vo.org and in the Strasbourg Data Center (ftp://cdsarc.u-strasbg.fr/pub/cats). Images of optical analogs of gamma-ray burst sources GRB110213A and GRB101224A were identified using digitized photographic plates of the UkrVO. Catalogs of coordinates and magnitudes for all the fixed faint objects around GRB110213A and GRB101224A were also conducted. For these and other gamma-ray burst sources, the results are being published in GCN Circulars Archive.

27. Machine Learning techniques for binary morphological classification of SDSS-galaxies and their problem point

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We studied the effectiveness of the Machine Learning techniques for binary morphological classification of SDSS-galaxies into early (E) and late (L) types. The target sample contained 316031 galaxies from the DR9 with a redshift z

28. Detecting Transient and Variable Sources Without Temporal Information

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The advent of large survey volume surveys in the next ten years, such as the Large Synoptic Sky Survey program and the Euclid mission, has the potential to revolutionize our discovery space of transient and variable objects. However, the unprecedented data volumes and wide coverage of these next generation surveys presents problems for the detection and classification of transient objects. Manual classification is impossible given the large volumes of data, and though past surveys have used supervised machine learning techniques to great benefit in detecting and classifying variable and transient sources, the difficulty of obtaining are presentative, robust training set of objects and the unsuitably of supervised learning techniques to find 'unknown unknown' objects present significant problems to the deployment of these techniques on next generation surveys. In this study, we explore the use of self-organizing maps to autonomously cluster, detect and classify transient and variable sources heterogeneous data samples from the Sloan Digital Sky Survey (SDSS) Stripe 82 field. We illustrate that detection and classification of variable and transient sources is possible with 4 SDSS color bands, namely u-g, g-r, r-i and i-z. Furthermore, we also illustrate that the mean photometric measurements are sufficient for this detection and classification, thus facilitating the detection and classification of transient and variable sources without temporal information. Lastly, were mark upon the applicability of this technique to autonomous pipelines for next generation surveys.

29. Detecting shock waves in RR Lyrae using large sample of spectra in SDSS and LAMOST

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Steps toward nature inside RR Lyrae can not only improve our understanding of variable stars but also innovate the precision when we use them as tracers to map the structure of the universe. In this work, we develop a hand-crafted 1D recognition program to fetch out the “first apparitions". We set up the first population study of the RR Lyrae stars showing hypersonic shock waves. There is a clear anti-correlation relationship between the temperature of the shock front and the intensity and normalized flux of the emissions lines, which is probably due to opacity increasing in the helium ionization zone as temperature rising. Moreover, we find the “phase concentrating path" phenomenon and suggest that points on log g -log Teff diagram in a certain phase interval from RR Lyrae stars sharing similar properties except for effective temperature tend to be concentrating on a linear path, which is supported by MESA simulations. In the selected sample, RRc stars tend to be metal poorer than RRab stars. Cooler stars tend to be metal richer than hotter stars. It is probably resulted by richer metallicity leading to higher opacity. It should be noted that we enable the detection of shock waves in the first-overtone and multi-type RR Lyrae for the first time. At last, we describe the model of detection rate we suggest in detail in this random survey.

Posters

1. From Evolved Stars to the Formation and Evolution of NGC 6822

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NGC 6822, an isolated dwarf irregular galaxy (dIrr), is at a distance of 490 ± 40 kpcs away from us. Due to close distance, apparent isolation, and easy observation, NGC 6822 has been always selected as a desired candidate for studying star formation (SF) and galactic evolution, without the strong gravitational influences of other systems. The main goal of this paper is to derive the SF history of NGC 6822. We use the method mentioned by Javadi et al. (2011) and it is based on theoretical models coupled with color-magnitude diagrams (CMDs) by using directly the long period variable (LPV) stars which are mostly asymptotic giant branch (AGB) stars at their very late stage of evolution, as well as more massive red super-giants (RSGs) stars according to their significant role to study the SFR, since they are helpful tracers of the properties of a galaxy. To calculate of SF history in the bar of the galaxy, we use more than 600 LPV stars from different catalogs of variable stars that two of the most important are Whitelock et al. (2012) and Letarte et al. (2002) that they reported the main part of the LPVs and the Carbon stars, respectively, Patrick et al. (2015) announced the RSG stars. Understanding the star formation history of NGC 6822 plays an important role in comparing the galaxy history evolution with other nearby dwarf galaxies as well as studying the nature of the evolving population of galaxies which were detected in deep redshift surveys.

2. Far-infrared study of IRAS18316-0602 star-forming region

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We present the results of the investigation of ISM and the young stellar population in the IRAS18316-0602 star-forming region which is referred to as UCHII (G25.65+1.05). Single temperature modified blackbody model shows that values of N(H2) hydrogen column density and Td dust temperature are in ranges 2-7x10^{23} cm^{-2} and 12-30 K., respectively. The analysis of Infrared photometric data allowed to reveal about 50 young stellar objects in the UCHII (G25.65+1.05) region.

3. Runaway stars in Vel OB1 association

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A significant fraction of the most massive stars moves through space with a high (supersonic) velocity. One of the physical explanations is that a supernova explosion leading to a high velocity of its counterpart. Another explanation is that the dynamic interactions of members of clusters in the early stages of evolution can also lead to high velocity. We present the origins of 4 runaway stars in the Vel OB1 association using Gaia proper motions and parallaxes. Proper motions and parallaxes show that mentioned 4 runaways came out from Vel OB1 association: 3 of them, namely CD-41 4637, HD 75860 and HD 298310 are the results of dynamical interaction in different clusters and Vela X-1 HMXB became a runaway after supernova explosion. We made membership analysis of host clusters of these 4 runaway stars using Gaia data.

4. Photometric observations of Massive stars

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All Massive stars play an important role in the chemical evolution of galaxies because of their very high mass-loss rates - up to 10^{-4} M⊙ a year. We are doing photometric observations of different types of massive stars. Our targets are on different evolutionary stages. Some of them are the members of massive binaries; some of them are blue or yellow hypergiants. We already have got very interesting results on the massive hypergiant star of P Cygni. We are presenting some results of analysis of our UBVRI photometric data, obtained during 2018-2019 years using the 48 cm Cassegrain telescope of the Abastumani Astrophysical Observatory, Georgia.

5. Comparative analysis of solar radio bursts before and during CME propagation

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As is well known, CME propagation often results in the fragmentation of the solar atmosphere on smaller regions of density (magnetic field) enhancement (depletion). It is expected that this type of fragmentation may have radio signatures. The general aim of the present paper is to perform a comparative analysis of type III solar and narrow-band type-III-like radio burst properties before and during CME events, respectively. The main goal is to analyze radio observational signatures

of the dynamical processes in the solar corona. In particular, we aim to perform a comparison of local plasma parameters without and with CME propagation, based on the analysis of decameter radio emission data. In order to examine this intuitive expectation, we performed a comparison of usual type III bursts before the CME with narrow-band type-III-like bursts, which are observationally detectable on top of the background type IV radio bursts associated with CME propagation. We focused on the analysis of in total 429 type III and 129 narrow-band type-III-like bursts. We studied their main characteristic parameters such as frequency drift rate, duration, and instantaneous frequency bandwidth using standard statistical methods. Furthermore, we inferred local plasma parameters (e.g., density scale height, emission source radial sizes) using known definitions of frequency drift, duration, and instantaneous frequency bandwidth. The analysis reveals that the physical parameters of coronal plasma before CMEs considerably differ from those during the propagation of CMEs (the observational periods 2 and 4 with type IV radio bursts associated with CMEs). Local density radial profiles and the characteristic spatial scales of radio emission sources vary with radial distance more drastically during the CME propagation compared to the cases of quasistatic solar atmosphere without CME(s) (observational periods 1 and 3). The results of the work enable us to distinguish different regimes of plasma state in the solar corona. Our results create a solid perspective from which to develop novel tools for coronal plasma studies using radio dynamic spectra.

6. Detailed Studies of Radiogalaxy Mrk1032

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The results of integral-field spectroscopy of the radiogalaxy Mrk1032 will be presented, obtained from the observations with the 6m telescope of SAO RAS.

7. Multiple asteroid systems from the UkrVO archive's digitized photographic plates

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Several catalogs of coordinates and B-values for more than 32 million stars and galaxies were compiled based on the processing of the Kyiv and Kitab parts of digitized photographic observations of the Northern Sky Survey. Based on these data, stored in the Ukrainian VO archives, two catalogs were also compiled for more than 5,000 positions and B-values of asteroids. In addition, a catalog of more than 1700 positions and B-values of asteroids, which were identified from digitized observations of open clusters in UBVR color bands at the Baldone

observatory, has been obtained. We analyzed the catalogs of asteroid positions obtained after processing the digitized plates. On the plates displayed in the observatories of Kyiv, Kitab and Baldone, among 6737 positions, we singled out 119 ones of 69 asteroids, which are known as double asteroids or asteroids with satellites. Most of the asterouids belong to the MBA, 3 – to Jupiter Trojans, 4 are Mars crossers, and 1 is a NEA. . The positional observations cover the period of 1973-1993 and may be useful for more detailed study of the dynamics of these systems. And the obtained photometric characteristics of the asteroids will be useful for study changes in the brightness.

8. Stellar spectra analysis of giant stars: ARCTURUS

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In this study, we analyzed the evolved red giant ARCTURUS (HR 5340, K2 III), using high-resolution spectroscopy that was taken by HARPS. Taking advantage of the high-resolution, we derive the basic stellar parameters, effective temperature (Teff= 4286 ± 30 K), surface gravity (log g= 1.66 ± 0.05), and metallicity ([Fe/H]= −0.52 ± 0.04). In addition, we provide an accurate atmospheric abundance for 17 elements; from Oxygen (z=8) to Zinc (z=30). We find that the chemical composition of ARCTURUS, as a local thick-disk star, is consistent with its kinematics. Collectively, this study improves our understanding of ARCTURUS atmospheric chemical composition that is more important as a differential analysis scale. These parameters and the chemical abundances are typical for the study of the nature and structure of our Galaxy; having accurate stellar parameters and chemical composition of red giants stars, provide useful information about the astrophysical condition that lead to the born of these stars. Therefore, as the next step, a comparison study, using the same type of investigation, will be carried out between another eight benchmark red giants stars (e.g., Gacrux, Hamal, Mira) and ARCTURUS to investigate the significant difference between high- and low-velocity giants.

9. Necessity of Joint Tools of GRB Catalogs

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With the accumulation of the observations of the highest energy transient sources, called "Gamma-Ray Bursts (GRB)", a huge database has occurred. And since these sources show their temporal and spectral features in a wide range, classification of them becomes important for the scientists to understand GRB cental engines and their formation scenarios. Although it is done by T90 distribution (Kouveliotou et al. 1993), it is shown that the traditional classification is not explained all the features (Gehrels et al. 2006, Minaev and Pozanenko, 2019). To help scientists,

different GRB catalogs can be combined to recover the theoretical models' reliability. A review of GRB Catalogues such as KONUS, BATSE, RHESSIGRB, FERMIGBRST etc. is given. Also in order to discuss GRBs contributions to their environment, it may help to consider such tools.

10. How do you hunt the observational data?

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I will show how to hunt the observational data of pulsars and millisecond pulsars in their catalogs

11. Restoring of Zone of Avoidance by direct and indirect methods

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We present "the algorithm of darning the Zone of Avoidance (ZoA)." It consists of dividing the authentic extragalactic surveys (e.g., the SDSS-galaxy from DR14) on the slices by redshifts, stellar magnitudes, coordinates, and other parameters. It needs to form a training sample and the general Generative Adversarial Network (GAN) scheme for the ZoA filling. We discuss principal tasks to generate galaxy distributions and their properties in the ZoA from the latent space of features. We then describe how the discriminative network will compare the obtained artificial survey with the real one and evaluate how it is a realistic one. The incompleteness of data depending on wavelengths indicates that there are still not resolved problems such as the dynamics in the Local Group and the near Universe; the large-scale structure of the Universe in the sky region obscured by the Milky Way; the velocity flow fields towards the Great Attractor; the Cosmic Microwave Background dipole. Here, we propose a new "algorithm of darning the ZoA" and the general GAN scheme as an additional machine learning platform to recover a spatial distribution behind the ZoA of our Galaxy.