On 14-19 November, the Meshcheryakov Laboratory of Information Technologies hosted the first JINR Autumn School of Information Technologies. The Autumn School became the first stage in a series of JINR Schools of Information Technologies.

The JINR School of Information Technologies aims to involve young specialists in solving tasks in different fields of science using state-of-the-art information technologies (IT). 60 senior students from 13 Russian universities, including those ones where JINR Information Centers (Far Eastern Federal University, Kamchatka State University named after Vitus Bering, Bauman Moscow State Technical University, National Research Technological University MISiS, National Research Nuclear University MEPhI, Peoples' Friendship University of Russia, Plekhanov Russian University of Economics, St. Petersburg State University, North Ossetian State University named after K.L. Khetagurov, Tver State University, Tomsk Polytechnic University, Tula State University, Dubna University) operate, participated in the event.

MLIT Director V.V. Korenkov opened the School by emphasizing that the main idea of the School is the professional training of high-class specialists for long-term cooperation with the Institute. JINR Director, RAS Academician G.V. Trubnikov presented the JINR development strategy for the next seven years and the Institute's leading projects. V.V. Korenkov continued the program with a lecture on the status and prospects for the development of MLIT, including the JINR Multifunctional Information and Computing Complex. With great interest, the students listened to a lecture by V.V. Voevodin (RCC MSU), a leading Russian specialist in computer technology, high-performance computing and parallel programming, "Supercomputer Systems and Structural Features of Algorithms". Professor R.L. Smelyansky (CMC MSU) spoke about the trends in the development of the computing infrastructure, and A.I. Avetisyan (ISP RAS) delivered a talk on "Computer Security, Secure Software".

A presentation of the modernized "Govorun" supercomputer, the performance of which enhanced by 23.5% and reached 1.1 PFlops, was also held within the School. A.A. Moskovsky (CJSC "RSC Technologies") spoke about the creation, modernization and technologies used in the "Govorun" supercomputer, and D.V. Podgainy (MLIT) dwelled upon the tasks solved on the "Govorun" supercomputer.

MLIT specialists, as well as invited lecturers from other Laboratories of the Institute and Russian universities became teachers of the School. Each day was devoted to one of the IT directions being developed and applied within JINR's projects. The students listened to lectures on distributed and high-performance computing to solve tasks at the NICA accelerator complex and of the JINR neutrino program. D.A. Oleynik (MLIT) introduced the participants to the basics of data processing for high-energy physics (HEP) experiments, and I.S. Pelevanyuk (MLIT) spoke about distributed computing based on the DIRAC platform. K.V. Gertsenberger (VBLHEP) and O.V. Rogachevsky (VBLHEP) delivered talks on information services for supporting the BM@N experiment and on computing for the MPD experiment at the NICA collider. The given direction continued with lectures by J. Busa Jr. "Automation of Assembling Large Packages on the Example of MPDRoot" (MPDRoot is a platform for data simulation and analysis within the MPD experiment), by F.V. Prokoshin (DLNP), who shared plans for using the *EventIndex* catalog implemented for the ATLAS experiment at the LHC and its adaptation for the SPD facility at the NICA collider, and by A.S. Zhemchugov (DLNP), who spoke about the Geant4 simulation package as the main simulation tool in HEP.

The direction "Mathematical Modeling, Numerical Methods and Algorithms for Solving JINR Applied Tasks" was opened by a lecture of Yu.L. Kalinovsky (MLIT), who spoke about the modeling of physical processes in a dense and hot nuclear medium, and D. Goderidze (MLIT)

acquainted the students with the parallel implementation of such algorithms. O. Grigoryan (MLIT) and A.S. Ayriyan (MLIT) devoted their lecture to neutron star simulation using a neural network approach, and I.R. Rahmonov (BLTP) described the mathematical modeling of hybrid Josephson structures that consist of superconductors and magnets. Within this direction, the students participated in a tutorial on tools based on *Python* libraries and the *Jupyter* ecosystem to solve scientific and applied tasks, which was prepared by the Heterogeneous Computing Group of MLIT JINR together with specialists from the Institute's Laboratories (A.R. Rahmonova, A.S. Vorontsov, A.V. Nechaevsky, I.R. Rahmonov, M.V. Bashashin, M.I. Zuev, O.I. Streltsova, Yu.A. Butenko).

The direction "Machine Learning and Artificial Intelligence for Solving JINR Applied and Scientific Tasks" was presented by lectures of Professor G.A. Ososkov (MLIT) "Applied Aspects in HEP Tasks", of A.V. Uzhinsky (MLIT) "Machine Learning in Applied Tasks Solved at MLIT" and of V.V. Papoyan (MLIT) "Methods of Machine Learning in Particle Identification Tasks".

The last day of the School was devoted to Big Data analytics. P.V. Zrelov (MLIT) introduced the School participants to the subject of the direction, S.D. Belov (MLIT) and A.A. Artamonov (Head of the Department of Competitive Systems Analysis, NRNU MEPhI) spoke about Big Data analytics technologies and their practical application. During the tutorial held by the NRNU MEPhI team (E.V. Antonov, M.S. Ulizko, R.R. Tukumbetova), the students got acquainted with the *Kibana* data analytics and visualization platform and the *ElasticSearch* search engine.

Especially for the School participants, talks on the JINR social infrastructure (A.V. Tamonov, SIM Office), on the Institute's educational program (A.Yu. Verkheev, UC), and on the activities of the JINR Association of Young Scientists and Specialists (V.A. Rozhkov, DLNP) were delivered.

The School participants visited exciting excursions: interactive exposition "JINR Basic Facilities" in the "Mir" Cultural Center, where they were able to see the models of JINR's basic facilities and learn the principles of their operation; Factory of Superconducting Magnets at VBLHEP; "Govorun" supercomputer and JINR Multifunctional Information and Computing Complex at MLIT; sightseeing tour of Dubna.

At the end of each day, fruitful discussions were held between the students and the teachers. The students asked questions on the materials of lectures and tutorials, talked over possible joint work on topics of their graduation theses. At the closing of the School, all participants were awarded certificates.

The presentations of the lectures, photos and video materials are available at the School website http://itschool.jinr.ru in the section "JINR Autumn School of Information Technologies".

In conclusion, we would like to express gratitude to all the participants of the School and the organizing committee, most of the committee members participated in the organization of such a large-scale and important event for the first time.

The second stage of the School, namely, the JINR Spring School of Information Technologies, where the students will present the results of joint work with the Institute's specialists on selected topics of their graduation theses, is planned for April 2023.


Tomsk Polytechnic University
Tula State University
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