

Modern information technologies in biology and medicine

Nov 22 – 24, 2023
Europe/Moscow timezone

[Overview](#)[Timetable](#)[Tutorial participants](#)

The international workshop “**Modern information technologies in biology and medicine**” will take place from 22 to 24 November 2023. There are oral and practice parts. During 3 days the specialists from JINR, Serbian and Russian institutes will share their views, outcomes concerning contemporary IT methods, and approaches in application for research. Topics include various scientific fields such as biomedicine, information technology and physics. The workshop is going to be online. The idea is to show the opportunity of application IT solutions for different scientific branches as well as be inspired to search for something new in a friendly ambience. On the 3rd day, the specialists of Meshcheryakov Laboratory of Information Technologies (MLIT) organize the tutorial for members who would like to try the use of Python for machine learning in biomedicine task.

The video conference room

<https://jinr.mts-link.ru/2271283/210907340>

ORGANIZING COMMITTEE:

Chairman: Oksana Streltsova (MLIT, JINR)

Vice-chairman: Marko Ćosić (Vinča Institute of Nuclear Sciences, Serbia)

Scientific Secretary: Inna Kolesnikova (LRB, JINR)

Nechaevskiy Andrey (MLIT, JINR / Dubna State University)

Podgainy Dmitry (MLIT, JINR)

Priakhina Daria (MLIT, JINR)

Sanja Despotović (Institute for Histology and Embryology, Serbia)

Zuev Maxim (MLIT, JINR)




Starts Nov 22, 2023, 10:00 AM

Ends Nov 24, 2023, 1:30 PM

Europe/Moscow



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Modern information technologies in biology and medicine - Nov 22, 2023 - Nov 24, 2023
Daily Program: Wednesday, November 22, 2023

Contribution: Welcoming address of the director of LRB JINR

Time and Place: (Nov 22, 2023 - Nov 22, 2023)

Presenter: Aleksandr Bugay

Contribution: Welcoming address of the director of Vinča Institute

Time and Place: (Nov 22, 2023 - Nov 22, 2023)

Presenter: Miroslav Adžić

Contribution: Overview of the activities of the Laboratory of Radiation Biology

Time and Place: (Nov 22, 2023 - Nov 22, 2023)

Presenter: Aleksandr Bugay

Contribution: The use of modern information technologies for applied radiobiological research

Time and Place: (Nov 22, 2023 - Nov 22, 2023)

Presenter: Inna Kolesnikova

Contribution: The approaches in visualization and quantification of collagen fibers

Time and Place: (Nov 22, 2023 - Nov 22, 2023)

Presenter: Sanja Despotović

Break: Break

Time and Place: (Nov 22, 2023 - Nov 22, 2023)

Contribution: Extracting biological meaning from lipidomics data through biostatistics, machine learning and pathway analysis

Time and Place: (Nov 22, 2023 - Nov 22, 2023)

Presenter: Romana Masnikosa

Contribution: The Basics of the Radon transform for medical and quantum state tomography

Time and Place: (Nov 22, 2023 - Nov 22, 2023)

Presenter: Marko Čosić

Modern information technologies in biology and medicine - Nov 22, 2023 - Nov 24, 2023
Daily Program: Thursday, November 23, 2023

Contribution: Recent studies on nonlinear dynamics of microtubules and DNA
Time and Place: (Nov 23, 2023 - Nov 23, 2023)
Presenter: : Slobodan Zdravković

Contribution: System for working with neurocognitive experiments data (MRI/fMRI) on the HybriLIT Heterogeneous Platform
Time and Place: (Nov 23, 2023 - Nov 23, 2023)
Presenter: : Maxim Zuev

Contribution: Monte Carlo simulation studies of radiation induced damage at cellular and sub-cellular level
Time and Place: (Nov 23, 2023 - Nov 23, 2023)
Presenter: : Miloš Đorđević

Contribution: Video-based unobtrusive physiological measurements: Perspectives and Opportunities
Time and Place: (Nov 23, 2023 - Nov 23, 2023)
Presenter: : Nadica Miljkovic

Break: Break
Time and Place: (Nov 23, 2023 - Nov 23, 2023)

Contribution: Quantifying the complexity of the collagen fiber arrangement
Time and Place: (Nov 23, 2023 - Nov 23, 2023)
Presenter: : Milivoje Hadžijojić

Contribution: Ultrasound for tissue microscopy
Time and Place: (Nov 23, 2023 - Nov 23, 2023)
Presenter: : Yulia Petronyuk

Contribution: High resolution ultrasound methods in tissue engineering
Time and Place: (Nov 23, 2023 - Nov 23, 2023)
Presenter: : Elena Khramtsova

Contribution: Photothermal effect in biomedical applications
Time and Place: (Nov 23, 2023 - Nov 23, 2023)
Presenter: : Slobodanka Galović

Contribution: JQuantPro - software for automation of image analysis
Time and Place: (Nov 23, 2023 - Nov 23, 2023)
Presenter: : Pavel Lobachevsky

Contribution: The prototype of a web service for a dataset of trajectories of the behavioral test Morris Water Maze
Time and Place: (Nov 23, 2023 - Nov 23, 2023)
Presenter: : Tatevik Bezhanyan

Contribution: The Usage of Complexities for Classification of Neuron Cells
Time and Place: (Nov 23, 2023 - Nov 23, 2023)
Presenter: : Olga Deeva

Modern information technologies in biology and medicine - Nov 22, 2023 - Nov 24, 2023
Daily Program: Friday, November 24, 2023

Contribution: Tutorial on the use of Python for tasks in Bio-Medical research: Part 1

Time and Place: (Nov 24, 2023 - Nov 24, 2023)

Presenters: : Anastasia Anikina; Daria Priakhina; Inna Kolesnikova; Margarit Kirakosyan; Maxim Zuev; Oksana Streltsova; Sara Shadmehri; Tatevik Bezhanyan

Break: Break

Time and Place: (Nov 24, 2023 - Nov 24, 2023)

Contribution: Tutorial on the use of Python for tasks in Bio-Medical research: Part 2

Time and Place: (Nov 24, 2023 - Nov 24, 2023)

Presenters: : Anastasia Anikina; Daria Priakhina; Inna Kolesnikova; Margarit Kirakosyan; Maxim Zuev; Oksana Streltsova; Sara Shadmehri; Tatevik Bezhanyan

Contribution: Closing session

Time and Place: (Nov 24, 2023 - Nov 24, 2023)

Extracting biological meaning from lipidomics data through biostatistics, machine learning and pathway analysis

Wednesday, November 22, 2023 11:55 AM (30 minutes)

In recent years, due to significant advancements in mass spectrometry, lipidomics has emerged as a fast growing scientific field that provides deep insights into complex changes in lipidome of human cells and tissues. Human blood is a self-regenerating lipid-rich biological fluid, a tissue that is easily collected in hospitals. Blood/plasma is rich in lipids and related metabolites, and its lipid composition (LIPIDOME) reflects diverse aspects of lipid metabolism and may give us insight into general human physiology in health and disease. Plasma lipidome is a tightly regulated and precisely defined constellation of lipid molecules and disturbances in the plasma lipidome occur in many diseases such as cardiovascular diseases and cancer, but also in conditions that are not directly linked to lipid metabolism. Hence, plasma lipidomics is an emerging tool in an array of clinical diagnostics. The most sought-after goals in the lipidomics community are to identify disease biomarkers, monitor a clinical treatment or confirm a biological hypothesis on a causality between a disease onset/progression and lipid profile. A recommended plasma lipidomics workflow consists of: preanalytics, analytics and post analytics, including study design, research hypotheses, sample collection, demographics data collection, lipid extraction, quality control, liquid chromatography and mass spectrometry, raw data processing, lipid annotation/identification, normalization, lipid quantitation, databases, data sharing and data analysis. The topic of this presentation is data analysis so I will put an accent to it. Lipidomics community nowadays uses dozens of biostatistical tools, artificial intelligence (AI), machine learning (ML) algorithms and chemometrics for data analysis, depending on size of datasets, data structure and the expertise of data scientists involved. Smart analysis of lipidomic data (provided these are of good quality) is of paramount importance for identifying potential biomarkers and understanding disease mechanisms. To accomplish this, they use, besides classical statistics-between groups comparisons, principal component analysis (PCA), orthogonal projections to latent structures discriminant analysis (OPLS-DA), partial least square analysis (PLS) and correlation analysis, all accompanied by various data pattern recognition and data visualization tools. Less often used are ML algorithms such as random forests (RF) and support vector machines (SVM), with only few applying deep learning and neural networks. Finally, to extract biological knowledge, i.e. metabolic pathways affected by a disease or applied treatment, data are subjected to different enrichment analyses, network analyses and pathway analysis. Life scientists working outside clinical setting, such as those investigating neurodegenerative changes in brain will also benefit from applying lipidomics to their model systems.

Primary author: Dr MASNIKOSA, Romana (Vinča Nuclear Research Institute)

Presenter: Dr MASNIKOSA, Romana (Vinča Nuclear Research Institute)