KYIV ACADEMIC UNIVERSITY

learning by doing research internationally

The State Research Institution «Kyiv Academic University» (KAU),
jointly run by the National Academy of Sciences of Ukraine and the Ministry of Education and Science of Ukraine

Dr. Volodymyr Nochvai,
Head of Virtual Center for Digital Innovation KAU (NOSC-UA DIH)
v.nochvai@kau.edu.ua

https://kau.org.ua/en
http://cloud-5.bitp.kiev.ua/?page_id=140

https://www.linkedin.com/showcase/nosc-ua-dih/

https://twitter.com/NOSC_UA_DIH

The university was established in 2016 through the reorganisation of the Physical and Technical Educational and Scientific Center of the NAS of Ukraine (formerly the Kyiv branch of the Moscow Institute of Physics and Technology). The key principle behind KAU is "learning by doing research internationally" - to provide a research-intensive education system by leveraging the expertise of research institutions within the NAS of Ukraine, while also promoting integration with the European Research Area and fostering international collaborations with leading research universities worldwide.

KAU uses a research-intensive education approach where students learn by doing research internationally. This involves hands-on learning through active engagement in research projects, often with international collaborators and always with the leading scientists from the National Academy of Sciences of Ukraine. By participating in global research, students gain valuable experience working with diverse teams and in cross-cultural communication, preparing them for careers in a globalised world.

Berlin Adlershof

Academ.city
RESEARCH EDUCATION TECHNOLOGY

Neurotwin Horizon 2020 project

HORIZON-EIE-2022-SCALEUP-01-01 — Expanding Entrepreneurial Ecosystems

Strengthening Entrepreneurial Ecosystem Development (SEED+)

4→InnoPipe

Erasmus+

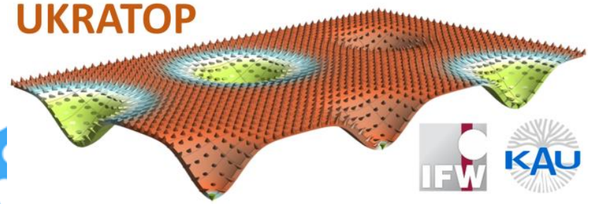
Erasmus+KA107, Université Savoie Mont Blanc (France)-KAU (Ukraine)
Duration: 2019-2020

UNIVERSITÉ SAVOIE MONT BLANC

"Topological order of electrons in solids: New materials, Phenomena & application Concepts

Ukrainian-German Excellence Center for Topological Matter

UKRATOP



IFW KAU

HUMBOLDT-UNIVERSITÄT ZU BERLIN

#Ilm | #Prague | #Kyiv | #Lüb | #Alm | #Baku | #Minsk | #Tash

SOMPATY

Spectral Optimization: From Mathematics to Physics and Advanced Technology

Julius-Maximilians-
UNIVERSITÄT WÜRZBURG

GUTT.UP

Innovation Network for Advanced Materials

BMBF-Joint project between the research and higher education institutions (Germany-Ukraine), 2018-2021.

BOOSTeLent

Empowering HEIs to Lead in Deep Tech Excellence with Innovative AI and ML for

8
departments

~50
students

Biomedicine and Neuroscience (at Kyiv Academic University)

Molecular Biology and Biotechnology (with the Institute of Molecular Biology and Genetics)

Fundamental Problems of General and Applied Physics (with the Institute of Physics)

Theoretical and Mathematical Physics (with Bogolyubov Institute for Theoretical Physics)

Theoretical Cybernetics and Methods of Optimal Control
(V.M. Glushkov Institute of Cybernetics)

Applied Physics and Nanomaterials (with G.V. Kurdjumov Institute for Metal Physics)

Mathematics (with the Institute of Mathematics)

Applied Physics and Material Science (with I. Franzevych Institute for Problems of Material Sciences, E.O. Paton Electric Welding Institute (PWI))

Department of Mathematics

From 2019, the Department of Mathematics of the Kyiv Academic University at the Institute of Mathematics of the National Academy of Sciences of Ukraine offers two master's programs: 111 "Mathematics" and 122 "Computer Science".

Education process is mainly aimed at students who are interested in pursuing a scientific career in the field of modern mathematics and computer science, as well as obtaining in-depth knowledge for further work in IT industry or business. The best scientists and lecturers of the Institute of Mathematics, V. M. Glushkov Institute of Cybernetics, Institute of Problems of Mathematical Machines and Systems, Institute of Software Systems and other institutions of the NAS of Ukraine as well as leading universities of Ukraine are involved in teaching and scientific work with students.

Scientific research work is the dominant component of educational and scientific programs of the department. The students are able to listen to individual lectures and training courses of foreign specialists, to get the first experience of international cooperation, to present reports at international conferences and seminars, and overall, we provide wide opportunities for academic mobility and internships abroad, etc. Everyone will get a chance to work in world-class scientific teams . Kyiv Academic University and Department of Mathematics is the place where the students are cared not only by their scientific supervisors, but also by the entire division of the institution (and in the case of interdisciplinary research, representatives of several institutions).

Head of Department - Dr.Sc., Vyacheslav Boyko, vyacheslav.boyko@gmail.com, +38067 681 97 58 (viber, telegram)

Research Directions

RESEARCH DIRECTIONS

111 Mathematics

- Analysis and mathematical physics.
- Algebra and topology.
- Probability theory and mathematical statistics.

122 Computer science

- Artificial intelligence.
- Data science.
- Machine learning.
- Optimization methods.
- Mathematical modelling.

Kyiv Academic University
Department of Theoretical and Mathematical Physics

TEACHING ADMISSIONS ALUMNI

Research groups

Bogolyubov Institute for Theoretical Physics of the National Academy of Sciences of Ukraine

Structure of atomic nuclei

Dr. Sc. Yuliya Lashko

Theory of integrable systems

Dr. Sc. Nikolai Iorgov

Soft matter physics

Prof. Dr. Sc. Bohdan Lev

Quantum optics

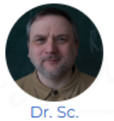
Quantum optics: Distribution of quantum light through the turbulent atmosphere, photodetection theory, cavity quantum electrodynamics, nonclassical properties of quantum light. Foundations of quantum physics: Bell nonlocality, quantum measurement theory, localization of photons and particles.

Dr. Sc. Andrii Semenov

Vadym Kovtoniuk

Mykyta Yurin

Ivan Yeremenko



Dr. Sc. Sergei Sharapov

Volodymyr Shubnyi

Ihor Nimyi

Physics of graphene and Dirac materials

Dirac materials (graphene, silicene, etc.), their electrical, thermoelectrical, optical properties, in particular in an applied magnetic field.

Nonlinear wave phenomena

The group investigates nonlinear wave phenomena in condensed matter systems such as Josephson junctions and magnets.

Theoretical and computational biophysics

The field of research is biophysics of macromolecules. The main results are related to the study of physical mechanisms of complex formation of active molecules and metal ions with the DNA and proteins. The phylosophy of research is to breadge the results of computational modeling with the experimental studies using the models of theoretical physics.

Department of Molecular Biology and Biotechnology

The Department of Molecular Biology and Biotechnology at Kyiv Academic University provides training for Master's degree seekers in the field of Biology (specialization 091) based on the **Institute of Molecular Biology and Genetics** of the National Academy of Sciences of Ukraine. The department prepares masters for work in modern research areas such as cell technologies and the basics of cell therapy, the development of advanced biotechnologies, molecular mechanisms of enzymology in protein synthesis, introduction to systems biology, computer modeling methods, modern genome editing techniques, epigenetic regulation of gene expression, genetic engineering of plant and animal cells, cell signaling cascades under normal and pathological conditions. The educational-scientific program is interdisciplinary, with a significant emphasis on research work. Starting from the first year of the master's program, students dedicate 50% of their time to research, increasing to 100% in the second year. Students learn basic laboratory techniques in a well-equipped laboratory for all major molecular biology research. Additionally, students directly participate in research activities of departments and laboratories based on their chosen master's thesis topic and contribute to grant research in relevant groups.

Our main mission is to cultivate a generation of future researchers and high-level professionals in the most promising fields of biology: molecular biology and biotechnology.

Head of the Department
Academician of the NAS of Ukraine Mykhailo Arseniyovych Tukalo
Institute of Molecular Biology and Genetics of the NAS of Ukraine,
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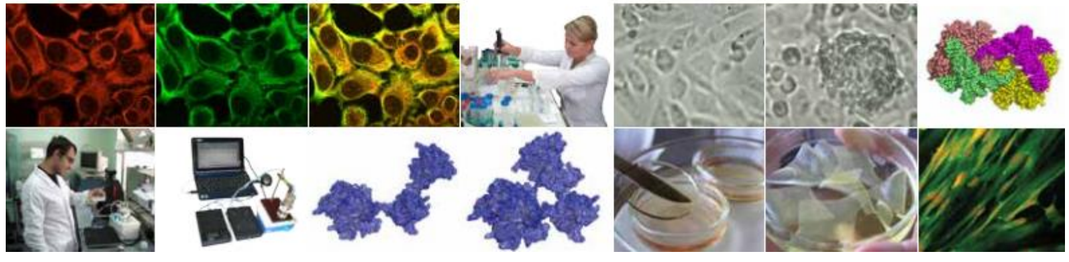
Tel: (380-44) 200-03-35;
Fax: (380-44) 526-07-59;
E-mail: mtukalo@imbg.org.ua

Deputy Head of the Department
Senior Researcher, Ph.D. Inessa Yakivna Skrypkina
Institute of Molecular Biology and Genetics of the NAS of Ukraine,

INSTITUTE
OF MOLECULAR BIOLOGY
AND GENETICS
NATIONAL ACADEMY OF SCIENCES OF UKRAINE



Chair of Biomedicine and Neuroscience

The Chair of Biomedicine and Neurosciences of Kyiv Academic University accomplishes a training program leading to the Master Degree in biology (specialty 091). This research and educational program is interdisciplinary with a research work as its main component. The research component is based on the knowledge and experience of researchers as well as infrastructure of Bogomoletz Institute of Physiology, National Academy of Sciences of Ukraine and Dobrobut Academy. The program focuses on the study of biological objects in terms of physical and chemical principles of their functioning. Research within the program covers two intersecting areas: the application of physical and chemical approaches and methods to solve biological problems, as well as the development of new research methods. The educational process involves direct participation of students in research in such modern areas of biomedicine and neurosciences as molecular biophysics, molecular pathophysiology, intercellular signalling, optogenetics, sensory signaling etc.

Head of the Department - Prof. Pavel Belan, PhD, Dr. Sci.

Secretary of the Department - Iryna Osadchenko, PhD

Lines of research

Molecular mechanisms of Covid-19 and acute respiratory distress syndrome
Cellular and molecular mechanisms of signal processing by spinal cord neurons
Molecular Pharmacology of TRP channels
Signaling of Neuronal Calcium Sensor (NCS) proteins
Role of long non-coding RNA in pathogenesis of post-traumatic stress disorder
Mechanisms of chronic pain development and maintenance
Development of computer algorithms for optimization of senolytic therapy
Development of novel methods of tissue engineering
Development of new optical and optogenetic approaches

Department of Fundamental Problems of General and Applied Physics

The KAU Department of Fundamental Problems of General and Applied Physics is based at the Institute of Physics of the NAS of Ukraine.

The Department offers the Bachelor's, Master's and PhD education programs in modern areas of quantum and nonlinear optics, laser physics. The main areas of research are:

INSTITUTE OF PHYSICS
National academy of Sciences of Ukraine

1. Physics of Lasers and Laser Materials;
2. Nonlinear and Singular Optics;
3. Fundamental Research of the Interaction of Laser Radiation with Matter and the Development of Scientific Base of Laser Technologies;
4. Holography.

During the studies, students are involved in research in the physics of gas, solid-state lasers and dye lasers. They study nonlinear optical phenomena in semiconductor, molecular and liquid crystals, photorefractive materials, polymers, organic molecules, photopolymer materials for holography and information recording. Moreover, students work on nonlinear ultrahigh-resolution laser spectroscopy and develop new methods for laser control of the motion of free atomic particles. Along with the traditional areas for the Institute, such as dynamic holography and multi-beam optics, speckle-field physics and holographic correlation methods for laser beam transformation, new ones areas are also being studied - for example, singular laser beam optics.

Department of Applied Physics and Nanomaterials

Department of Applied Physics and Nanomaterials operates on base of the G.V. Kurdjumov Institute of Metal Physics of NAS of Ukraine.

The Department offers outstanding graduate and postgraduate students strong but flexible lecture courses and rigorous research training in field of **applied physics and nanomaterials**. The research can be done in following directions:

- **Superconductivity and other electronic properties of metals:**
  - search of high-temperature superconductivity mechanisms;
  - fundamental and applied research of vortex matter;
  - development of new superconducting materials;
  - synchrotron study of electronic structure, ARPES;
  - superconducting electronics and spintronics;
  - topology in condensed matter: concepts and materials for future technologies.

Physics of strength, ductility and fracture
Collaboration with University of Bordeaux (France) (ILL, Grenoble, France) Brno University of Technology, Institute of Physics of Materials ASCR, Central European Institute of Technology (Brno, Czech Republic), The University of Vienna (Austria) UCLA and Advanced Materials Inc. (USA)

This research goes in close collaboration with IFW Dresden, Helmholtz-Zentrum Dresden-Rossendorf and BESSY Berlin (Germany), Swiss Light Source and PSI (Switzerland), Stockholm University (Sweeden), International Laboratory of High Magnetic Fields and Low Temperatures in Wroclaw (Poland)...

Condensed matter theory

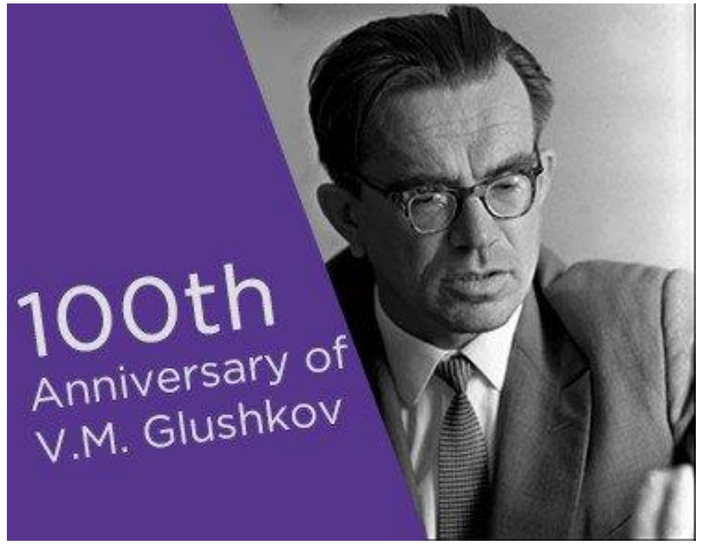
- **Computational Physics:**
  - quantum-mechanical calculations of the electronic structure of metals and modeling their physical properties;
  - development of ab initio methods of computational physics, creation and improvement of complex computer programs to study the physical and chemical properties of complex polyatomic systems.

Colaboration with Max-Planck Institute for Solid State Physics, Stuttgart, Germany; Max-Planck Institute of Microstructure Physics, Halle, Germany; Ames National Laboratoty, Ames, USA; Byalistok University, Byalistok, Poland.

Department of Theoretical Cybernetics and Methods of Optimal Control

The KAU Department of Theoretical Cybernetics and Methods of Optimal Control is based at the V.M. Glushkov Institute of Cybernetics of the NAS of Ukraine. The department provides Bachelor's, Master's and PhD programs in the field of mathematical and information technologies (IT) and prepares students to work in such areas as:

- theory and methods of systems analysis, mathematical modeling, optimization and artificial intelligence (AI);
- advanced systems of mathematical support of general and applied purpose;
- development of new information technologies and intelligent systems;
- solving fundamental and applied problems of informatization of society.



Together with the Ukrainian State, the Institute went through past years overcoming crises, and today it is a scientific center well known in Ukraine and abroad, which solves fundamental and applied problems of computer science and computer engineering and introduces their methods and means into various spheres of human activity. Today, the main directions of scientific research of the Institute are as follows:

- the development of a general theory and methods of systems analysis, mathematical modeling, optimization, and artificial intelligence;
- the development of a general theory of control and methods and means for the construction of intelligent control systems of different levels and destinations;
- the creation of a general theory of computing machines and development of advanced computer facilities, artificial intelligence, and informatics;
- the creation of perspective general-purpose and applied software systems;
- the development of new information technologies and intelligent systems;
- the solution of fundamental and applied problems of informatization of society.

Applied Physics and Material Science Department

The department is based at E.O. Paton Electric Welding Institute (PWI)

The main academic disciplines and areas of scientific research during master's studies at Kyiv Academic University at the Department of Applied Physics and Materials Science are:

theoretical foundations of materials science

methods of creation, characterization and analysis of modern materials

physical, mathematical and computer models of processes in materials and structures

nanostructured materials and composites

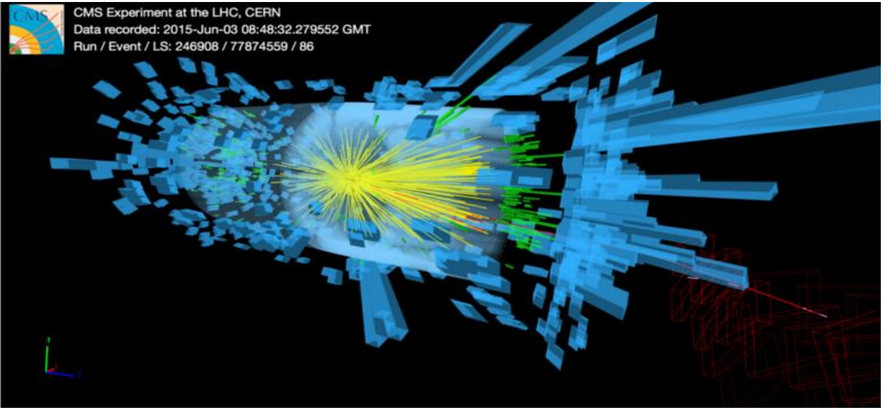
materials science of organic environments

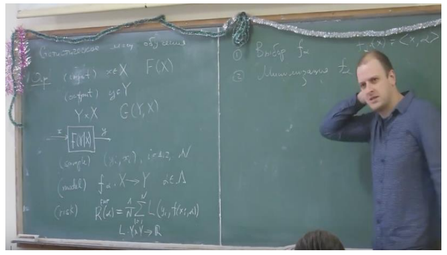
the basics of connection and processing of materials

fundamentals of scintillator physics

MAIN DIRECTIONS OF SCIENTIFIC RESEARCH

o Advanced Technologies of Welding and Merger of Materials
o Strength, Reliability and Longevity of Welded Constructions
o Building up, Coating and Surfacing Technologies
o Special Electrometallurgy Process
o Technical Diagnostics and Non-destructive Control
o Automation of Welding and Allied Technologies
o Mathematic Modelling of Welding and Allied Technologies
o Nano-structural systems, Nano-Technologies and Nano-Materials

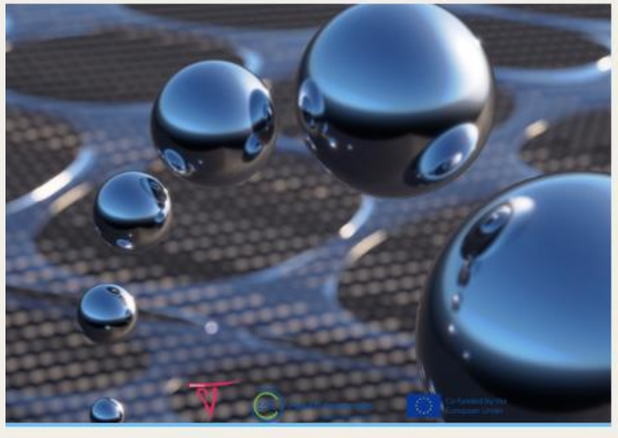




- Quantum Research Center
- Innovation Center
- Virtual center of digital innovation NOSC-UA DIH
- Laboratory of Data Research and ML
- Laboratory of prototyping and 3D printing
- Laboratory of Electronic Instrumentation

Advanced Powder Technologies

Machine Learning in Materials Lifecycle



Density functional theory for computational materials design

Fundamentals of materials science

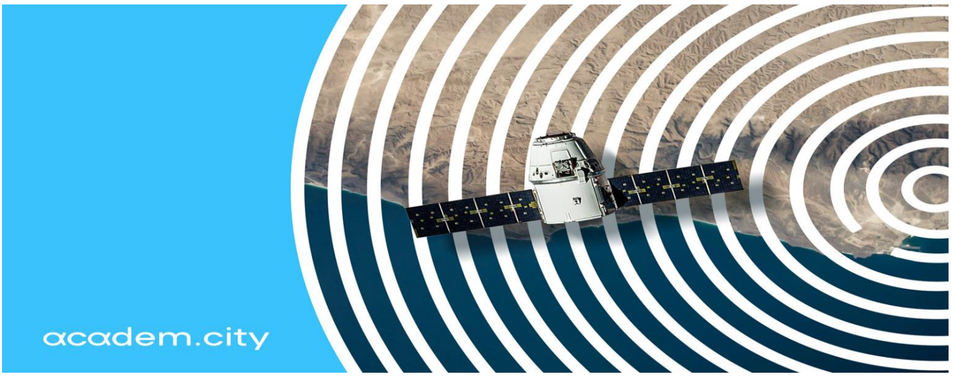
KAU's main activities include scientific research, education, innovation, and dissemination.

The **KAU Innovation Centre**

coordinates and implements technology transfer tools, increasing

the technology and market readiness of innovations within KAU and academic institutes, and establishing

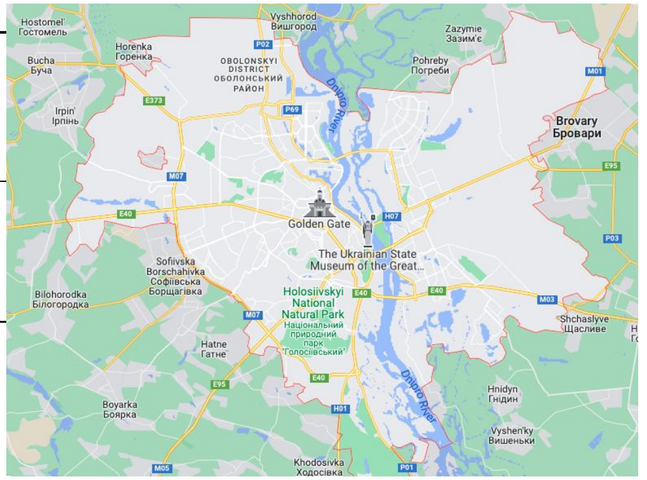
a Deep Tech Science Park "Academy.City."



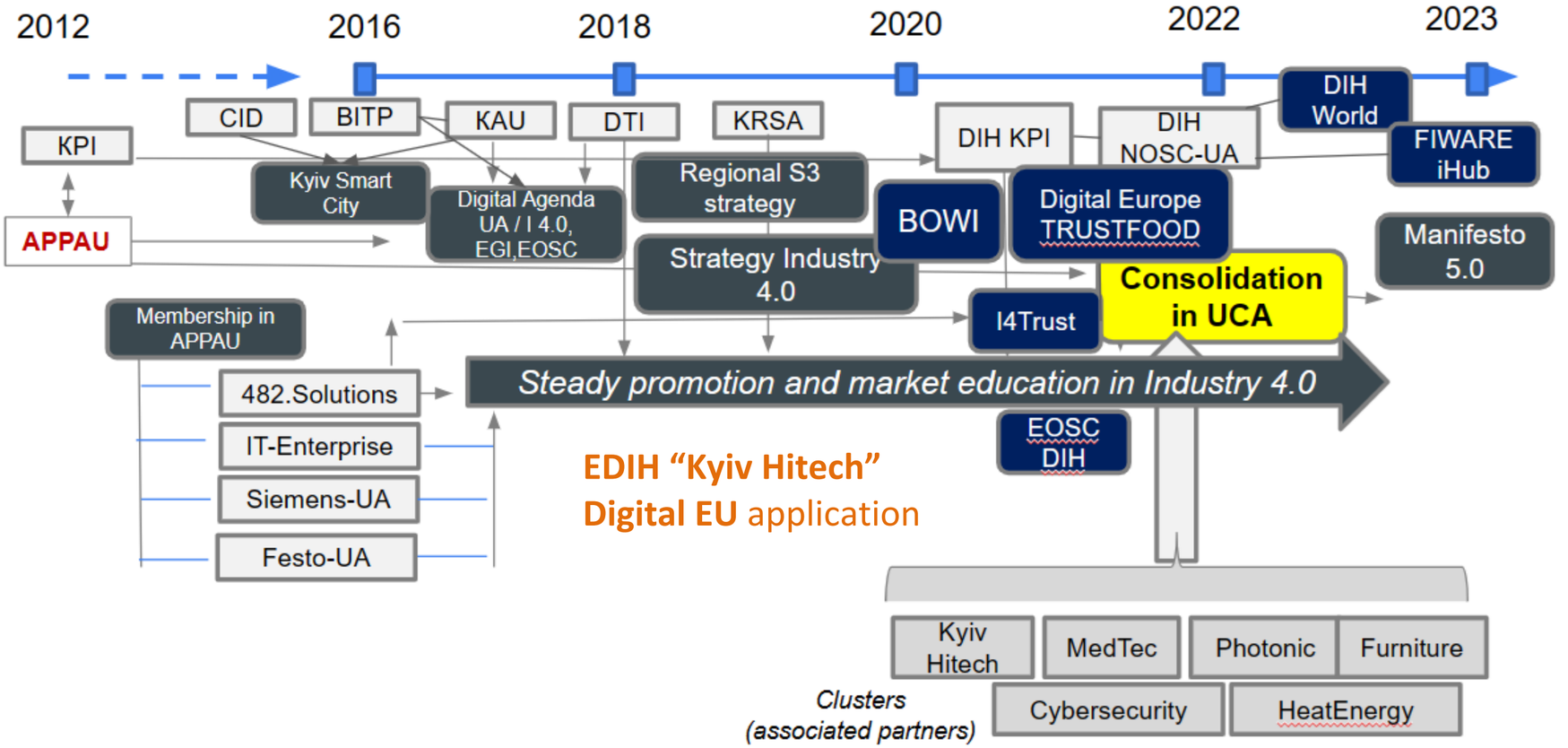
Currently, KAU Innovation Center aims to launch a Deep Tech Science Park “Academ.City” (https://kau.org.ua/en/science/innovation/academ-city) partnering with 12 research institutes of NAS of Ukraine located in the Akademmistechko district in the north-west of Kyiv as a place-based innovation ecosystem to increase Technology and Market Readiness Levels (TRL and MRL) of regional innovations.

R&I Directions

- Artificial intelligence and Machine learning
- Advanced Materials
- Biotechnologies
- Nanotechnologies
- Quantum technologies
- New Energy
- Green technologies



Virtual Center for Digital Innovation NOSC-UA DIH



- Digital ecosystem building, scouting, brokerage, networking
- Co-design and piloting of digital projects
- Education and digital skills development
- Accessing the digital technologies and services offered by the EGI and EOSC at national level

Catego... nce Services

Integrate...

April 23, 20...

Introduction Integrated Hydro-Kinetic ... ul tool for simulation of a relativistic heavy ion collision, which allows to describe or pr... sured bulk observables. Naturally, a researcher is interested in finding the connection between Read More ...

Digital Science Services, High-Energy Physics *Leave a comment*

DSTEST educational and research software platform

April 23, 2021 *viktoria.krechko*

Project overview One of the most important areas of development of computer modeling in applied research is to increase the speed and accuracy of numerical methods for solving mathematical models of the environment. For example, in modeling air and water Read More ...

Digital Science Services, Ecology *Leave a comment*

Systema "Vozdukh" ("Air")

April 23, 2021 *viktoria.krechko*

Project overview The web-service "Air" is based on the information technology of forecasting atmospheric spread of pollution due to accidents with emissions of hazardous substances, developed by IPMMS NASU, based on

April 2024

M	T	W	T	F	S	S
1	2	3	4	5	6	7
8	9	**10**	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

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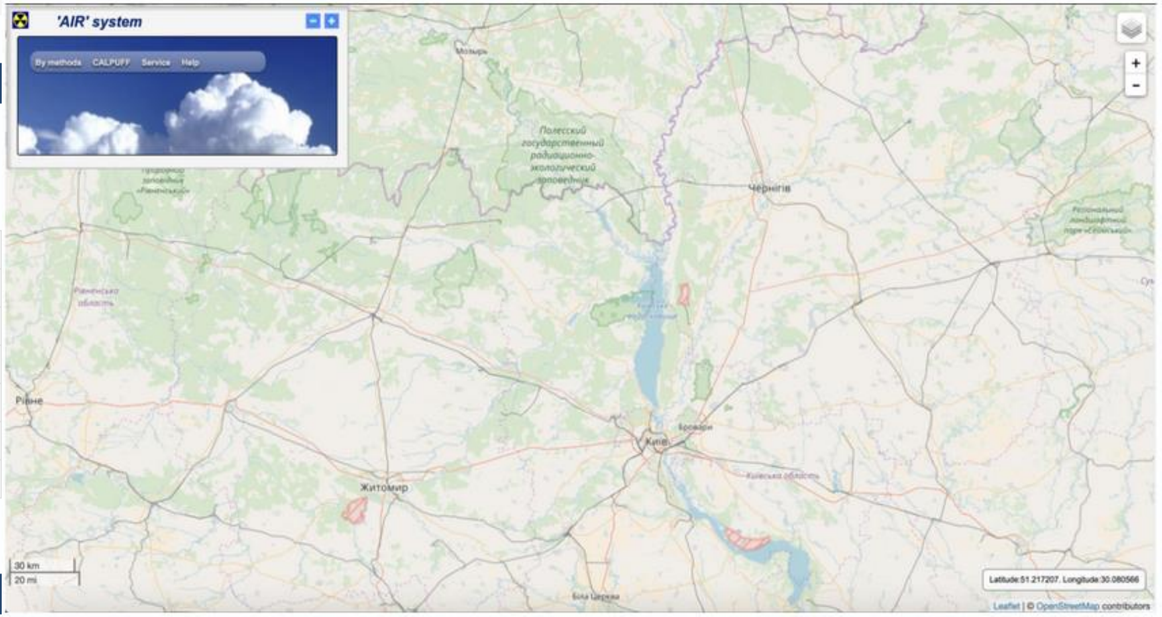
Systema "Vozdukh" ("Air")

April 23, 2021 *viktoria.krechko*

project website | Users guide | Ask the author



Project overview

The web-service "Air" is based on the information technology of forecasting atmospheric spread of pollution due to accidents with emissions of hazardous substances, developed by IPMMS NASU, based on integration of emission scenarios, atmospheric transport models of different levels of complexity (from simplified screening models of local scale to regional model CALPUFF and weather forecasting system WRF-Ukraine, developed by IPMMSU:

NOSC-UA DIH

Digital Innovation Hub

FIWARE iHubs

NOSC-UA DIH develops digital innovation services for scientists, business sector and public authorities on the basis of a cloud cluster of the Ukrainian National Grid

EIT HEI: «Strengthening Innovative Pipelines for Impactful Universities»

InnoPipe

Horizon Europe: «Strengthening Entrepreneurial Ecosystem Development»

SEEDplus

Digital Europe:

«Advanced Digital Skills on Blockchain for Trusted Food Supply Chains»

TRUSTFOOD

Empowering HEIs to Lead in Deep Tech Excellence with Innovative AI and ML for Sustainability, Aerospace, Advanced Materials, and Electronics

BOOSTalent

Coordinated and supported by EIT RawMaterials – Connecting matters

- Fundamentals of ML
- ML in Materials Lifecycle
- Introduction to Powder Technology
- Density functional theory for computational materials design

Coordinated by EIT European Institute of Innovation & Technology

Funded by the European Union

DIH KAU STARTUPS supported

Gravity

STRUCTURESCOPE
ETHER GRAVITY+AI

DIH-WORLD

Non-destructive testing technology with artificial intelligence (AI)

helps fast and cheep detect defects in metal ware

fundraising - 45 000 euro

technological and business services

DIH KAU STARTUPS supported

BLOCKCHAIN4ESG

i4Trust

The project of 482.solutions provides software solution ESG.Electrodo for ESG data and risk assessment and data processing aimed at accelerating the transition of industrial enterprises to a low-carbon economy according to EU Green Deal.

fundraising - 100 000 euro
direct funding - 30 000 euro

DIH KAU STARTUPS supported

ACTIVEHOUSE
DIGITWIN

Supported by EIT Food — Funded by the European Union — EIT HEI Initiative

InnoPipe

digital instrument for developers to monitor compliance of their projects with the European standards of comfortable and sustainable buildings

winner of International Active House Awards 2019 (Designed buildings with radar) Toronto, Canada.

DIH KAU STARTUPS supported

AGRIFOOTPRINT
+
CADS
CARBON AGRI DATA SPACE

EOSC DIH
DIGITAL INNOVATION HUB

cloud model for Carbon Footprint assessment in crop growing and agrifood value chains

fundraising - 120 000 euro
direct funding - 30 000 euro

Carbon Agri Data Space (CADS)

BUSINESS PARTNER

BIOINVEST-AGRO INNOVATION COMPANY

EOSC SERVICE PROVIDER

NEXUS

EGI-ACE

EOSC DIH

SUPPORTING PROJECT

EOSC Future

With support of EOSC DIH and in the scope of I4Trust 2nd Open Call the i4Trust Data Spaces Experiment “Carbon Agri Data Space (CADS) was realized.

i4Trust

NOSC-UA DIH Digital Innovation Hub

DIH FbN FIWARE iHub

FIWARE FOUNDATION

iSHARE

FundingBox

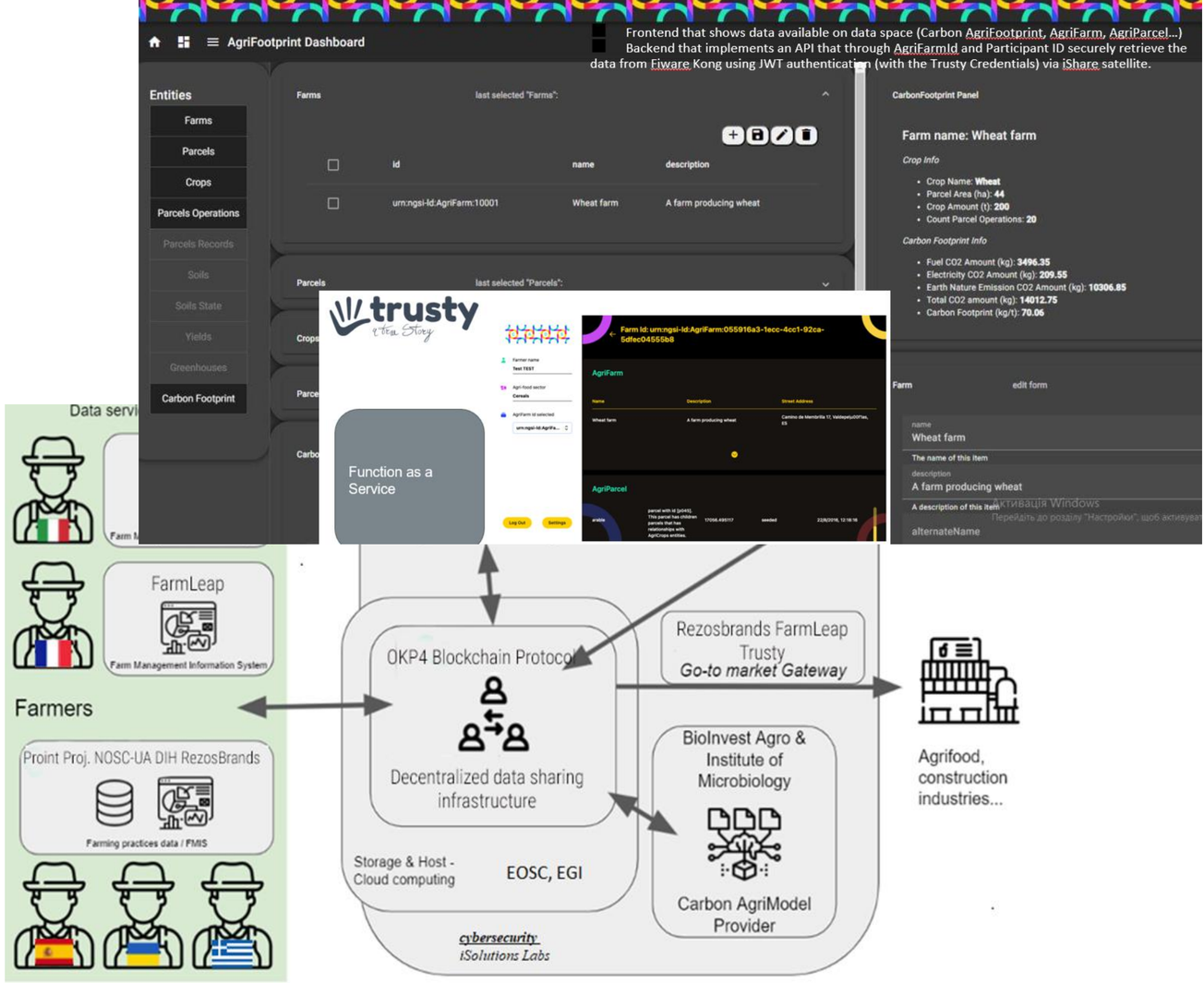
we work on **creating a Data Space**

that

- facilitates multiple users
- shares data
- makes it accessible for services and data consumers, including commercial users

FMIS & farmers data

- a verifiable carbon footprint is **under control**
- global aims of reducing CO2 are reached
- production is **safe and organic**



Idea to create cloud service for counting CO2 footprint + **tecnnical support**

development of agroclimatic data space

GOAL: **CADS Data Space** with participants that deliver data driven digital services for farmers and other enablers of bio-based solutions with reduced environmental impacts on soil, water, and air quality, biodiversity and climate, in line with the EGD objectives, the EU circular economy action plan, the EU sustainable product initiative as well as the EU data strategy

Tasks: Developing CADS data space

- **to support enablers of the digital transition** developing innovative and sustainable value-chains in the bio-based agrifood sectors.
- to **adopt agroecological solutions** based on co-creation between scientists, relevant stakeholders and end users at the farm and/or landscape level
- **to develop of methodology and algorithms** to the calculation of the carbon footprint of agricultural products during the cultivation of agricultural crops, food production and biomass processing under the conditions of the use of modern biotechnological tools

Activities

- **Infrastructure preparation and support** for deployment of the data space and related cloud services.
- **Data space architecture**, design of the data model, and definition of data sources
- Identification of key agrotechnological techniques to adopt effective decision-making in sustainable agriculture
- **Data providers and data users support**

AgriFootprint - Cloud service for assessing the carbon footprint of agricultural products in the growing process.

Collaboration directions in agroecology:

- Manage soil and water to improve soil health
- Develop agronomic practices serving to increase resilience, water conservation and to drastically reduce the use of chemical inputs
- Promote natural regulation of pests and diseases, use of biocontrol, and integration of biocontrol practices with cropping practices
- Enhance ecosystem services, biodiversity and beneficial biological interactions among different components in the farming system and the surrounding environment

Project that contributes to the crops growing technologies improvements to

- ☑ adapt them to climate change
- ☑ make food production technologies more green
- ☑ increase the overall product quality