ITMO

AI Solutions

, 2025

Catalog

Guide to Symbols

The catalog presents a wide range of AI-based solutions. We understand that choosing the right system can be challenging, so we have developed a symbol system to help you quickly navigate the catalog and find what you need.

User

- Scientist
- Programmer
- Domain Specialist

Benefits

- Cost Savings
- Time Savings
- New Opportunities

Implementation Conditions

- Ready for Use
- Requires Configuration
- Requires Customization and Integration

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Artificial Intelligence Institute

ITMO
INSTITUTE OF ARTIFICIAL INTELLIGENCE

The AI Institute is a research unit of ITMO University, responsible for shaping the university's R&D strategy in AI and ensuring the full cycle of research and development in AI and related digital technologies — from fundamental and exploratory research to the implementation and maintenance of industrial prototypes. The AI Institute includes various departments of ITMO University.

ITMO
RESEARCH CENTER "STRONG AI IN INDUSTRY"

The Research Center "Strong AI in Industry" was established at ITMO University in 2021 as a part of the federal project "Artificial Intelligence" and the Russian Government Decree No. 1120 dated July 5, 2021. The center focuses on the creation and the application of AI technologies for addressing new classes of problems. Those problems are the subject of creative activity for industry specialists (design engineers, technologists, managers), related to engineering and technology and typical for industrial enterprises.

The center's key focus is the development of strong AI (AGI) technologies combining composite machine learning mechanisms and multi-agent systems.

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NATIONAL CENTER
FOR COGNITIVE RESEARCH

The **National Center for Cognitive Research** is a National Technology Initiative competence center focused on the cross-cutting field of "Machine Learning and Cognitive Technologies." It was established in May 2018 on the basis of a consortium of leading Russian organizations in science, industry, and higher education, headed by ITMO University, in accordance with Russian Government Decree No. 1251 dated October 16, 2017.

The center primarily performs engineering functions: its mission is to develop a balanced domestic ecosystem for the development, replication, and implementation of AI technologies to create high-tech products and services in demand across various industries, including:

- Creating AI tools for rapid development and replication of industry-specific solutions based on foundational models and generative AI.
- Developing tools to automate the design, development, training, and implementation of AI systems accessible to industry specialists.
- Assessing the effects of AI system implementation in various fields and managing risks through computer modeling.
- Developing specialized industry-specific AI solutions on demand and training qualified customers and users of AI systems.

Problem-Oriented Frontier Laboratories

Problem-oriented frontier laboratories are research units focused on exploratory research in innovative AI fields. These include:

- **Laboratory of Composite Artificial Intelligence**
- **Laboratory of Automated Machine Learning**
- **Laboratory of Theoretical Computer Science**

Corporate Laboratories

Corporate laboratories are research units created to conduct comprehensive R&D aligned with the development programs of strategic industrial partners. These include:

- **Corporate Laboratory of PJSC Rosneft Oil Company**
- **Corporate Laboratory of SBI Mosstroyinform**

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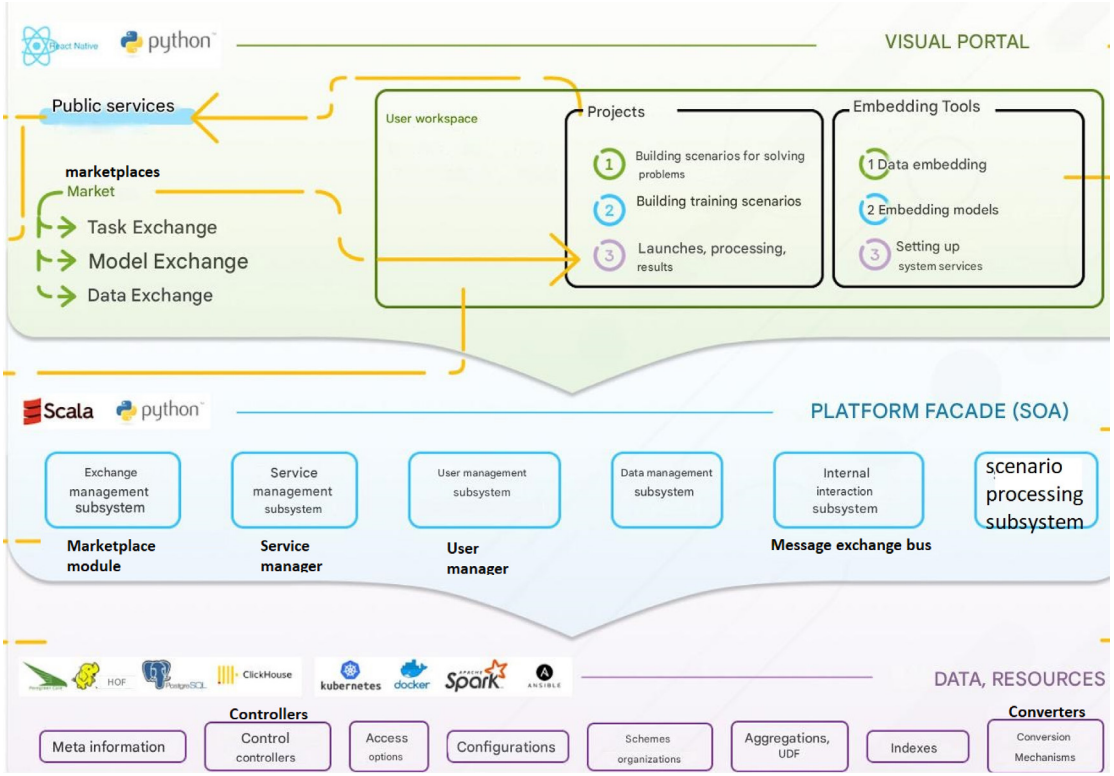
Technologies and Tools for AI System Development

DataMall 2.0: Distributed Instrumental Platform for AI Digital Object Development and Maintenance Based on Big Data

Designed to support the lifecycle of AI system development and operation based on big data and heavy models by distributed teams. It manages high-performance computing resources and data storage, supports AI model prototyping and debugging using ready-made components, simplifies custom model and service development, and enables objective progress assessment for qualified customers.



A high-level architecture of the AI systems development and support platform

Effects of Implementation

Acceleration of AI system development by up to 30%

Optimization of computational resources by up to 20%

Competitive Advantages

Automation of supercomputing resources and big data storage for AI model training

Transparent management of distributed AI system development and operation

Unified development tools (Python, Jupyter Notebook)

Development Lead

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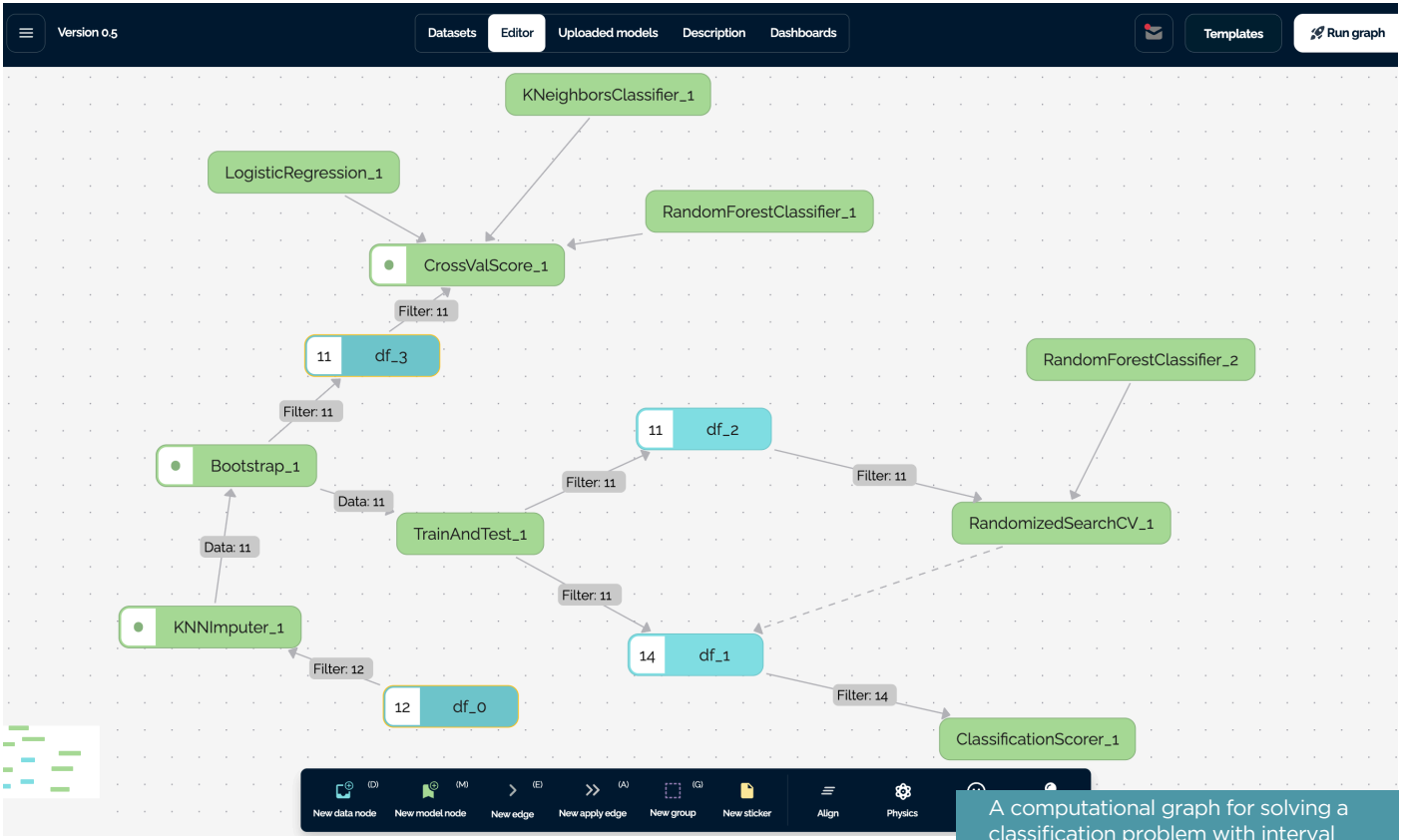
System Proven and Ready for Full Commercial Deployment: An actual system proven through successful operations in an operating environment, and ready for full commercial deployment.

An actual system proven through successful operations in an operating environment, and ready for full commercial deployment.

SMILE.Cloud: Platform for Rapid Prototyping, Development, and Model Training on Data

Designed for rapid AI model development and training by domain specialists without programming or database skills. It provides dataset preparation and preliminary analysis, automates AI model construction using Low/No-Code approaches, enables the creation of complex composite AI models from various components, and supports synthetic data usage.



A computational graph for solving a classification problem with interval quality estimates

Effects of Implementation

Acceleration of AI system development by 5–14 times

Acceleration of AI training by 2–4 times

Competitive Advantages

Visual AI model construction based on task and data graphs

Automated construction of composite application graphs using AutoML

Docker technology for remote computation of composite applications

Porting built models to Python code

Development Lead

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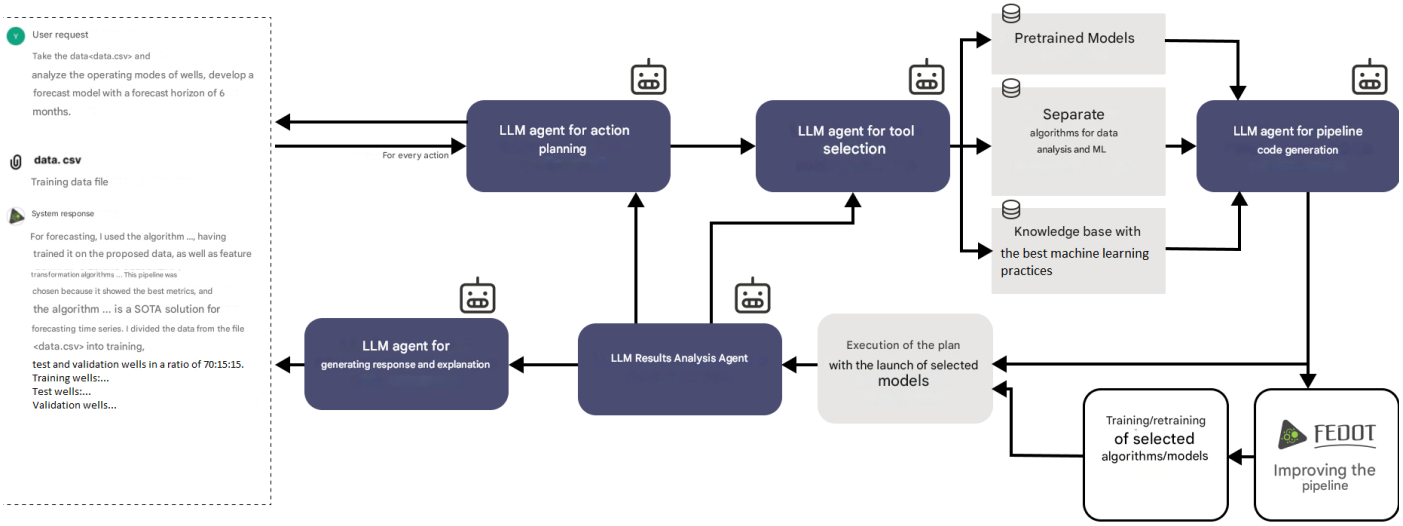
System Proven and Ready for Full Commercial Deployment: An actual system proven through successful operations in an operating environment, and ready for full commercial deployment.

FEDOT.LLM: Intelligent Assistant Based on Automated Machine Learning

Designed for end-to-end automation of predictive model creation. FEDOT.LLM transforms user queries in free form into structured problem statements, processes input data accordingly, and solves the task using the FEDOT or FEDOT.Industrial framework. It can handle classification, regression, time series forecasting tasks and anomaly detection.



Process architecture of automating the creation of predictive models using FEDOT.LLM

Effects of Implementation

Acceleration of predictive model development by at least 10 times

In 75% of cases, model quality exceeds human-created benchmarks

Competitive Advantages

Tasks are formulated in natural language (no programming knowledge required)

Automated solution selection based on quality metrics

Explainable solutions and Python code generation

Development Lead

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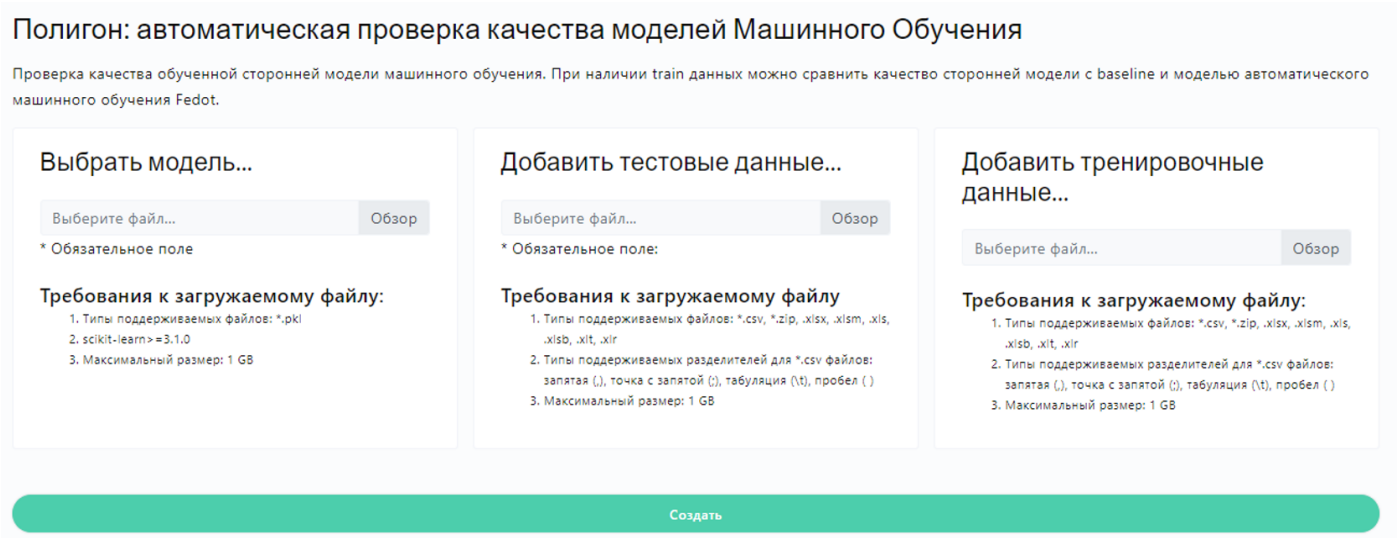
System Incorporated in Commercial Design: Actual system/process completed and qualified through testing and demonstration (pre-commercial demonstration).

Digital Testing Ground for AI System Quality Assessment

Designed for experimental evaluation of AI system quality based on a set of metrics during certification testing. It provides objective assessment and quality (accuracy) control, defines the applicability boundaries of developed AI systems, explains existing AI systems, tests AI systems under extreme conditions, as well as assesses their development potential and determines the resource cost of the further improvement.



Evaluating of Machine learning model quality in the polygon interface

Effects of Implementation

Increase in certification test coverage by at least 6 times

Reduction in testing labor costs by at least 4 times

Competitive Advantages

Building benchmark SOTA solutions using AutoML

Simulating various operational conditions with synthetic data

Objective comparison of multiple AI system versions or different AI systems based on varying principles

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System Incorporated in Commercial Design: An actual system/ process completed and qualified through testing and demonstration (pre-commercial demonstration).

Development Lead

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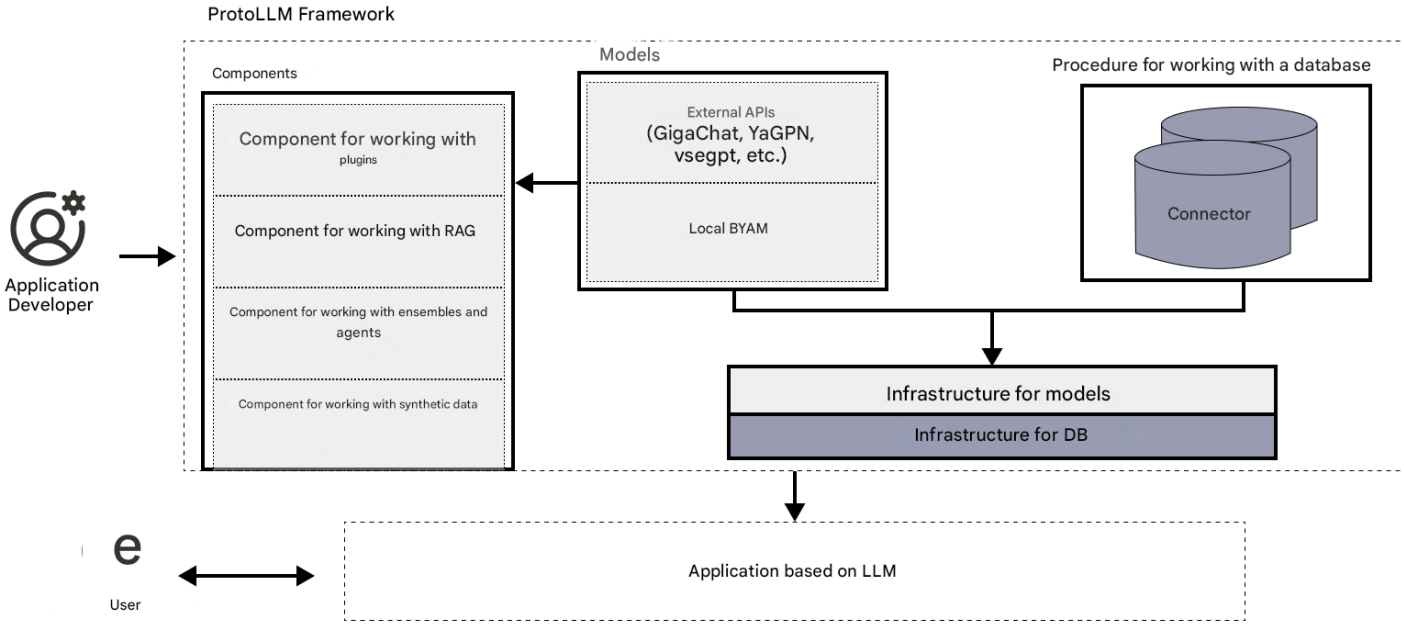
ProtoLLM: Rapid Prototyping Framework for Applications Based on LLMs

Designed for rapid prototyping of multifunctional applications using large language models (LLMs) and retrieval-augmented generation (RAG). It supports external service and model integration via plugins, optimizes LLM performance through ensemble methods and multi-agent approaches, generates synthetic data for LLM training, and accelerates LLM-based system development.



Process architecture of automating the creation of predictive models using FEDOT.LLM

Effects of Implementation

Acceleration of LLM-based system development by at least 5 times

Optimization of computational resources up to 20%

Competitive Advantages

Templates for LLM agents and multi-agent systems

Multifunctional RAG: texts, databases, and engineering software

Support for arbitrary LLMs, either directly or via APIs

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Integrated Pilot System Demonstrated: System/ process prototype demonstrated in an operational environment (integrated pilot system level).

Development Lead

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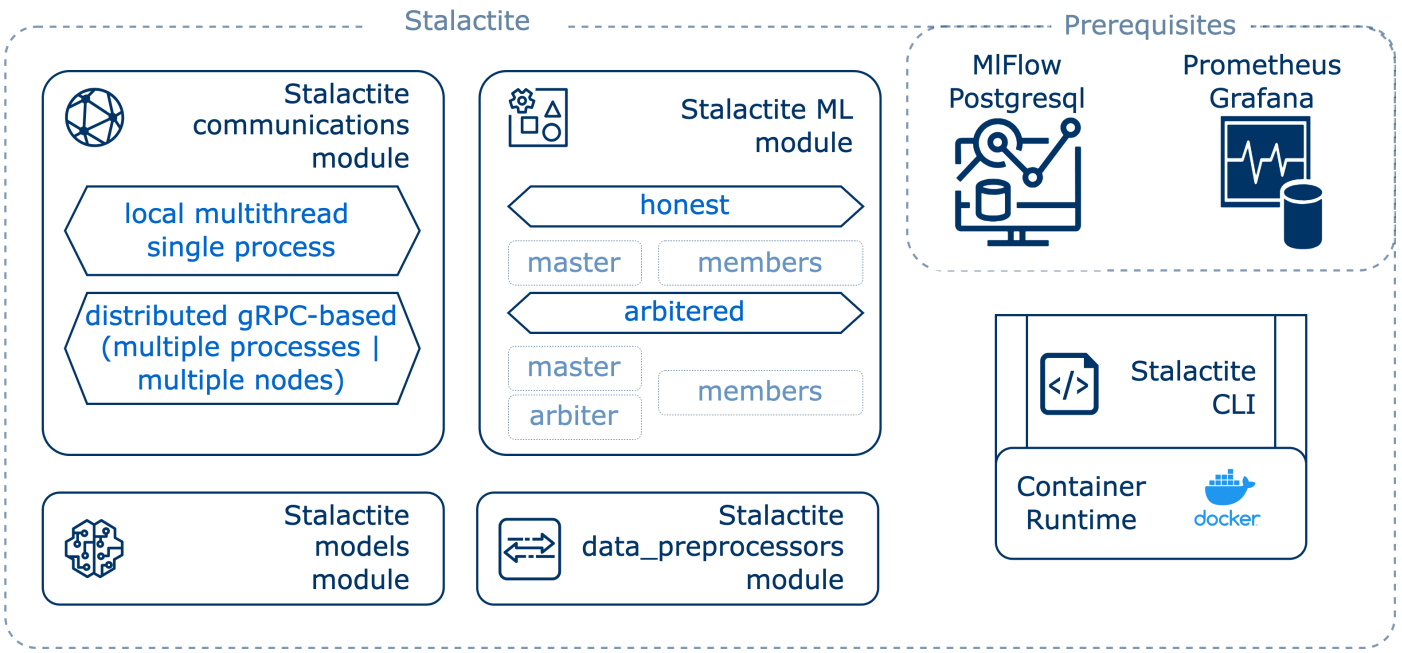
Stalactite: Federated Learning Framework for Big Data

Designed for rapid prototyping of vertical federated learning systems, focusing on execution and monitoring of machine learning models working with distributed data. It supports secure data exchange between parties using homomorphic encryption and gRPC, includes built-in monitoring (Prometheus, Grafana) and reporting (MLFlow) tools, and features a CLI for convenient training and process tracking.



Prototyping process architecture of vertical federated learning systems

Effects of Implementation

10% higher predictive model quality

15–30% higher utilization of corporate data

Competitive Advantages

Supports datasets with up to 100M records and 10K features

Models for tabular data (linreg, logreg, MLP, tabular ResNet) and images (ResNet, EfficientNet)

CLI for training, inference, and status tracking

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System Proven and Ready for Full Commercial Deployment: Actual system proven through successful operations in an operating environment, and ready for full commercial deployment.

Development Lead

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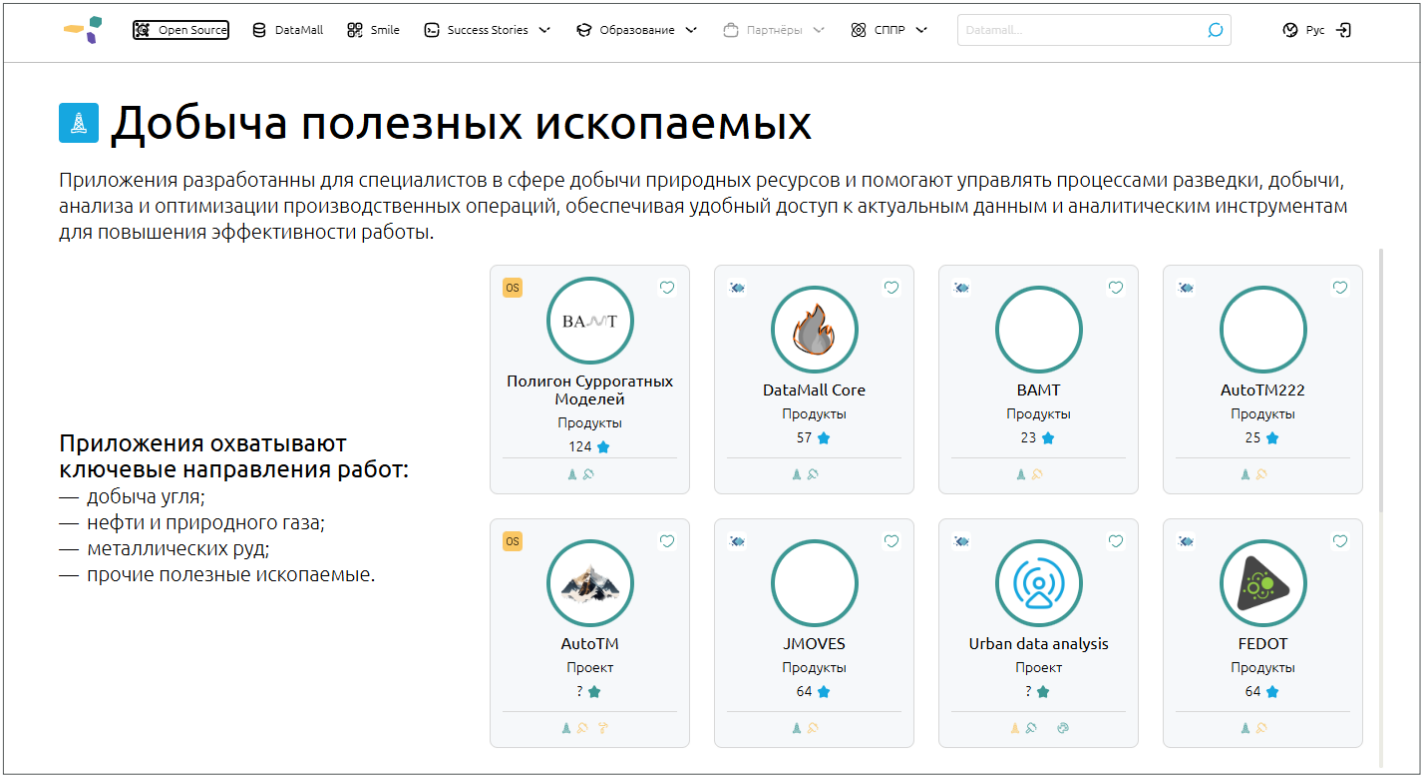
AI Systems for Industry

Marketplace Platform for AI-Enabled Digital Solutions and Services for Industrial Digital Transformation

Designed to provide access to development tools and services created by ITMO University and partners as part of industrial digital transformation (by industry). It enables intelligent search for services and libraries, provides access to cloud-based AI development tools, and showcases proprietary solutions for various industrial partners. It can also be used for practical training of industry specialists.



Interface of the marketplace platform for AI solutinons and services for inductry using Stalactite

Effects of Implementation

Acceleration of solution search and evaluation by up to 5 times

Reduction in technical proposal preparation time by up to 2 times

Competitive Advantages

Unified interface for accessing applied services, tools, and libraries with detailed documentation

Cloud-based service and demo application deployment

Industry-specific solution categorization

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System Proven and Ready for Full Commercial Deployment: An actual system proven through successful operations in an operating environment, and ready for full commercial deployment.

Development Lead

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Intelligent Multi-Agent Engineering System iMAgES

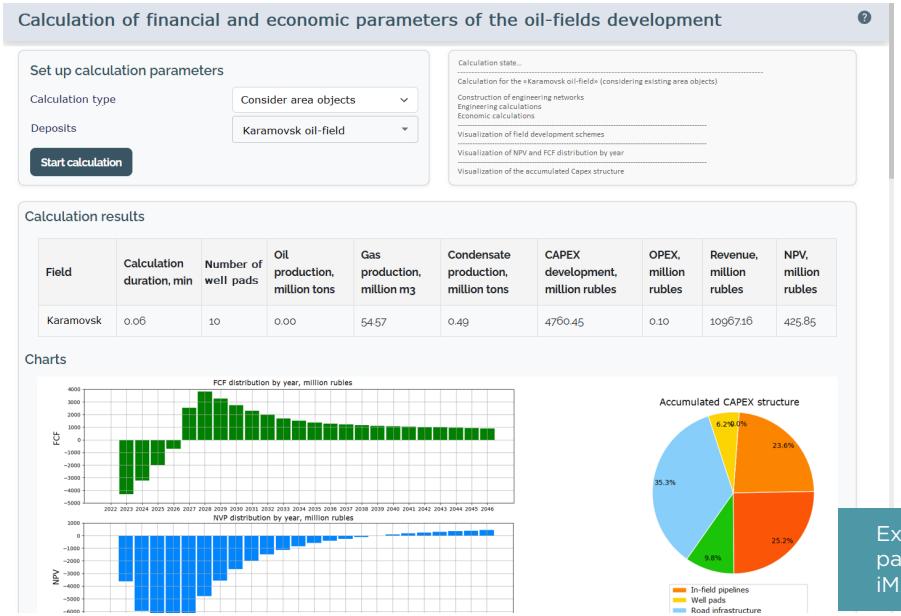
Designed to optimize technical and economic indicators for drilling and oilfield development projects. It provides interactive data preparation and interpretation for medium-term production planning, builds optimal drilling and development scenarios, and generates subsequent stages of the project value chain.

Competitive Advantages

End-to-end planning across all stages of the value creation chain

Fast plan variant calculations using surrogate models

Verification calculations using external models and engineering software



Example of calculating financial and economic parameters for field development in the iMAgES system

Development Lead

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Decision Support System for Optimal Low-Temperature Gas Processing Technology Selection

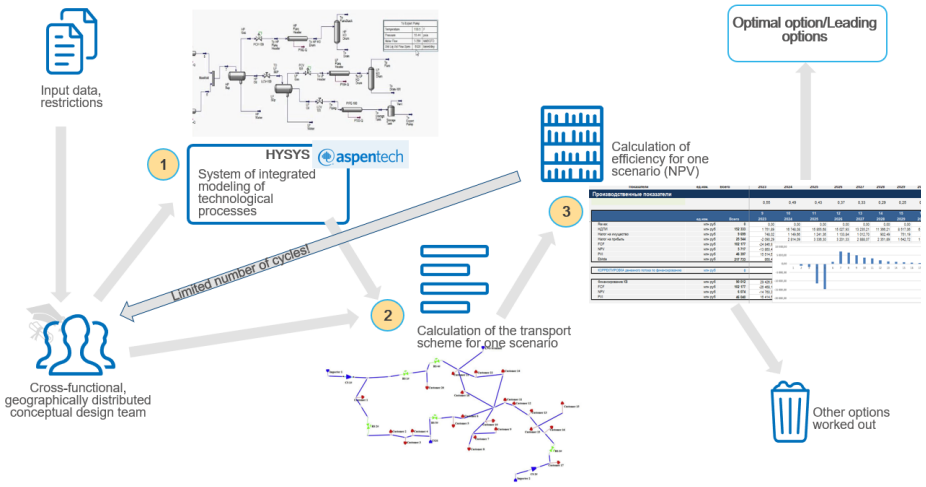
Designed to justify optimal low-temperature gas processing technology selection using intelligent multi-agent systems. It automates the construction of efficient technology application scenarios and manages project quality based on quantitative indicators.

Competitive Advantages

Comprehensive solutions accounting for expert logic

Intuitive graphical interface for interactive scenario building

Verification calculations using external models and engineering software



Architecture of building low-temperature gas preparation scenarios

Development Lead

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Intelligent Decision Support System «Tatneft Digital Expert Council»

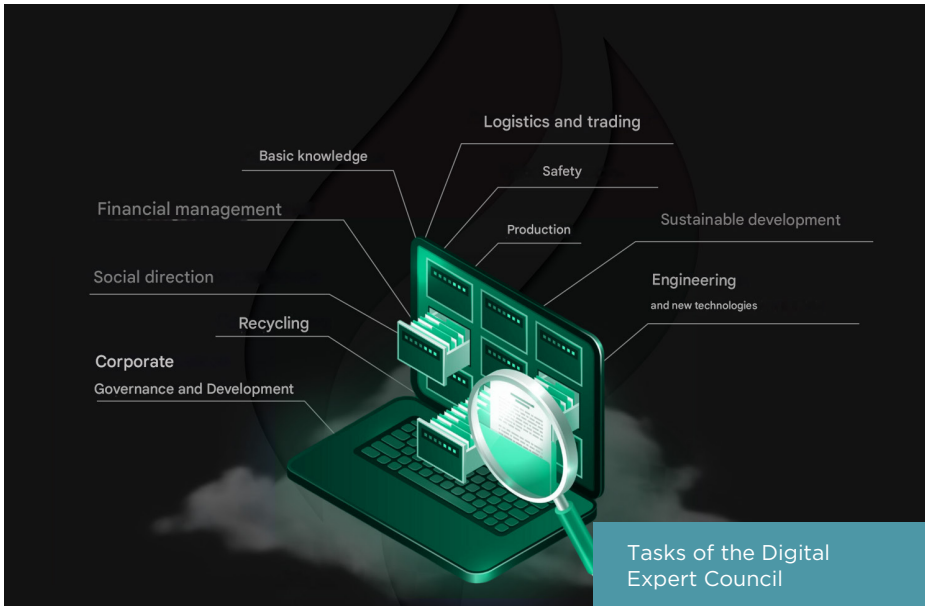
Designed for intelligent data analysis and high-level decision support in automating and optimizing oil extraction and refining processes. It allows natural language queries and provides detailed answers backed by reference materials. Implemented as a multi-agent system based on a foundational AI model.

Competitive Advantages

Use of large language models

Integration with corporate documentation and knowledge bases

Handling complex queries requiring cross-domain expertise



Tasks of the Digital Expert Council

Development Lead

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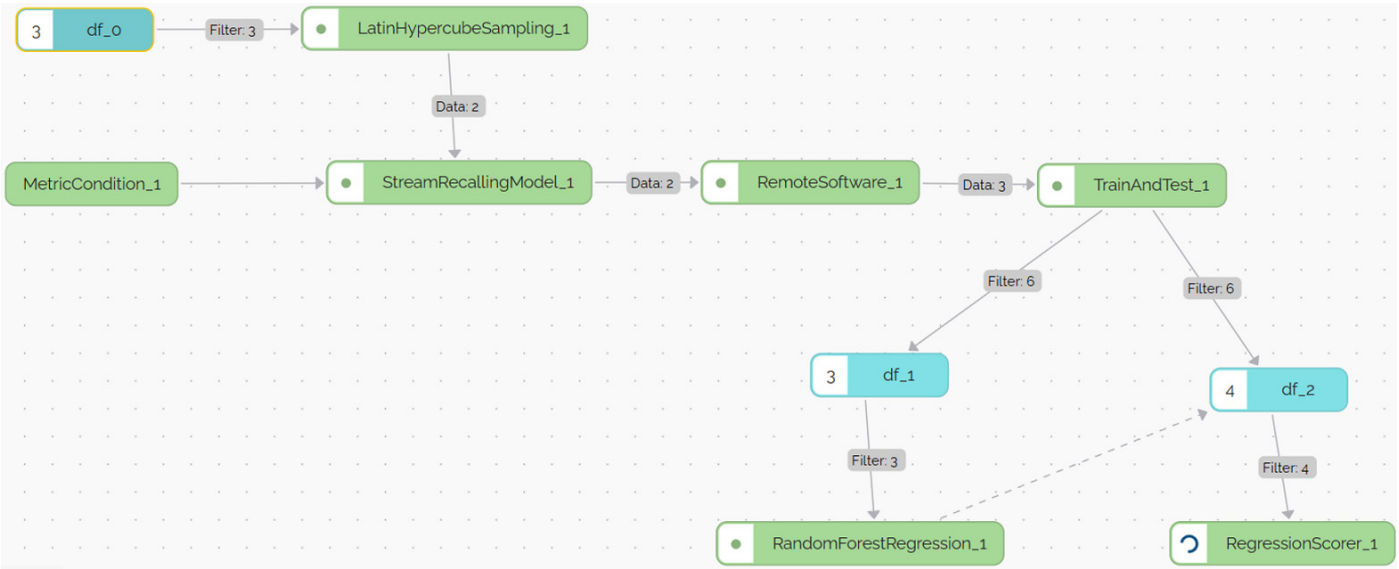
Digital Platform for Surrogate Modeling and Industrial Software Reengineering

This platform is designed to automate the development of low-resource surrogate models and data-driven digital twins for a wide range of industrial systems and assets. Leveraging engineering software, it constructs a physical modeling database that captures diverse object states, then employs automated machine learning (AutoML) techniques to train and validate surrogate models.

Using a unified database, the platform integrates multi-parameter surrogate models into operational digital twins. This enables direct utilization without requiring the execution of the original engineering software, significantly reducing computational overhead.



Architecture of checking the surrogate model of the software

Effects of Implementation

Acceleration of surrogate model development – 2 to 4 times faster

Faster computations compared to physical modeling – 5 to 50 times quicker

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7

Integrated Pilot System Demonstrated: System/ process prototype demonstration in an operating environment (integrated pilot system level).

Competitive Advantages

Automatic database generation by running engineering software on a remote supercomputer

Automatic alignment of the database content and model structure to achieve the required accuracy

Visual interface requiring no programming knowledge

Development Lead

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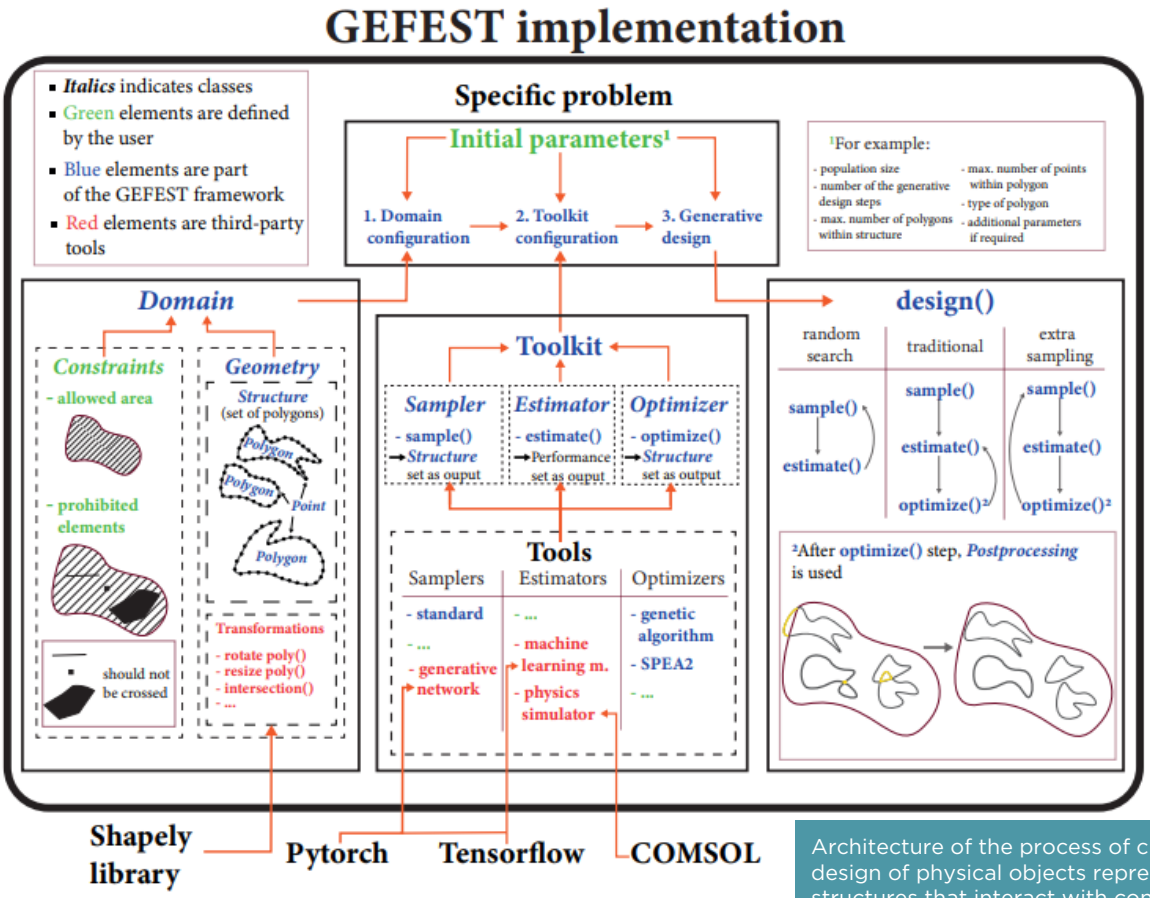
Open Source

GEFEST: A Generative Design Library for Physical Objects

Designed for creating AI tools for generative design of various physical objects in continuous media using evolutionary optimization. It supports multi-objective problem formulation, integration with physical simulators, and generative AI models.



Architecture of the process of creating a generative design of physical objects represented as geometric structures that interact with continuous media

Implementation Benefits

Simplifies the development of customized solutions by 2–4 times

Accelerates conceptual design processes by up to 60 times

Competitive Advantages

Supports both structural and functional design based on polygonal structures

Fast evolutionary optimization algorithms with controlled convergence

Handles stochastic external influences

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System Proven and Ready for Full Commercial Deployment: An actual system proven through successful operations in an operating environment, and ready for full commercial deployment.

Development Lead

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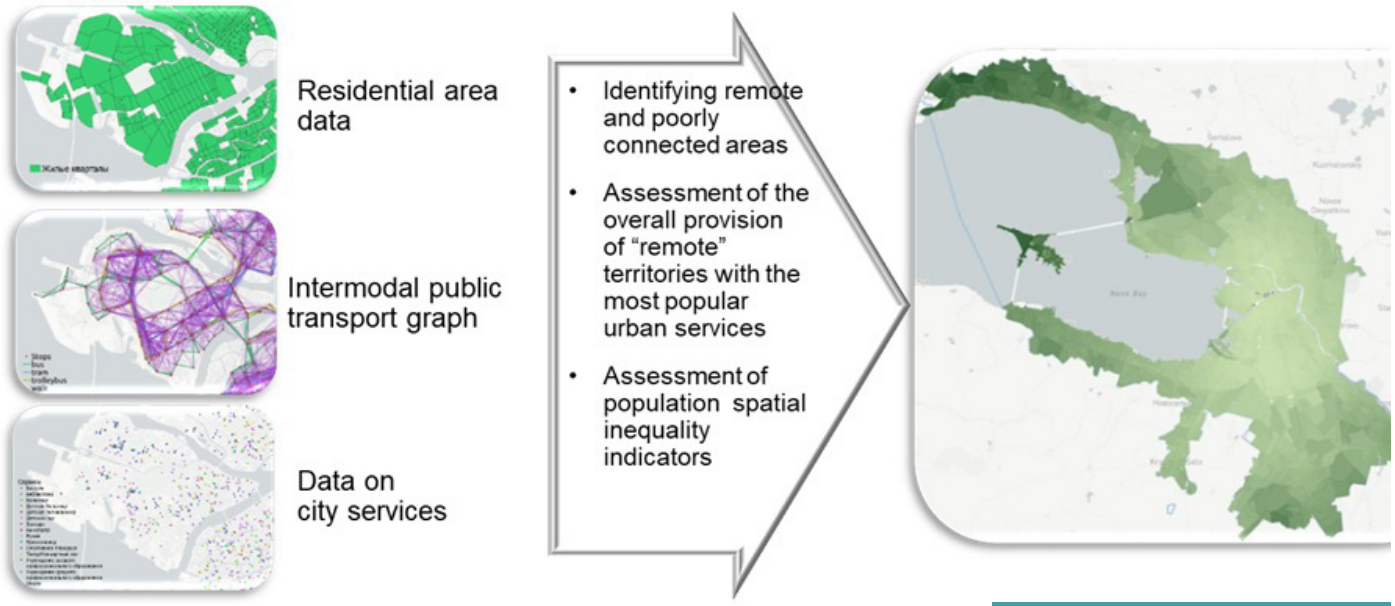
4

AI Systems for Urban Planning

Instrumental Platform for Digital Urbanism

Designed to solve typical urban planning tasks related to assessing and planning urban development based on spatial indices and metrics derived from city information models. It evaluates urban environment conditions based on service infrastructure availability, accessibility, transport connectivity, centrality, and development potential.



User Interface of the Digital Urbanism Tool Platform

Effects of Implementation

Reduction in pre-project research time by 25–50%

Reduction in system development and implementation costs by 35–50%

Competitive Advantages

Open architecture for integrating data from various cities and territories

Wide range of machine learning and spatial analysis models integrated into the digital city model

Scenario modeling for strategic urban planning

Development Lead

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9

System Proven and Ready for Full Commercial Deployment: An actual system proven through successful operations in a real environment, and ready for full commercial deployment.

PROSTOR: Digital Platform for Territorial Development Management

Designed for urban planning tasks, it assesses and plans urban development based on spatial indices and metrics from city information models. Provides an assessment of the territory's condition based on a set of factors, including ecological, transportation, social, and engineering aspects. It forecasts the development prospects of the territory in accordance with one of the possible profiles: housing, industry, agriculture or recreation. During the conceptual design stage, it ensures automation of functional zoning of the territory and generation of concepts for its development. At the stage of predicting the effects of territorial development, it forecasts socio-economic consequences for the specific location, surrounding context, and the region as a whole.

User interface for the Renovation and Reclamation Planning Platform

Effects of Implementation

Reduction in pre-project research time by 25–50%

Reduction in system development and implementation costs by 35–50%

Competitive Advantages

Regional urban planning context and development plan integration

Social risk assessment for development projects

Accelerated conceptual design using generative AI

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5

Laboratory Testing of Integrated/Semi-Integrated System: the system component and/or process validation is achieved in a relevant environment. (development continues in 2025).

Development Lead

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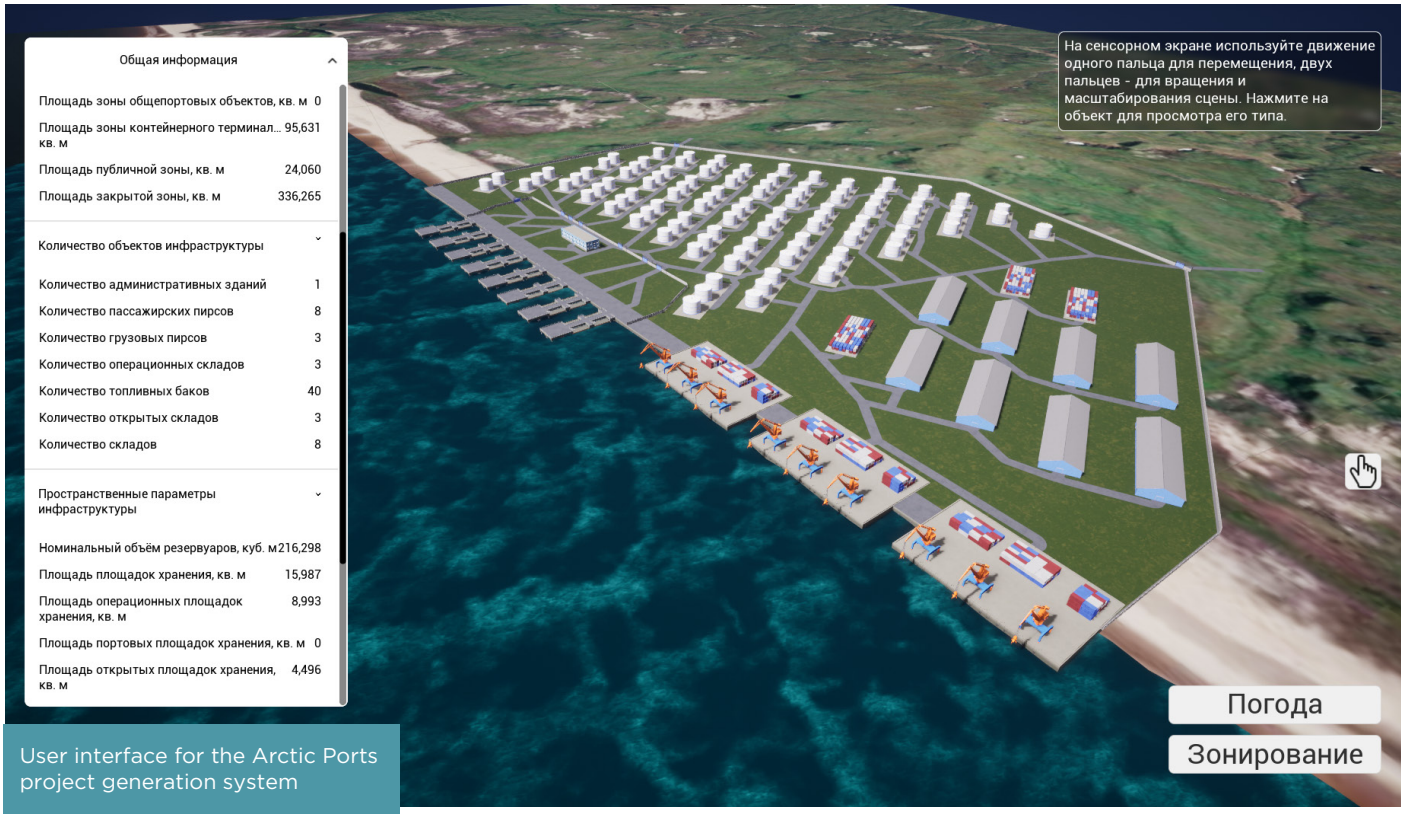
Generative Design Technology for Complex Industrial Facilities and Structures

Intended for conceptual design of industrial and logistic complexes using generative AI to evaluate the territory development potential and select basic technological and construction solutions. Applicable for designing facilities in harsh climates, such as Arctic cargo terminals.



User interface for the Arctic Ports project generation system

Effects of Implementation

Conceptual design phase acceleration by up to 10 times

Space utilization efficiency improvement by up to 45%

Competitive Advantages

Rapid digital model generation under uncertainty

Multiple alternative development scenarios

Optimization considering regulatory and spatial constraints

Consideration of climatic features, operational and extreme characteristics of the external environment

Development Lead

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TRL

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Prototype System Verified: a system/ process prototype demonstrated in an operating environment (beta prototype system level).

«Digital Mayor»: Intelligent Assistant for Comprehensive Decision Support in Urban Management Based on a Foundational Model

Designed to improve urban management efficiency (speed, cost, quality). It provides a natural language Q&A interface, works with urban databases and knowledge bases, and integrates with urban planning software.

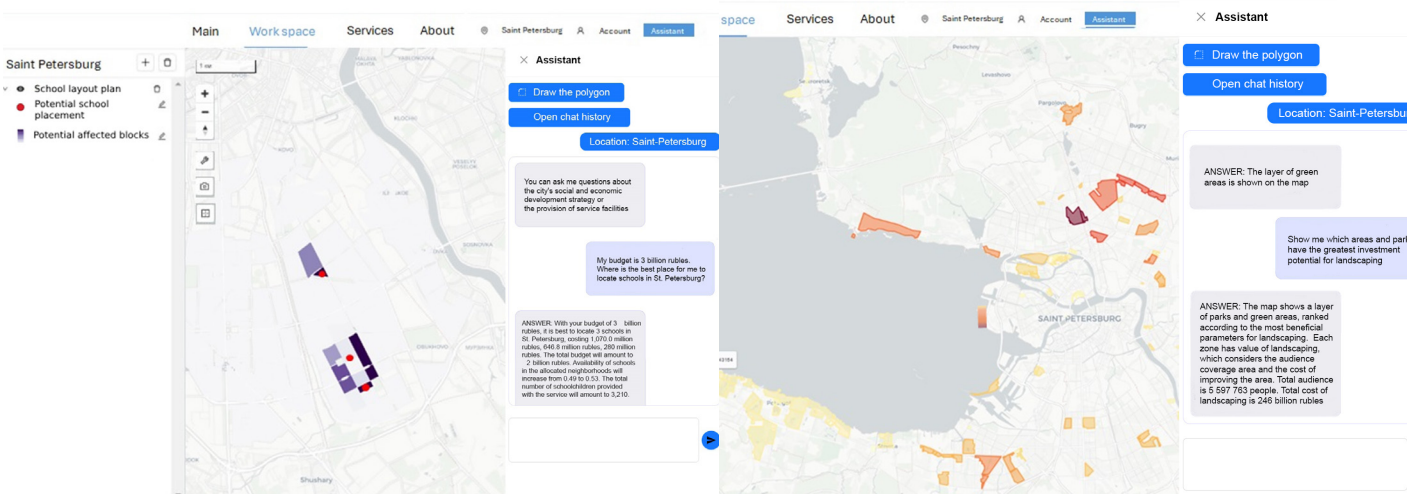

Illustration of the conversational interface for the virtual assistant in the digital urbanism platform

Effects of Implementation

Decision preparation speed increased by up to 5 times

Personnel workload reduction by 3–6 times

Competitive Advantages

Elimination of hallucinations via effective knowledge base usage

Automated execution of digital urbanism platform modules and data unification.

Natural language interaction and result explanation

Development Lead

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7

Integrated Pilot System Demonstrated: System/ process prototype demonstration in an operating environment (integrated pilot system level).

rTIM Generative Design Core

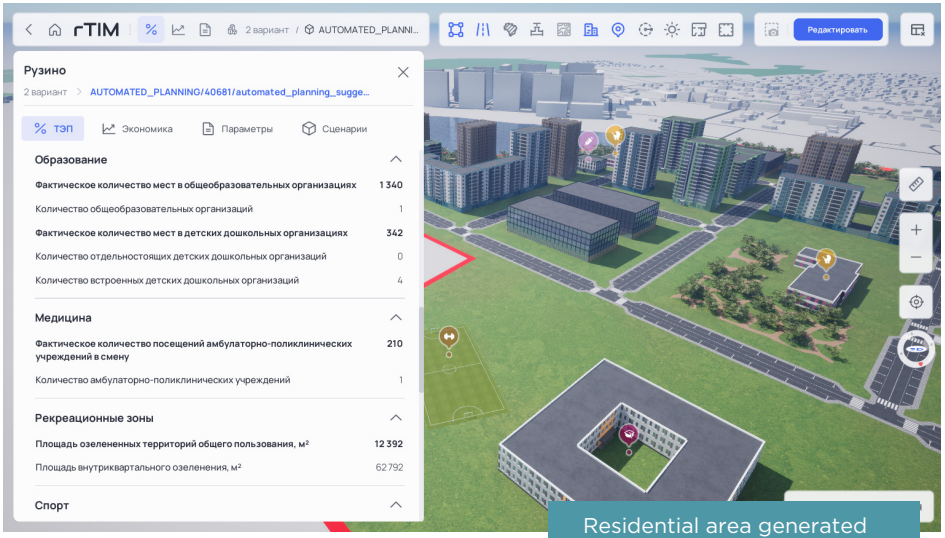
Designed for rapid digital model creation for territorial development concepts in civil engineering. It automates zoning, placement of residential, social, and commercial objects, and ensures compliance with regulatory requirements. The rTIM generative design core is the foundation of the rTIM territorial information modeling AI platform.

Competitive Advantages

Master plan development and evaluation accelerated by 3 times

Ensures compliance with regulations and accurate prediction of technical and economic indicators

Optimal scenarios for complex development projects under incomplete data



Residential area generated in the rTIM platform

Development Lead

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Intelligent System for Analytical Support in Urban Planning

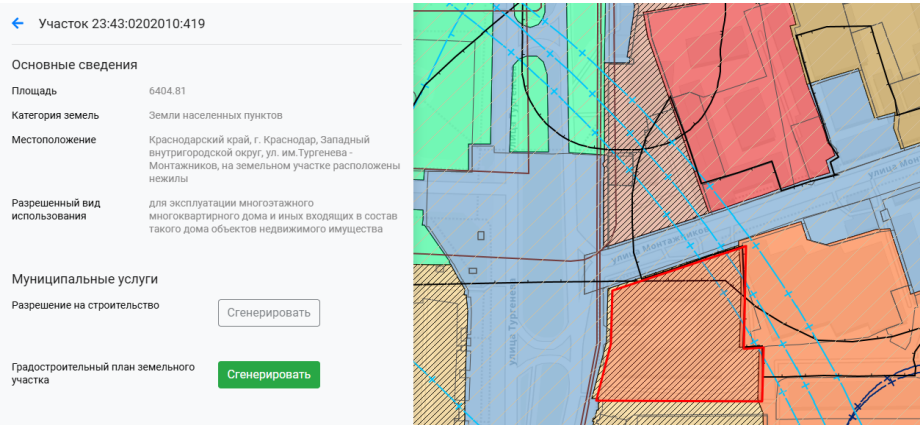
Designed for preparing and analyzing digital urban planning documentation. It automatically generates the graphical and textual parts of the document, taking into account regulatory requirements, as well as a digital model in the form of a set of geospatial layers. Moreover, it checks projects for compliance with construction parameters, and compliance with accessibility and social infrastructure norms.

Competitive Advantages

Auto-generation of compliant documentation

Prevention of regulatory violations

Verification and correction of manually created documentation



Land parcel Analysis Interface

Development Lead

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Intelligent Service for Generating Apartment Layouts in Residential Buildings

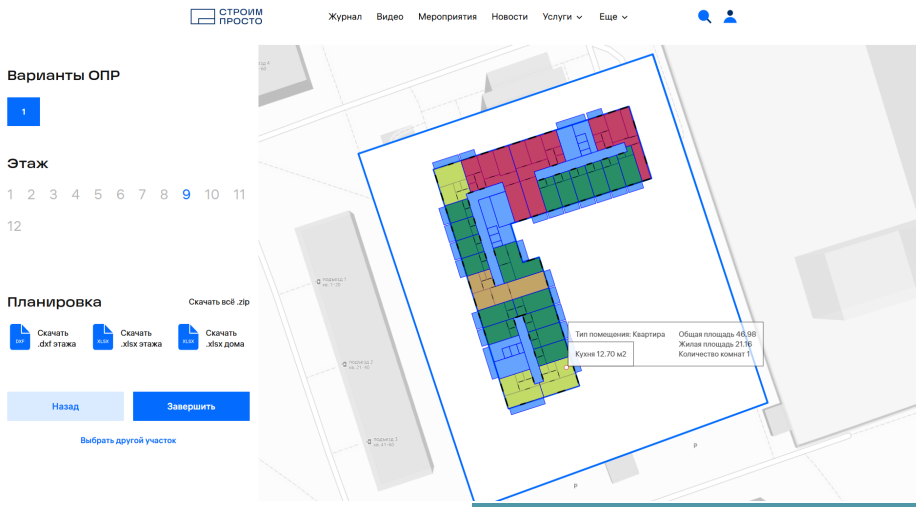
Designed for automatic digital model creation of apartment layouts for Moscow's renovation program. It considers input data such as existing apartments, target requirements, and land plot details, and outputs digital models with floor plans and descriptions.

Competitive Advantages

Rapid layout generation (1–3 minutes)

45% more efficient land use

35% more efficient living space utilization



Interface of the apartment generation service for the Moscow renovation program

Development Lead

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Open Source

Soika: Library for Spatial-Semantic Text Data Analysis

Designed to enrich city digital models with data from citizens' digital footprints and vernacular quality assessments.

Competitive Advantages

Fact extraction and aggregation from social media

Subjective urban quality assessment based on citizen opinions

Methods of identifying and geocoding of mentioned locations, a set of classifiers and NER models for functional content classification

Development Lead

Alexander Antonov

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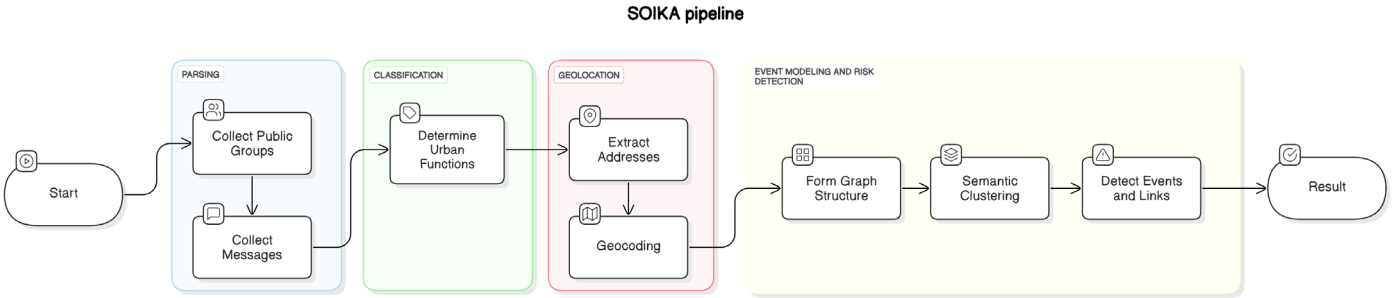


Library module workflow: two-level geolocation classification and risk detection

Open Source

Blocknet: Network Analysis and Modeling Library for Urbanists

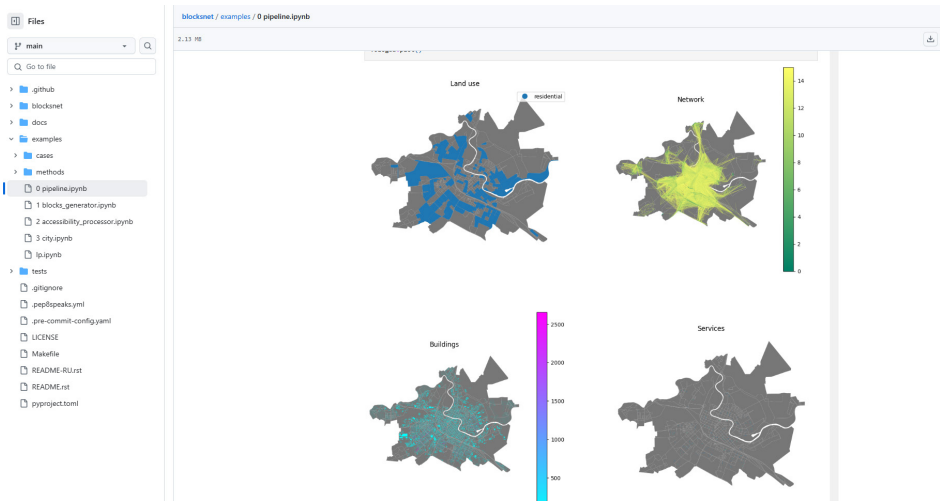
Provides tools for creating block-network city models and generating optimal development requirements. It evaluates network metrics like connectivity and centrality, calculates service provision based on norms, and optimizes city models.

Competitive Advantages

Universal city information model based on open data

Resident-service competition modeling

Optimization using simulated annealing



Visualization of the process of creating a city block network model

Development Lead

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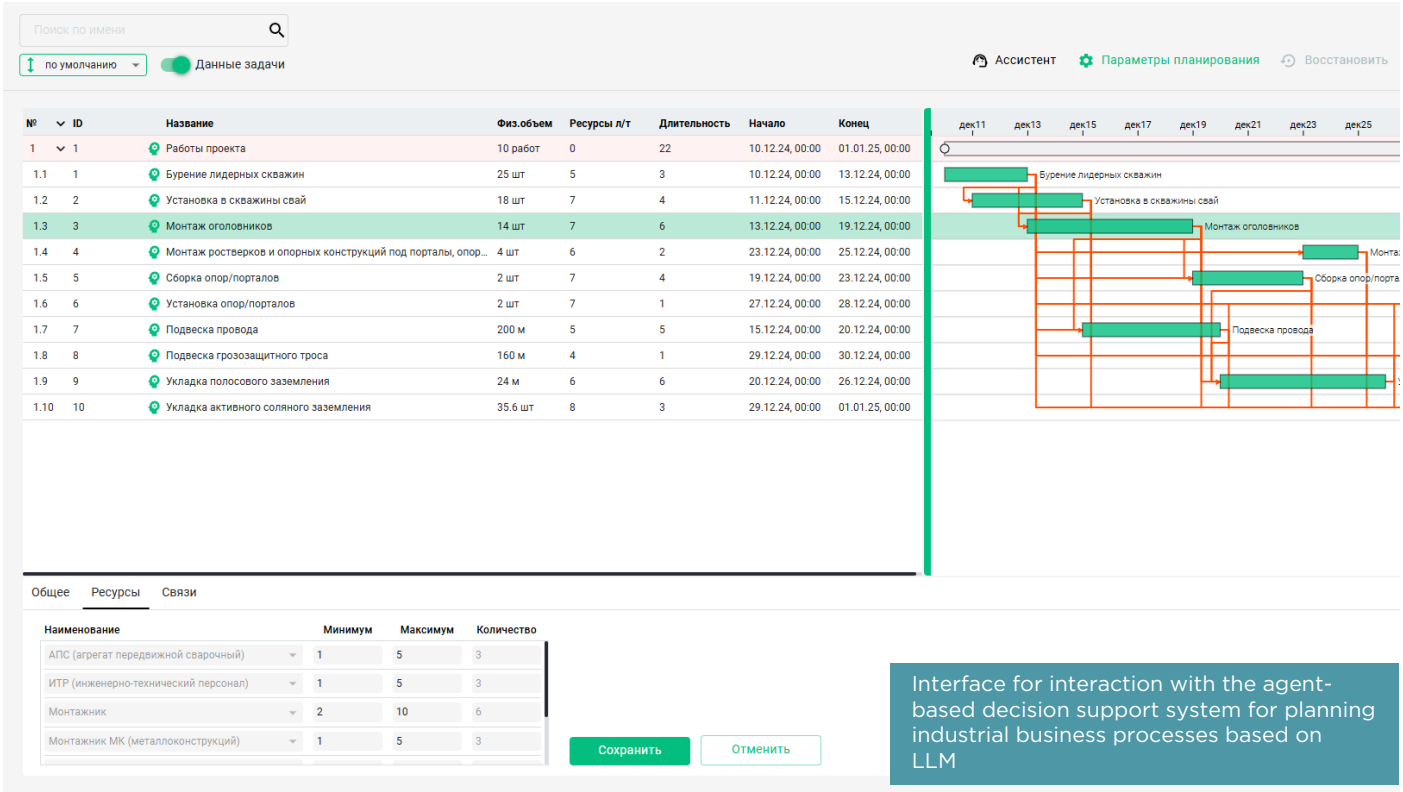
5

AI Systems for Scheduling and Planning

Intelligent Multi-Agent Decision Support System for Industrial Business Process Planning Based on LLMs

Designed to optimize industrial business process scheduling under uncertainty and incomplete data. It automates steps from documentation analysis to schedule validation and provides recommendations.



Interface for interaction with the agent-based decision support system for planning industrial business processes based on LLM

Effects of Implementation

Plan efficiency improvement by up to 30%

Planning labor reduction by 16–20 times

Competitive Advantages

AI-driven scheduling automation using corporate data

Fast schedule optimization and validation algorithms

Individual and collective labor function assessment

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System Incorporated in Commercial Design: An actual system/ process completed and qualified through test and demonstration (pre-commercial demonstration).

Development Lead

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Intelligent Tool for Optimizing Geographically Distributed Production Structures

Designed to justify the optimal structure of geographically distributed production through combinatorial optimization of workshop placement, taking into account various costs, including internal and external logistics, personnel, and capital construction. The tool enables comprehensive evaluation of solutions across a range of parameters — from product specifications to key economic indicators.

Competitive Advantages

- Multi-scale modeling of production processes
- Discrete optimization using state-of-the-art algorithms
- Configurable constructor mode with extensive user-defined settings

Development Lead

Sergey Ivanov,
Ph.D. in Technical Sciences

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Interface of the system for selecting the optimal structure of distributed production

Library of Transport Routing Methods for Light Petroleum Product Delivery Using Graph Neural Networks

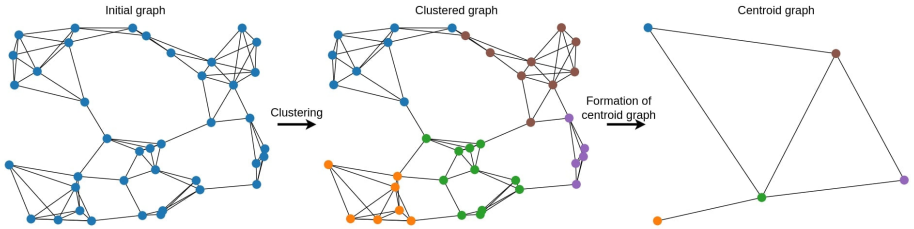
Designed for rapid scheduling and route planning for petroleum product delivery, considering road conditions and station inventory.

Competitive Advantages

Faster transport problem solving using graph neural networks

Possibility of use as a methodological core for creating various applied solutions

Adaptable to other logistics tasks



The route between two points on the optimized UGN graph is slightly less accurate than the original algorithm, but much faster to calculate

Development Lead

Sergey Mityagin,
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Open Source

SAMPO: Framework for Optimizing Production Processes Under Uncertainty

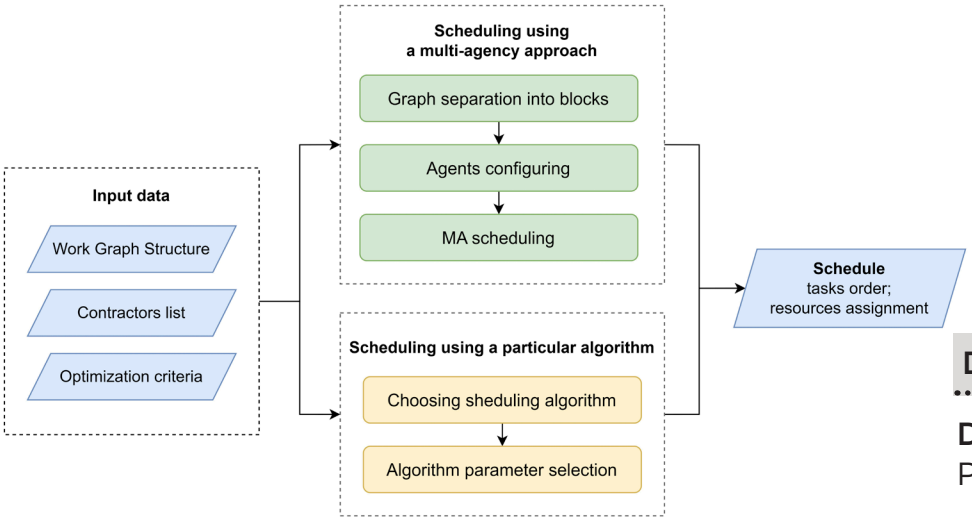
Designed for automating production planning in complex conditions, such as oilfield development. It uses metaheuristics to build Pareto-optimal plans considering time, resources, and budget.

Competitive Advantages

Adaptable to changing conditions and limited resources

Plan development time reduced from months to days

Robustness and controllability of plans in response to external changes



Scheme of the adaptive optimization process for production scheduling SAMPO

Development Lead

Denis Nasonov,
Ph.D. in Technical Sciences

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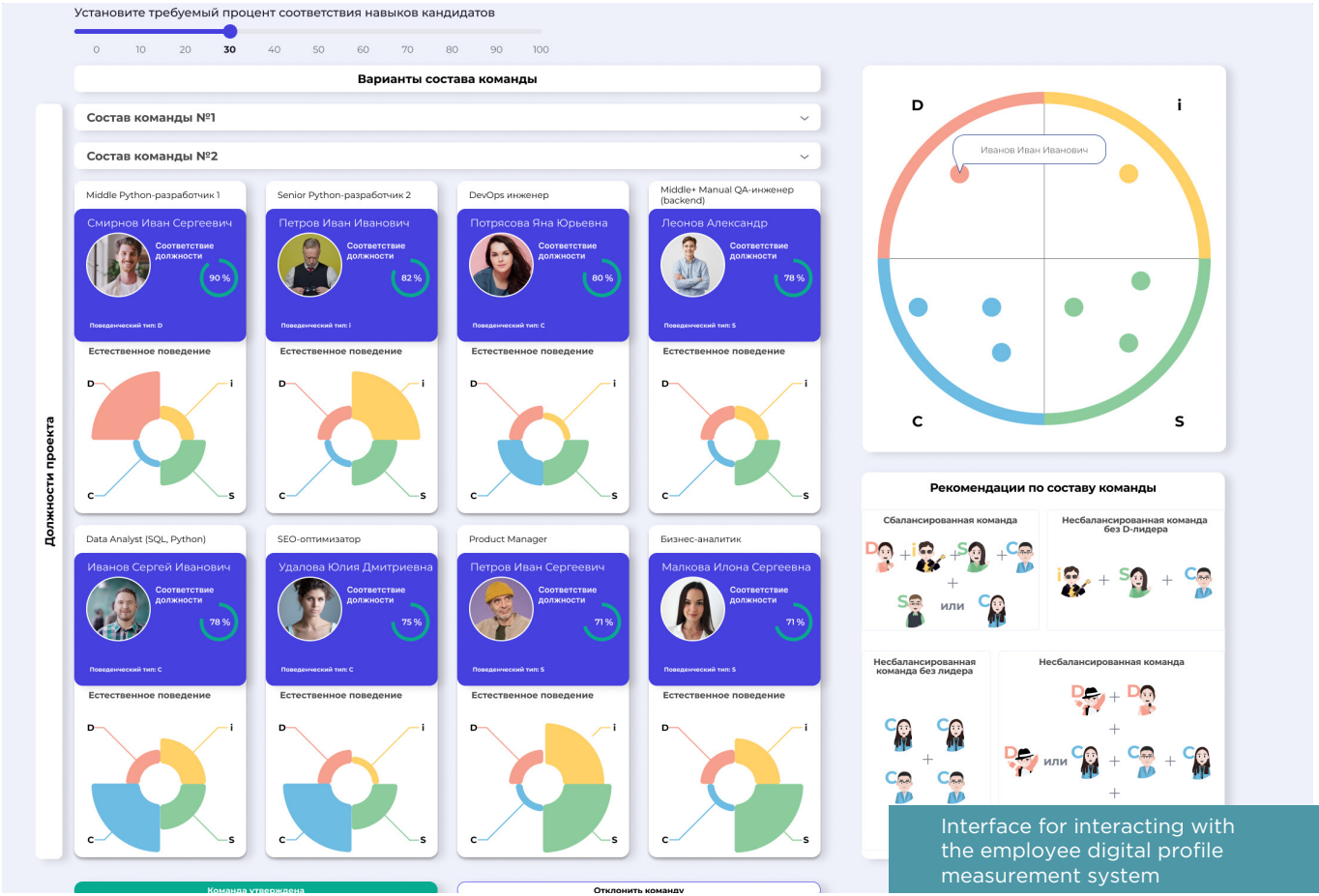
6

AI Systems for Human Resources Management

Expert.HR: Intelligent System for Measuring Employee Digital Profiles

Designed for HR and recruitment optimization. It automates video interview question generation and survey, analyzes candidate behavior based on multimodal data. Identifies early indicators of HR risks and determines ways to address them through training or management of employee authority.



Interface for interacting with the employee digital profile measurement system

Effects of Implementation

Video interview analysis time reduced by 9 times

Automated screening for large candidate pools (1000+ resumes)

Competitive Advantages

Automated candidate-job matching

Interview question generation based on job descriptions

Individual and collective labor function assessment

Development Lead

Anastasia Laushkina,
Ph.D. in Technical Sciences

aalaushkina@itmo.ru

TRL

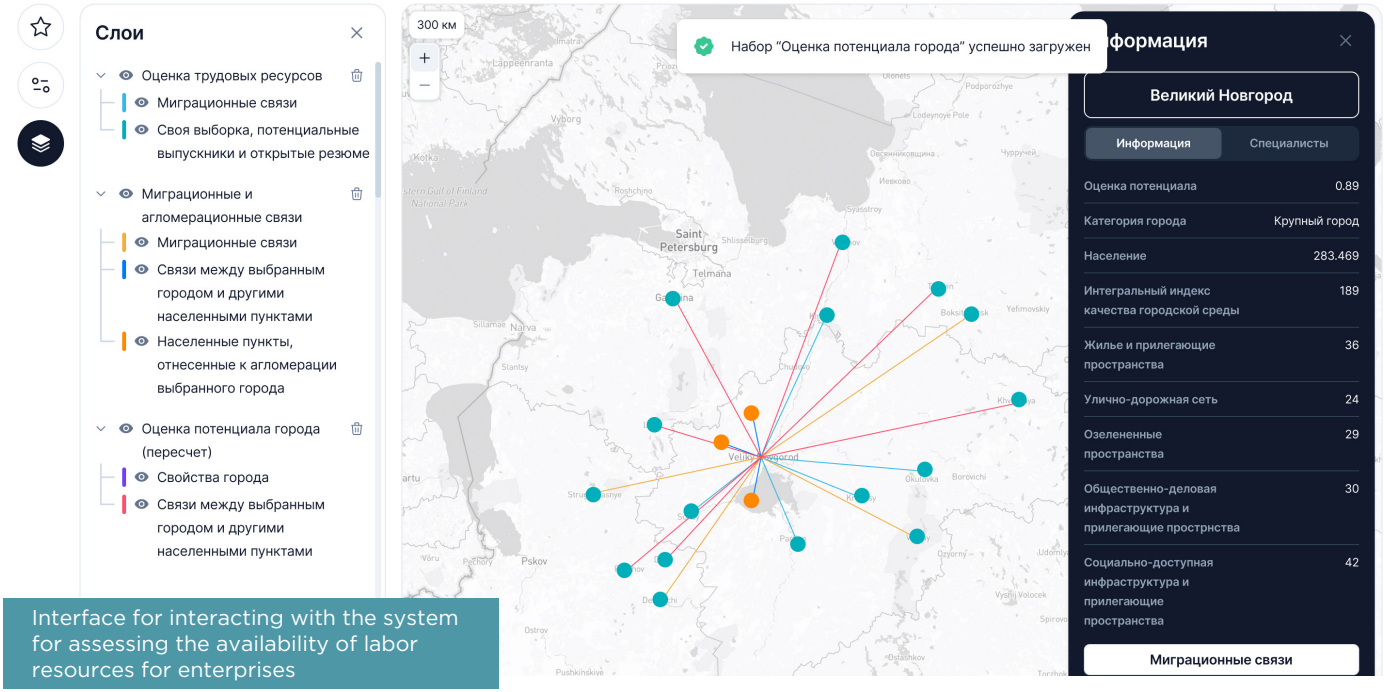
8

System Incorporated in Commercial Design: An actual system/ process completed and qualified through testing and demonstration (pre-commercial demonstration).

System for Assessing Labor Resource Availability at Industrial Enterprises

Designed for the objective assessment of the personnel availability for organizing new production facilities in a given territory, determining the feasibility of managing workforce migration (including consideration of transport accessibility), and identifying conditions that contribute to the stability of an enterprise's workforce potential (living conditions, logistics). Applicable for supporting decision-making regarding both the establishment of new production facilities and the modernization of existing ones.

Цифровая платформа «Трудовые ресурсы»



Interface for interacting with the system for assessing the availability of labor resources for enterprises

Effects of Implementation

Employee turnover reduction by 10–40%

Retention cost optimization by up to 10%

Competitive Advantages

Comparison of the development potential of different enterprises based on the availability of human resources

Multi-level workforce potential modeling (national, regional, city)

Objective and subjective migration factor integration

Development Lead

Sergey Mityagin,
Ph.D. in Technical Sciences

mityagin@itmo.ru

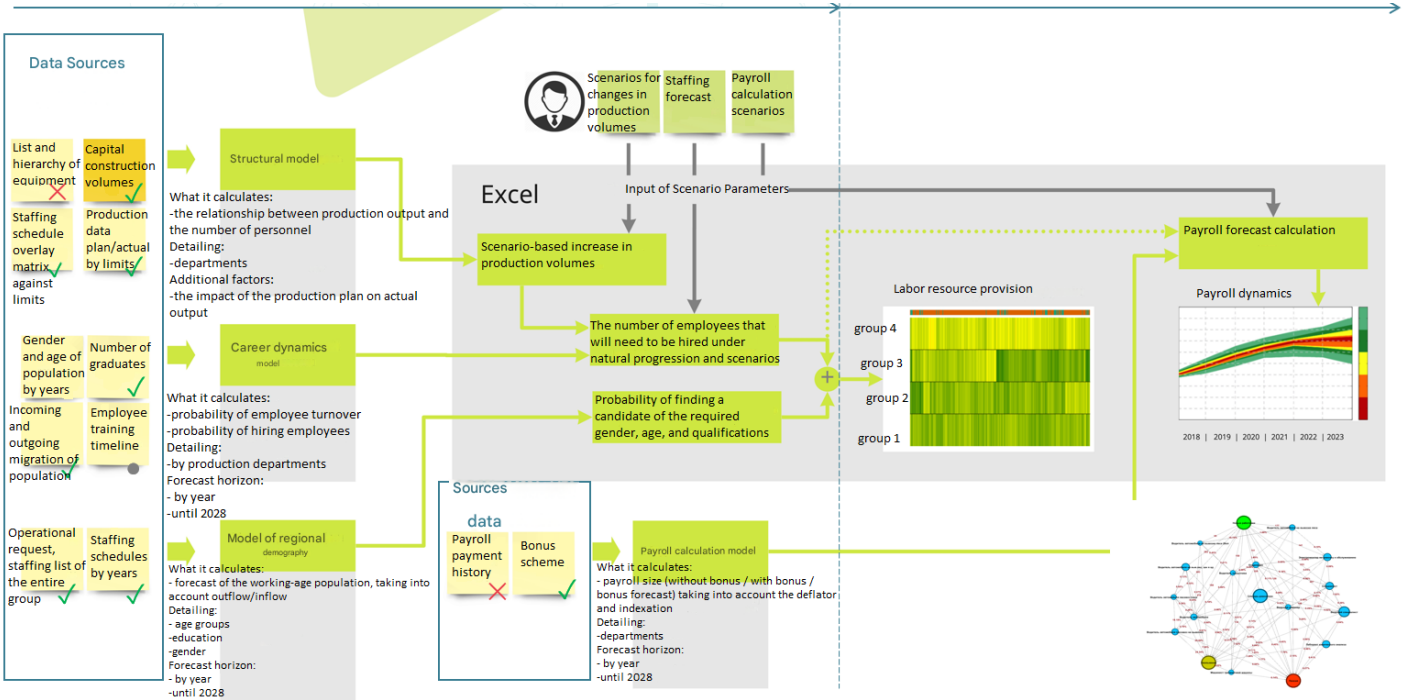
TRL

6

Prototype System Verified: System/process prototype demonstration in an operational environment (beta prototype system level).

System for Forecasting Personnel Needs Based on Long-Term Development Programs

Designed for high-level production modeling to achieve workforce planning for the company, detailing down to individual positions and professional roles within a production unit/workshop/section. The calculation methodology is based on forecasting production volumes and the required workforce resources using regression analysis, balance-based economic models, Markov chains, and graph theory.



Structural diagram for forecasting personnel requirements

Effects of Implementation

Workforce strategy planning up to 5 years ahead

HR risk cost savings of 5–10%

Competitive Advantages

Multi-scale process modeling

Adaptation to company-specific production structures

Use of both internal company data and regional socio-economic and demographic statistics

Development Lead

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TRL

6

Prototype System Verified: a system/process prototype demonstrated in an operationing environment (beta prototype system level).

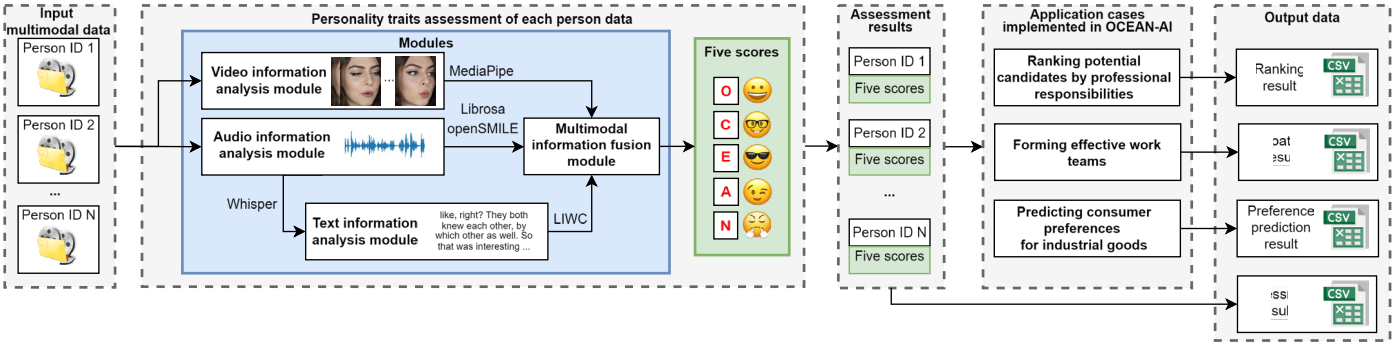
Open Source

OCEAN-AI: Library for Intelligent Personality Trait Assessment

Designed for the development of AI-based applied systems that utilize algorithms for intelligent analysis of human behavior based on multimodal data (audio, video and text) to automatically assess the level of human's individual personal traits by the Big Five (OCEAN) model. The following traits are evaluated: Openness to Experience (Openness), Conscientiousness, Extraversion, Agreeableness, Emotional Stability (Non-Neuroticism)

Competitive Advantages

- Multimodal data (audio, video, text)
- Affective traits analysis
- Adaptable to various professions



Scheme of operation of algorithms for intelligent analysis of human behavior based on multimodal data

Development Lead

Alexey Karpov,
Dr. of Technical Sciences, Prof.

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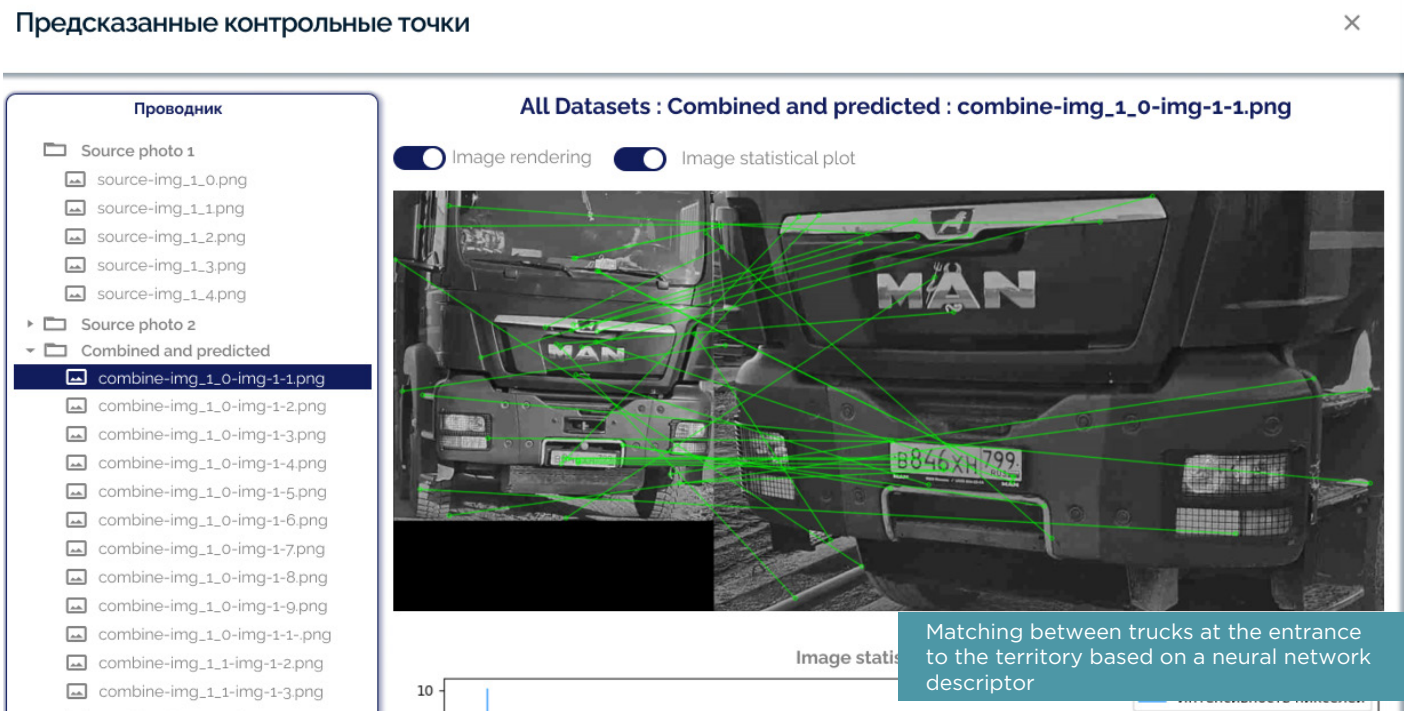
7

AI Systems for Computer Vision and Robotics

SMILE.CV: Environment for Training Industry-Specific Computer Vision Systems

It is designed to automate the creation and training of computer vision systems across various industries by leveraging low-code programming and standardized templates. Provided as a cloud service, it democratizes the development process, ensures the required functional performance of computer vision systems on limited computing resources through the creation of composite machine vision models using automated machine learning methods with compression and optimization for end devices, and provides access to specialized computing resources with horizontal scalability.



Matching between trucks at the entrance to the territory based on a neural network descriptor

Effects of Implementation

Model development cycle reduced by at least 5 times

Enables compression of trained models by up to 10 times, with no more than a 10% drop in accuracy in target use cases

Competitive Advantages

«Smart» consumer model with customizable individual characteristics for specific population categories and cities (regions)

Takes into account informational (news) background, advertising, and the macroeconomic context

Maintains performance during sudden changes in the situation (e.g. crises)

Development Lead

Sergey Ivanov,
Ph.D. in Technical Sciences

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TRL

4

Lab Testing/Validation of Alpha Prototype Component/Process: design, development and lab testing of components/ processes. The results provide evidence that performance targets may be attainable based on projected or modeled systems (development continues in 2025).

Open Source

ODRS: AutoML Framework for Object Recognition Tasks

Provides automatic deep learning model selection and pipeline formation for object recognition tasks. It not only provides recommendations for selecting object detection models but also allows training the suggested models directly within the framework through a convenient API.

Competitive Advantages
Model selection based on prior research
Updatable knowledge base from literature
Open-source integration

Development Lead

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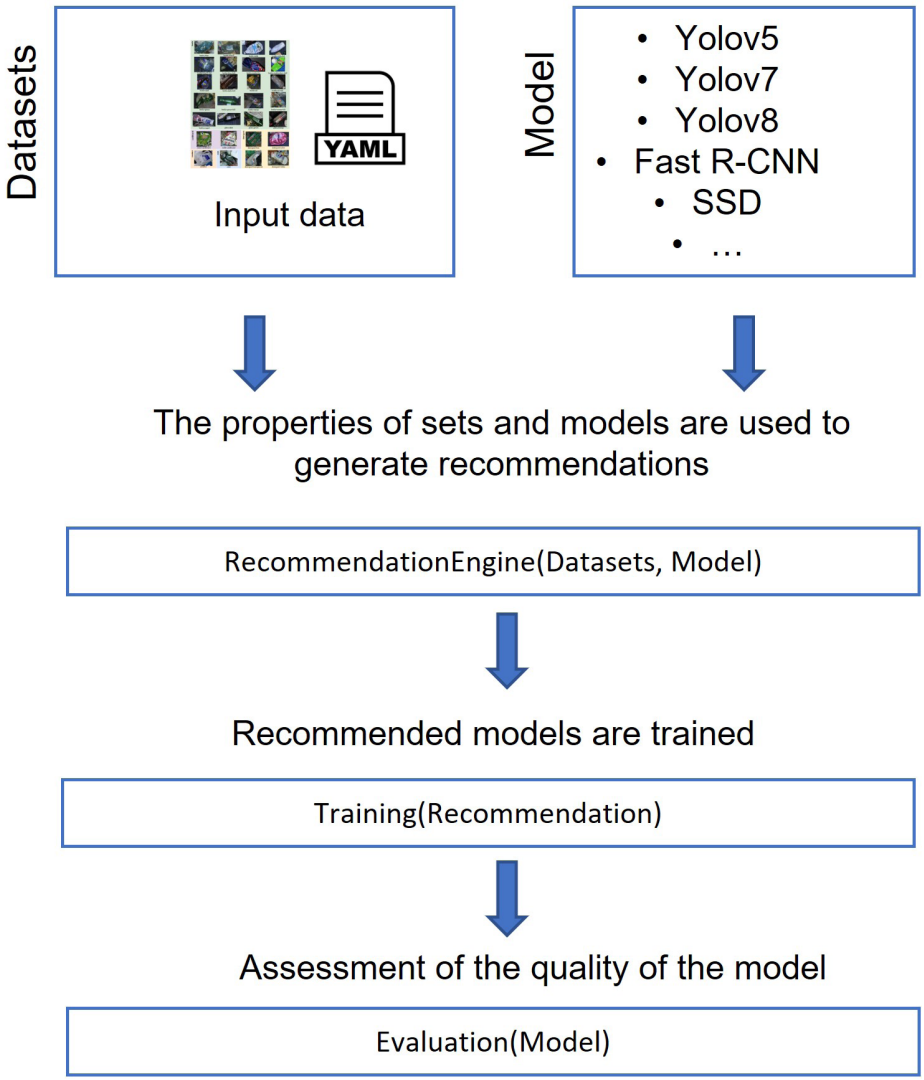


The principle of operation of a framework for object recognition tasks

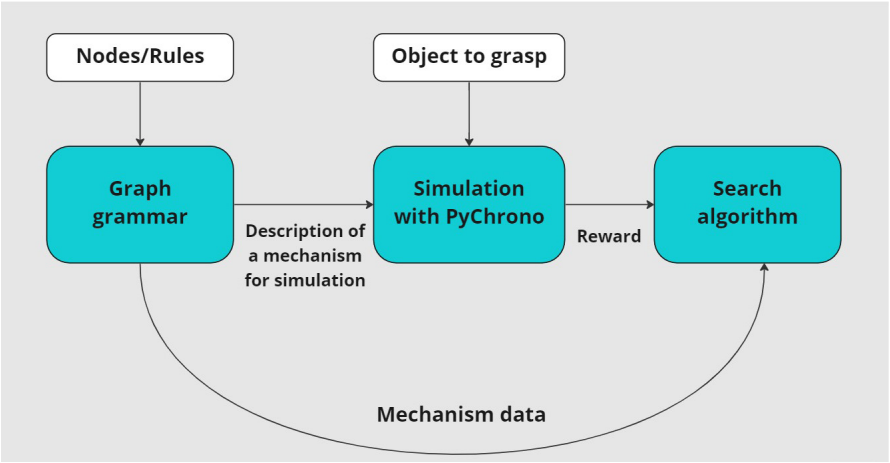
Open Source

ROSTOK: Framework for Generative Design of Mechatronic and Robotic Systems

It is aimed at the generative design of mechatronic and robotic systems made for various purposes. The framework implements an automated co-design algorithm, including the initial mechanism description as a graph, environment setup, simulation of generated mechanisms, and finding the best possible design.

Competitive Advantages

- Only physically feasible design generation
- Fast multi-parameter optimization using efficient graph algorithms
- Co-design of robotic functions and infrastructure



Algorithm for the framework of generative design of lever mechanisms for robotics

Development Lead

Sergey Kolyubin,
Dr. of Technical Sciences
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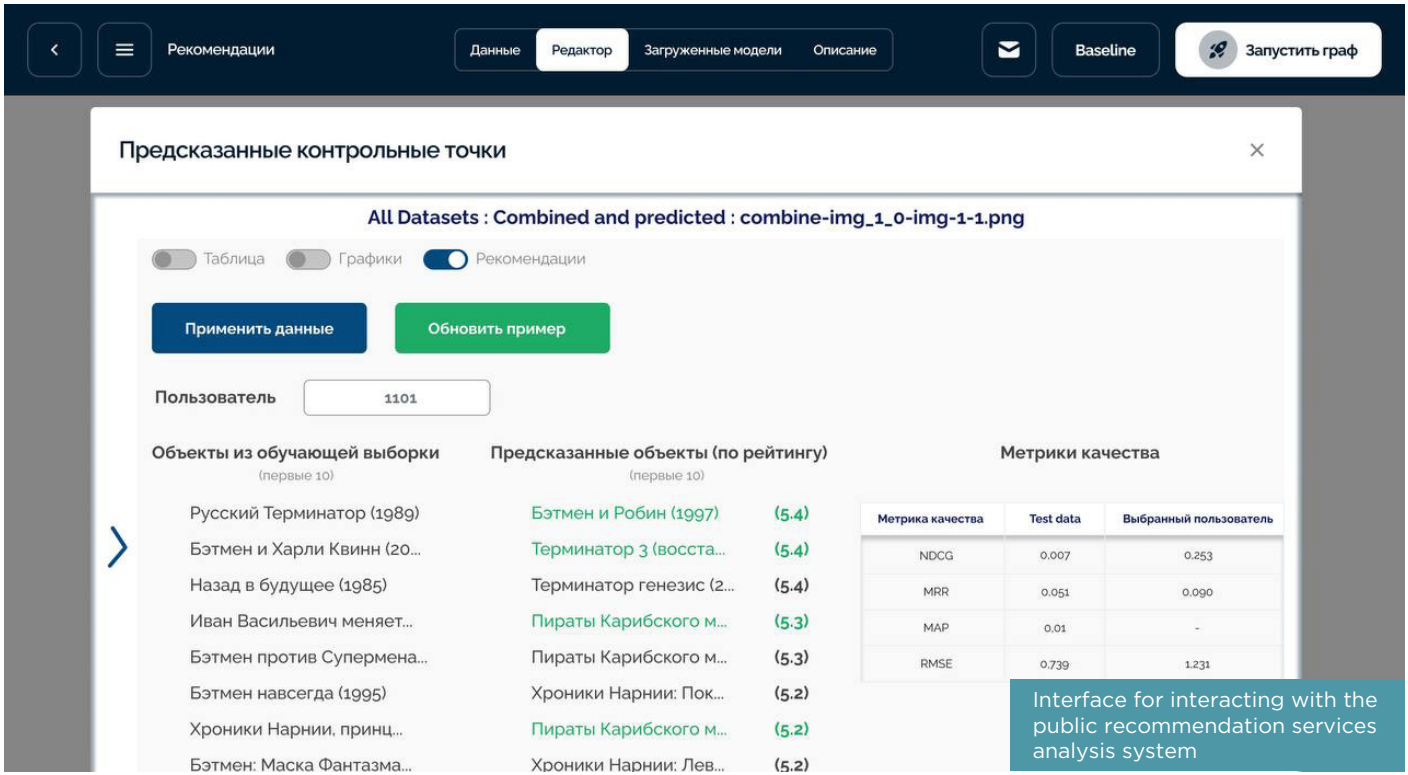
8

AI Recommender Systems For Business

SMILE.RS: Instrumental Environment for Creating Public Recommender Services

Designed for rapid prototyping, development, and testing of large-scale recommendation services. Accelerates the deployment of recommendation systems by leveraging: pre-trained models, on-the-fly retraining, validation using synthetic behavioral data from user avatars.



Interface for interacting with the public recommendation services analysis system

Effects of Implementation

Development and training time reduced by 2–4 times

Cold start time reduced by 30%

Competitive Advantages

Multiple built-in models and algorithms

Template-based solutions with Low-Code customization

User behavior simulation

Development Lead

Sergey Ivanov,
Ph.D. in Technical Sciences

svivanov@itmo.ru

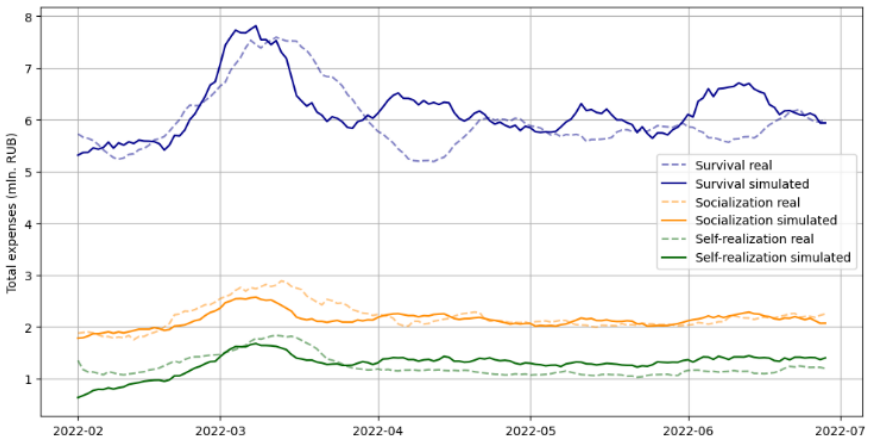
УГТ

4

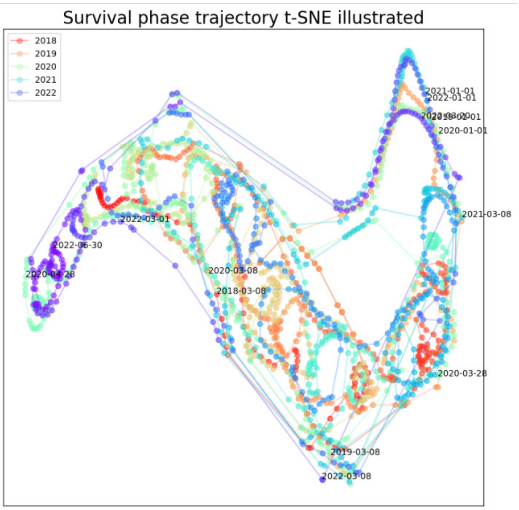
Lab Testing/Validation of Alpha Prototype Component/Process: dDesign, development and lab testing of components/ processes. The rResults provide evidence that performance targets may be attainable based on projected or modeled systems. (development continues in 2025).

ANT-Farm: Framework for Multi-Scale Financial Behavior Forecasting

Designed to model behavioral economics processes at both: Population-level (district, city, region) and Individual-level across diverse macroeconomic scenarios, including crises triggered by external shocks and internal factors.



Comparison of the total consumption of the artificial agent population with the consumption of real users by category of basic needs during periods of instability



Projection of the phase trajectory of a real consumer population for analyzing the dynamics of total transaction volume over several years.

Effects of Implementation

Consumer behavior forecasting during crises (5–14 days)

Conversion rate improvement by 10–18%

УГТ

6

Prototype System Verified: System/process prototype demonstration in an operational environment (beta prototype system level).

Competitive Advantages

Smart consumer models with customizable profiles

News, advertising, and macroeconomic context integration

Robustness under sudden changes

Development Lead

Anton Kovantsev

ankovantcev@itmo.ru

Open Source

Sim4Rec: Generative AI Library for Training Recommender Systems

It is designed for creating synthetic data arrays that simulate the behavior of participants in service provision processes (bank customers, trading platforms, food service industry, entertainment industry) for training, testing, and comparing the quality of recommendation systems.

Competitive Advantages

Individual user response modeling

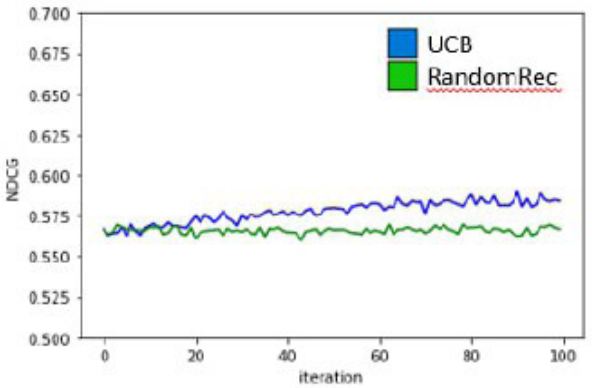
Easy adaptation for interaction mechanisms

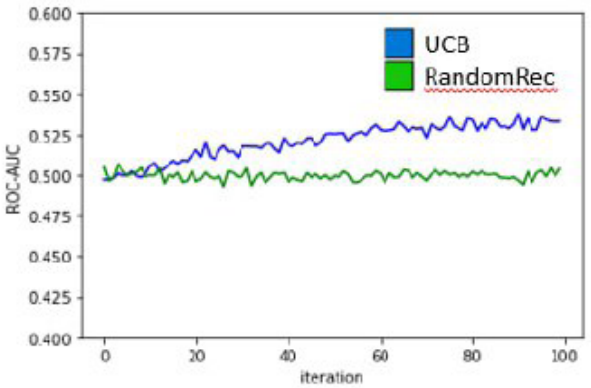
Behavior change prediction during crises

Development Lead

Anton Lysenko

blinkop@itmo.ru





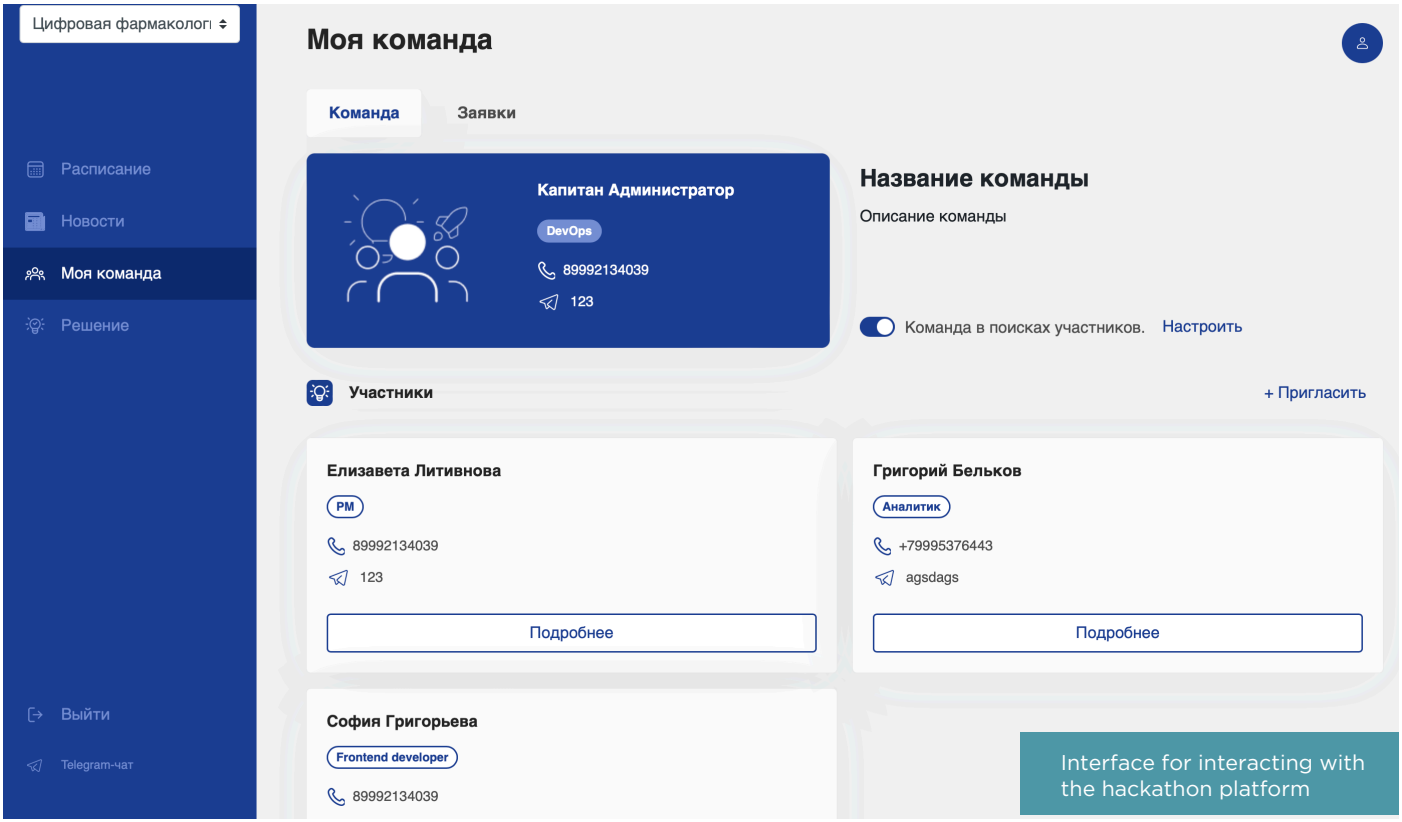
The quality of the UCB recommendation system as it learns in the simulator, compared to random recommendations (RandomRec)

9

AI Systems for Education

ITMO.HACK 2.0: AI Hackathon Platform

It is designed to automate organizational and technological processes during AI and related digital technology hackathons. These processes include forming a team, data access, computing resources utilization, task management, result quality evaluation, and ranking participants according to various criteria.



Interface for interacting with the hackathon platform

Effects of Implementation

Hackathon organization complexity reduced by 15–25%

Supports up to 2000 participants

Competitive Advantages

Informal automatic result verification (including tracking of the decision process)

Tailoring for various industries and formats

Rapid decision prototyping (baseline) using AutoML

Development Lead

Meruert Nurysheva

mknurysheva@itmo.ru

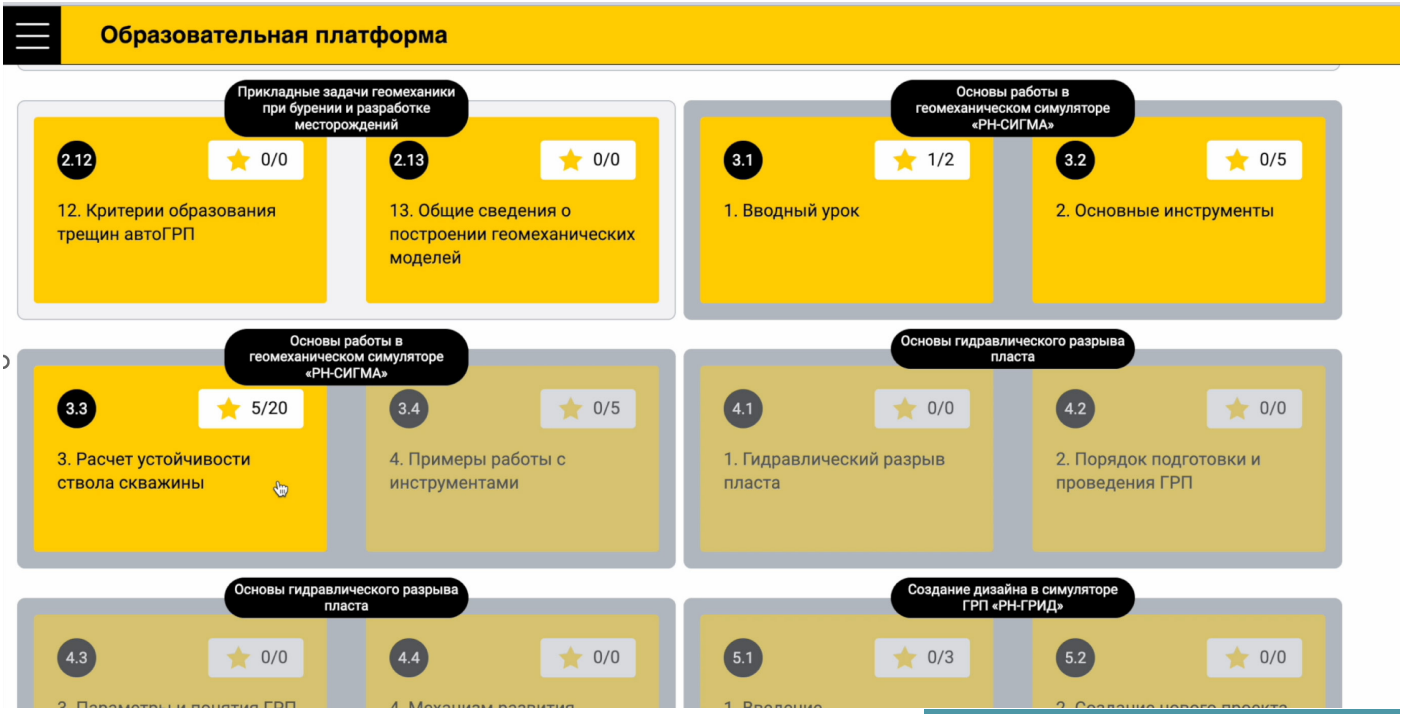
TRL

9

System Proven and Ready for Full Commercial Deployment: an actual system proven through successful operations in an operating environment, and ready for full commercial deployment.

iLMS: A Platform for Practice-Oriented Training in Digital Technologies Using Applied Software and Digital Twins

It is designed to organize the educational process in disciplines that actively use digital technologies. It enables theoretical learning in a “flipped classroom” format, with a focus on laboratory and practical works that are done directly in engineering software packages, industry-specific applications, and digital twins of real-world objects and systems. The platform provides learning progress tracking, as well as assessments using AI technologies.



Interface for interacting with a digital technology learning platform

Effects of Implementation

Infrastructure organisation complexity reduced by 8–12 times

Study class size increased by 3 times without quality loss

Competitive Advantages

Seamless integration with open-source and proprietary software for learning with transparent license control

Using AI for generating assignments, assessing learning progress, and adjusting educational trajectories

Cloud-based access model for educational software

TRL

8

System Incorporated in Commercial Design: An actual system/ process completed and qualified through testing and demonstration (pre-commercial demonstration).

Development Lead

Kirill Plugin

kirillplugin@itmo.ru

Open Source

Edulytica: A Library for Evaluating Text-Based Learning Outcomes Using a Large Language Model

It is designed for in-depth evaluation of informal learning outcomes presented as complex documents (term papers, graduation theses, etc.) to assess their alignment with the user's objectives (student's, reviewer's, examiner's, etc.).

Competitive Advantages

Ability to customize the evaluation process to meet specific user requirements and subject areas

Use of Retrieval-augmented generation (RAG) with regard to specific domain and data context

Possibility of advanced prompt customization using specialized patterns

Development Lead

Vladislav Tereshchenko

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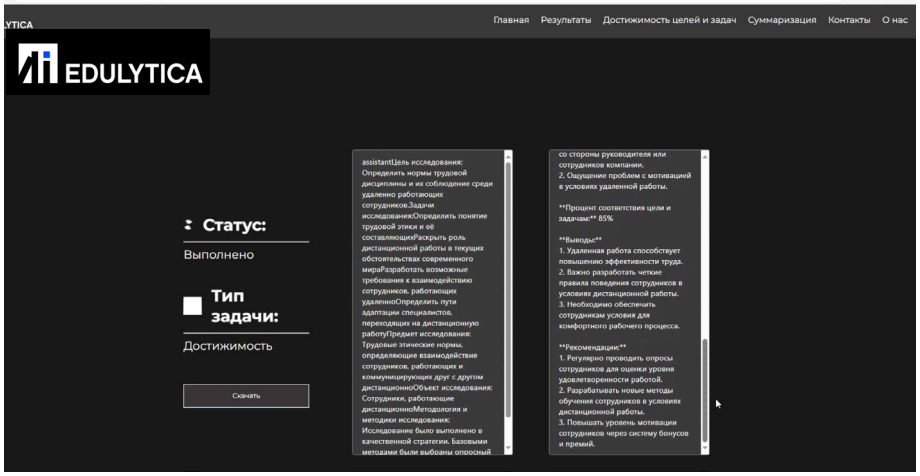

Interface for interacting with the library of educational text assessments

10

Education

#Higher Education Program

ИТМО

Big Data and Machine Learning (Master of Science in Applied Mathematics and Informatics)

The program aims to those who want to understand artificial intelligence approaches at the system level, learn how to develop and apply big data and machine learning technologies to solve various practical problems, and gain in-depth knowledge and skills in working with big data and developing data mining methods. The program has been accredited by the AI Alliance Russia – it complies with professional standards in the field of AI and meets the actual business needs of employers.

Students of the Big Data and Machine Learning Program

#Additional Professional Education

We offer Advanced Training and Retraining Programs, including those tailored to meet the customer's needs.

Subject Modules

Introduction to Artificial Intelligence:

- AI approaches and technologies;
- Ethics of AI;
- Trust and safety of AI;
- AI technologies in scientific research;
- AI technologies in education;
- AI technologies in industry.

Large Language Models:

- Introduction to large language models;
- Prompting;
- Effective fine-tuning;
- Instructional based learning;
- RAG: using external knowledge in LLMs;
- LLM agents and ensembling;
- Beyond text: multimodality.

Artificial Intelligence Technologies

- Data handling;
- Data-driven AI Models;
- AI Quality;
- Basics of Generative AI;
- Computer Vision;
- Natural language and speech processing systems;
- Decision support systems;
- Generative AI for industry-specific tasks.

Working with Customers

- Interaction between the Customer and AI Systems Developer
- AI Development Tools
- AI in the modern university;
- Methodology for implementing AI-related disciplines.

Professional retraining program: «Artificial Intelligence for a Qualified Customer»

Objective: the program is designed to support the needs of industry experts responsible for implementing AI technologies in their subject area, to teach them how to choose an AI-based approach, to correctly set tasks for AI system design, to effectively manage the development process, as well as to accept and assess the quality of AI systems based on effective practices of interaction between the customer and developers.

Target audience: Industry specialists responsible for implementing AI technologies in their fields.

Workload

250 academic hours

Learning outcomes:

- Understanding of data processing, requirements for data collection, preparation, and storage.
- Ability to evaluate the quality of AI models.
- Ability to effectively communicate with AI system developers.
- Ability to control project activities in AI systems design.

School of Generative Artificial Intelligence

Objective: Developing a systematic understanding of large language models.

Workload	Format	Target audience
72 academic hours	In-person	Master's students

Learning outcomes:

- Knowledge of the main architectures underlying modern LLMs;
- Ability to understand the specifics of applying LLMs to various tasks;
- Ability to work with model prompts and understand their form and structure;
- Ability to use external facts and knowledge to refine LLM knowledge using RAG techniques and document corpora;
- Ability to fine-tune models using various modern approaches.

The study group of the School of Generative Design in the United Arab Emirates with teachers from ITMO University

ITMO

OPEN SOURCE

The largest academic community in Russia unites enthusiasts creating and using open-source scientific projects, including in the field of AI/ML.

We actively promote the idea that contributions to science are achieved not only through publications but also through convenient tools that can solve various research-intensive tasks. We also host "Open Science" meetups where developers of open-source libraries can present them to colleagues and conduct analytical research. Also, we implemented the AI-based tool OSA (Open Source Advisor, https://github.com/aimclub/OSA) that allows automating the improvement of scientific repositories.

Telegram channel

Meet up of Open Source Community

About us

The open-source ecosystem includes over

30 projects in the field of AI

1800+ stars for main repositories

1000+ community members

Solutions used in over **40** countries

In 2024, we conducted a consolidated review of used Data/ML open-source solutions across various categories, helping users navigate the main tools and practices. The study reflects not only the current state but also forecasts the industry's development for the next couple of years. The review is based on insights from top experts and quantitative metrics.

Read the study

Our repository on GitHub

We are on Open Data Science

Our recommendations for open-source developments in AI

FEDOT

Provides automatic generative design of machine learning pipelines for various real-world problems.

https://github.com/aimclub/FEDOT

EPDE

A library for automatically identifying data structures in the form of differential equations.

https://github.com/ITMO-NSS-team/EPDE

iOpt

Automated search for optimal hyperparameter values for complex mathematical models, processes, and methods.

https://github.com/aimclub/iOpt

BAMT

A tool for modeling and analyzing data based on Bayesian networks. It includes algorithms for building and training Bayesian networks on data and applying them for tasks like missing data imputation, synthetic data generation, edge significance evaluation, etc.

https://github.com/aimclub/BAMT

TEDEouS

A universal solver for approximate solutions of (O,P)DEs, combining the power of PyTorch, numerical methods, and mathematics in general.

https://github.com/ITMO-NSS-team/torch_DE_solver

GOLEM

A framework for optimizing graph structures using metaheuristic methods.

https://github.com/aimclub/GOLEM

AutoTM

Automated selection of topic model parameters using evolutionary algorithms. AutoTM provides tools for preprocessing English and Russian text datasets and tuning topic models.

https://github.com/aimclub/AutoTM

FEDOT.Industrial

An AutoML framework for predictive analytics in industrial tasks (tabular data and images).

https://github.com/aimclub/FEDOT.Industrial

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