Informatics, Artificial Intelligence and Control Systems Faculty as a Digital transformation Cluster

NATURAL AND ARTIFICIAL INTELLIGENCE HARMONYZATION

BACKGROUNDS:

- INFORMATICS,
- NEUROPHYSIOLOGY,
- CYBERNETICS

1948 - 1988 **Academician Solodovnikov V.V.** Head of automatic control systems department (IU1) created following theories:

automatic control,

complexity,

methods of object's identification,

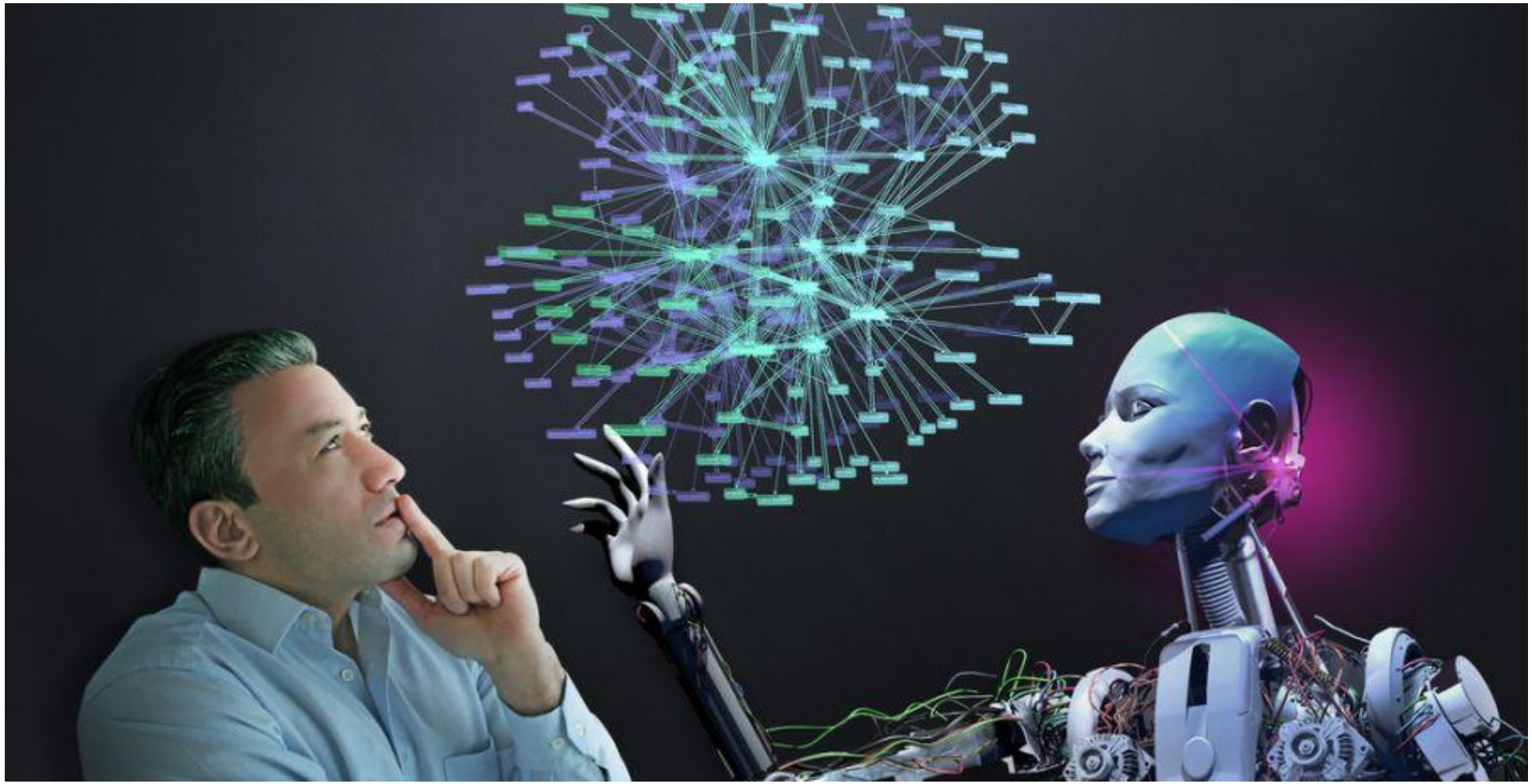
analytical self-adjusting automatic systems, etc.

1989 - 1999 **BMSTU Scientific Program "Intelligent Systems"**

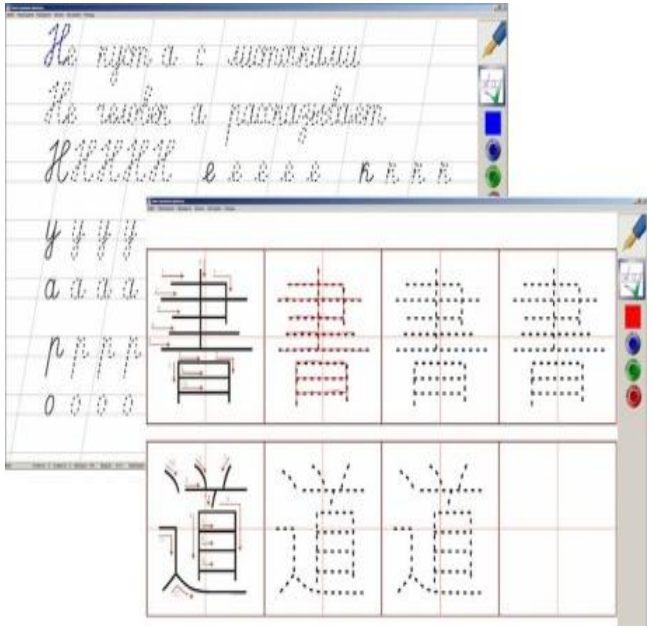
Artificial Intelligent Systems Theory and Practice were created

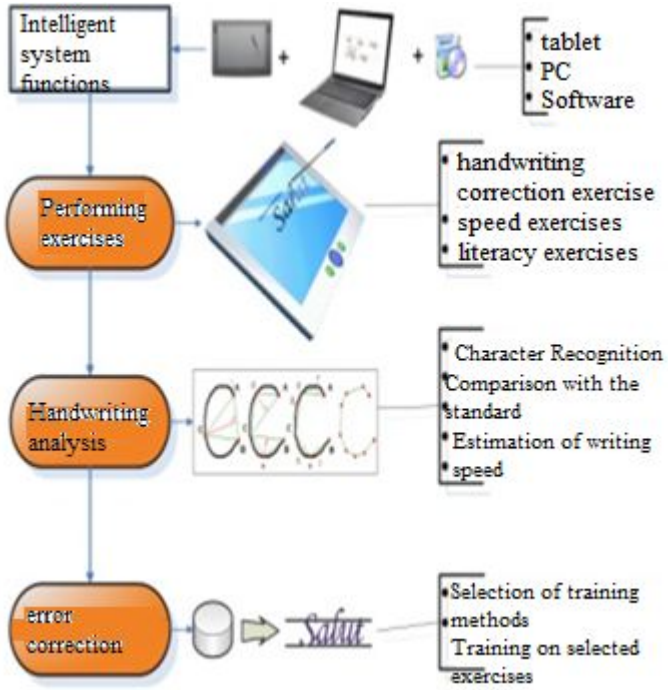
2000 - nowadays **Experimental Design Research** on advanced control systems, including those with intelligent components, dynamic objects

COMPLETED PROJECTS OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES



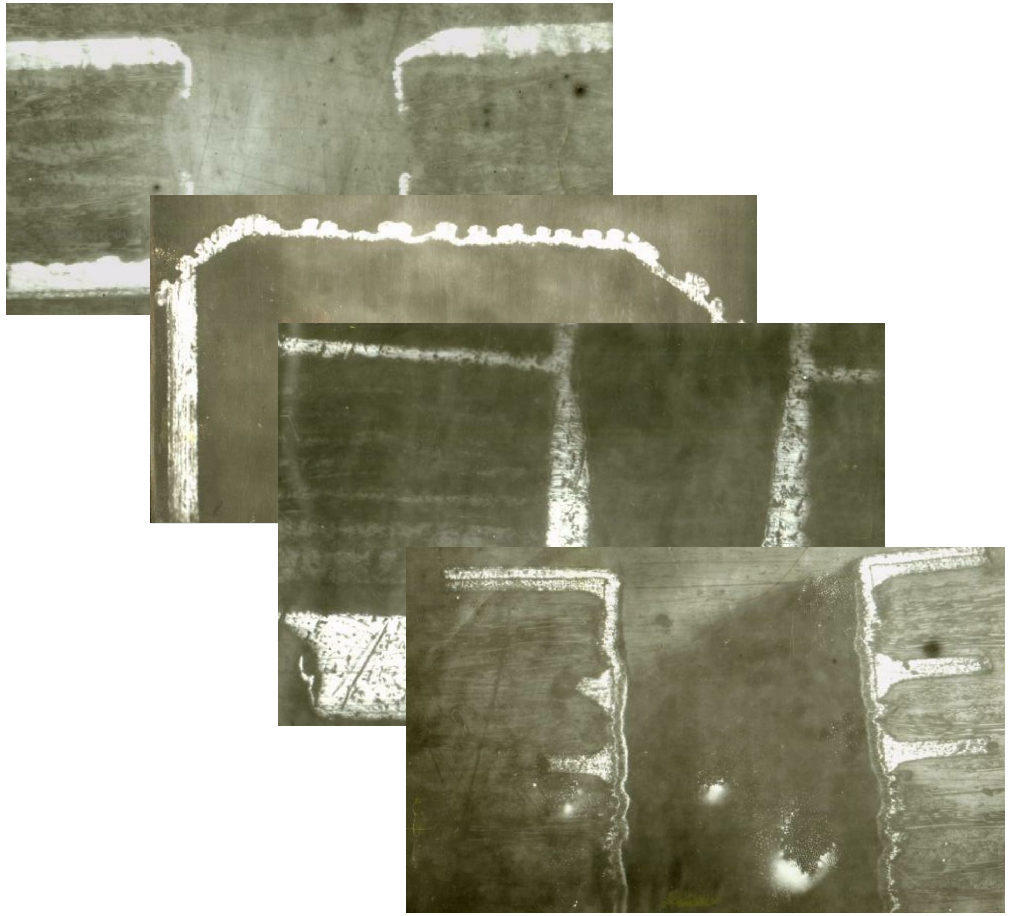
In Medicine: ARTIFICIAL INTELLIGENCE REHABILITATION COMPLEX



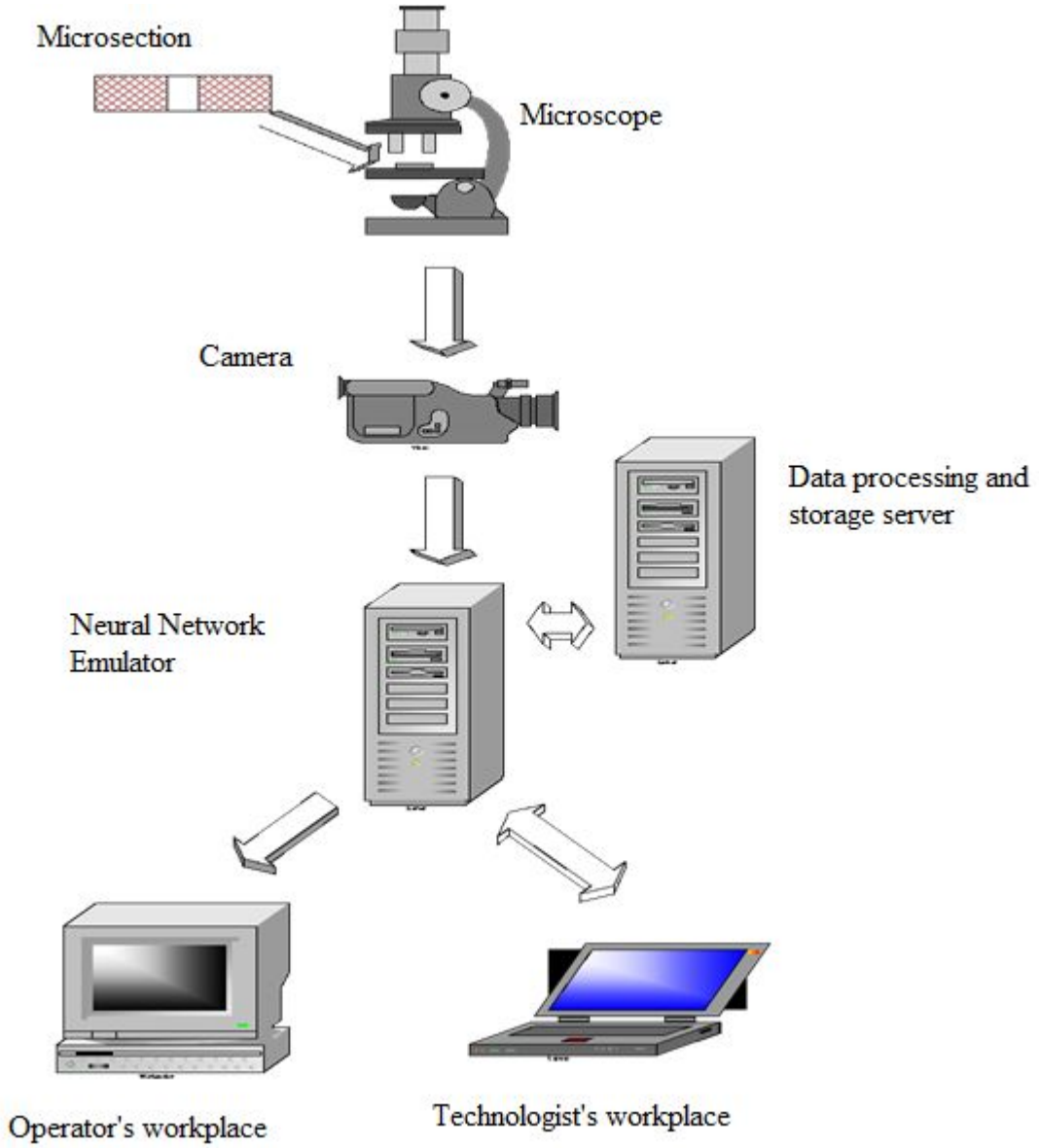


Patient's fine motor skills restoration with vascular diseases of the brain

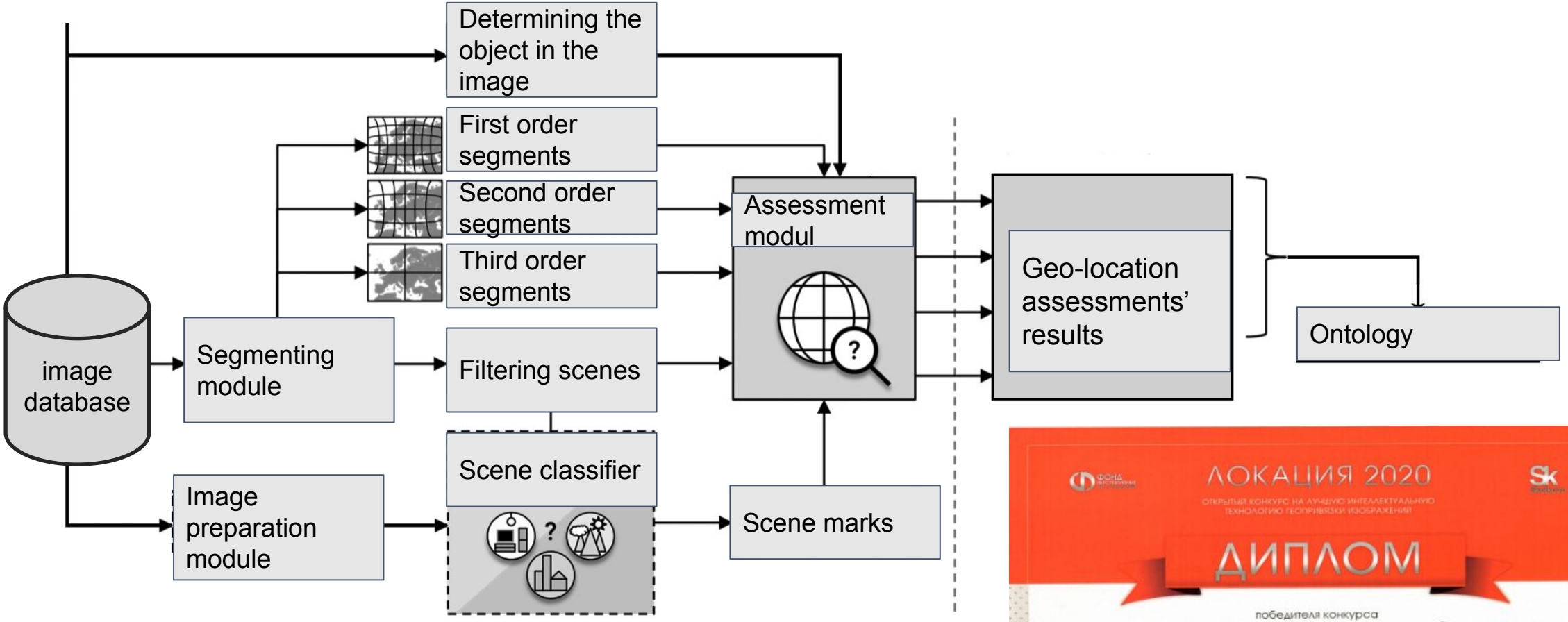
In Technology: IMAGE RECOGNITION SYSTEMS

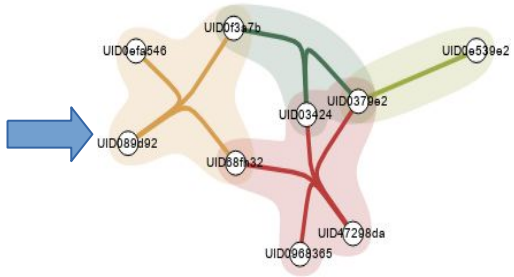


Typical defects of metallized PCB holes



In Technology: HYBRID INTELLIGENT SYSTEM FOR DETERMINING THE LOCATION OF OBJECTS BASED ON THEIR PHOTOS



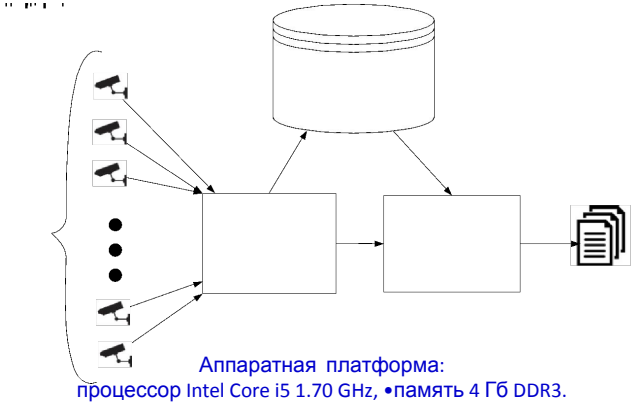


In Technology: Video-information intellectual control system

On the territory of the Chertanovo Central district :
174 residential apartment buildings;
Each house has from 1 to 16 entrances;
741 surveillance cameras
the entrance area.
To reduce the decision-making time for cleaning the territory, the cleanliness control system of the entrance area uses artificial intelligence methods.

Dispatcher's workplace

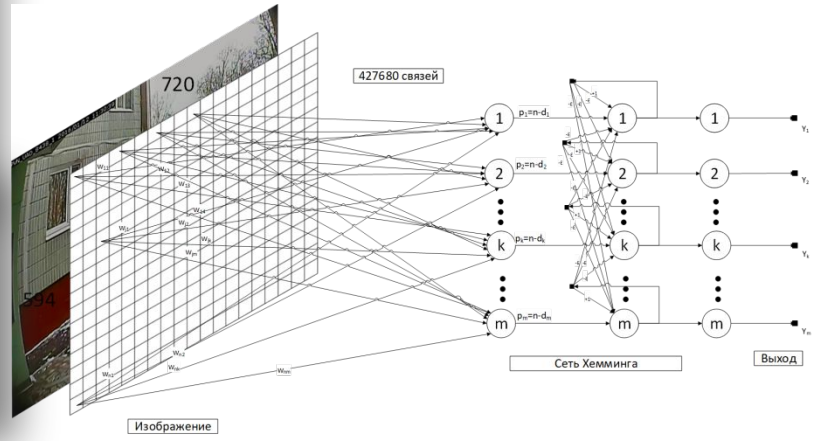
Архитектура системы



Аппаратная платформа:
процессор Intel Core i5 1.70 GHz, •память 4 Гб DDR3.

Images obtained
from CCTV cameras

The resolution of the video surveillance cameras is 720x576 pixels



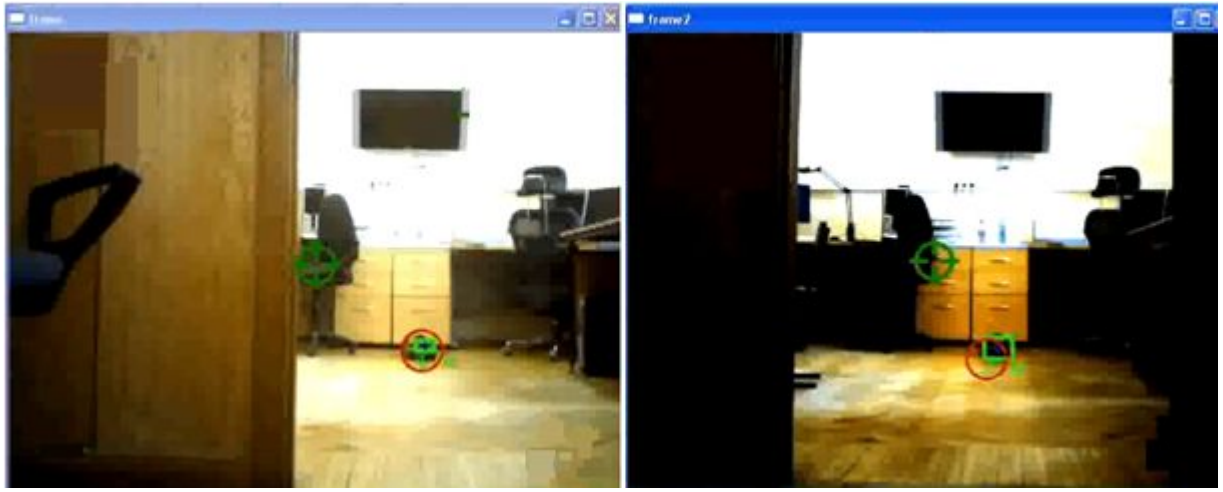
Examples of system reports for 1-10.01.2016

Reports are sent to officials on mobile devices

Directions for further work on improving the system

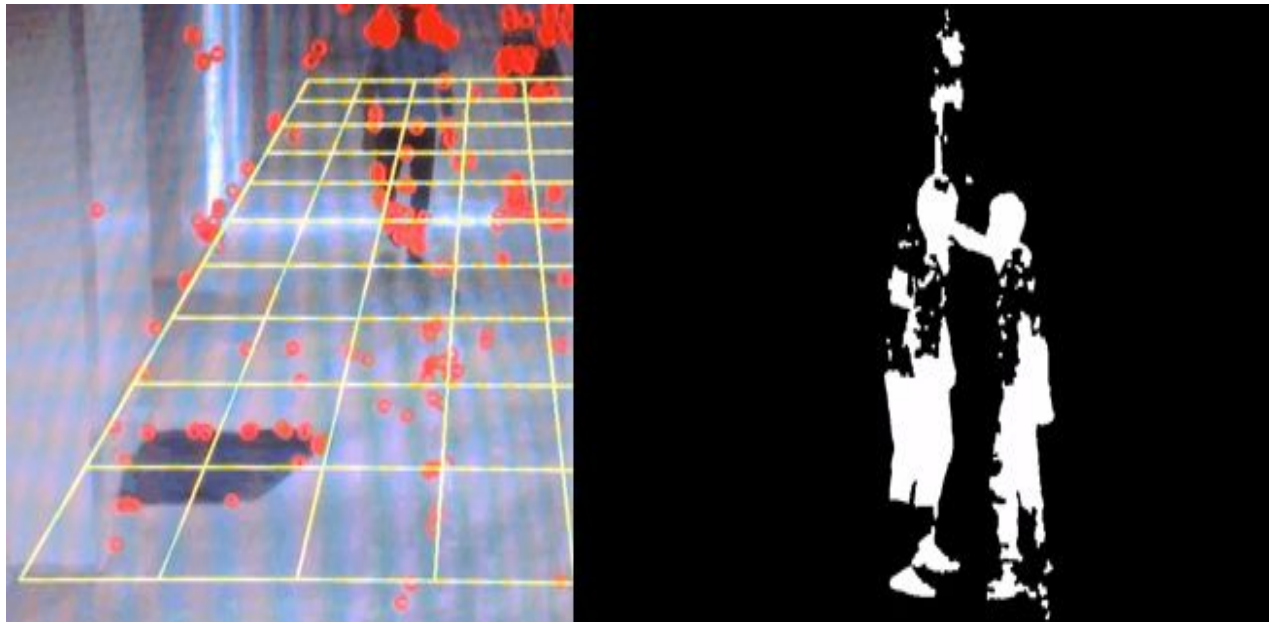
1. Control of events for the portal "Our City";
2. Year-round analysis of the state of the territory;
3. Control of container sites;
4. Control of places of unauthorized trade;
5. Control of the movement of special equipment.

Research of the Foundation for the Promotion of Innovation - the development of a computer vision algorithm for capturing and tracking a moving object and determining the parameters of the object.



Research and Development of the Ministry of Education and Science of the Russian Federation - capturing and tracking an object from a variety of video cameras in difficult conditions

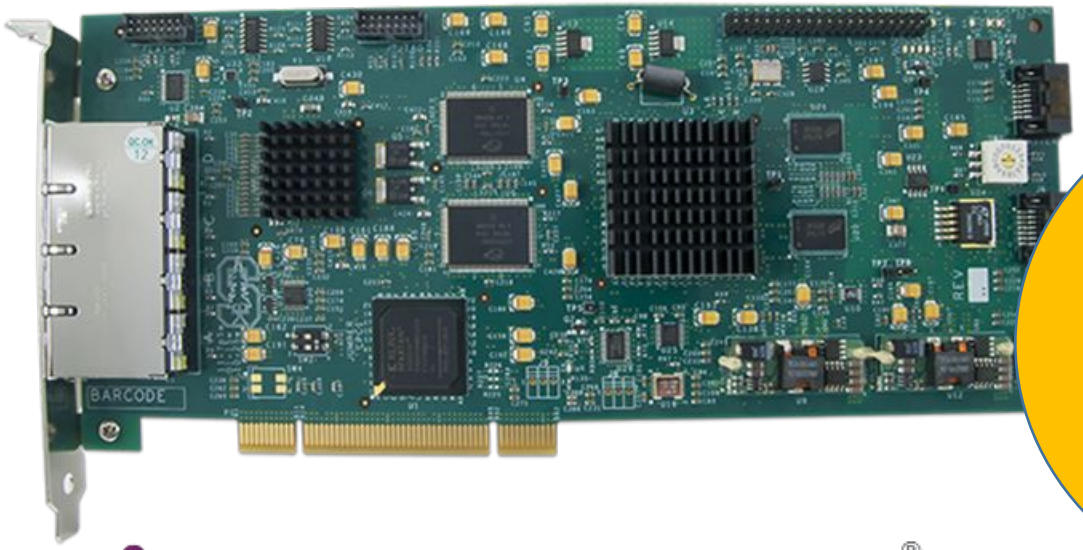
RFBR Research and Development - the development of an artificial intelligence software platform for the recognition of abnormal behavior.



artificial intelligence in the decision-making algorithm for puncturing the wall of a venous vessel with an injection needle

In Education: SW & HW AI Complex on HETEROGENEOUS Supercomputer

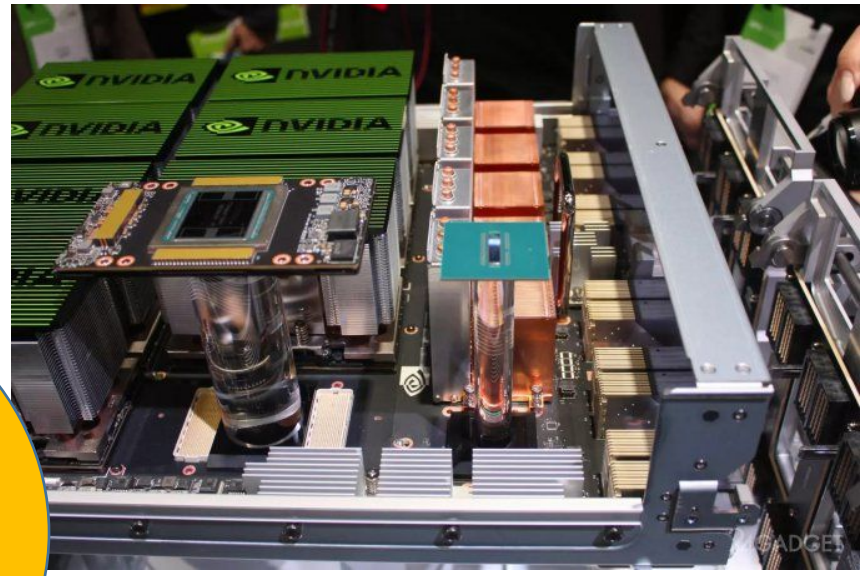
Original processor manipulating with datasets, data structures and graphs has been developed at BMSTU as a part of the National Security Threat Prevention System



Leonhard®

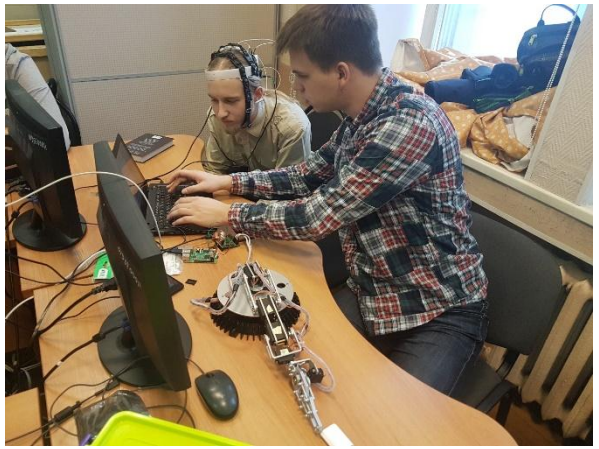
Heterogeneous SuperComputer

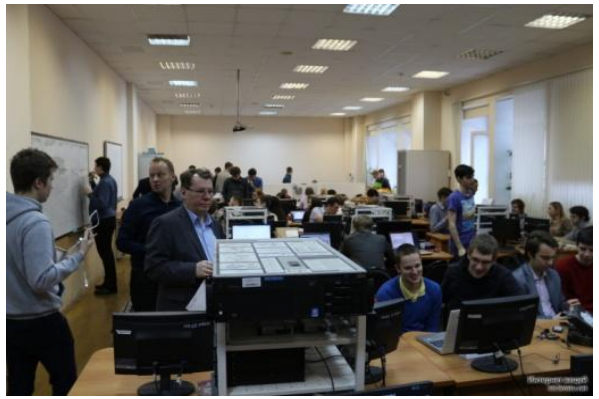
Super-server NVidia DGX2

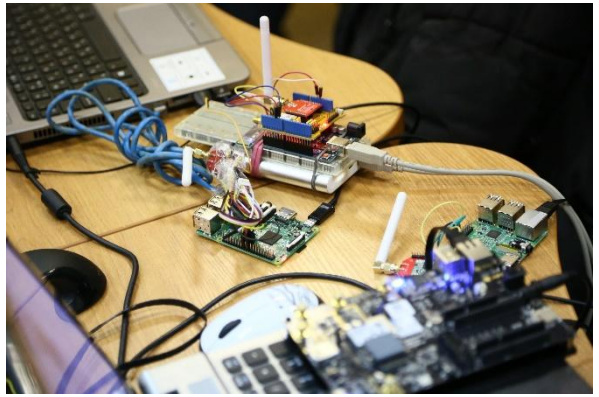


Computing Accelerator Xilinx ALVEO U200

Students AI Projects' Competitions:





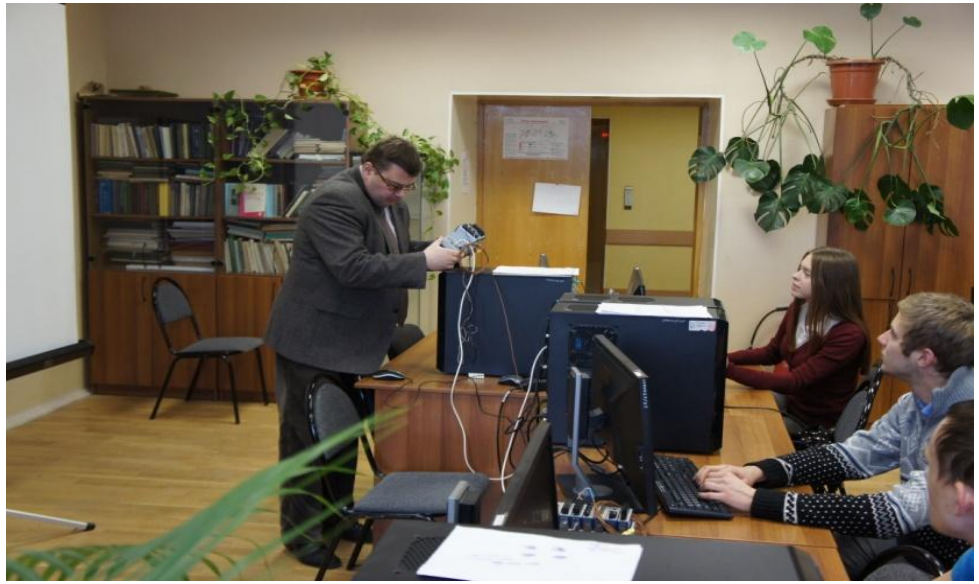


April 2016 12 projects	Distributed cyber-physical systems of the Internet of Things (jointly with IBM)
November 2016 15 projects	Systems based on energy-efficient long-range radio communication networks
November 2017 24 projects	Brain-computer interface-based systems (jointly with IBM)
November 2018 24 projects	Cloud medical Services and Blockchain (together with the First Sechenov Moscow State Medical University)
November 2019 23 projects	Artificial Intelligence in Medicine (together with the First Sechenov Moscow State Medical University)
November 2020 26 projects	Artificial intelligence in the field of security (with the Ministry of Internal Affairs)
November 2021	Technologies for accelerating the computing process

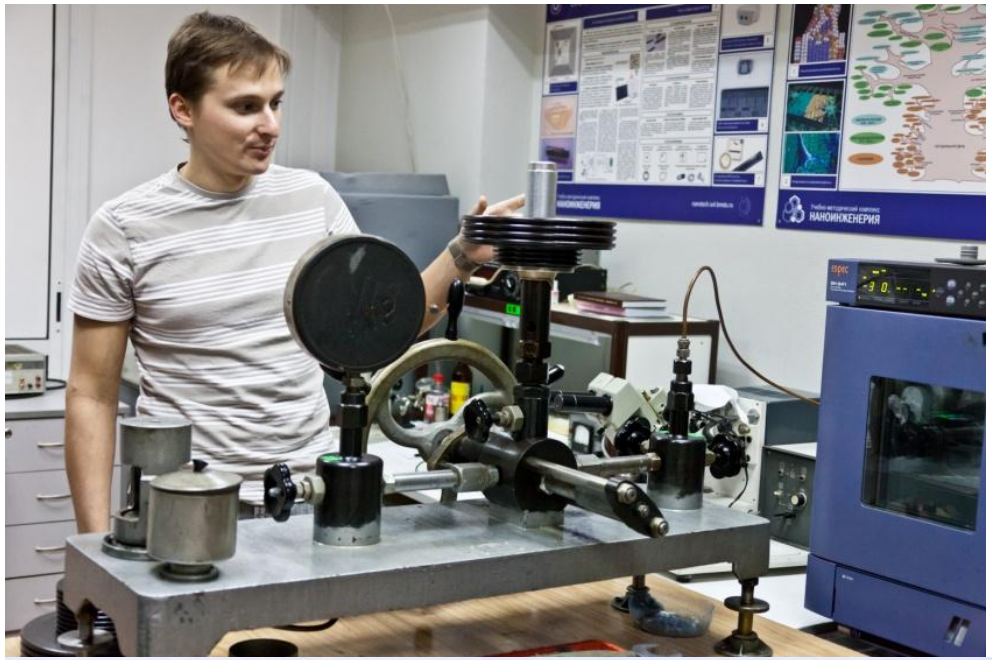
Where and how:

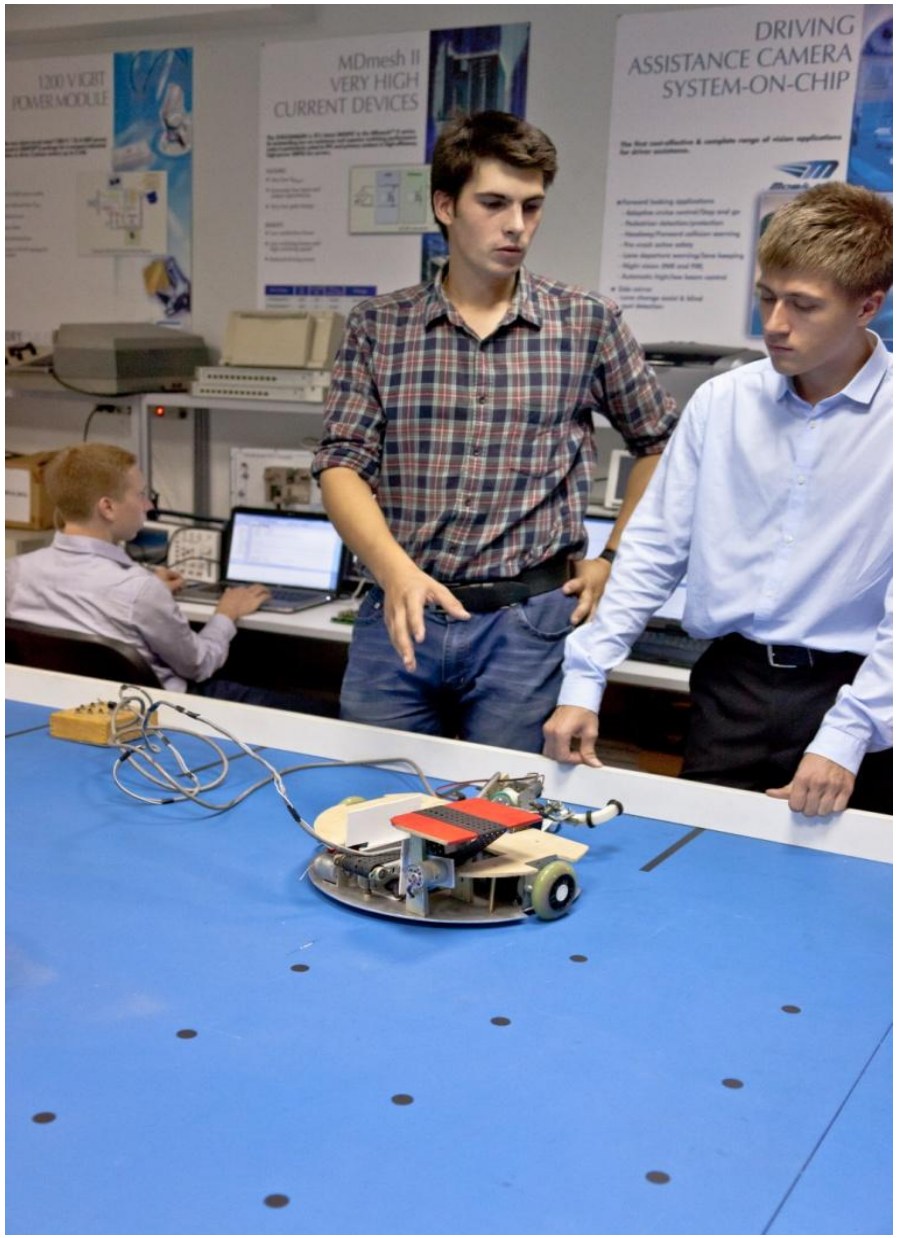
Programming Center «TechnoPark Mail.ru»

Engineering Center«BMSTU- National Instruments»



Nanoengineering Laboratory





Faculty of Computer Science and Control Systems

IU-1 Automatic control systems

IU-2 Instruments and systems for orientation, stabilization and navigation

IU-3 Information Systems and Telecommunications

IU-4 Design and manufacture of electronic equipment

IU-5 Information processing and management systems

IU-6 Computer Systems and Networks

IU-7 Computer software and information technologies

IU-8 Information Security

IU-9 High-performance computer technologies

IU-10 Security in the banking sector

IU-11 Space systems and complexes

THE MAIN DIRECTIONS OF SCIENTIFIC AND EDUCATIONAL ACTIVITIES

- Artificial intelligence;
- Information and communication technologies, big data, decision support systems;
- Computer systems and networks, Internet of Things;
- Mathematical modeling of complex processes and objects using supercomputer technology;
- Intelligent control systems;
- Creation of a comprehensive information security system for infocommunication structures;
- Software Engineering;
- Systems of orientation, navigation, control of moving objects;
- Modern devices and electronic equipment.

More than 900 employees

45 doctors of Sciences, 140 candidates of sciences

EDUCATION: DISCIPLINES concerned to ARTIFICIAL INTELLIGENCE

Theory of artificial intelligence
Artificial intelligence technologies
Intelligent control systems.
Technologies for working with big data
Elements of artificial intelligence in control systems
Methods of evolutionary optimization
Neural network technologies in system analysis tasks
Methods and technologies of intelligent computing and machine learning
Methods and technologies of artificial intelligence
Methods and technologies of pattern recognition
Parallel and distributed computing
Algorithms for determining the parameters of objects in the video stream
Extracting knowledge from the data warehouse
Multi-agent intelligent systems
Knowledge representation in information systems
Cloud technologies
Mivar technologies of logical AI
Complex problem-oriented algorithms of narrow AI
Complex graphs
Knowledge storage and processing systems
Process Mining
Models of consciousness
Goal setting models
Intelligent technologies and systems
Cognitive support technologies
The art of analytical work with big data
The art of system engineering and management of organizations
Big Data Mathematics
Hybrid AI Methods for Big Data processing
Data Interpretation and Visualization
Methods Machine Learning methods
Methods of modeling and analysis of socio-economic processes and phenomena
Big Data processing methods
Neural network methods of big data analysis
Intelligent technologies in information security

Thank You for Your Attention!

Ques?

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