

# **SAMARA STATE MEDICAL UNIVERSITY:**

## EDUCATION, SCIENCE, INNOVATION, CLINICAL PRACTICE



- **1** academician
- **4** honored scientists of Russia
- **25** honored doctors of Russia
- **7** honored workers of higher school of the Russian Federation
- **1** honored health worker of the Russian Federation
- **190** doctors of Sciences and **400** candidates of Sciences



**Alexander Kolsanov**

Rector of Samara State Medical University  
PhD, Professor RAS

### 2007 and 2011

SamSMU-winner of the international prize "Profession is Life" in the nomination "Medical school of the year"

### 2010, 2012, 2014, 2016 and 2018

Winner of interregional competition "The Best higher education institutions of the Volga Federal district"

### 2010, 2011 and 2012

Entered in the registers: "National quality mark", "Leading healthcare institutions of the Russian Federation"

### 2012

SamSMU is included in the register of employers, who are guaranteed to comply with the labor rights of employees in the framework of the project "Declaration of enterprises for the implementation of labor rights of employees and employers"

### 2012

SamSMU - the best training center in Russia, the winner in the nomination "For creating conditions for the development of physical culture and sports at the University"

### 2013

- The University entered the ranking of the best universities in terms of quality of admission of applicants
- laureate in the nomination "For the formation and promotion of healthy lifestyle values at the University through creativity and social advertising"

### 2011 and 2013

- Successful quality management system audit by "Intersertifica-TUV" (Germany) of compliance with the requirements of the international standard ISO 9001: 2008





### 2014

- An innovative territorial cluster of medical and pharmaceutical technologies of the Samara region was organized, with Samara State Medical University as the cluster coordinator
- The Center for Youth Innovative Creativity started its activity

### 2015

- A science and technology industrial park and two international research and innovation laboratories have been established
- **Samara State Medical University - coordinator of the scientific and educational medical cluster "Nizhnevolzhsky"**
- **The training and production center for simulation training at Samara State Medical University is accredited by the Russian Society for Simulation Training in Medicine (ROSOMED), and it is assigned the 2nd qualification level**

### 2016

- International professional and public accreditation of the specialties «General Medicine» and «Pediatrics»

### 2017

- 41 ranks among Russian universities in the ARES ranking
- **Samara State Medical University is recognized as a university center for innovative and technological development (following the results of a competition of the Ministry of Education and Science of Russia)**
- Samara State Medical University - laureate of the national competition "100 best educational institutions of the Russian Federation-2017"
- 7 educational programs of the university are recognized as the «Best educational programs of innovative Russia»
- **The Volga NeuroNet Center took 1st place according to the results of the rating of the NeuroNet Industry Union organized on the basis of Samara State Medical University**

### 2018

- **39 rank among Russian universities in the ARES ranking received**
- Scientific and technical cooperation with more than 40 reputable Russian and foreign organizations

### 2019

- **Information on educational programs in «General Medicine» and «Pediatrics» of Samara State Medical University, which received international accreditation, was placed in the European register of accredited programs**



## Structure:

- **10** faculties
- **78** departments where more than **8,000** students are trained
- **3** educational institutes
- Clinics of Samara State Medical University (for **1015** beds)
- **5** research institutes
- **5** unique research and educational centers
- Breakthrough Research Center «IT in Medicine»
- Research and Production Technopark
- Samara State Medical University - Coordinator of the scientific and educational medical cluster «Nizhnevolzhsky»



## Scope of activity of Samara State Medical University

- **Training specialists for health care, using innovative educational technologies:** fundamental knowledge, continuous professional development, competencies in practical health care (in particular, personnel for digital healthcare)
- **Scientific and innovative activities of the University:** development of medical devices and health-saving technologies, with their implementation in clinical practice; development of innovative infrastructure; interaction with industrial enterprises in the frame "idea - prototype - mass production - transfer to the market"
- **Provision of medical services** in the University Clinics
- **Technological entrepreneurship:** integration with the real sector of the economy (industrial sector and practical healthcare system), development of network programs





## IT Medicine New branch of the region's economy

- In 2014, with the support of the Government of the Samara Region, a decision was made to form a **new branch of the economy of the Samara Region - "IT Medicine"**
- More than **25** innovative projects of world and Russian level are being implemented; **12** of them have been brought to the serial model and commercialized
- Cooperation with **40** partner organizations (universities, manufacturing enterprises, IT companies, development institutions)



## Cluster of medical and pharmaceutical technologies of the Samara region

- An innovative territorial cluster of medical and pharmaceutical technologies (September, 2014) was created at the **initiative of Samara State Medical University and the business community, with the support of the Government of the Samara Region**
- **Samara State Medical University became the Cluster coordinator**
- Currently, **70 organizations** participate in the Cluster's activities (starting from 30 at the time of creation)
- Cooperation agreements were concluded with the Vitebsk Medical and Pharmaceutical Cluster, the Penza Biomedical Cluster and the Ural Biocluster





Samara State Medical University provides training for students in **7 specialties**:

- **General medicine**
- **Pediatrics**
- **Dentistry**
- **Pharmacy**
- **Preventive medicine**
- **Nursing**
- **Clinical psychology**



## Education

### Professional training of international students

- Training of international students in Samara State Medical University has been conducted **since 1992**
- Over **1000 graduates from more than 35 countries** completed their studies at Samara State Medical University
- **453 foreign students** (from the countries of the CIS, Africa, the Middle East, Southeast Asia, Latin America, USA) are currently studying in SamSMU
- **The University has the course of the Russian language in pre-university training department**
- **International students study in graduate school, have residency training, and can choose continuing education courses**
- Every year, **about 100 students and teachers of SamSMU have educational and scientific internships** in foreign universities and partner organizations (IFMSA - European countries, leading medical universities of Belarus, Uzbekistan, Kazakhstan, Macedonia)
- The University implements joint educational programs with international partner universities (in educational and methodological spheres, in e-education)



- **In the Institute of Professional Education of Samara State Medical University**, students receive higher professional education (residency) and additional professional education (professional retraining and advanced training)
- **The annual training of 8.5 thousand students, including 7.5 thousand students in the courses** of professional retraining and advanced training, more than **300 residents** (first and second years of study)
- The training is conducted on **the basis of 16 departments and 2 educational** courses at the departments of endocrinology and internal diseases





Year 2015 – for the first time in Russia a department of **information systems and technologies in medicine** was created in SamSMU (co-education with Bauman MSTU and VSUTI)

**Year 2018 - realization of engineering training program (APE):**

- medical image analysis technology
- medical image analysis (CAD-systems) in roentgenology practice
- image analysis (CAD-systems) in medical visualization

**Year 2018 - realization of medical training program (APE):**

- Methods and technologies of big data analysis in medicine



### Realization of the concept of continued medical education

On the basis of SamSMU there is a branch of the Central Attestation Commission of the Ministry of Health of the Russian Federation in the Volga Federal District

- More than **80% of the doctors** of Samara region take part in the CME programs
- Annually more than **400** doctors and nurses pass their certification, receive or improve their qualification category
- From 2013 to 2019 the Central Attestation Commission in VFD confirmed qualification of more than **2500** specialists



### Clinics of Samara State Medical University have:

- **1015** in-patient beds
- **57** specialized branches
- **24** clinical departments
- **60** professions
- Federal Center for Organ and Tissue Transplantation

**92%** of department heads and **34%** of doctors have academic degrees of candidates and doctors of medical sciences





- Providing medical care to **25 thousand** patients annually
- Performing more than **16.5 thousand** operations, including more than 550 large joint arthroplasty operations, about 900 high-tech operations on the heart and blood vessels annually.
- The Interuniversity Student Medical Center and the Mobile Health Center accept 26 thousand patients a year.
- In 2005, on the basis of Clinics of SamSMU, the Samara Center for Organ and Tissue Transplantation was opened. To date, 440 kidney transplantations and 4 liver transplantations have been made
- Testing and clinical use of innovative developments, created at SamSMU

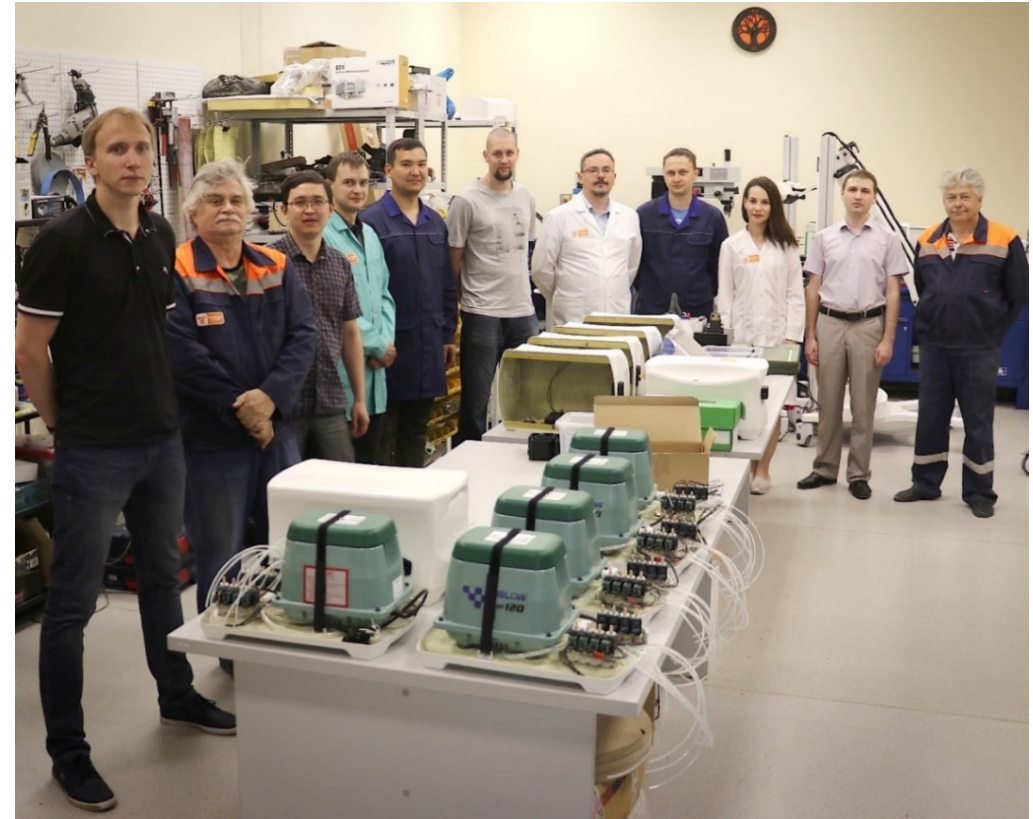


- Personnel consists of highly qualified **IT specialists**
- Creation of software products for education, healthcare, industry using **VR/AR** technology, **neurocomputer interfaces**, **artificial intelligence**, **big data**



### Full-cycle of engineering and production

- New products design
- Reverse engineering
- Product upgrade
- Premises over **1000 sq.m.**
- More than **20** units of high tech equipment: from 3D-printers to industrial machines with CNC
- More than **100** highly qualified engineers
- Services: modeling, prototyping, creation of experimental samples, small-scale production of innovative medical products and devices





## Technological competencies



### Virtual Reality

7 projects in the field of medical rehabilitation, education, virtual tours



### Augmented Reality

6 projects in the field of surgery, specialized education, tours accompaniment



### Neural networks

2 projects in the field of diagnostic medicine



### Simulation technologies

6 projects in the field of medical education, practical medicine



### BCI (Brain Computer Interface)

6 projects in the field of rehabilitation and diagnostics



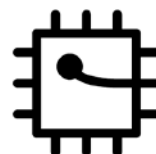
### Big Data

2 projects in the field of diagnostic medicine



### High precision 3D-modelling

Over 10 projects in the field of diagnostic medicine, rehabilitation, surgery, education, virtual tours



### Lab-on-chip

5 projects (in development) in the field of diagnostic medicine

*Мирогор*

Interactive anatomy visualization table

- Hardware-software complex for virtual work with a three-dimensional model of the **human body**
- Discipline training (topographic anatomy, normal anatomy, pathological anatomy, radiology, invasive surgery, histology)
- **4** interactive study modes (viewing, comparison)
- Built-in **PACS** for CT, MRI, ultrasound diagnostics
- More than **4000** students, **1000** interns and residents, **500** doctors trained
- Commercialization of more than **80** units of the product in Russia and the CIS countries (universities, schools of biomedical profile)



#### Cat and Cow anatomical 3D-visualization

- designed for specialists training in agricultural universities
- possibility of practice during lectures and studies, allowing for object demonstration in the required perspective view
- provides complete set of organs and structures, with clinical and physiological aspects modeling
- includes 3D-models of animal body layers, systems, syntopy and intraorganic structure, required for study of animal anatomy



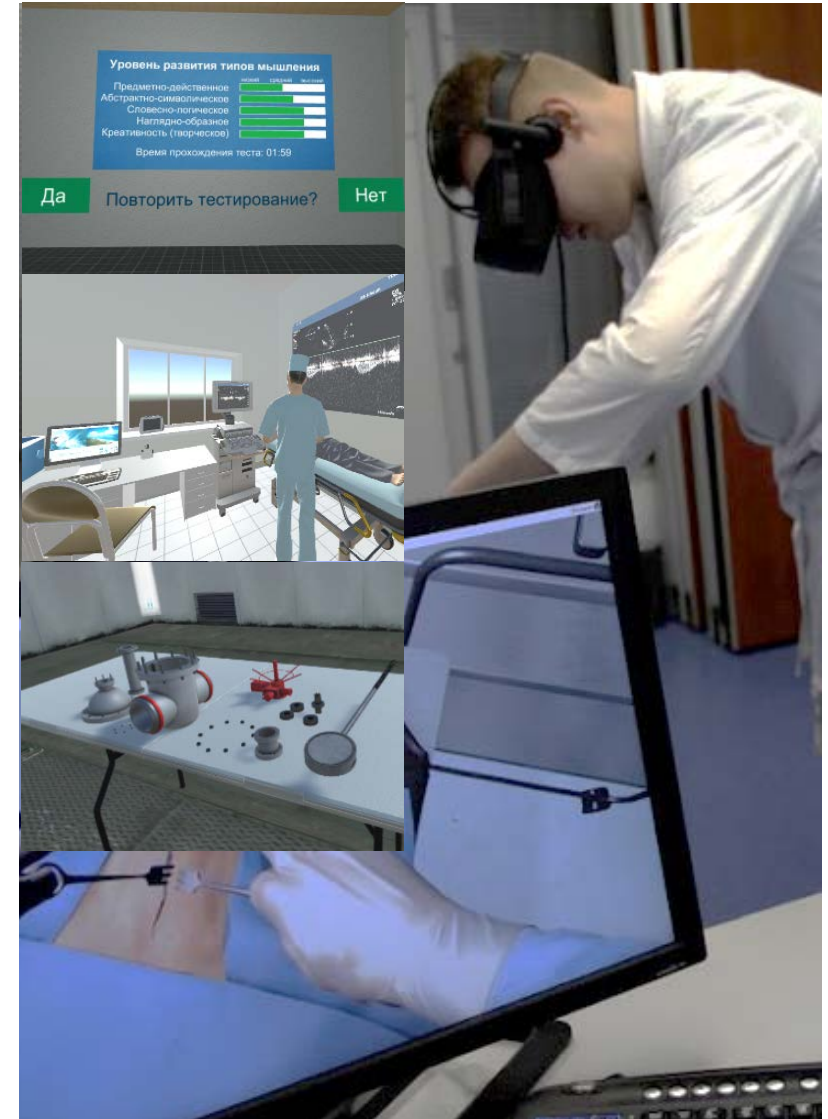


### PraxisVR

#### *Educational VR-platform*

The interaction of the scientific and pedagogical community to increase the effectiveness of the training of medical personnel and related professions (engineers) includes:

- methodology of education of students and doctors in virtual reality
- online platform for educational content distribution
- courses for teaching medical specialties
- integration of physiological data analysis to assess the effectiveness of training



### PraxisVR

*Solutions for Industrial Training and Safety*

#### VR- INDUSTRIAL SAFETY TRAINING SIMULATOR

- Simulates working processes, including underlying ones, and emergency conditions
- Collects data on behavioral reactions and problems, when performing the tasks
- Simulation of realistic stressful situations

#### VR- INDUSTRIAL EQUIPMENT MAINTENANCE TRAINING SIMULATOR

- Simulates interaction with non-standard objects and processes of various complexity
- High level of training ability
- Dynamic environment, moderated by instructor
- Mobility



#### **PraxisVR**

*Solutions for marketing, branding and sales*

#### **Exhibition booth**

Demonstration of unlimited number of objects and processes. Place-saving and re-usable.

#### **Products catalogue**

Unlimited number of items. Realistic product visualization, view in section, in operation and as a part of a machine.

#### **Museums and Show-rooms**

Substitutes the massive structures in museums and show-rooms.  
Can be installed easily in any place.

#### **Virtual tour**

Cost-saving solution for different events



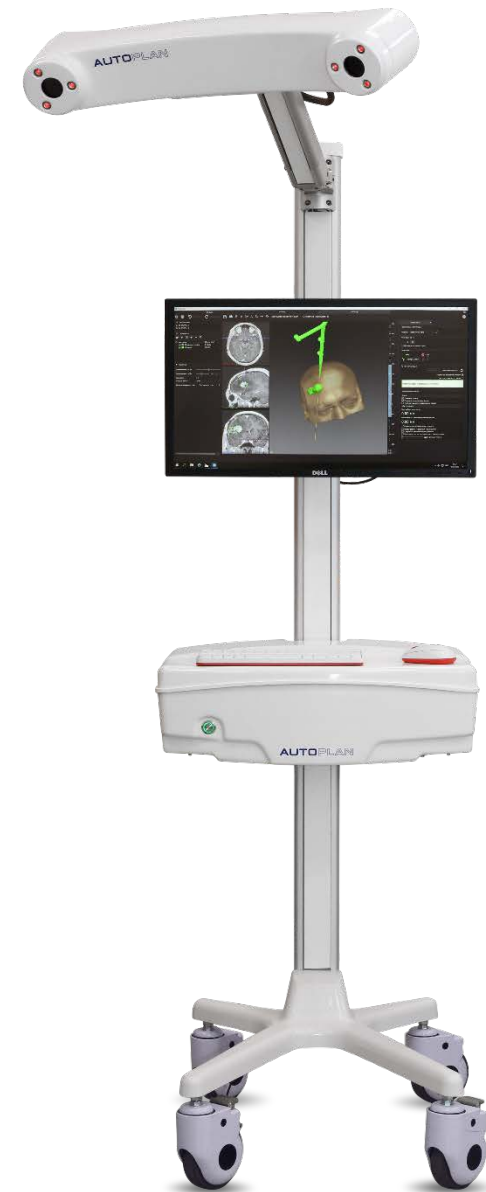


# AUTOPLAN

*Surgical navigation system*

Preoperative planning, intraoperative localization of anatomical structures, monitoring the results of surgical treatment

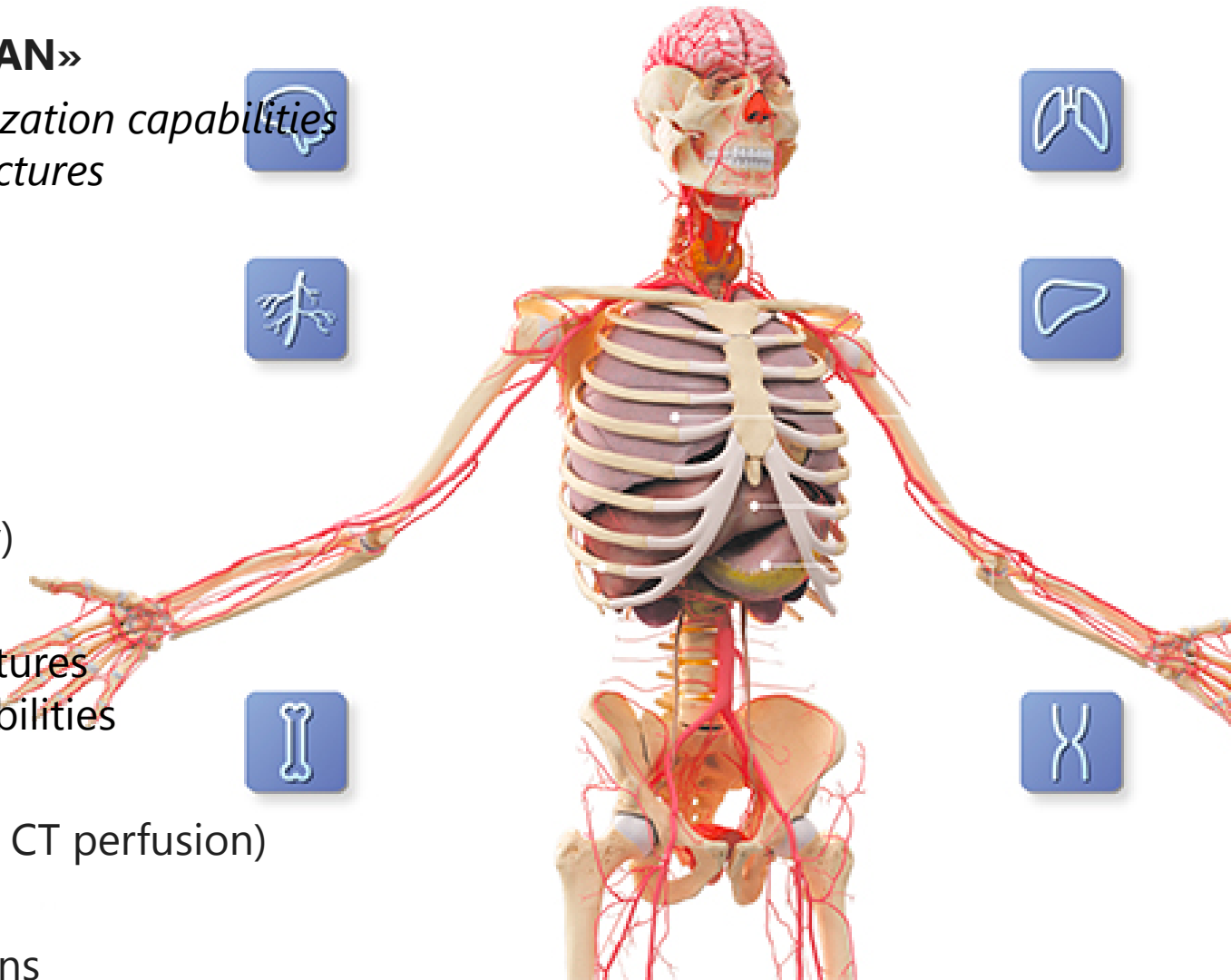
- **Application:** neurosurgery, endocrine surgery, traumatology
- Usage of **CT and/or MRI data**
- Detailed operation **planning**
- Intraoperative control
- **Reduced** surgery time
- **Reduced** surgical risks and postoperative complications
- More than **500** successful surgeries



#### DICOM WORK STATION «AUTOPLAN»

*DICOM viewer with additional visualization capabilities and segmentation of anatomical structures*

- A modern set of viewing modes (MPR, 3D VR, Cutting plane, CRV)
- Full set of measurement tools
- Calculation of volumes (volumetry)
- Segmentation of anatomical structures with additional visualization capabilities
- CAD modules (lungs, liver, vessels, CT perfusion)
- Exporting DICOM Image Projections





*VR-system for passive rehabilitation of patients with lower limb motor function disorder*

Hardware-software complex with tactile feedback

- Indications for use: stroke, spinal cord and brain neurosurgery, spinal cord injuries, Parkinson's disease, multiple sclerosis, etc.
- Rehabilitation possible on the 3d day post-stroke
- Used in 21 rehabilitation institutions of Russia
- Mass production on the basis of "Vega" concern ("Rostec" Group of Companies)



ReviVR stimulates three key receptors



Visual



Tactile



Auditory





*Video game rehabilitation system for patients with movement impairments*

Hardware-software complex with biological feedback

- Indications for use: infantile cerebral palsy, traumatic brain injuries, stroke, autism spectrum disorder, multiple sclerosis, Parkinson's disease, etc.
- A computer game based on the therapeutic PE (synchronous and asynchronous swinging arms, legs, squats, turns, jumps)
- ReviAIS information analytical system generates an individual patient card



ReviMotion biological feedback is formed by two key receptors

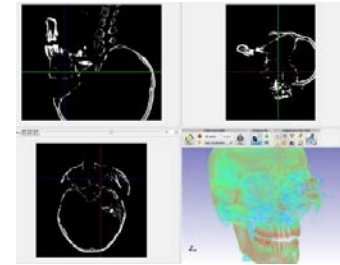


Visual

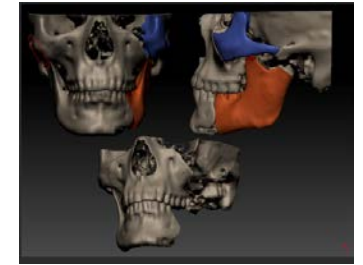


Auditory

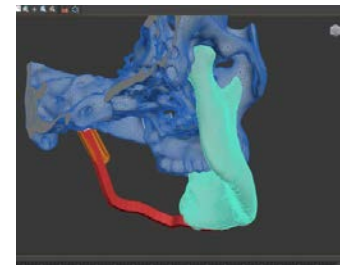
- **A personal, anatomically correct model** that takes into account all the features of the patient
- **The implant is formed directly on the model** before surgery and does not require an intraoperative fit
- **The risk of post-surgery abnormalities** in the patient **is reduced**
- **Reduced surgery time**
- **Application:** traumatology and orthopedics, maxillofacial surgery
- **Testing and implementation:** Clinics of SamSMU, State Budgetary Healthcare Institution Samara Regional Clinical Oncology Center, State Budgetary Healthcare Institution Samara Regional Clinical Hospital



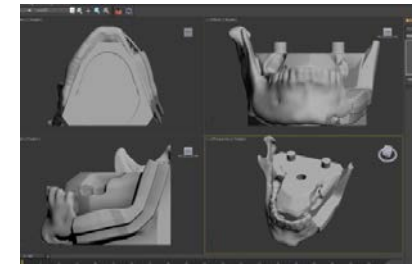
CT scan



Design of  
3D-model



Resection area  
definition



Mold design

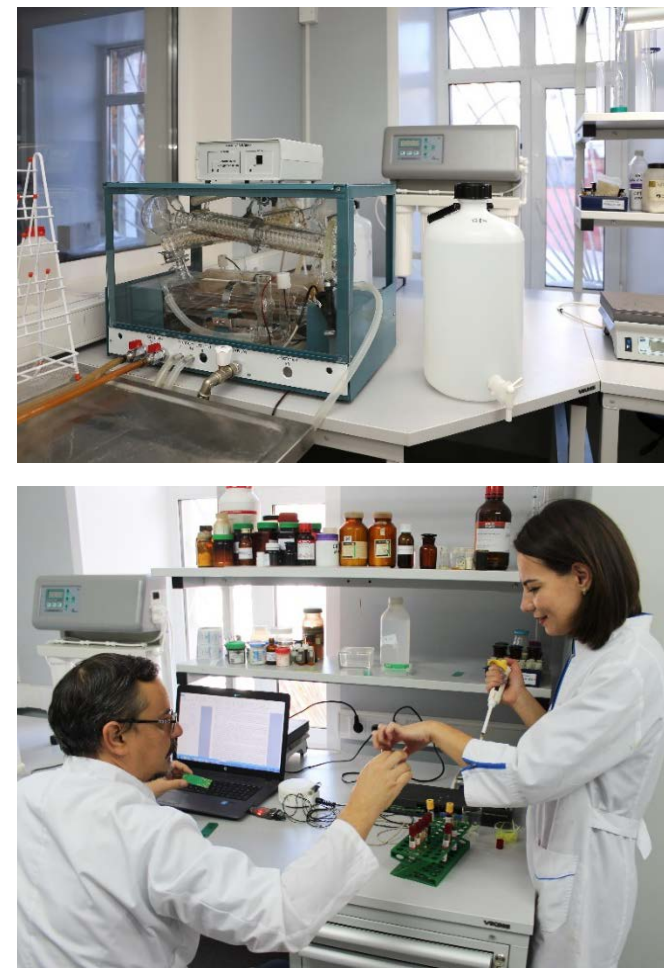


Mold printing

Lab-on-chip express diagnostic systems  
An ultramodern approach to analysis, which reduces the time to obtain results and does not require contacting the laboratory

#### Great variability of analysis methods:

- Express Analysis Separation Methods
- Electrochemical analysis methods
- Routine and screening rapid tests
- Differential diagnosis in the general medical network
- Early diagnosis of HFRS, health screening analysis



*Ideal for mobile labs and personal use*



#### GAS ANALYSIS MODULE

Compact universal instrument for measuring hazardous substances concentration in the atmosphere.

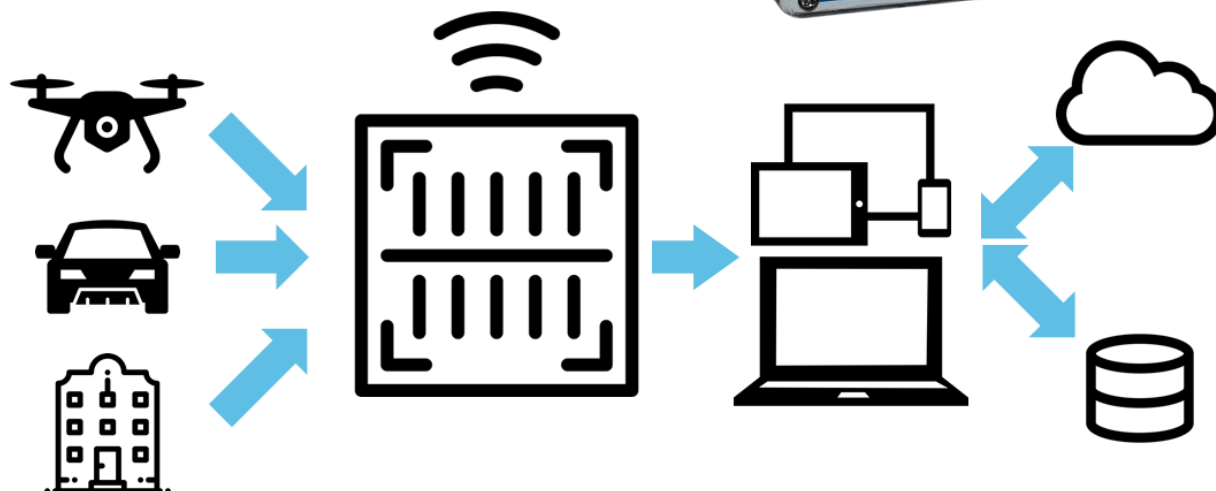
- **Most toxic gases can be detected:**

- NO<sub>2</sub>
- SO<sub>2</sub>
- H<sub>2</sub>S
- CO
- HCHO
- VOC

- **Operation temperatures:**

-10°C - +40°C

- **Power voltage:** 6V, 12V, 24V  
or 220V using an adapter



## Developments of Samara State Medical University

### Cell and tissue engineering technologies

Tissue bioengineering technologies and tissue therapy, the application of different components of human tissues are well-known highly effective methods of regenerative medicine.

- More than 100 variants of bioimplants are made from bone and cartilage tissue, tendons, fascia, brain cover for clinical use in adult and pediatric traumatology and orthopedics, dentistry, ophthalmology, ENT, general surgery
- A unique clinical and technological complex for restoring the lost volume of bone tissue, using individual endoprotheses from the Lioplast biomaterial, was developed and introduced for the first time in Russia (it has been manufactured by Samara State Medical University for Samara for more than 30 years)
- Products are used in 80 cities of Russia, known in Germany, Spain, France.



## The international cooperation Scientific centers and laboratories

- **2015** - International biotechnological laboratory for the cultivation of heart valves. **Partners:** University of Dusseldorf Heine
- **2017** - International Research and Production Laboratory for the Study of Medical Additive Technologies. **Partners:** University and University Hospital of Saint-Etienne
- **Collaboration with the Plant Biotechnology Laboratory Francois Rabelais Tours (France):** joint research, publications, educational projects, internships, exchanges of students, graduate students, teachers





**THANK YOU FOR YOUR ATTENTION!**

