



**InnoRenew CoE**

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# University of Primorska Equipment

## Equipment obtained through the InnoRenew project

Update: 25/03/2022

University of Primorska,  
Koper, Slovenia



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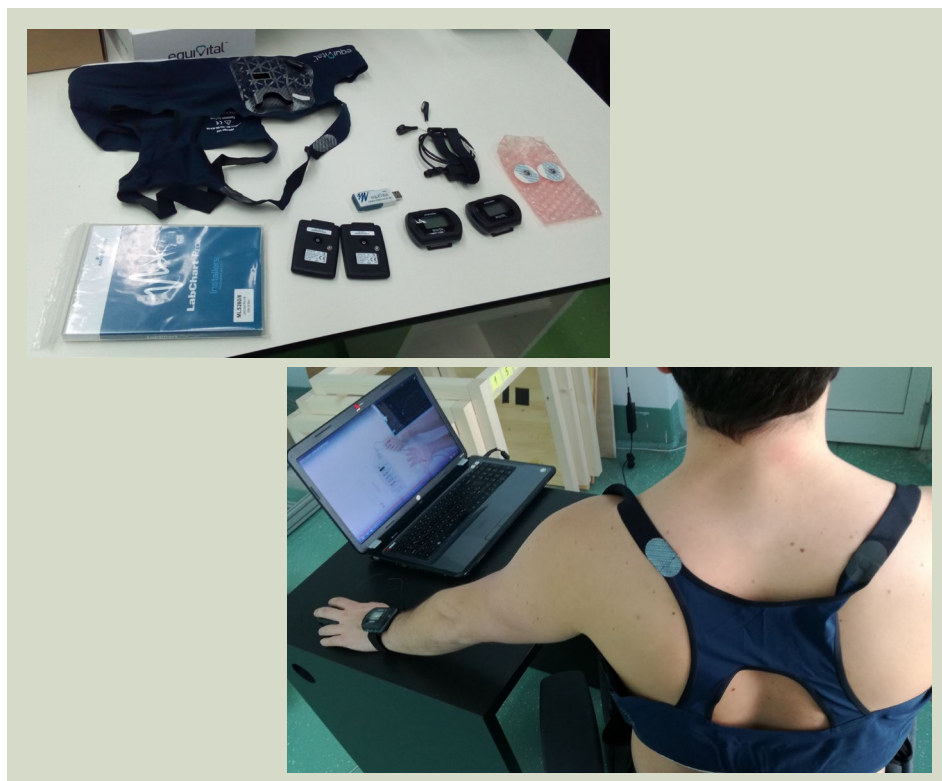
# LABORATORY FOR PHYSIOLOGICAL, NEUROLOGICAL AND BIOCHEMICAL RESPONSES



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## Wireless system for tracking cardiorespiratory and skin responses



- Sensor, mounted on human body that measures ECG, heart rate, breathing rate, skin temperature, activity and body position and connects to external sensors for data storage and transmission. It is used in sports, ergonomics and rehabilitation research.

**Owner institution:** University of Primorska

**Location:** Industrijska 4b, Izola

**Contact:** Nejc Šarabon  
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## Portable near-infrared measuring system



- Near-infrared-spectroscopy (NIRS) is a spectroscopic method that uses the near-infrared field of the electromagnetic spectrum (from 780 nm to 2500 nm). This method is used in medical, sports, ergonomic and rehabilitation research.

**Owner institution:** University of Primorska

**Location:** Industrijska 4b, Izola

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## Accelerometer for monitoring physical activity and sleep



- Accelerometer ActiGraph is designed to evaluate the intensity of movement activity. With the help of the accompanying software, it gives us the information about time we spent in low, moderate and high activity. It also gives us the information on the number of steps and energy consumption. In addition, we can evaluate the quality of sleep.

**Owner institution:** University of Primorska

**Location:** Industrijska 4b, Izola

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## Immuno-diagnostic systems - iSYS

Multi-disciplinary automated immunoassay device



- Assay serum, plasma, blood, saliva, urine for a variety of endocrinological indicators
- Enzyme activity
- Spectrophotometer, magnetic particle chemiluminescence
- First results within 8 minutes
- Auto-process up to 120 samples

**Owner institution:** University of Primorska

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**Contact:** Michael Burnard  
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## Body Pressure Mapping System for Sitting/Table (Pressure films)



- Pressure films are used to detect the redistribution of pressures on the substrate. They can objectively evaluate comfort while sitting and optimize the redistribution of pressures while sitting. With the help of the corresponding programme, we can define areas where the pressures are too high (red colored) and areas where the pressures are acceptable (blue colored).

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## Stadiometer – High precision measurement device for spine height measurements during sitting



- A stadiometer is used to measure the spinal curves (lumbar, chest and neck). It can evaluate the change in spinal curves over a certain period (e.g., before and after an 8-hour sitting and before and after an 8-hour sitting with active breaks). The stadiometer is extremely accurate since it allows reading the measurements to three decimals.

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## Mobile wireless EMG system

- The electromyography measuring system is aimed at implementing the **electromyography method**. Electromyography is a non-invasive electro-diagnostic **method for assessing and recording electrical activity caused by skeletal muscles**. The measuring system enables the simultaneous evaluation of muscular activity on 16 different muscles.

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# LABORATORY FOR RESEARCH OF RENEWABLE MATERIALS



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## Camera module for kinematic system with active markers



- The system enables precise and high frequency digital recording of **reference points (markers) in 3D space**. Markers are usually placed in pre-defined places on the human body, which are then recorded by the camera and converted into digital form. This allows accurate tracking of the observed motion in the room and further basic and advanced kinematic processing.

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## Hyperspectral imaging system

Acquire spectral maps of diverse objects in visible and infrared ranges



- Five hyperspectral cameras covering following the bands: VNIR (400-1000nm), NIR (900-1700nm), SWIR (1000-2500nm), MWIR (2.7-5.3 $\mu$ m) and LWIR (8-12.4 $\mu$ m)) produced by SPECIM and two dedicated scanners (20cm x 40cm and 50cm x 100cm) allow chemical mapping of various materials. The software can be used for exploratory, qualitative and quantitative analysis.

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## Spectrophotometer



The spectrometer is a mobile device used to quantify color and gloss of objects.

Using 45 deg circumferential illumination, excellent repeatability is achieved in measurements. This device is perfect for assessing color change in materials undergoing durability tests, modifications, etc.

**Owner institution:** University of Primorska

**Location:** Glagoljaška ulica 8, Koper

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## Vibration measurement and assessment system

A set of accelerometers, cables, an acquisition unit and a processing computer



For monitoring and assessment of building and building component vibrations with calculation of periods, mode shapes, etc.:

- One 16-channel acquisition unit
- Five 3-axial MEMS accelerometers, each with 50 m of cable
- Sixteen 3-axial MEMS accelerometers, each with 20 m of cable
- One laptop with processing software

**Owner institution:** University of Primorska

**Location:** Glagoljaška ulica 8, Koper

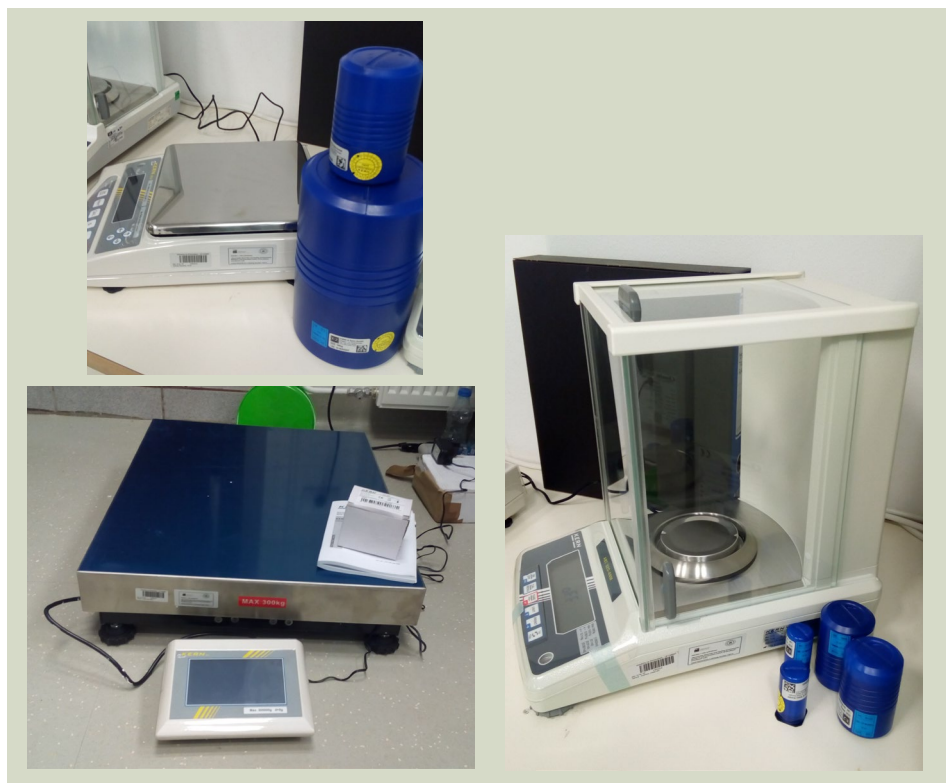
**Contact:** Iztok Šušteršič  
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## Weights and scales



Three scales:

- 1.) capacity to 300 kg
- 2.) capacity to 10 kg + weights
- 3.) capacity to 300 g + weights

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**Location:** Glagoljaška ulica 8, Koper

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## Zwick/Roell Creep Machine

Creep testing of materials

10 kN capacity long-term testing device. Five independent loading stations with fixtures for tension, three-point bending, and compression. Features a programmable environmental chamber for temperature and humidity control.

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## EQUIPMENT FOR DUST MONITORING





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## Dust monitor

EDM 365



The Model 365 is a mobile stand-alone environmental monitoring station that is used for monitor air pollution.

All particles (aerosol) passing through the measurement cell are classified by size distribution into 31 channels.

Based on this size distribution principle, EDM 365 obtained the European Equivalence Approval for PM10 and PM2.5 as well as the US-EPA Approval for PM2.5. In addition to the PM10 + PM2.5 + PM1 values, the contribution of semi-volatile compounds is measured. Scientists all over the world agree that the semi volatile compound (SVC) fraction normally produced by man-made processes (industrial areas, automotive, combustion, etc.) can amount to 20-50% of the total dust.

Additionally, to particulate matters, this stand-alone environmental monitoring station measures relative humidity, temperature, wind speed, wind direction, precipitation and atmospheric pressure.

All measured data can be used to determine the sources of fine particulate matter.

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# UPDATED IT INFRASTRUCTURE AND EQUIPMENT



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## Computer laboratories

### Research work



- With purchased IT equipment, we fully upgraded three computer laboratories and supplemented one computer laboratory. The laboratories are modernly equipped with 16 or 20 computers. For the needs of research work, dual operating systems (Linux Ubuntu and Windows 10) are installed on all computers. Standardized software enables research work for different fields.

**Owner institution:** University of Primorska

**Location:** Glagoljaška ulica 8, Koper

**Contact:** Albert Kleva Tomc  
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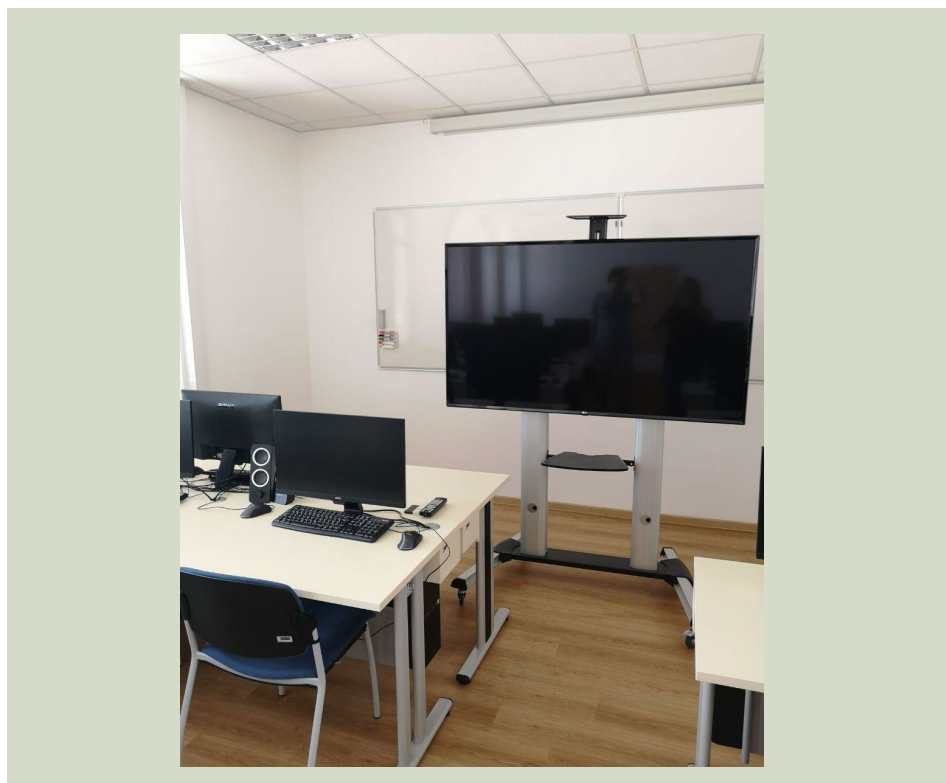
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## Lab TV

Presentations and seminars about research work



**Owner institution:** University of Primorska

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albert.kleva-tomc@famnit.upr.si



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## Seminar room

Presentation of research work



- With the modernization of the IT equipment, several new seminar rooms were upgraded. In the seminar room a computer, a modern projector and a suitable projection screen are installed for the needs of the research process. With the installed equipment, the quality of various presentation is enabled.

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## Computer network and server infrastructure

Improving research work



- The server infrastructure and computer network were updated. The central system room is richer for two new servers. A great acquisition is a **more powerful server for computing**, which will primarily be dedicated to research work and performing more complex tasks. The other server is data and is gradually being transferred to databases and repositories for storing working files of researchers and administrative staff of the InnoRenew CoE.

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## Printer

Improving research work



Color laser printer XEROX Versalink

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## Cluster

### Improving research work



A computer cluster is a set of loosely or tightly connected computers that work together so that, in many respects, they can be viewed as a single system. The components of a cluster are usually connected to each other through fast local area networks, with each node (computer used as a server) running its own instance of an operating system.

The computing cluster at UP FAMNIT consists of 24 computers with 16 CPU cores, 32 threads capability and 32 GB of RAM and a GPU unit. In total, the cluster is capable of computing 768 processes in parallel. Each computing node consists of an AMD Threadripper CPU, 32 GB RAM, NVME disk and an NVIDIA GTX 1080ti GPU.

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## Licenses

### Improving research work

Four licenses:

- Wolfram Mathematica Multilicence
- Ansys Academic Research
- Tobii Full Pro Lab Perpetual license
- Tobii Pro VR Analytics Perpetual license
- MATLAB Campus-Wide license

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## DESIGN STUDIO

*Vision: "Internet of Things as a method of designing future interactive objects to improve everyday life."*

Objects and built environments surrounding us are gaining computational and communication capabilities and provide new opportunities for interaction design. Both objects and built environments are core to the InnoRenew project. Interacting in such spaces requires research conducted in two dimensions: exploring interaction with physical materials and objects in living environments and interacting with digital capabilities of these objects. Only the right combination of the two can provide peak user experiences. Some examples include (i) surfaces of physical spaces becoming triggers for digital objects, (ii) creating proxies to control digital technologies (controlling the TV through interacting with physical objects in the environment) using micro gestures on physical objects, (iii) adding emotions to physical objects through sound and visual augmentation, and (iv) mixing natural surfaces with digital parts (a wooden wall with a couple of rectangles changing texture, colour, transparency, etc. based on the time of the day, weather, etc.).



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## **Cognionics Quick-20 wireless EEG headset**

20 channel EEG and 3-axis accelerometer measurement



20 channel wireless EEG headset with dry electrodes. Enables quick setup and mobility due to Bluetooth connection. The software supports LabStreamLayer to connect to other software for data analysis.

**Owner institution:** University of Primorska

**Location:** Glagoljaška ulica 8, Koper

**Contact:** Peter Rogelj  
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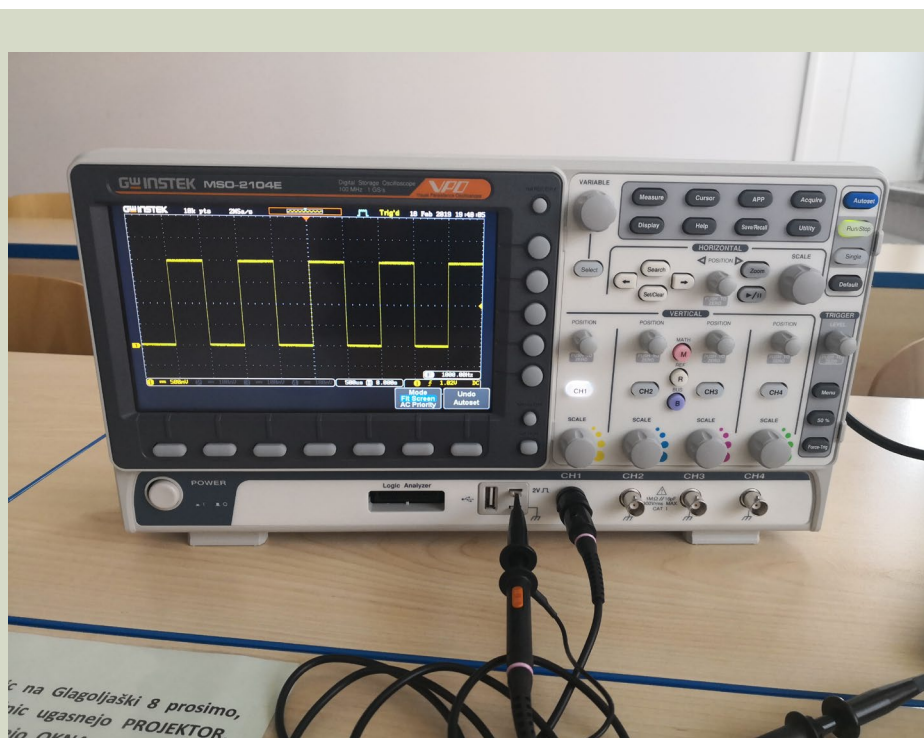
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## Gwinstek MSO 2104E digital storage oscilloscope

4-channel signal measuring and 16-channel logic analysis



100Mhz 4-channel analog and 16-channel digital inputs. Enables spectral analysis, signal decoding and analysis for I2C/SPI/UART/CAN/LIN, signal filtering functions.

**Owner institution:** University of Primorska

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## BASIC TOOLS



Basic tools are intended to support the research process by allowing researchers to **fabricate IoT devices** that have digital and physical components. Basic tools are required in order to support the design and implementation of electronic components as well as the design and fabrication of physical elements using various materials such as wood, plastic and composites.

**Owner institution:** University of Primorska

**Location:** Glagoljaška ulica 8, Koper

**Contact:** Matjaž Kljun  
Klen Čopič Pucihar



## Table based LCR

## Basic tool



LCR meter is a type of electronic test equipment used to measure the inductance (L), capacitance (C), and resistance (R) of an electronic component.

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**Location:** Glagoljaška ulica 8, Koper

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## Table-based multimeter

Basic tool



Multimeter, multitester or a VOM (volt-ohm-milliammeter) is an electronic measuring instrument for measuring voltage, current and resistance.

**Owner institution:** University of Primorska

**Location:** Glagoljaška ulica 8, Koper

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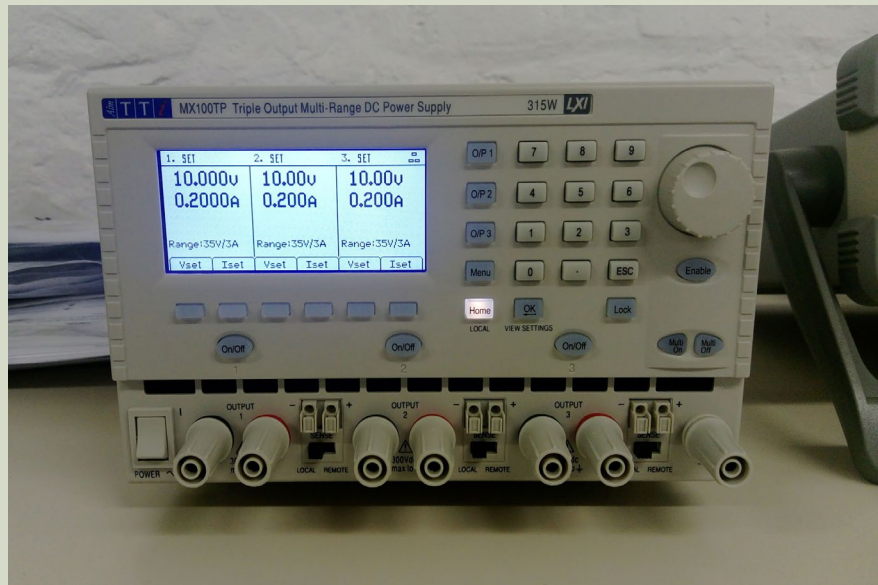
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## Laboratory power supply

Basic tool



Electrical device that supplies electric power to an electrical load by converting electric current from a source to the correct voltage, current, and frequency to power the load.

**Owner institution:** University of Primorska

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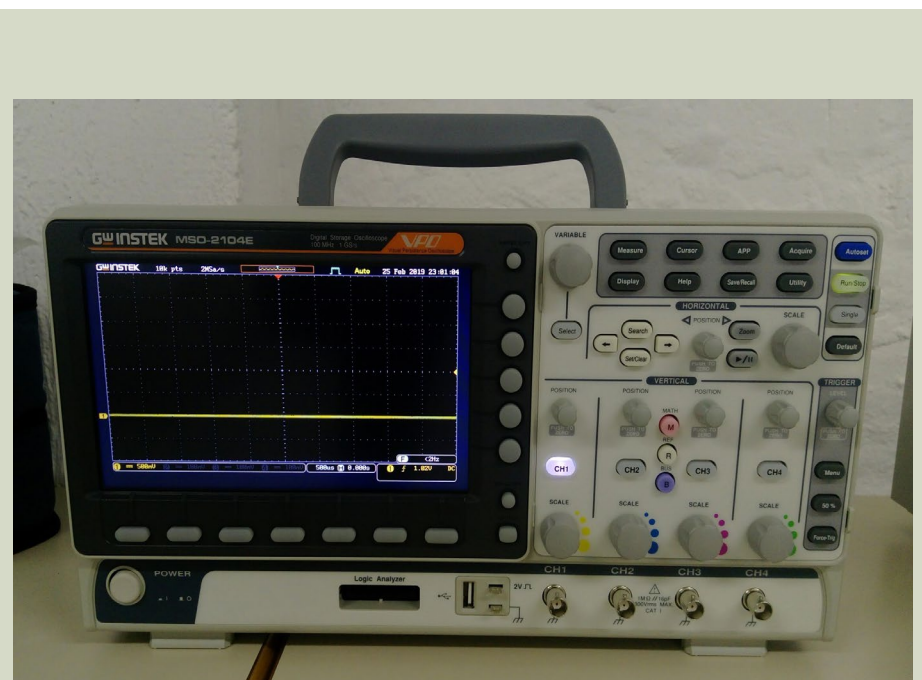
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## Oscilloscope

Basic tool



Laboratory instrument used to display and analyze the waveform of electronic signals.

**Owner institution:** University of Primorska

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## Digital soldering station

Basic tool



Device designed for electronic components soldering used in electronic and electrical engineering.

**Owner institution:** University of Primorska

**Location:** Glagoljaška ulica 8, Koper

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## De-soldering station

Basic tool



Device designed for de-soldering electronic components used in electronics and electrical engineering.

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## Manual multimeter

Basic tool



Portable electronic measuring instrument for measuring voltage, current, and resistance.

**Owner institution:** University of Primorska

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## Manual LCR meter

Basic tool



Portable electronic test equipment used to measure the inductance, capacitance, and resistance of an electronic component.

**Owner institution:** University of Primorska

**Location:** Glagoljaška ulica 8, Koper

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## Rotary laser

Basic tool



Control tool consisting of a laser beam projector useful for setting up virtual reality frames to which various sensors are attached or for installing wall interactive elements.

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**Location:** Glagoljaška ulica 8, Koper

**Contact:** Matjaž Kljun  
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## Wallscanner

Basic tool



A device for locating various materials in the walls and ceilings required when mounting wall or ceiling interactive devices or frames supporting such devices.

**Owner institution:** University of Primorska

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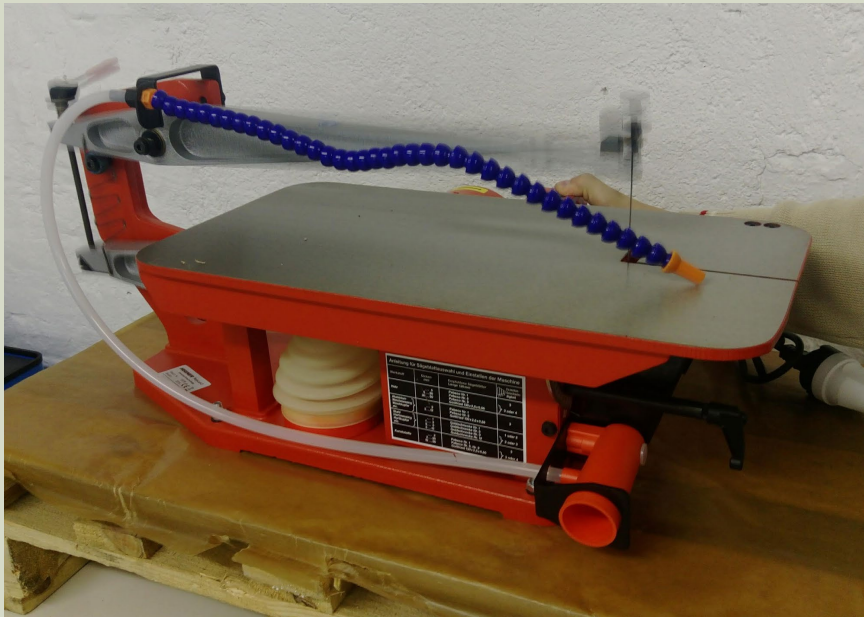
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## Table band saw

Basic tool



Precise modelling saw for cutting precise pieces of plastic or wood to produce supporting elements of interaction devices.

**Owner institution:** University of Primorska

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## 6-piece set of battery power tools

Basic tool



A set of various tools for building, cutting, fixing, screwing: Combi Drill, Circular Saw, Jigsaw, Brushless Impact Driver, SDS+ Hammer Drill, Torch

**Owner institution:** University of Primorska

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## Table band saw

Basic tool



A saw for cutting larger wooden pieces to a surface suitable for further processing in laser cutters or with other more precise devices.

**Owner institution:** University of Primorska

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## Electric hand planer

Basic tool



A device for thinning or fine finishing of wood surfaces such as wooden frameworks for augmented reality or support frames for interactive devices.

**Owner institution:** University of Primorska

**Location:** Glagoljaška ulica 8, Koper

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## Table band grinder

Basic tool



A device for precise thinning or fine finishing of wood surfaces such as wooden frameworks for AR or support frames for interactive devices.

**Owner institution:** University of Primorska

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## Table planer

Basic tool



A device for thinning or fine finishing of wood surfaces such as wooden frameworks for AR or support frames for interactive devices.

**Owner institution:** University of Primorska

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## Circular laser gauge

Basic tool



Control tool consisting of a laser beam projector useful for setting up virtual reality frames to which various sensors are attached or for installing wall interactive elements.

**Owner institution:** University of Primorska

**Location:** Glagoljaška ulica 8, Koper

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## Industrial vacuum cleaner

Basic tool



A vacuum cleaner for cleaning workshop surfaces and for retrieval on various power tools producing waste.

**Owner institution:** University of Primorska

**Location:** Glagoljaška ulica 8, Koper

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## Piston-based silent compressor

Basic tool



A mechanical device that increases the pressure of a gas by reducing its volume intended for blowing out dust from computer equipment and circuit boards.

**Owner institution:** University of Primorska

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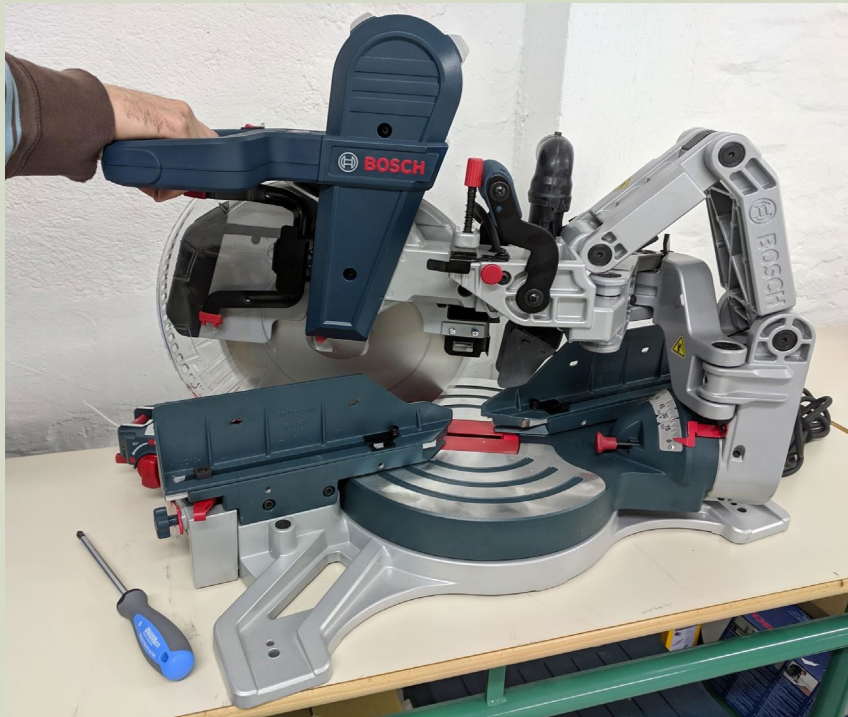
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## Mitre saw

Basic tool



A saw used to make accurate crosscuts and miters in a workpiece and cuts of different angles for preparing samples and prepare raw elements for fabrication.

**Owner institution:** University of Primorska

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## Electric file

Basic tool



File for shaping and grinding precise things.

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## Suction system

Basic tool



Waste extraction system from various machine tools. This machine is vital to lower the amount of dust in the lab.

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## Workshop tool set

### Basic tools



A set of various hand tools to help with various parts in the manufacture of stands, housings and similar frames for new research into the use of computer-aided systems.

**Owner institution:** University of Primorska

**Location:** Glagoljaška ulica 8, Koper

**Contact:** Matjaž Kljun  
matjaz.kljun@upr.si



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## Work desks

### Basic tools



A set of work desks for various jobs (soldering, cutting, grinding, etc.) with drawers for storing tools, meters, oscilloscopes and other building materials.

**Owner institution:** University of Primorska

**Location:** Glagoljaška ulica 8, Koper

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## Classroom robot kit

Design studio



A set of robots for research and support in various computer supported prototypes which can be used for various autonomous automated tasks, modelling of robot cluster, and machine learning for the collaboration between autonomous devices. Autonomous systems are vital for building future smart environments. Each robot is individually assembled according to the requirements of the research.

**Owner institution:** University of Primorska

**Location:** Glagoljaška ulica 8, Koper

**Contact:** Klen Čopič Pucihar  
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## **Handheld 3-Axis Gimbal Stabilizer with Dual Handle and Remote Control**

Design studio



Camera stabilizer for capturing professional video for various research purposes such as creating 3D virtual worlds, recording studies with users for later analysis, interviews, and recording and documenting designed prototypes, etc.

**Owner institution:** University of Primorska

**Location:** Glagoljaška ulica 8, Koper

**Contact:** Klen Čopič Pucihar  
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## Kit: Camera and two lenses

Design studio



Professional camera for capturing professional video for various research purposes such as creating 3D virtual worlds.

**Owner institution:** University of Primorska

**Location:** Glagoljaška ulica 8, Koper

**Contact:** Klen Čopič Pucihar  
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## Photo studio

Design studio



The photo studio is designed to produce professional videos for various research purposes, such as creating 3D virtual works. To be used with other cameras, photo cameras and projectors.

**Owner institution:** University of Primorska

**Location:** Glagoljaška ulica 8, Koper

**Contact:** Klen Čopič Pucihar  
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## 360° and 3D camera

Design studio



Camera to capture 360 degree video and stereoscopic video, which is then used in virtual worlds for various purposes, such as studying the immersiveness of such worlds, studying through experiential learning, etc.

**Owner institution:** University of Primorska

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## Graphics tablet – Creative Pen Display 22 inch

Design studio



Graphic tablet computer for drawing and design. For use in making user interfaces, prototyping, designing various media products, and for the support of other research work.

The special feature of this device is that it enables capacitive touch raw data access, which is vital for developing advanced touch and pen interaction techniques.

**Owner institution:** University of Primorska

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## Graphics tablet small

Design studio



Graphics tablet computer for drawing and design. For use in making user interfaces, prototyping, designing various media products, and for the support of other research work.

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## Professional drone

### Design studio



Professional drone to research influences of new buildings on environments and inhabitants; for research in the area of human-drone interaction, such as the impact on privacy; the use of drones in the case of natural and other disasters, e.g., a quick overview of the terrain, the guidance of people, helping the movement of users with disabilities; and use of drones for delivery to remote locations.

A special feature is 360 degree collision detection system, which allows full customization of the payload compartment.

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## Drone (compact)

Design studio



Smaller drone for research in the area of human-drone interaction, such as the impact on privacy, the transfer of control from one user to another, the use of drones in the case of natural and other disasters (e.g., a quick overview of the terrain, the guidance of people, helping the movement and guidance of users with disabilities), and use of drones for delivery to remote locations.

**Owner institution:** University of Primorska

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## Drone (first person mode)

Design studio



Smaller drone for research in the area of the human-drone interaction such as the impact on privacy, the transfer of control from one user to another, the use of drones in the case of natural and other disasters.

This drone supports first person view, which additionally expands research possibilities.

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## **DSD voice recorder**

Design studio



Sound recorder to support research, such as recording interviews, producing quality audio recordings, and generating multimedia content for augmented reality research.

**Owner institution:** University of Primorska

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## **Switch and Access Point**

Design studio



Switch and access point to connect various research equipment to the internet.

**Owner institution:** University of Primorska

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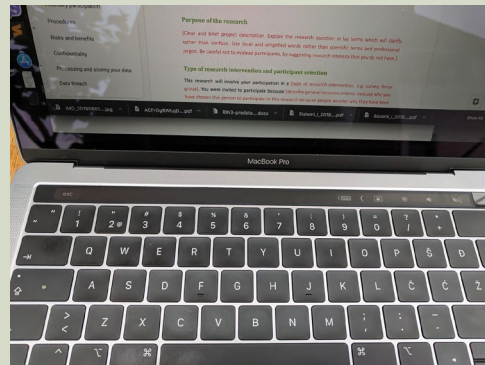
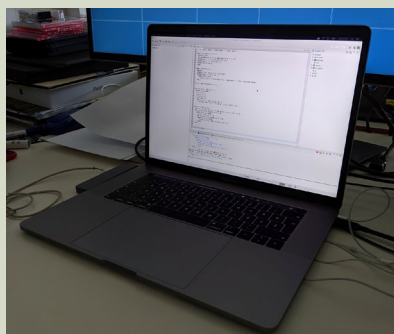
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## Upgraded computer equipment for research

Design studio



Portable computers and tablet computer for creating multimedia content and for developing applications and interfaces for macOS, iOS, tvOS watchOS and for support of various research tasks.

**Owner institution:** University of Primorska

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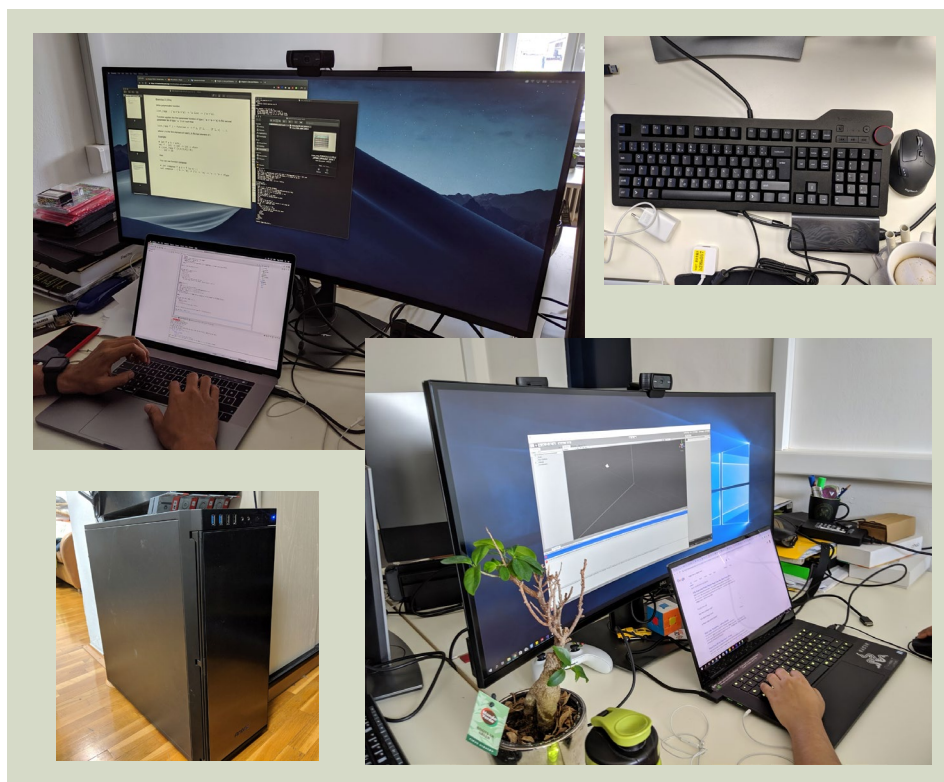


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## Upgraded computer equipment for research

Design studio



- Computer screens for media production, software development, research, and for supporting various research tasks.
- Keyboards and mice.
- A computer dedicated to support 3D printers and laser cutters, production of multimedia content, and for supporting various other research tasks.

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## A2 printer

Design studio



High-definition inkjet technology printer that supports formats up to A2.

The device is intended for printing the graphics needs to calibrate devices that use machine vision methods to print labels that are used as markers for the production of augmented reality applications where the marker is used to track the camera position in 6 degree of freedom, and, as identifier, the printer is also intended to be used to support fabrication of prototypes etc.

In addition to high-quality printing, the printer's specialty is its ability to print on thicker paper.

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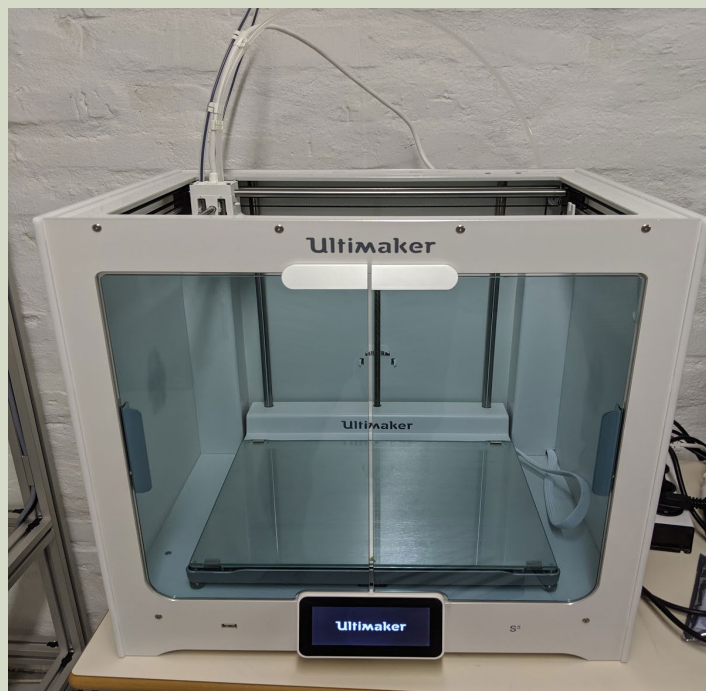


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## 3D printer

Design studio



Desktop 3D printer with FDM technology that allows 3D printing of simple objects. Its specialty is the extremely low price of basic material and maintenance of the device.

The device is intended to support the rapid prototyping needs of the design studio.

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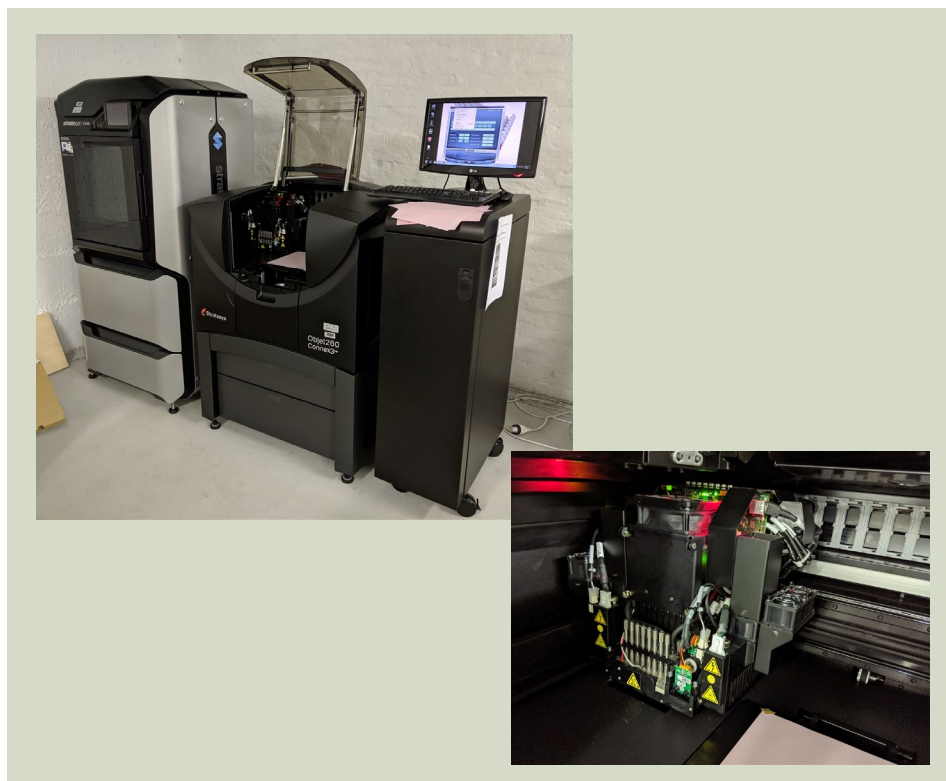


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## Advanced 3D printing system (FDM and Jet)

### Design studio



#### FDM technology

Industrial 3D printer FDM technology provides high quality printing with high precision and reliability. The printer is designed for printing various computer-aided prototypes, where high-precision quality is required and where the complexity of geometry is high.

#### PolyJet technology

A more powerful industrial 3D printer for PolyJet technology uses basic material in liquid form, which allows: multi-material printing at the same time (the printer provides three-material printing + support), any mixing of three materials (digital material), which allows printing in colors, printing with mixing material for the purpose of changing the mechanical properties of the material (strength, toughness). The printer also makes it possible to print translucent structures. The printer is designed for printing various computer-aided prototypes, where multi-material multi-color printing is at the same time, transparency is required, the finishing of finite surfaces is required. It is also intended to explore how to create products where the geometry and structure of the material at the micro level can be changed.

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## **Advanced 3D printing system: Water jet system for removing support material**

Design studio



System for the rinsing of supporting materials of 3D prints. The device is essential since the support material is difficult to remove, especially in the case of small details.

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## **Advanced 3D printing system: Cleaning system for labor-less cleaning support material**

Design studio



System for cleaning of supporting materials of 3D prints using dissolving solution and heat. The device is essential since the support material is difficult to remove, especially in the case of small details.

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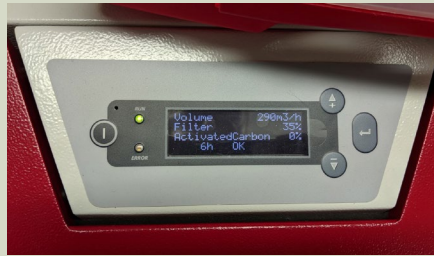
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## Laser cutter

Design studio



Laser cutter for the manufacture, processing and cutting of pieces for various housings and pieces of computer-aided devices or stands (for example, a wooden head mount display case) and for supporting various research tasks.

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## Height adjustable tables

Design studio



Tables for the multimedia design, development and for exploring the future ergonomic office and use of information and communication technologies in conjunction with new technologies, which promote active operation in an office environment, and for the support of other research work.

**Owner institution:** University of Primorska

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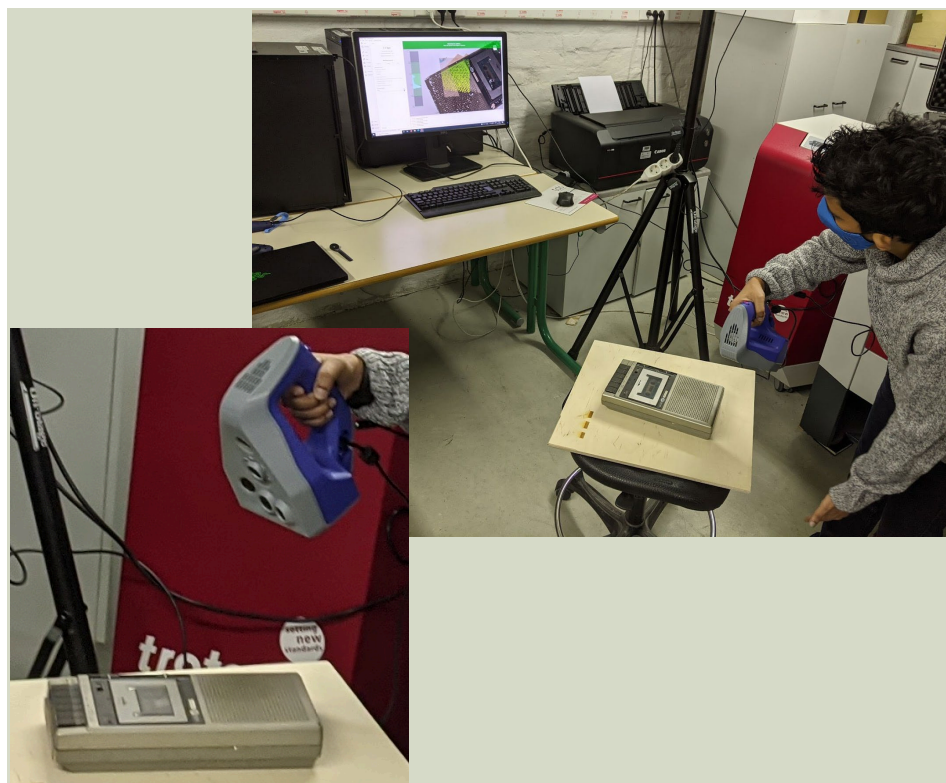


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## Handheld 3D scanner

Design studio



Handheld 3D scanner with metrological accuracy. The scanner is capable of high resolution 3D scans and can capture 3D point clouds and textures. It is an essential tool for reverse engineering and digitalisation of 3D objects that can be used in immersive digital environments. The scanner also comes with high performance software Artec Studio.

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## IMMERSIVE ANALYTICS LAB

Immersive Analytics (IA) is an interdisciplinary research area that focuses on exploring novel interaction techniques for analyzing data. The interaction with data facilitates analytical reasoning, particularly important when one wants to enhance people's ability to individually or collaboratively analyze and explore large datasets in order to: (i) discover new tacit and explicit knowledge, (ii) transfer such knowledge by supporting learning or teaching, (iii) perform decision making, especially in situations that require resolving complex and time critical problems, and (iv) carry out control or monitoring of future systems that employ artificial intelligence. This is particularly the case when one has a large amount of data. Such is the case at the InnoRenew CoE, where smart materials that will build our future environment also act as data collectors producing vast quantities of data. The challenge here is how to utilize this data in the best possible way. One possibility is to use IA data exploration techniques and tools which would be developed and advanced here. In addition, these immersive technologies (an integral part of immersive analytics) also enable one to immerse data into living environments and enable research on how people interact with such physical spaces and collaborate within them, which is also an important part of the InnoRenew project.



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## Optical see through AR display (large FOV)

Immersive analytics lab



A wide viewing angle head mount display with a wide spectrum of research possibilities into augmented reality through new interfaces that allow the mixing of real and digital objects and new worldviews, research into the impact of technology on humans and the identification of the limits of human ability to perceive such worlds. The technology enables personalization of spaces, opens up new avenues for communication with smart appliances in buildings, thus opening up new possibilities for the development of smart environments.

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## Stereoscopic camera

Immersive analytics lab



Stereoscopic camera for 3D reconstructions, capturing structures from motions or 3D scanning. The camera is used to create computer interfaces through computer vision and for the purpose of 3D reconstruction.

**Owner institution:** University of Primorska

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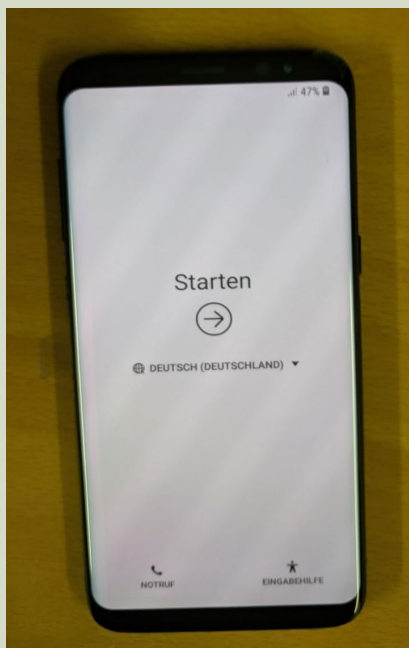
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## Smartphone

Immersive analytics lab



The phone is compatible with the Structure IO sensor, which is used to capture depth image, through which we can make conversion of the real world into different forms of presentation such as sound. Samsung devices are the only Android devices compatible with Structure IO sensor.

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## Touchscreen

### Immersive analytics lab



Screen for studying collaborative work on such screens, for the development of various touch interfaces and different input modes, for cognitive and ergonomics research for such use, for simultaneous use with, for example, multiple screens simultaneously (phone and screen) and users ability to merge information from multiple devices, and for the support of other research work.

**Owner institution:** University of Primorska

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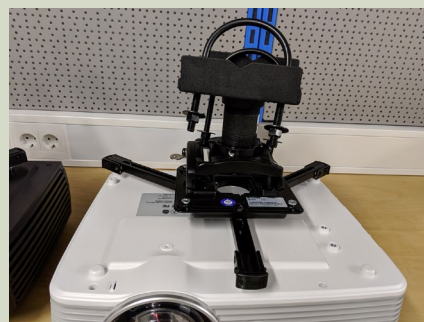


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## Projection system for illumni room

Immersive analytics lab



High intensity projector to extend the real estate and surface of screens across the entire wall, to explore the potential of immersive experiences in watching multimedia content (movies, playing games), in effects of the ambient augmented reality on users and their ability to deal with or recover from stressful situations.

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## Kit: Projector, mirror head, MDX media server system

Immersive analytics lab



A mirror-head projector with the possibility of projecting an image in a radius of 180 degrees, where each surface can become a "screen" intended for research in the area of ambient supplementary reality. The projector has the ability to project onto all walls and objects in the space and allows building of smart environments (such as smart offices) that help users in various ways to increase productivity, reduce stress, and improve communication between colleagues in a shared work environment.

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## Fast projector unit

Immersive analytics lab



A high frequency refreshment projector that can project onto moving objects for research in the field of ambient augmented reality where any object can become an interactive display.

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**InnoRenew CoE**



## Upgraded computer equipment for research

### Immersive analytics lab



#### COMPUTER FOR OPTI TRACKER

A dedicated powerful computer to be used with motion capturing system, OptiTrack, that will enable researchers to supervise, classify (computational interactions) and understand users' movements and adapt either real or virtual worlds, and for the support of other research work.

#### MEDIA SERVER/COMPUTER

Computer for development and running multimedia content through various projectors (fast, mirror projector, illumni room), video wall with 10K resolution, and high resolution virtual reality headsets (e.g., XTAL), and for supporting various other research tasks.

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## VR HMD with integrated eye tracking with software

Immersive analytics lab



Headset with eye tracking system. The device is intended for research in the field of virtual reality with an emphasis on the study of the of VR gaze and its basic characteristics, such as how we can use gaze information to build more advanced methods for planning smart environments, how can gaze be used to assess cognitive complexity, feeling and emotional response of users, can we use gaze to predict and ameliorate motion sickness problems.

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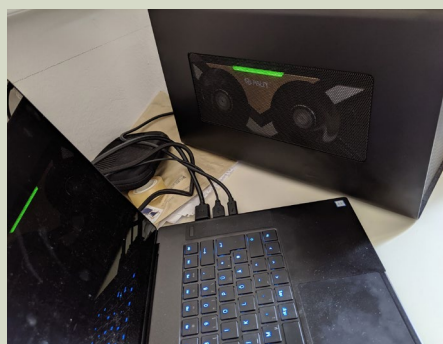


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## Laptops for VR research

Immersive analytics lab



High performance laptops with an external GPU device intended for the development of virtual and augmented reality systems. Notebooks are crucial because they allow working in different locations, which is especially important in the case of the development AR applications.

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## Videowall with touch

Immersive analytics lab



High performance wall display with touch. It can show resolution of images of up to 10800x3840 and can detect 32 touch points. The screen is important for the development in the area of information visualization where large sets of data are in question and where the goal is discovery of new knowledge through data visualization. This infrastructure is also important for the research in crisis management where optimal methods of data visualisation and interaction are explored at strained circumstances.

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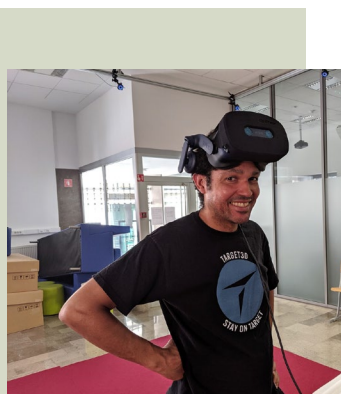
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## Tracking System and Multi-user VR System

Immersive analytics lab



This is a high quality infrared camera tracking system designed for tracking rigid and deformable objects. Such a system is needed to create or calibrate augmented and virtual reality systems, especially in a context where we want to enable collaboration of multiple individuals in the same virtual or augmented world. This kind of capability opens the door to new research in the field of immersion analytics, where we try to uncover new knowledge through data visualization in immersive virtual worlds. This kind of infrastructure also allows us to carry out remote collaboration research and explore new ways of performing remote expert assistance and education.

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## HoloLens: AR head mounted display

Immersive analytics lab



Hololens2 is a mixed reality head-mounted display that can be used for generating immersive augmented reality experiences. The device is fully mobile with advanced on-device processing capabilities.

Augmented reality is a new interfaces that allow the mixing of real and digital objects and a new worldviews, research into the impact of technology on humans and the identification of the limits of human ability to perceive such worlds. The technology enables personalization of spaces, opens up new avenues for communication with smart appliances in buildings opening up new possibilities for the development of smart environments.

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# LABORATORY FOR COGNITIVE, PERCEPTUAL AND BEHAVIORAL PROCESSES

The goal of the lab is to study a broad range of cognitive, perceptual and behavioral processes, thus expanding the understanding of human behaviour, cognition and perception that spans from understanding how perceptual stimuli are detected and processed, to the structure of decision-making and memory processes, and to how the brain translates information into action. In this context, this laboratory also plans to focus on exploring rehabilitation potentials of novel technologies, such as evaluation of neurological degenerative diseases through the capture of data with a mobile device (e.g., mobile phones and tablets) using tapping tests, spyrography, accelerometer and walk analysis. Integrating these findings into buildings of the future would allow for the curation of smarted environments that could autonomously monitor the health of its inhabitations. Besides using consumable electronics, this research facility will enable researchers to measure the user's physiological responses that are caused by interventions such as the introduction of newly designed smart physical objects and environments that have computational capabilities. Besides expanding the core understanding of how our brain works and how new technologies could be used in rehabilitation process, the vision of this research area also includes advancing the field of Brain-Computer Interfaces, which focus on exploring how captured brain signals could be used for controlling external computer systems.





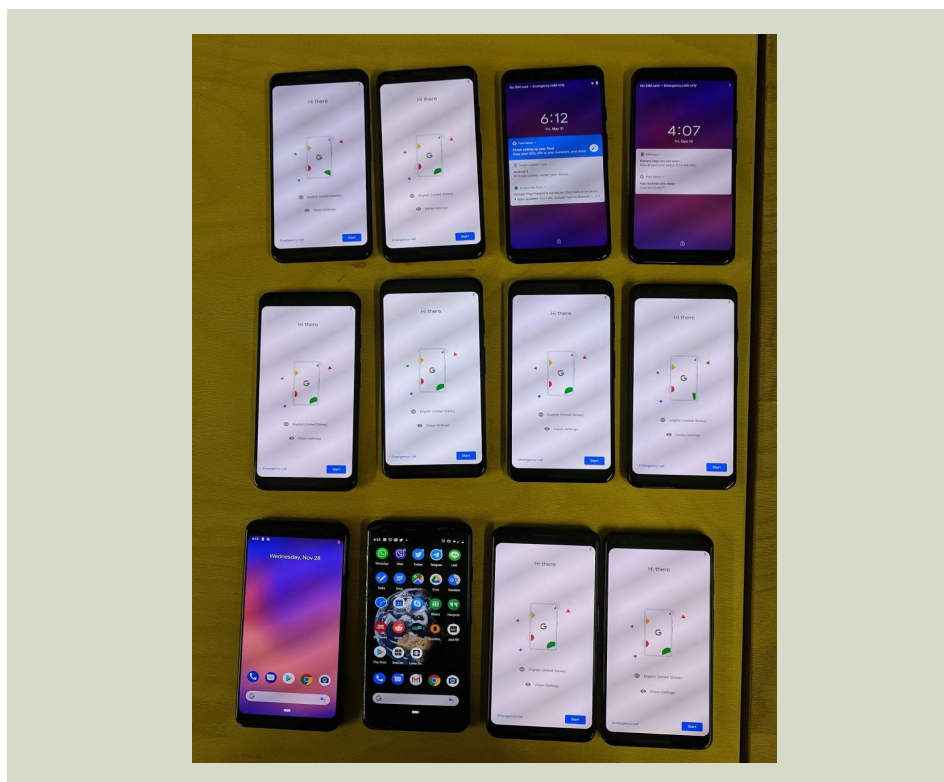
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## Smartphones

Laboratory for cognitive, perceptual and behavioral processes



Smartphones for research in various fields, such as the use of mobile devices for rehabilitation purposes evaluating progress of neurological degenerative diseases through tapping tests, spirography, accelerometry for walk analysis. Mobile phones also represent a platform for building smart environments, whether for the purpose of interacting with smart devices, such as smart homes, through which we achieve more optimal operation of the environment, a better sense of the user and potentially influence user behaviour in positive ways.

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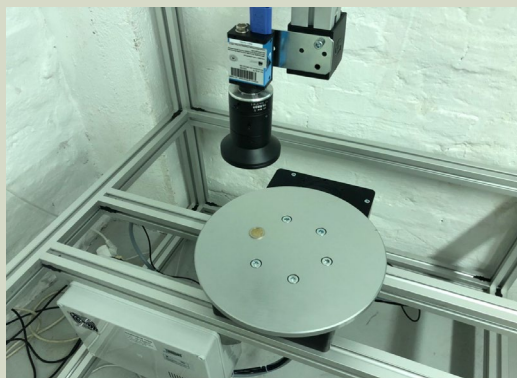


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## Industrial dual camera setup

Laboratory for cognitive, perceptual and behavioral processes



A system of two industrial USB 3.1 12MP cameras with lenses  $f=8, 12$  (2x), 25 (2x), 35 and 50mm. For development of computer vision systems.

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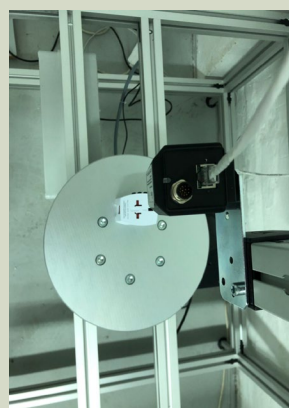
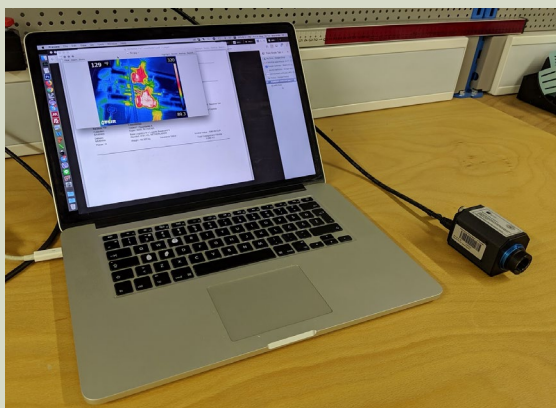
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## Thermal camera

Laboratory for cognitive, perceptual and behavioral processes



Thermal camera for sensing temperature of objects. Suitable for acquisition of thermal images of people/faces that can provide information related to physical and psychological conditions.

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## Smart tablet

Laboratory for cognitive, perceptual and behavioral processes



Tablet computers with bigger screen real estate than smartphones for various research purposes in various fields, such as augmented reality, use of mobile applications for rehabilitation purposes, for assessing neurological degenerative diseases through the capture of data with a mobile device, and for the support of other research work.

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## Chairs

Laboratory for cognitive, perceptual and behavioral processes



Chairs dedicated to the development and research of the ergonomic office and the use of information and communication technologies in connection with new technologies, which should promote active operation in the office environment.

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## Working table made of alu profiles for the needs of research work

Laboratory for cognitive, perceptual and behavioral processes



Working table for prototype setups of computer vision systems. Includes a rotational and linear drive that enables controlled image acquisition of objects from different angles and distances.

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## **PC for eye tracking, GSR, EMG, ECG**

Laboratory for cognitive, perceptual and behavioral processes



A designated computer to connect various devices such as a vision tracking device, GSR, EEG, EMG, ECG, and for supporting various research tasks.

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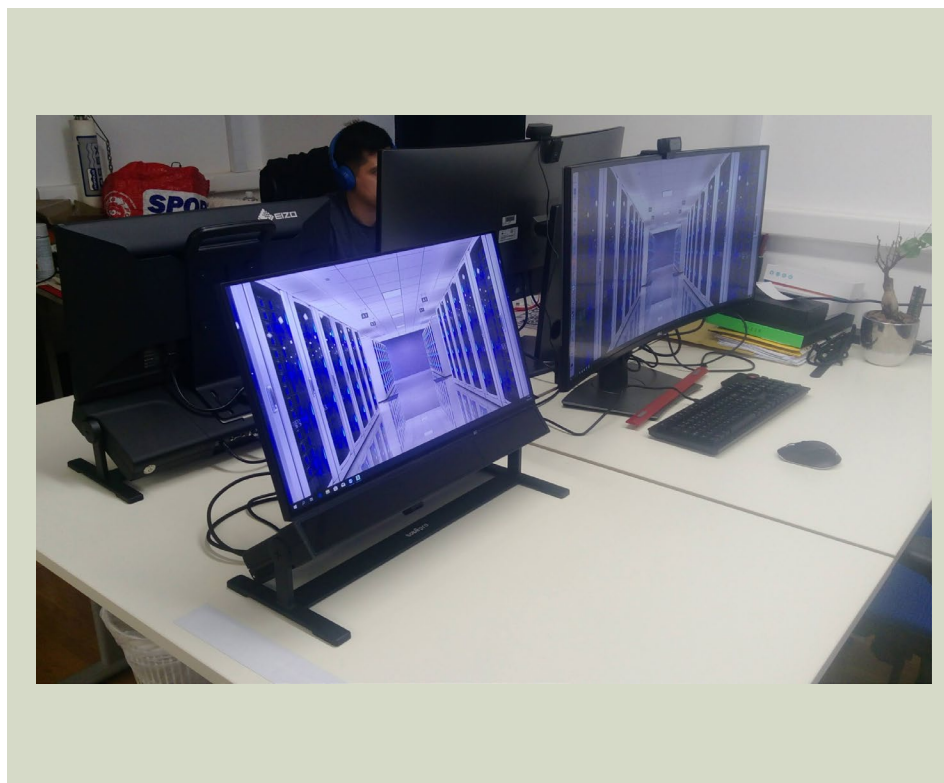


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## **Flexible system for eye tracking with software: Tobii Pro Spectrum**

Laboratory for cognitive, perceptual and behavioral processes



High frequency vision tracking system for testing user interfaces and user experience, observing the behavior of different user groups (including, for example, users with special needs, illnesses, etc.) when using computer systems.

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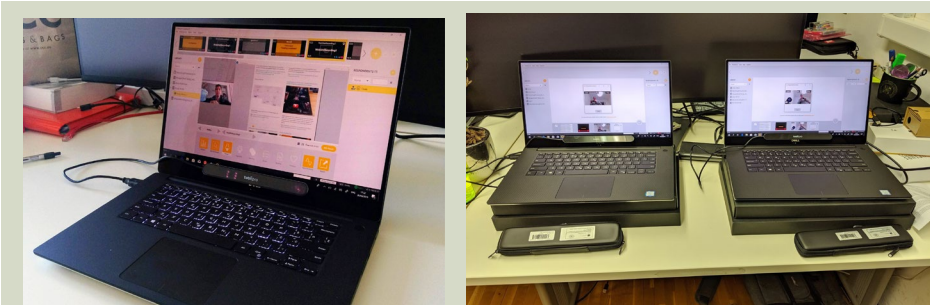
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## **Flexible system for eye tracking with software: Tobii Pro nano + Laptops for eye tracking**

Laboratory for cognitive, perceptual and behavioral processes

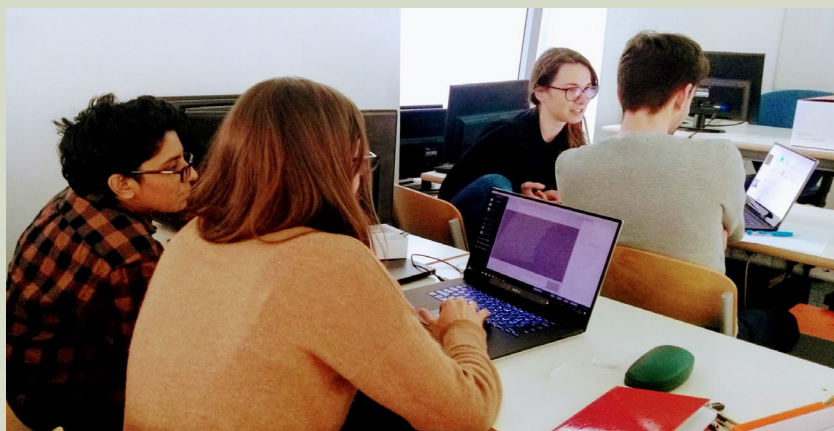


Portable vision tracking system for simultaneous testing of large user groups while they are using user interfaces and testing user experience and to observe the behavior of different user groups (including, for example, users with special needs, illnesses, etc.) when using computer systems.

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## Professional EEG

Laboratory for cognitive, perceptual and behavioral processes



EEG system for testing the response of users while using computer systems, for research in the field of brain-computer interaction and similar research. 64-channel EEG system from g.tec enables precise measurements of electric potentials on the skull and, thus, study of mental processes. Enables integration into extended system for tracking users at interaction with devices.

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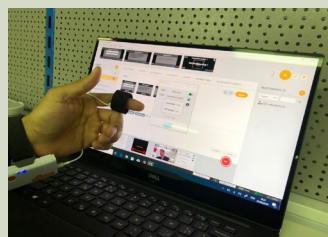
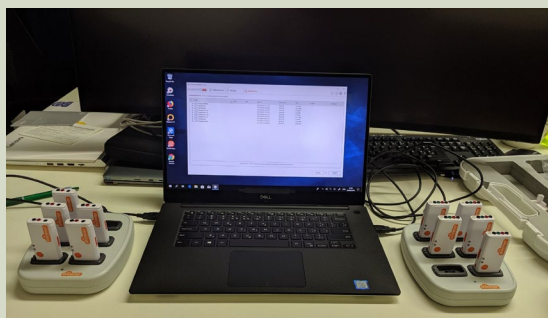
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## EMG & ECG sensing units + Galvanic skin response

Laboratory for cognitive, perceptual and behavioral processes



EMG & ECG system for studies in which we want to test the biological response of users in the use of computer systems for measuring arousal, immersiveness and other parameters.

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## Eye tracking glasses and correction lenses

Laboratory for cognitive, perceptual and behavioral processes



Eye tracking glasses for studying user response when the user does not look at the computer screen.



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## Screen based eye tracker (gaming) with API key

Laboratory for cognitive, perceptual and behavioral processes



System for gaze tracking for simultaneous testing of large user groups while they are using user interfaces and testing user experience, and to observe the behavior of different user groups (including, for example, users with special needs, illnesses, etc.) when using computer systems. The special feature of this system is that it allows operation on larger screens and contains an API key that allows full access to the source data.

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