

Digitalization of Laboratory Processes at the Aleksandre Natishvili Institute of Morphology, Faculty of Medicine, TSU



2nd October, 2024
Tbilisi

Laboratory Services

- ✓ Histopathology – Based on the routine hematoxylin and eosin (H&E)
- ✓ Intraoperative frozen section consultation
- ✓ Histochemistry
- ✓ Cytopathology
- ✓ Immunohistochemistry (based on more than 100 markers and digital analysis software)
- ✓ Molecular diagnostics (PCR)

Pathologists:

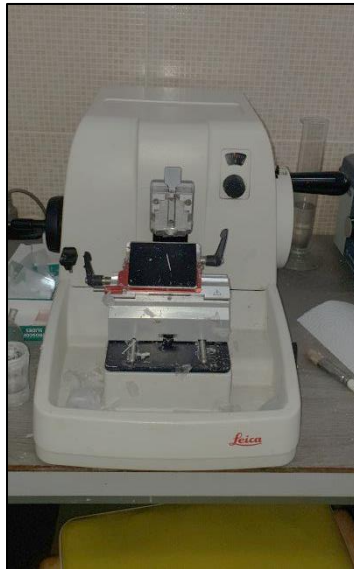
- Prof. Dr. Mikheil Jangavadze
- Prof. Dr. Sopho Mchedlishvili
- Dr. Keti Tsomaia
- Prof. Nana Goishvili

200-400 cases are diagnosed per month. Among them 50-100 represents the cases for rechecking (the second opinion) sent from different hospitals or by the patients themselves.

Digitalization of laboratory processes

- ✓ Digitalization of laboratory processes refers to the transformation of traditional manual laboratory workflows into digital formats through the integration of advanced technologies such as digital instruments, automation, data management systems, and computational tools.
- ✓ In Georgia, the state of digitalization of laboratory processes varies widely depending on factors such as economic resources, technological infrastructure, and government priorities.
- ✓ In the pathology laboratory at TSU, we undertake several steps to integrate digital workflows into our working processes.

Lab Equipment



Lab Equipment:

- ✓ Tissue Processor
- ✓ Tissue embedder
- ✓ Microtome
- ✓ Microtome for frozen sections
- ✓ IHC heater

Lab Equipment



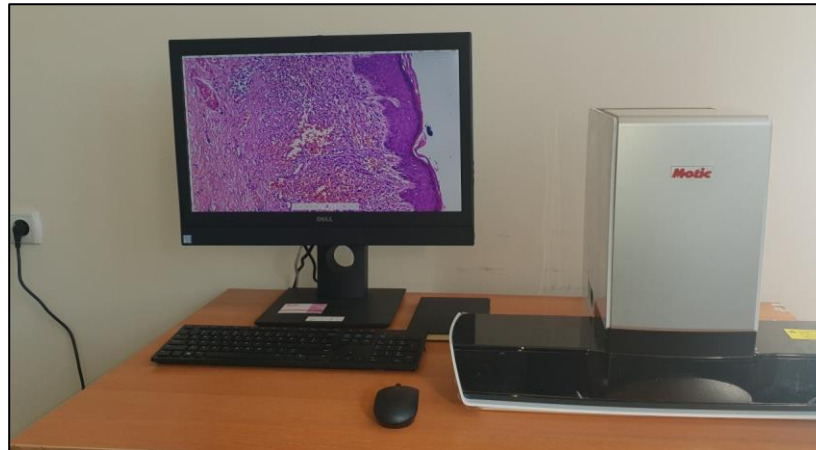
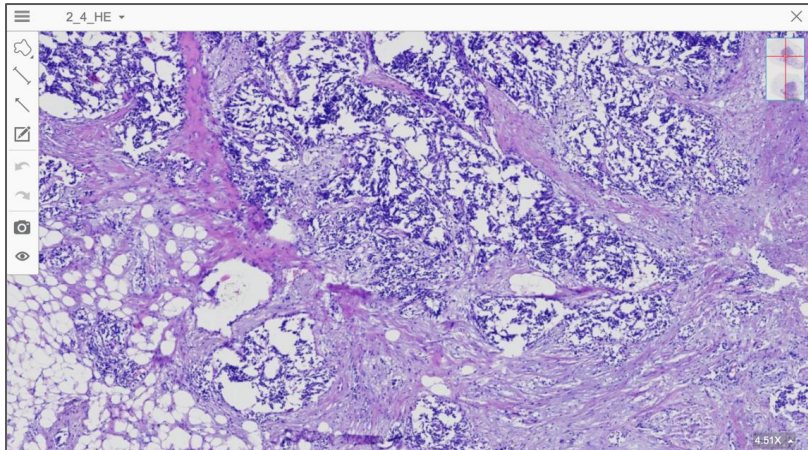
Real Time PCR (Applera)



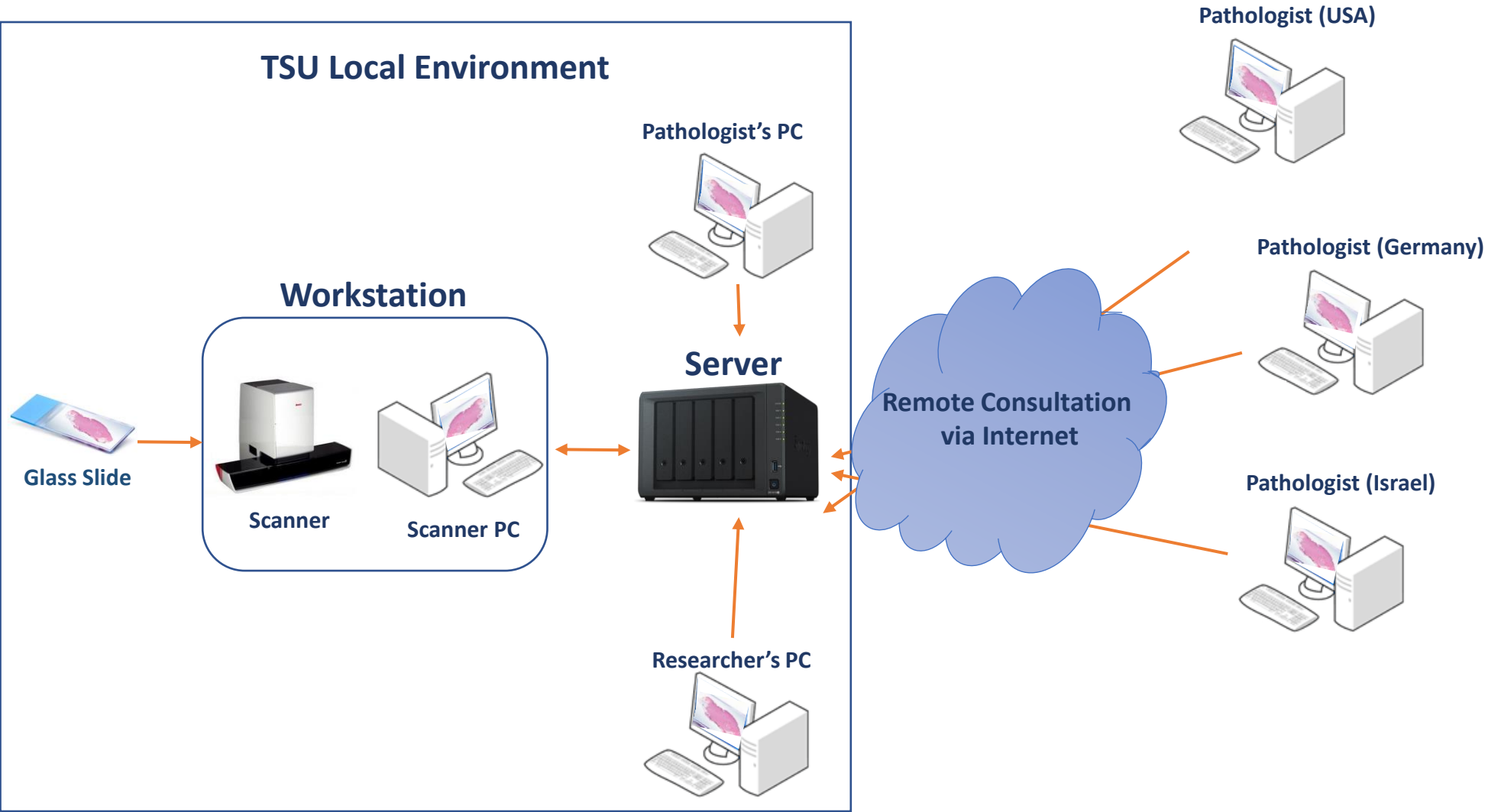
Working space with air-pressure control

Digital Pathology System

- ✓ **Scanner:** MoticEasyScan Pro 6
- ✓ **Slide capacity:** 6 slides
- ✓ **Image Resolution:** 20x (0.52um/pixel), 40x(0.26um/pixel)
- ✓ **Scanner computer:** Dell OptiPlex with 4k resolution, 23.8" LED monitor, Intel Core i7-7700 Processor, 16 GB Memory, 128 GB SSD & 1TB SATA Disk
- ✓ **Image Server:** 8TB HDD + 128GB SSD, Dell PowerEdge T40 Server, Intel Xeon E-2224G 3.5GHz, 16GB 2666MT DDR4



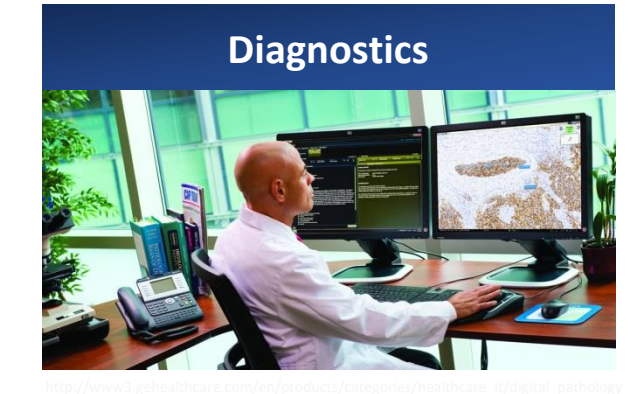
IT Infrastructure of Digital Pathology Laboratory at TSU



Digital Pathology System

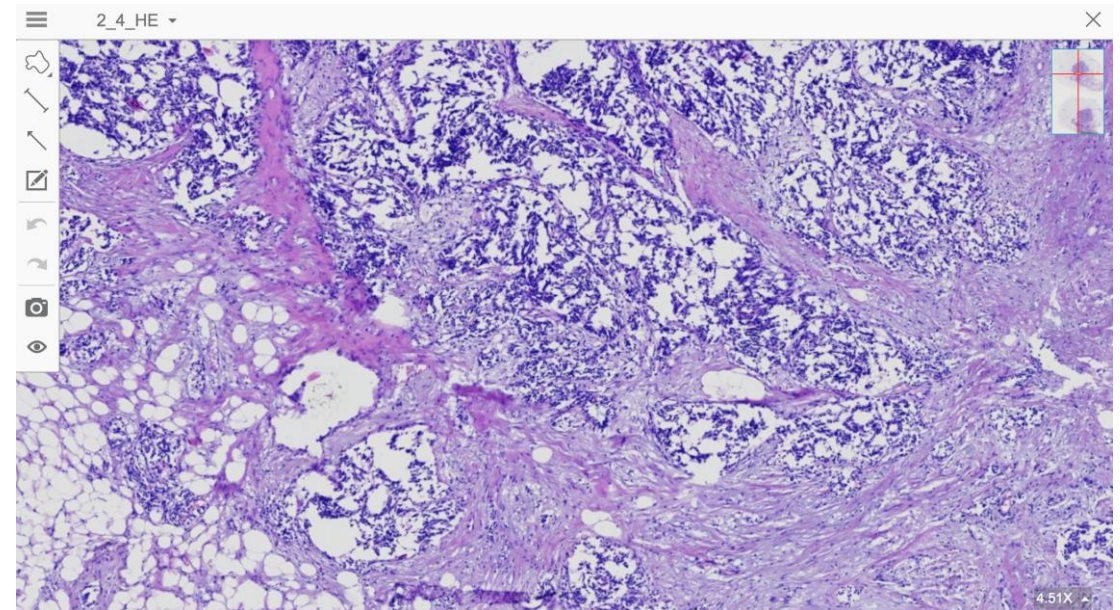
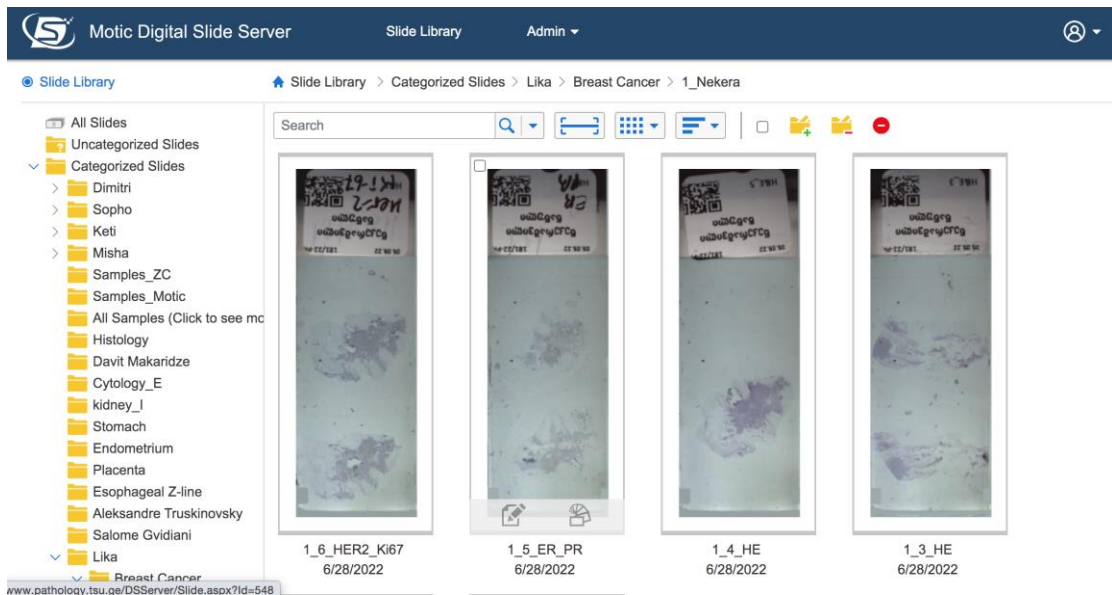
We use the Digital Pathology System for several purposes:

- Remote consultation ✓✓✓
 - USA
 - Germany
 - Spain
 - Israel
- Research ✓
- Education ✓
- Routine diagnostics ✗



Current state of Digital Pathology System at TSU

- 4 Pathologists – personal account and separate space on the server
- 15 Guest users (remote pathologists, researchers)
- Scanned images: 850 slides
- Cases: 65 patient cases
- Available via software and Web Access from any computer
- Annotation and measurement tools integrated in the image viewing system



Research Project

- **Title:** Development of a Complex Model for Breast Cancer Classification using Digital Pathology
- **Goal:** to create a complex model for breast cancer classification that determines the **degree of histological malignancy** of breast cancer and classifies the **subtype** according to receptor status based on the histological images using machine learning algorithms.

	1 point	2 points	3 points
TUBULE FORMATION What percentage of the tumor is made of normal appearing tubules?	>75% 	10-75% 	<10%
NUCLEAR PLEOMORPHISM Are the nuclei small and uniform; large and bizarre; or somewhere in between?	Small, uniform, same size No nucleoli 	Enlarged, but mostly same size Nucleoli present 	Large, bizarre, dark nuclei Prominent nucleoli
MITOTIC FIGURES How many mitotic figures can you find in 10 high powered fields (40x) in the "worst" part of the tumor? <small>NOTE: Actual count varies by the field diameter of your microscope. Using a high power field diameter of 0.50 mm, the criteria are as follows:</small>	Rare 0-9 mitoses 	Frequent 10-19 mitoses 	Abundant 20 or more mitoses

Competitive Innovation Fund (CIF) Project in Molecular Pathology

- ✓ **Project Name:** Development of a molecular pathology curriculum and Implementation in Georgian universities in order to improve higher medical education
- ✓ **Head of the project:** Prof. Mikheil Jangavadze
- ✓ **Project duration:** 18 months (06.2024 – 12.2026)
- ✓ **The main goal is to enhance the teaching of molecular pathology in Georgia's higher medical school by:**
 - Creating and implementing educational course of **molecular pathology** for first-level medicine, residency, master's and doctoral students in biology
 - Creating modernly equipped interuniversity **teaching-research molecular pathology laboratory** ("Hub") and a **center of bioinformatics** for the joint scientific-educational activities of scientists and students
 - The preparation of the interuniversity structural **doctoral program** of molecular pathology for accreditation



Innovation, Inclusion and Quality



საქართველოს განათლებისა
და მეცნიერების სამინისტრო

Applied project for Horizon Widening Call – Twinning: Bottom Up

- ✓ **Project Name:** Twinning to Enhance Liver Transplantation Research
- ✓ Applicant: Aleksandre Natishvili Institute of Morphology, Faculty of Medicine, TSU
- ✓ Collaborators from Spain, The Netherlands, Switzerland
- ✓ Evaluation mark: 12 points (from 15)
- ✓ Next call in 2025
- ✓ Main priorities: **Digital transformation**, Green Deal



Our interests and future directions

Research, education and diagnostic purposes:

- ✓ Image processing and Digital pathology
- ✓ Data management process in pathology laboratory
- ✓ Bioinformatics for molecular pathology

Thank you for your attention!

