Healthcare industry BW

**Company profile**

# HS-Analysis GmbH – using digital histology to develop new drugs

**The idea of analysing tissue samples automatically sounds more of a pipe dream than anything else. However, it already happens. HS-Analysis GmbH's ability to interpret tissue samples automatically is driving new drug development a decisive step forward.**

Sergey Biniaminov graduated with a diploma in Economics and Political Science at Karlsruhe Institute of Technology (KIT) and now he is managing shareholder at HS Analysis GmbH, based in Karlsruhe, Eggenstein-Leopoldshafen. HS Analysis means "High Scale Analysis" and stands for the management of Big Data, which focuses on the efficiency of drug development. HS Analysis employs computer scientists, researchers and designers with the goal to secure trust in artificial intelligence in life science. “With our different backgrounds, we complement each other very well. We believe that we are well prepared for rapid growth and sustainable development of the company,” says Biniaminov.

## Automated digital histology

Managing shareholder of HS Analysis GmbH: Sergey Biniaminov

HS-Analysis GmbH develops software that enables researchers, pathologists and other researchers in the pharmaceutical industry and university hospitals to analyse tissue samples automatically. Tissue samples that are prepared in companies and institutes are digitalised using a microscope robot called a slide scanner, and subsequently analysed with HS-Analysis software. Biniaminov regards whole-slide imaging (WSI) as the key element in this area of research because it uses digital scanners to scan conventional glass slides with whole tissue sections in order to produce digital ones with high microscopic resolution.

The company's development team trains the software based on scans produced by HS-Analysis GmbH clients with slide scanners. They teach the software to recognise and automatically analyse different features in the tissue section. This can be simple features such as the colour components of the image and more complex features such as morphological tissue properties. A method called deep-learning needs to be applied for more complex analyses. Different examples are used to teach the software how to analyse tissue samples. The algorithm is trained using about 100,000 different examples. Different parts of the tissue section are used so that a training session with 100,000 examples needs around 70 tissue sections. "We have set ourselves the goal of significant reduction of the data required for the training of corresponding artificial neuronal networks", says the expert.

## Automation in pharmaceutical research

This is what the tissue analysis software can look like. All clients receive customised software versions.


The software makes it possible to see digitalised histological sections on the screen in continuous magnifications. This cannot be done with microscopes, which have objectives with specific magnification levels. Researchers usually use so-called tissue microarrays (TMAs) to achieve a relatively high sample throughput. Tissue microarrays are slides on which dense arrays of small tissue discs are arranged. Such microarrays enable the simultaneous analysis of a relatively large number of biopsies. The software is particularly useful for high-throughput analyses, which is why the development team ensures that the software is suitable for TMA analyses.

## Speeding up drug discovery

A pharmaceutical company looking for a new drug often uses digitalised histological sections. The effect of drug candidates is assessed with tissue samples. The HS-Analysis GmbH software enables researchers to analyse tissue samples much faster than they can using conventional methods. "Our clients receive a modular, scalable solution that enables them to speed up the evaluation of studies, thus saving time and money and delivering a higher return on investment," says Biniaminov. The software uses the most modern algorithms and has an extremely high degree of usability.

## Digital histology for all organs

The company HS Analysis is most experienced with kidney and brain sections. The software is able to automatically recognise renal glomeruli. Renal glomeruli are located in the cortex of the kidneys and are the first stage in a process that filters primary urine from blood. The HS-Analysis GmbH software can also recognise fibrotic changes in the renal glomeruli. Necrotic changes occur when damaged tissue is replaced by a connective tissue-like protein matrix.

In addition to the analysis of organ-specific tissues from the lungs, heart or intestines, cancer is another important issue HS-Analysis GmbH focuses on. The company analyses cancer-specific markers as well as blood vessels, as tumour blood vessels differ from their normal counterparts. Immunohistochemical labelling of blood vessels, i.e. staining blood vessels with antibodies, makes it possible to determine the number of blood vessels and their proportional area in the tissue. Biniaminov is convinced that no matter what kind of tissue or disease the software is applied to, it will help save time in the search for new drug candidates. He also firmly believes that digital histology will quite quickly make a contribution to improving patients' quality of life.