Epifanov Rostislav

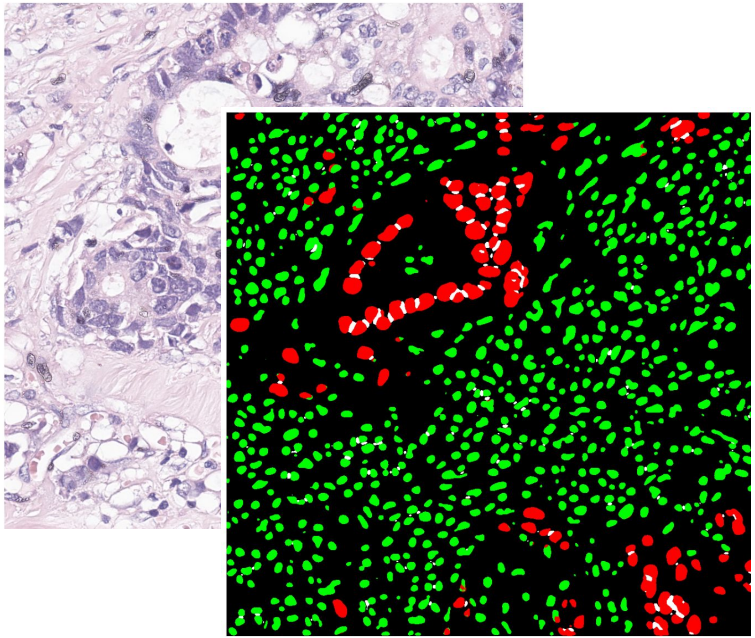
Experience in computer vision

Software for TC value calculation on pancreatic and colon histological images (2023)

Problem: software development for TC value calculation on pancreatic and colon histological images.

Multitask neural network learning was applied to develop an algorithm for determination of unique cells on histological images. Using found unique cells were calculated TC value.

According to test phase, the developed algorithm was ranked on seven place in PAIP2023 challenge at the ISBI conference (B+).

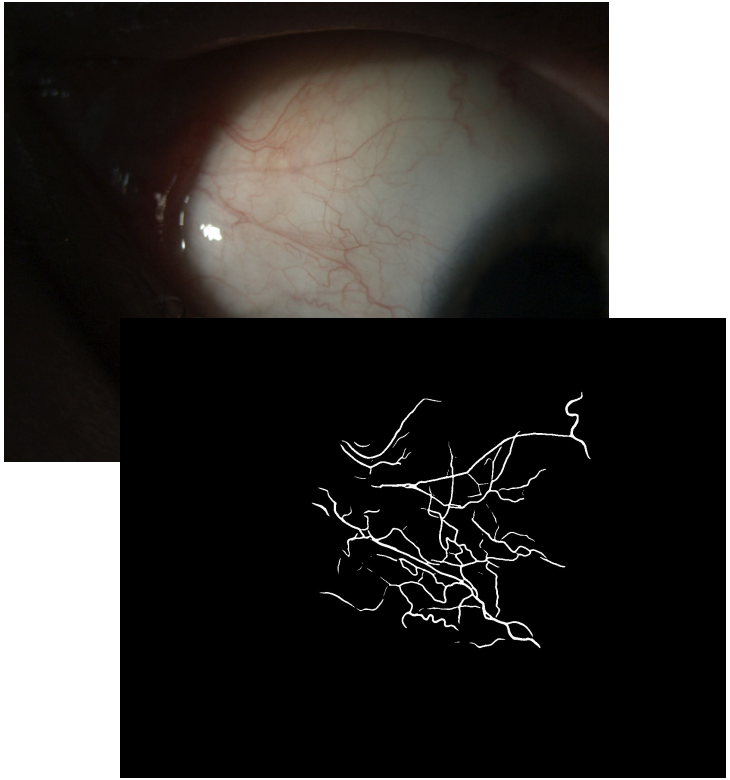


Top: histological image
Bottom: its cell mask generated by the algorithm

Software for retinal vessel detection (2022)

Problem: software development of retinal vessel detection using images from the ophthalmic slit.

An approach using the U-net neural network architecture is proposed.

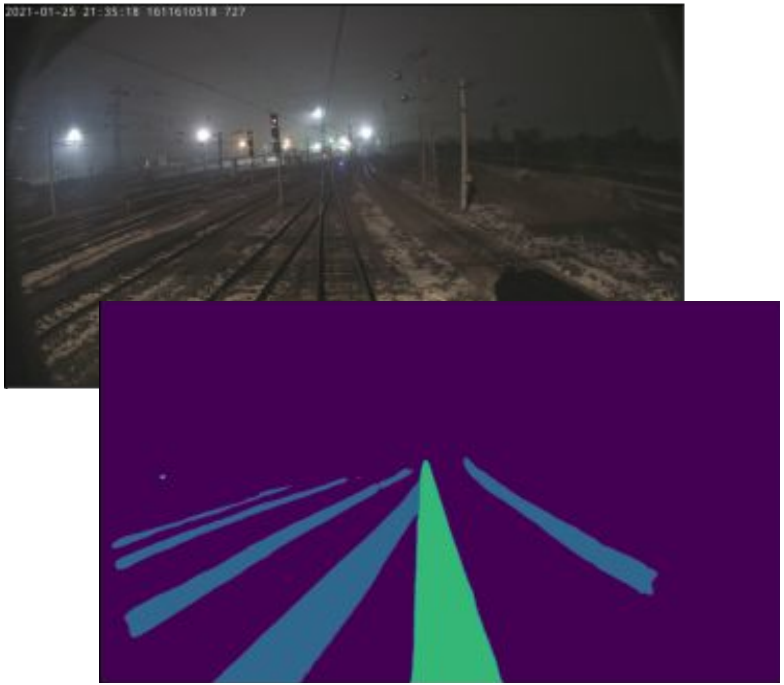


Top: image from the ophthalmic slit
Bottom: found retinal vessels

Software for railway emergency prevention (2022)

Problem: software development for detection of main and side railway tracks by images from camera placed on locomotive.

An approach is proposed using the U-net to detect the required regions. According to test phase, the accuracy of 0.8 was reached according to the IoU metric.



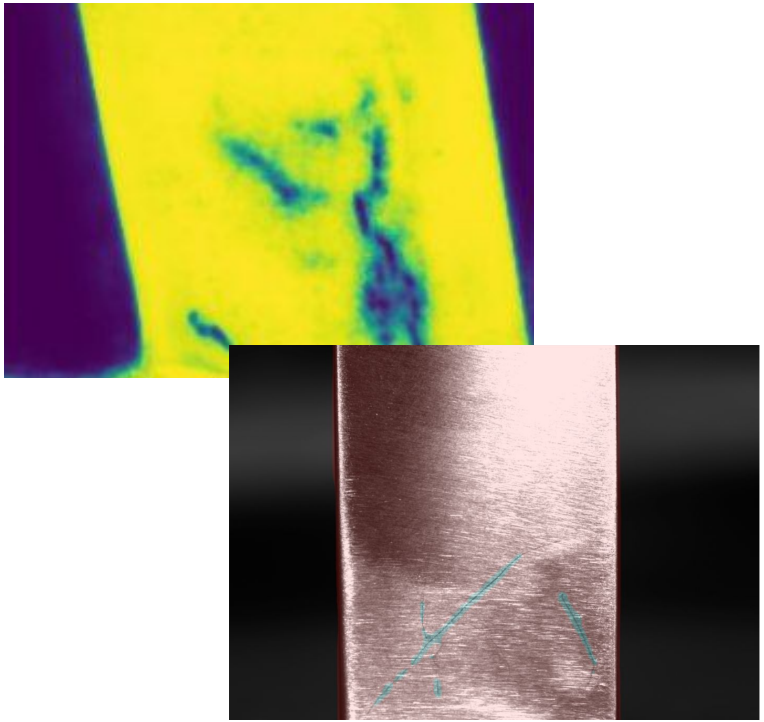
Top: image from camera placed on locomotive
Bottom: regions of main (green) and side railways (blue)

Software for defect detection of gas turbine engine blades (2022)

Problem: software development for defect detection of gas turbine engine blades and preparation of the developed software for integration into production according to the terms of reference.

An algorithm based on Unet was developed to detect seven common blade defects. According to test phase, the developed algorithm was ranked on 2nd place in TechAvia hackathon.

A docker container using the REST API was built for integration into production and deployment instructions were prepared.



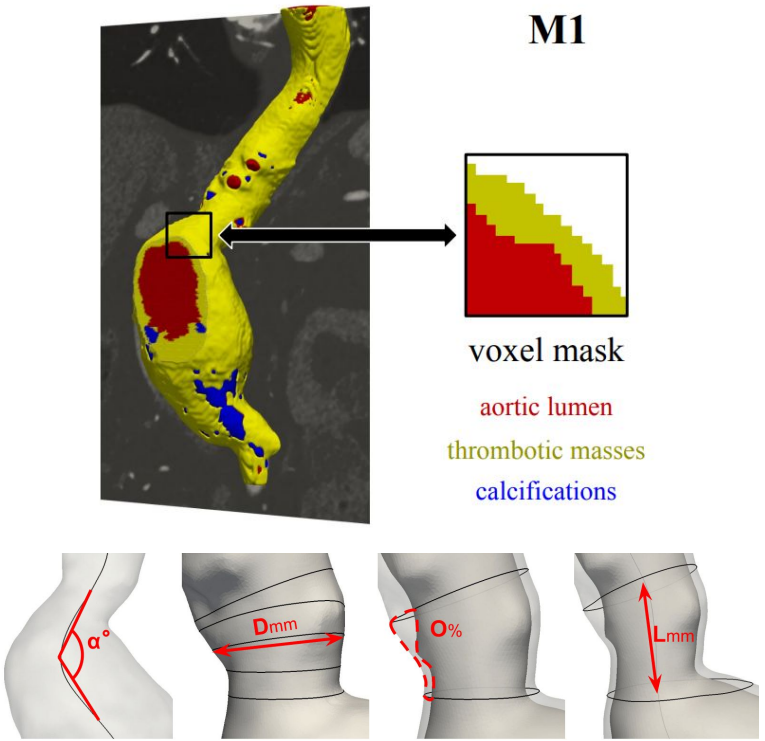
Top: Defect map obtained by the neural network
Bottom: Template for marking areas with defects for further grinding

Software to facilitate planning of abdominal aortic aneurysm surgery (2021-2022)

Problem: software development to assist the surgeon in planning of abdominal aortic aneurysm treatment.

Within the developing software, an algorithm was proposed to segment 3D CT images. According to the test results, the accuracy of the segmentation algorithm by dice metric is comparable to the accuracy of interobserver agreement.

Based on the obtained aneurysm geometries by segmentation algorithm, methods of calculating clinically significant features facilitating the planning of surgical intervention were proposed.



Software for wheat analysis (2021)

Problem: software development for segmentation of spike structural elements and spikelet detection.

Multitask neural network learning was applied to develop an algorithm for wheat spike analysis. Model accuracy according to the IoU metric was 0.94 for the body and 0.77 for the awns of wheat. For the spikelet detection task, the accuracy of 0.98 was reached according to the F1 metric.

Left: spikelet detected positions
Right: segmentation mask for wheat body and awns