Our Offer

We set up an extremely efficient, integrated toolkit for AI model development. Whether you want to develop image segmentation models together with us, get custom models developed for specific tasks, or would like access to this optimized tooling, we are the right partner for you.

For a personal demonstration, technical or licensing questions and other inquiries, please contact our experts. We are there for you and offer you customized solutions and a smooth integration that meets partner-specific needs.

We are an applied research institute and develop software under an ISO-certified quality management system. We not only develop clinical application prototypes, but also supply algorithms or larger software components for integration into medical products.

References

[1] G. Chlebus et al. "Robust Segmentation Models Using an Uncertainty Slice Sampling-Based Annotation Workflow," IEEE Access, vol. 10, pp. 4728–4738, 2022.

[2] V. S. Cangalovic et al. "Comparative evaluation of uncertainty estimation and decomposition methods on liver segmentation," Int J CARS, vol. 19, no. 2, pp. 253–260, 2024.

[3] K. Geißler et al. "Structure Size as Confounder in Uncertainty Based Segmentation Quality Prediction," MIDL 2024, https://openreview.net/forum?id=cRfg2vho5K

[4] K. Geißler et al. "Application of Active Learning based on Uncertainty Quantification to Breast Segmentation in MRI," in BVM 2024: Springer, pp. 178–183, 2024

Fraunhofer MEVIS

Fraunhofer Institute for Digital Medicine MEVIS

Contact

Dr. Hans Meine
hans.meine@mevis.fraunhofer.de

Fraunhofer Institute for
Digital Medicine MEVIS
Max-von-Laue-Strasse 2
28359 Bremen, Germany
www.mevis.fraunhofer.de

Uncertainty-Driven Training Loop

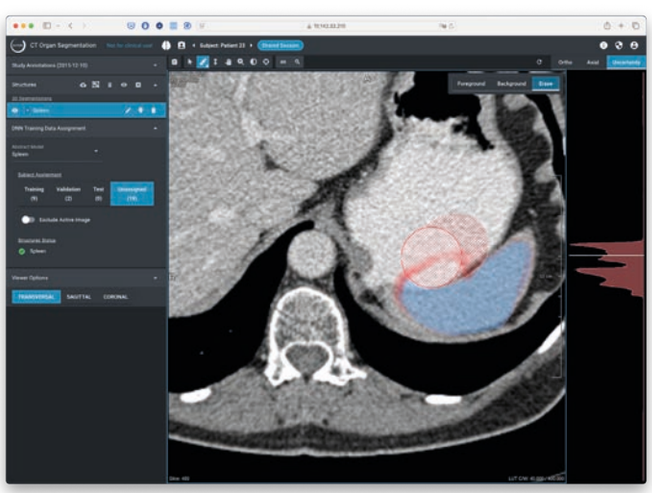
Accelerate AI Development with Active Learning

Solution

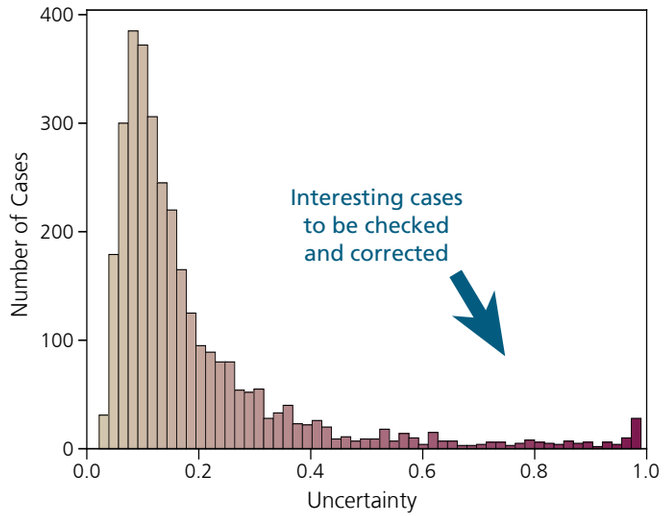
The uncertainty-driven training loop presented here implements an optimized development workflow for segmentation tasks. It is part of our AI collaboration toolkit that streamlines data curation and model development.

- **Integrated Toolkit**
  Our web-based data curation frontend is tightly integrated with model training and inference components in the backend. Each trained AI model is run on the whole dataset so that annotators can see the results of the most recent model, perform corrections, and trigger the next training iteration.

- **Uncertainty-Driven Training Loop**
  The uncertainty guidance is particularly useful with large datasets, because experts do not have to spend time on cases on which the segmentation already works well. Also, it allows you to focus labeling effort on difficult or unusual cases to avoid models that perform well on average but fail spectacularly more often than necessary.



Uncertainty on 3200 MRIs
(model trained with 100 cases)



Benefits

Robust, fully automatic segmentation algorithms play an important role in modern medical image analysis. Although there are a plethora of algorithms on the market already, the need for improved diagnostics and interventional support requires further developments.

Our toolkit increases efficiency in the model development process and reduces the necessary human effort. In an example study on liver segmentation, we have shown that it was possible to spend nearly ninety percent less time on annotation and obtain a model as robust as when training with the complete data pool [1].

Key Features

Our uncertainty-driven training loop helps to reduce the necessary labeling effort and therefore development costs in multiple ways:

Training with Local Corrections
Our model training can incorporate local corrections on any number of slices and does not require each case to be fully labeled.

Uncertainty Guidance
Each segmentation model trained during the iterative development process estimates its uncertainty. This is used to guide users to cases, slices, and areas that would benefit from additional labels. Such guidance is particularly useful and time-saving on large datasets.

Efficient, Guided Reading Workflow
The data curation workflow is customized to project-specific needs and processes for maximal efficiency.