Fraunhofer
IGD

FRAUNHOFER INSTITUTE FOR
COMPUTER GRAPHICS RESEARCH

SMART MACHINE LEARNING FOR MEDICAL IMAGE ANALYSIS

Sample applications

- Automatic contouring of medical imaging data:
  - Over 40 structures in head / neck CT data
  - All visible teeth in panoramic X-rays
- Automatic annotation of paranasal sinus regions in head CT data
- Automatic marking and analysis of tumor regions in CT and MRI data
- Detection and classification of pathological regions in CT and MRI data

CONTACT:

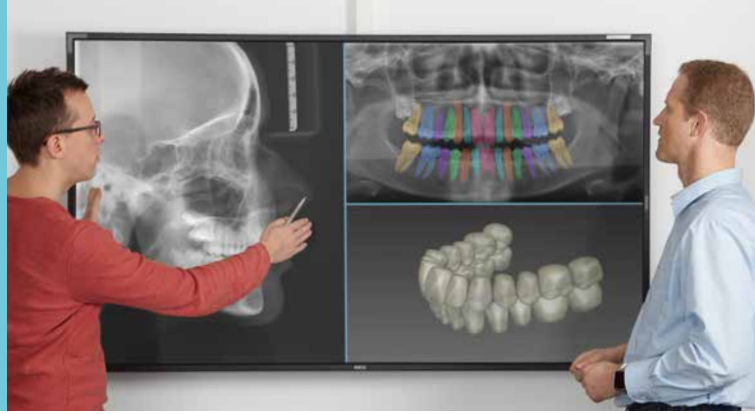
Fraunhofer Institute for Computer Graphics Research IGD
Fraunhoferstrasse 5
64283 Darmstadt, Germany

Dr. Stefan Wesarg
Head of Competence Center
"Visual Healthcare Technologies"

Phone: +49 6151 155-511
stefan.wesarg@igd.fraunhofer.de

https://fh-igd.de/vht-en

V04-19-01



SMART COMBINATION OF AI METHODS FOR REAL-WORLD MEDICAL PROBLEMS

Everyone is talking about deep learning, but it is just one small part of the machine learning methods that are available. Deep learning also cannot reasonably solve every problem in medical imaging analysis. It is much more a matter of intelligently combining classical image processing, model-based approaches and machine learning methods in a problem-specific way in order to be able to automatically analyze medical imaging data.

The problem of sufficient data

Many problems can only be solved with the help of additional prior knowledge – like doctors whose medical knowledge helps them interpret the imaging data. To do this, models – neural networks or statistical models – need to be trained on the basis of a multitude of datasets. The volume of training data needed for this varies depending on the structure to be detected and the method to be used. Deep learning requires a comparable large volume of training data in order to be able to train a suitable network well. Yet, this cannot always be guaranteed when it comes to solving real-world medical problems.

Our approach: *smart machine learning*

This is why we rely on *smart machine learning* – using the method that best fits the problem and the available data for the individual steps of the image analysis being conducted. This allows the shape of an anatomical structure to be described by a statistical model quite well based on a moderate volume of training data. The brightness distribution within a structure or in relation to the immediate surroundings, on the other hand, is represented by a large number of pixel (2D) or voxel (3D) clusters. This is where the deep learning approaches are especially useful in training a suitable neural network. Our capability to intelligently choose the best method for a specific problem is the result of more than 25 years of experience in the area of medical image processing.