Smart Healthcare, Powered by Edge AI

AI-Powered Brain Tumor Detection Solution

Clinical Pain Point

Interpreting MRI images requires highly specialized knowledge and experience. Brain tumors vary greatly in morphology, location, size, and relationship with surrounding tissues, creating challenges even for experienced radiologists. Early-stage brain tumors can be very small with signal differences that aren't obvious compared to normal brain tissue, requiring significant time and effort to carefully examine each image. In addition, achieving consistent delineation of brain tumors before treatment and accurately tracking volume changes after therapy require significant time and effort, especially given the subtle signal variations across MRI scans. This creates a burden for healthcare professionals with heavy workloads. Developing advanced MRI techniques and more precise image analysis methods (such as AI-assisted diagnosis) to improve early detection of small lesions while reducing false positives and negatives, optimizing MRI examination processes, and shortening examination time has become an urgent problem for the medical, industrial, and academic sectors.

Market Demand

Globally, in the United States alone, approximately 85,000 people were diagnosed with brain tumors in 2021. Worldwide, about 864,000 people are diagnosed with brain tumors annually. With an average of 3 outpatient follow-up visits per patient, there are approximately 2.5 million patient visits utilizing MRI equipment for examinations each year. There are approximately 50,000 MRI machines worldwide.

MRI Brain Tumor Localization - Artificial Intelligence DeepBT™ Detector-Plus Algorithm

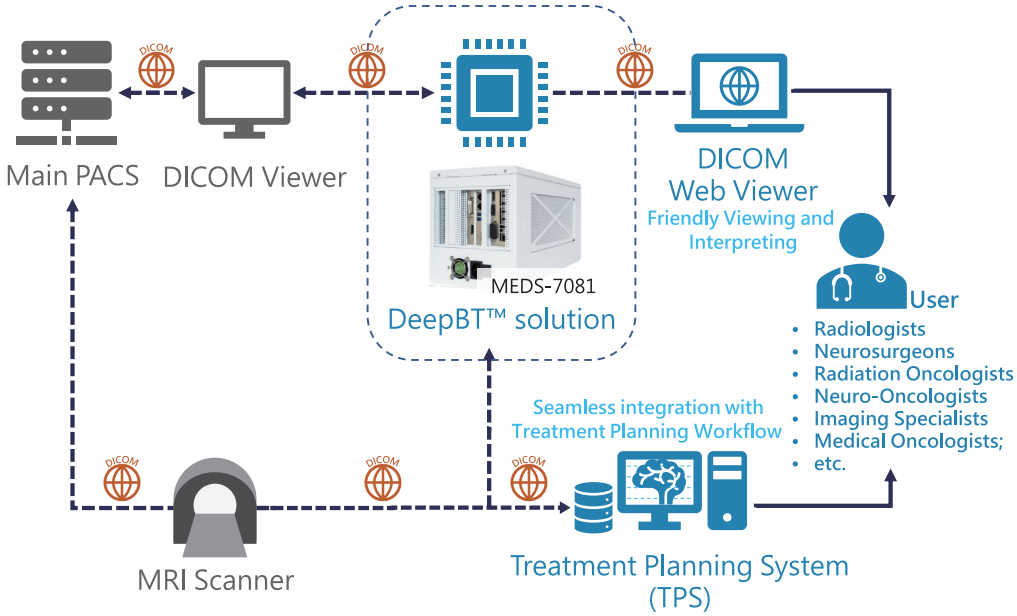
DeepBT™ Detector-Plus is a Software as a Medical Device(SaMD), its core technology is a Dual-pathway Residual U-Net, which combines a dual-pathway structure with residual connections to enhance deep learning model performance in image segmentation tasks. The dual-pathway concept uses two parallel paths to process input data, designed to capture information from the anisotropic nature of MRI across different imaging directions. In image segmentation tasks, this helps the model learn complementary directional features inherent to MRI acquisition. Residual connections, introduced by ResNet, address gradient vanishing or explosion problems in deep neural networks. The convolutional layers in both pathways typically use residual blocks instead of ordinary convolutional layers, helping to train deeper networks and improve information propagation. The advantages of Dual-pathway Residual U-Net include effectively preserving local details and global context while enabling deeper and more effective model training.

Solution Implementation

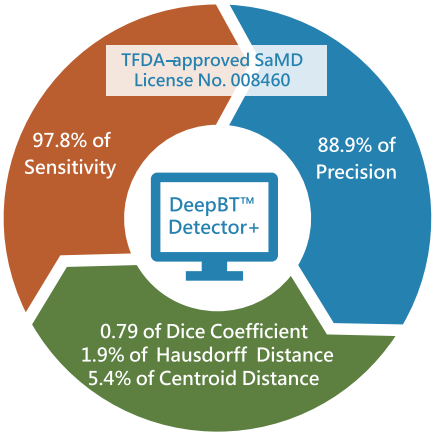
This solution combines a medical system platform equipped with 13th generation Intel Core processors with the Dual-pathway Residual U-Net algorithm for brain tumor detection, providing a powerful hardware foundation and precise algorithm. Through careful hardware configuration, software environment setup, algorithm training, deployment and optimization, and integration with existing medical systems, it develops an efficient and accurate auxiliary tool for brain tumor detection and post-operative tracking, playing an important role in clinical practice and improving physicians' efficiency in brain tumor diagnosis and post-operative follow-up.

The Future of Smart Healthcare:
Edge AI Applied to Intelligent Precision Medical Systems

This solution utilizes high-performance hardware to accelerate AI model inference processes, enabling rapid analysis of large volumes of MRI images. The Dual-pathway Residual U-Net algorithm more precisely captures multi-scale tumor features and effectively segments tumor boundaries, helping doctors more accurately determine tumor size, location, and morphology. This reduces the subjectivity and errors in human interpretation, enhances diagnostic reliability, significantly shortens diagnostic time, improves medical efficiency, and enables doctors to make decisions faster and provide treatment to patients earlier.



The solution of Artificial Intelligence DeepBT™ Detector-Plus Field Applications



Clinically Validated Performance of DeepBT™ Detector-Plus

MEDS-7081 Product Advantages

To ensure system stability and high-performance operation, MEDS-7081 offers the following technical advantages

1. Central Processing Unit (CPU): 13th Gen Intel Core Processors, responsible for operating system functions, data preprocessing, partial computation for model training, controlling model deployment and inference workflows, and generating visualizations and reports.
2. PCIe x16 Gen5 slot supports for GPU or FPGA: Performance requirements can be met by selecting NVIDIA GeForce RTX series or higher-grade medical GPUs. Trained models can be deployed on GPUs for real-time or near real-time brain tumor detection.
3. Solid State Drive (SSD): 1x M.2 Type M 2280 SSD, 2x 2.5" SSD: Used for installing the operating system, deep learning frameworks, development environment, and storing training datasets and trained models.
4. Chassis Assembly and Cooling: Simple design for easy hardware installation, upgrades, and maintenance, which is very important in medical environments.
5. 900W medical grade power supply: Medical-grade power supply meeting strict medical safety standards, with 900W power sufficient to support high-performance CPU and GPU operation.

MEDS-7081

- Intel Gen 12th /13th Processor
- PCIe Slot for GPU or FPGA
- Support for Video Capture and Video Stream
- 900W Medical Grade Power Supply
- Simple Chassis Assembly Design, Unique Thermal Solution

Portwell
No. 242, Bo'Ai St., Shu-Lin Dist, New Taipei City 238, Taiwan
Tel: +886-2-7731-8888 Fax: +886-2-7731-9888
E-mail: info@portwell.com.tw
www.portwell.com.tw

Altewan 智德萬生醫科技
7F., No. 1, Yumin 6th Rd., Beitou Dist., Taipei City 112042, Taiwan (R.O.C.)
Tel: +886-2-2826-7169
E-mail: services.dept@aitewan-bio.com
https://en.aitewan-bio.com/