



Contribution ID : 66

Type : Talk

Run in seconds on your laptop: A lightweight model for CT segmentation of maxillary sinuses in children with chronic rhinosinusitis

Wednesday, 9 September 2026 09:40 (30)

We present a compact 3D neural network for segmentation of maxillary sinuses from CT scans in children with chronic rhinosinusitis. It comprises 12 convolutional layers totaling 50k parameters, minimal compared to most 3D medical-imaging architectures, and completes the prediction in a few seconds on an average CPU, making the tool accessible for most clinicians. The sinus volume and its fraction occupied by inflammatory changes are estimated with an RMSE of 0.5 cm^3 and 1.5 %pts, respectively, which allows for precise longitudinal monitoring. The network includes no dropout, no pooling, and no padding, the latter preventing layer-wise injection of meaningless zeros. We utilize a custom normalization that does not average the data but employs the same running statistics in both prediction and training, making the model insensitive to overall contrast and local artifacts. The network is fully convolutional and translation-invariant. It has an inner receptive field of $18 \times 18 \times 18$ voxels to detect sinus walls and an outer receptive field of $88 \times 88 \times 88$ voxels to provide a broader context. The internal data flow is designed to minimize the number of mappings that the network must learn. It operates in a reduced resolution of $1 \times 1 \times 1 \text{ mm}^3$, which still allows for high precision thanks to the use of fuzzy labels accounting for the partial-volume effect. The model was trained and tested on a dataset of 92 scans collected and manually annotated specifically for this study.

Primary author(s) : OLBRATOWSKI, Przemysław (Biological and Chemical Research Centre, University of Warsaw); ZĄBER-KUCHARSKA, Aldona (Department of Pediatrics, Nephrology and Allergology, Military Institute of Medicine - National Research Institute); GINTER, Józef (Faculty of Medicine, University of Warsaw); GOŁUCHOWSKA, Natalia (Department of Pediatrics, Nephrology and Allergology, Military Institute of Medicine - National Research Institute); KALICKI, Bolesław (Department of Pediatrics, Nephrology and Allergology, Military Institute of Medicine - National Research Institute); TOMASZEWSKA, Agata (Department of Pediatrics, Nephrology and Allergology, Military Institute of Medicine - National Research Institute)

Presenter(s) : OLBRATOWSKI, Przemysław (Biological and Chemical Research Centre, University of Warsaw)

Session Classification : Machine Learning in Medical Applications

Track Classification : Machine Learning in Medicine