RSNA Intracranial Aneurysm Detection

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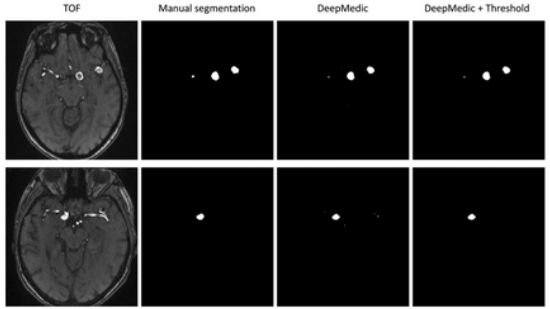
PROBLEM STATEMENT

Detect the presence of one or more intracranial aneurysms in neuro-imaging exams and localize their anatomical sites across multimodal scans (CTA/MRA/MRI) from multiple centers.

INTRODUCTION / MOTIVATION

Intracranial aneurysms are dilated brain arteries that may rupture, causing life-threatening hemorrhage. Early and accurate detection on CT/MR angiography saves lives, yet small aneurysms are often missed or inconsistently reported. AI-assisted detection can act as a second reader, improve sensitivity, reduce missed lesions, and support standardized diagnosis across hospitals.



LITERATURE REVIEW

- 3D CNN / U-Net models dominate for volumetric detection & segmentation.
- Two-stage pipelines (candidate generation + false-positive reduction) improve specificity.
- Multi-center validation crucial due to scanner variability; RSNA assembled diverse data.
- Recent results: Deep-learning models show high sensitivity for lesions ≥3 mm but drop for smaller ones; external validation still limited.
- Notable studies: Sichtermann et al. (TOF-MRA, 3D CNN), Hu et al. (Lancet Digital Health 2024), Bizjak et al. (2023 review).

DATASET

- Aneurysm Detection (Kaggle) Dataset.
- Deep Learning–Based Detection of Intracranial Aneurysms in 3D TOF-MRA
- Modalities: Multimodal – CT angiography, MR angiography (TOF-MRA), selected MRI sequences.
- Annotations: Study-level presence/absence + localization to 13 predefined intracranial sites, labeled by expert neuroradiologists.
- Format: Volumetric DICOM images with CSV/JSON label files; multi-site, multi-scanner data.
- Goal: Build models that classify each study and correctly localize aneurysms.

TASKS

- Study-level classification – aneurysm present / absent.
- Localization – identify aneurysm site(s) for positives.
- Generalization – robust to modality, scanner, center.
- Evaluation – sensitivity, specificity, localization accuracy.

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