

AbstractID: 8534 Title: Effect of massive-training ANNs on the performance of a CAD system on “missed” polyps in CT colonography

**Purpose:** A major challenge in computer-aided detection (CAD) of polyps in CT colonography (CTC) is the detection of “difficult” polyps which radiologists are likely to miss. Our purpose was to develop a CAD system incorporating massive-training artificial neural networks (MTANNs) for the detection of polyps and evaluate its performance on polyps “missed” by radiologists in a large multicenter clinical trial.

**Material and Methods:** Our database consists of CTC scans obtained from a multicenter clinical trial in which 15 leading medical institutions participated nationwide. For testing our CAD system, we randomly selected 14 polyps/masses in 14 patients that were “missed” by radiologists in the trial. Lesion sizes ranged from 6-35 mm, with an average of 10 mm. We developed a CAD system consisting of 1) colon segmentation based on CT value-based analysis and colon tracing, 2) detection of polyp candidates based on morphologic analysis on the segmented colon, 3) calculation of 3D pattern features of the polyp candidates, and 4) classification of the polyp candidates as polyps or non-polyps by use of a classifier. We tested two different classifiers for step 4): quadratic discriminant analysis based on the pattern features and our original 3D MTANNs.

**Results:** With our CAD system based on quadratic discriminant analysis, we achieved 43% (6/14) by-patient sensitivity with 5.6 (78/14) false positive detections (FPs) per patient for the 14 “missed” polyps in a leave-one-lesion-out test. We replaced quadratic discriminant analysis with 3D MTANNs, and obtained 71.4% (10/14) sensitivity with 4.8 (67/14) FPs per patient.

**Conclusion:** The performance of 3D MTANNs was superior to that of quadratic discriminant analysis. With our CAD system based on the 3D MTANNs, 71.4% of polyps “missed” by radiologists in the multicenter clinical trial were detected correctly, with an FP rate of 4.8 FPs per patient.