

AbstractID: 5481 Title: Massive training artificial neural network (MTANN) to reduce false positives due to rectal tubes in computer-aided polyp detection

Purpose: One limitation of current computer-aided detection (CAD) of polyps in CT colonography is a relatively large number of false positives. Rectal tubes are a common source of false positives and may distract the reader from less common polyps in the rectum. Our purpose was to develop a three-dimensional massive-training artificial neural network (3D MTANN) for reduction of false positives due to rectal tubes generated by a CAD scheme.

Material and Methods: Our database consisted of CT colonography of 73 patients, scanned in both supine and prone positions. Fifteen patients had 28 polyps (15 polyps: 5-9 mm; 13 polyps: 10-25 mm). These cases were subjected to our previously reported CAD scheme that included shape-based detection of polyps and reduction of false positives with a Bayesian neural network. With this scheme, 96.4% (27/28) by-polyp sensitivity with 3.1 (224/73) false positives per patient was achieved. To eliminate false-positive rectal tubes, we developed a 3D MTANN that was trained to enhance polyps and suppress rectal tubes.

Results: In the output volumes of the trained 3D MTANN, various polyps were represented by distributions of bright voxels, whereas rectal tubes appeared as darker voxels. The 3D MTANN removed all 20 false-positive rectal tubes produced by our original CAD scheme without removing any true positives. To evaluate the overall performance, we applied the 3D MTANN to the entire database containing 27 polyps (true positives) and 224 non-polyps (false positives). The 3D MTANN eliminated 33% (73/224) of non-polyps without removal of any true positives in an independent test.

Conclusion: The 3D MTANN was able to improve the false-positive rate of our original CAD scheme from 3.1 to 2.1 false positives per patient, while an original by-polyp sensitivity of 96.4% was maintained.

Conflict of Interest: HY, SGA: shareholders, R2 Technology, Inc.