AbstractID: 3624 Title: Study of Radial Gradient Features in LDA Classifier for Automated CT Lung Nodule Detection

Purpose: To study the use of radial gradient index features by an LDA classifier for false positive reduction in automated CT lung nodule detection.

Method and Materials: Our database contains 38 diagnostic CT scans, with a total of 82 lung nodules. A radial gradient index (RGI)-based approach
is used to reduce false positives detected by our automated method. For each CT section a complementary image (an "RGI map") is generated in which
the pixel intensity is proportional to the RGI computed along a circle of chosen diameter d, centered at that pixel. As the RGI is maximum for a
perfect circle, an RGI map enhances the intensity of nodules relative to neighboring anatomic structures. For every candidate we calculate a set of
three RGI features, for each of five different values of the RGI diameter. We evaluate the performance of the classifier by introducing in turn RGI
features corresponding to a particular diameter, together with an optimal set of 9 non-RGI features determined previously. The results are compared
with the performance of the LDA without RGI features. Finally, we use stepwise LDA in order to identify optimal features.

Results: The performance for d = [12, 16, 20] is optimal (the sensitivity increases from 70 % to 79 % at 0.5 false detections/section) while for d
$\geq$ 24 performance decreases. A stepwise LDA was performed for 10 random partitions of the database in order to evaluate the relative weight of
different features for classification. This revealed that 8 out of 15 RGI features were included 9 or more times within the optimal feature set.

Conclusion: Inclusion of RGI features results in a substantially improved FROC performance, which is consistent with results of stepwise linear
discriminant analysis.

Conflict of Interest: SGA is a shareholder in R2 Technology, Inc.