MedIX REU In the News

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DePaul

A publication for alumni of the School of Computer Science, Telecommunications and Information Systems

Winter 2008 Vol. 10 No. 2

CTI research looks at early diagnosis of lung cancer

CTI undergraduate students are working alongside graduate students to develop software that will aid in the early detection of lung cancer.

The work was made possible by the National Institutes of Health (NIH) when it funded a consortium of five universities affiliated with medical schools to populate a database with CT scans of lung nodules. The Lung Image Database Consortium has been submitting the data to NIH for the past three years. The data include images of the nodules, as well as radiologists' assessments regarding various characteristics that can indicate whether a nodule is malignant or benign. The database, which is available to the public, is expected to consist of some 1,300 nodules by 2009.

CTI faculty members Jacob Furst (far left) and Daniela Raicu (second from right) are leading CTI student researchers in developing new approaches to analyzing lung scans.

Under the guidance of CTI faculty members Daniela Raicu and Jacob Furst, CTI student researchers are using the NIH data to develop algorithms that will quickly compare a patient's CT lung scan with the scans stored in the database.

The students are developing two approaches to help radiologists analyze new lung scans. They could be used either separately or simultaneously. One approach actually will submit a new scan to CTI's algorithm, and it will come up with a computer-aided diagnosis, which the radiologist could accept or reject, providing a second opinion of sorts, according to Furst. **"There have been a number of studies that have shown that man and machine generally can perform better than man alone or machine alone,"** he says.

The other method would allow radiologists to outline a lung nodule of concern and submit it to a content-based image retrieval (CBIR) system. It would scour the entire database for other nodules with similar characteristics and present the radiologist with all relevant scans and their respective diagnoses. It would present the information but would not make a computer-aided diagnosis. The CBIR system will improve over time as radiologists give feedback based on their interpretations of the scans' similarities. The goal of such system refinements is to deliver results that resemble the human perception of similarity, says Raicu.

"One of the big issues right now is the number of images that exist versus the number of people qualified to read them," Furst says. The radiologists spend most of their time reviewing perfectly normal images. Having computers weed out the healthy images would allow them to focus on CT scans that appear to be abnormal. The computer could even rank the images by level of normality, so radiologists could further prioritize the images.

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