

TENURE RECOMMENDATION
UNIVERSITY OF MICHIGAN
MEDICAL SCHOOL
DEPARTMENT OF RADIOLOGY

Approved by the Regents
May 14, 2009

Berkman Sahiner, Ph.D., associate professor of radiology, without tenure, Department of Radiology, Medical School, is recommended for the granting of tenure to be held with his title of associate professor of radiology, Department of Radiology, Medical School.

Academic Degrees:

Ph.D.	1993	University of Michigan
M.S.	1988	Middle East Technical University, Ankara, Turkey

Professional Record:

2004-present	Associate Professor of Radiology, University of Michigan
2003-2004	Associate Research Professor of Radiology, University of Michigan
1997-2003	Assistant Research Scientist, Department of Radiology, University of Michigan
1996-1997	Research Investigator, Department of Radiology, University of Michigan

Summary of Evaluation:

Teaching: Dr. Sahiner's teaching activities include undergraduate students, graduate students, postdoctoral fellows, medical students, radiology residents and faculty. In addition to the Department of Radiology, Dr. Sahiner has lectured to the Department of Radiation Oncology and in the College of Engineering at the University of Michigan. Dr. Sahiner provides teaching in multiple settings. He teaches and mentors graduate students and postdoctoral fellows rotating in the radiology research laboratories. These students and trainees come not only from the Medical School, but often from the College of Engineering and from computer science. He teaches undergraduate students in the Undergraduate Research Opportunity Program (UROP). He teaches fourth-year medical students, radiology residents, and fellows the imaging physics of computed tomography. His work in the computer assisted diagnosis laboratory is a particular interest as it is the application of physics and computer science to the detection of breast cancer. These CAD techniques have been commercialized and are in common usage throughout the country to augment the interpretation of screening mammograms. The laboratory has extended this work into the detection of pulmonary nodules and similar broad applications are anticipated. The usefulness of these techniques in clinical work has led Dr. Sahiner to expand his teaching to include clinical trainees. Thus, his teaching now includes radiology residents, fellows and faculty.

The quality of Dr. Sahiner's teaching is excellent. He was selected as the only non-physician to serve on the Department's Resident Selection Committee. His specific role is to

evaluate candidates, especially those with a combined M.D./Ph.D, for their research potential. His extensive list of mentored students also attests to the quality of his teaching.

Dr. Sahiner has provided leadership and creativity through his efforts to include laboratory science as well as clinical work in Radiology's training programs. He is the single basic scientist who participates in resident selection and subsequently in the mentoring of these trainees. The Department of Radiology recently awarded an NIH training grant for both physicians and basic scientists. This grant was awarded in part due to the work of Dr. Sahiner, and he is expected to play a significant role in the program.

Research: The field of radiology entails the analysis of images, the detection of abnormalities and the discrimination of abnormalities which are benign, requiring no further evaluation or potentially significant requirement of additional testing or treatment. Although most radiologists have undergone at least six years of postgraduate education and training, human errors persist. Computer assisted diagnosis is a method in which complex algorithms are used to identify potentially abnormal features and, in some cases, to sort them among likely etiologies. Applications in mammography are well accepted and widely used throughout the country. These systems tend to be sensitive but not specific, requiring the radiologist to sort through many abnormal notations. They tend to add more value when used by general radiologists than by radiologists subspecializing in breast imaging. Dr. Sahiner has extended these techniques and applied them to both screening mammography and breast ultrasound. The image segmentation, feature extraction and classification techniques he has employed have resulted in even greater accuracy than that routinely obtained even by experienced subspecialty radiologists. Computed tomography presents an additional challenge. Finely collimated CT examinations of the chest often result in as many as 2000 axial images. This is beyond the ability of the human to carefully analyze, such that detection depends more on lesion conspicuity. Dr. Sahiner has expanded his CAD techniques to include 3D reconstructed images and the detection of lung nodules on CT. Another important aspect of CAD is a comparison with prior studies. Analysis of change of an identified lesion is an important aspect in predicting its biologic behavior.

Recent and Significant Publications:

Shi J, Sahiner B, Chan HP, Ge J, et al: Characterization of mammographic masses based on level set segmentation with new image features and patient information. *Med Phys* 35 (1):280-290, January 2008.

Sahiner B, Chan HP, Hadjiiski L: Performance analysis of three-class classifiers: Properties of a 3-D ROC surface and the normalized volume under the surface for the ideal observer. *IEEE Transactions on Medical Imaging* 7:215-227, 2008.

Sahiner B, Chan HP, Hadjiiski L: Classifier performance prediction for computer-aided diagnosis using a limited dataset. *Medical Physics* 35:1559-1570, 2008.

Sahiner B, Chan HP, Roubidoux M, Hadjiiski L, et al: Malignant and benign breast masses on 3D US volumetric images: Effect of computer-aided diagnosis on radiologist accuracy. *Radiology* 242:716-724, 2007.

Sahiner B, Chan HP, Roubidoux M, Helvie M, Hadjiiski L, et al: Computerized characterization of breast masses on three-dimensional ultrasound volumes. *Medical Physics* 31(4):744-754, 2004.

Service: Within the Department of Radiology, Dr. Sahiner provides extensive service in his work on the Resident Selection Committee. This is one of the largest and most important committees within the department. It is challenged with the time consuming tasks of reviewing applicant materials, conducting interviews, which are usually eight day-long sessions in the fall and winter, and ranking the interview candidates. It is likely that Dr. Sahiner's service commitments will increase as work begins on the NIH Radiology Research Training Grant. Dr. Sahiner also serves on the Resident Education Committee, which has the responsibility of the entire resident education program. On a national level, Dr. Sahiner served on the Medical Imaging Conference Program Committee for SPIE and is currently chair of the SPIE Medical Imaging – Image Perception Observer Performance and Technology Assessment Conference.

External Review:

Reviewer A: “Dr. Sahiner is known for his development of various CAD techniques including an automated computerized method for differentiating malignant and benign breast masses on 3-D ultrasound volumes. In his research, he carefully demonstrated segmentation and feature extraction methods, and subsequently evaluated them using round-robin techniques. Realizing the importance of all aspects of translational research, Dr. Sahiner also conducted an observer with his 3-D analysis technique and showed that with CAD, high sensitivity could be maintained while increasing specificity.”

Reviewer B: “Throughout the years I have been quite impressed with Berkman and his achievements in image analysis and CAD....The area of CAD in radiology is quite important and there are quite a number of groups working on these problems, yet over the past 10 years Berkman has made some important and exciting contributions by approaching the problem in new ways. His work on sample size issues in particular has led to some very exciting papers and discussions at conferences....CAD research in radiology is being done by a number of groups, but Berkman has successfully carved out a niche for himself and ranks among the best in this area.”

Reviewer C: “Dr. Sahiner has established himself with high quality teaching and research work and is known as a skillful and knowledgeable researcher in the field of computer-aided diagnosis specialized in mammographic image analysis and theoretical development for ROC/FROC bases evaluation study. Recently, he received highly competitive research awards from an Army breast cancer research award and an NIH R21/R33 grant.”

Reviewer D: “The field of Dr. Sahiner's work is one that attracts intense research interest from a wide international community because of its very significant clinical and commercial potential. The impact of his work in this competitive environment has been outstanding....The esteem in which his scholarship is held should be looked at in the context of the peers that make such judgements [sic] and it is clear from this that Berkman is a major contributor to an area of

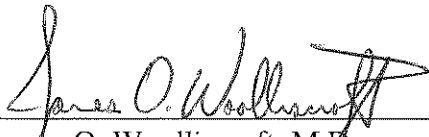
science that has many very talented research groups. He is a highly respected member of this community.”

Reviewer E: “Dr. Sahiner has made valuable contributions to the national medical-imaging community by his service as a referee for several of the most prestigious scientific journals in our field, by reviewing grant applications submitted to several major funding agencies, and by his service as a member of program committees and as a session chair for annual topic meetings of the Society of Photo-optical Instrumentation Engineers (SPIE).”

Reviewer F: “The rubber-band straightening transform that Berkman developed for the analysis of the margins of masses, where the most significant signs related to cancer are expected to be concentrated, is an absolutely original and innovative piece of work...Berkman’s other works on the analysis of spiculation and morphological features of tumors are also important contributions to the field. His works on pattern classification and evaluation methods address important questions regarding the accuracy of segmentation, sample size, and the number of features used to represent samples for classification, and demonstrate the breadth of the scope of his expertise as well. His recent works on the properties of the three-dimensional receiver operating characteristics surface and the characterization of mammographic masses based on level-set segmentation make important and timely contributions to the field.”

Summary of Recommendation:

Berkman Sahiner, Ph.D., is a well trained medical physicist who is making major contributions to the field of diagnostic radiology and to the education of a variety of trainees at the University of Michigan. Dr. Sahiner has developed an international reputation for the quality of his work. I am pleased to recommend him for the granting of tenure to be held with his title of associate professor of radiology.



James O. Woolliscroft, M.D.
Dean
Lyle C. Roll Professor of Medicine

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