



## Biomedical and Health Informatics Lecture Series

Thursday, April 28, 2011

1:30 - 2:20 p.m., Room E-216

**Ira J. Kalet, Ph.D.**

Professor Emeritus, Radiation Oncology  
joint with Medical Education and Biomedical Informatics  
University of Washington, Seattle

### “Ontologically Computing the Spread of Tumor Cells”

We describe a computational model of cancer metastasis that uses an anatomy ontology, the University of Washington Foundational Model of Anatomy, together with a simple theory of tumor spread through the lymphatic system, enabling the automatic calculation of clinical target volumes for radiation therapy planning. It has long been believed that the main mechanism of spread of tumor cells in the head and neck is through the lymphatics. Some involved nodes are visible or palpable, but often the disease spread is microscopic and its extent can only be guessed based on clinical experience. This is the basis for drawing (by hand) clinical target volumes, defining the lymph nodes to treat for specific tumors. However, elementary logic implemented in simple recursive functions together with a probability table can in principle predict patterns of spread. Once the lymph nodes at risk for microscopic disease are known, the next computational challenge is to automatically generate the contours that enclose these nodes. We are making progress on both steps but a system that is ready for regular use in a cancer clinic is still a little further in the future. Opportunities for developing the model include incorporating medical image data to modify the initial state probabilities and genomic and pathologic data to characterize the microscopic behavior of the tumor cells and thus the transition probabilities.

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Ira Kalet is Professor Emeritus of Radiation Oncology, and of Medical Education and Biomedical Informatics at the University of Washington. Until retiring in 2011, he was an Adjunct Professor in Computer Science and Engineering and also in Biological Structure. He also served a five-year term as IT Security Director for the UW School of Medicine and its two major teaching hospitals. His research interests include simulation systems for design of radiation treatment for cancer, software development methodology and artificial intelligence applications to medicine, particularly expert systems, ontologies and modeling.

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Podcasts from previous quarters are available at <http://courses.washington.edu/mebi590/past.lecture.schedules.html>