Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Predicting tumor sizes of ductal carcinoma in situ from immunohistochemical images using a novel approach of mathematical pathology: preliminary results, potentials and challenges ahead[1] YAO-LI CHUANG, University of New Mexico, Dept. Pathology, MARY EDGERTON, University of Texas, MDACC, Dept. Pathology, PAUL MACKLIN, University of Southern California, Center for Applied Molecular Medicine, WEI YANG, University of Texas, MDACC, Dept. Radiology, ELAINE BEARER, University of New Mexico, Dept. Pathology, VITTORIO CRISTINI, University of New Mexico, Dept. Pathology and Dept. Chemical Engineering — Differential equation models have recently drawn increasing attentions as a useful tool to help advance the knowledge in cancer research. However, challenges remain for applying such models to clinical practices on a patient-specific basis to assist surgical decisions. Clinical diagnoses essentially at a single time point are often insufficient to fully constrain the time-dependent differential equations. Here we present a novel mathematical pathology approach, identifying robust indicators for time-invariant predictions of the model that can be used for surgical planning. We demonstrate this approach by predicting the sizes of ductal carcinoma in situ by calibrating model parameters from immunohistochemical images. Our preliminary studies of 17 excised tumor cases resulted in a better agreement with the actual measured sizes than the other estimates available to us, showing the potential of our approach for patient-specific cancer diagnosis. Conversely, our studies also revealed challenges to overcome before we can take this approach to the next level.

[1]Supported by Cullen Trust for Health Care, NIH 2P30CA016672, NINDS NS046810

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Date submitted: 29 Nov 2011 Electronic form version 1.4