

Data Science Seminar

Hosted by the Department of Mathematics and Statistics

- Date: Tuesday, September 9, 2025
- Time: 12:15pm - 1:15pm
- Room: Whitney Hall 100E
- Speaker: Dr. Nancy Guo (School of Computing at Binghamton University)
- Title: AI-empowered precision medicine.

Abstract

Lung cancer remains the leading cancer-related mortality for both men and women. Prediction and prevention of tumor recurrence and metastasis are current unmet clinical needs. To discover novel biomarkers for treatment selection and develop new drugs to meet these unmet clinical needs, we established leading-edge Dempster-Shafer belief networks, non-negative matrix factorization/Monte Carlo simulation, and graph theory centrality to model multi-omics networks and signaling pathways in patient liquid biopsies, tumors, and single cells. Our AI technology has more competitive advantages in computational efficiency, scalability, accuracy, and biological alignment than other methods in rigorous comparison. Using our biologically aligned AI technology, a 7-gene lung cancer assay Dr. Guo invented is predictive of tumor recurrence/metastasis and chemotherapy benefits and has been validated in >1,641 patients, including a randomized phase 3 clinical trial. The FDA considered it a "Novel Technology" in review. Our approach to integrating multi-omics profiles in a patient cohort with large-scale patient EMRs such as the SEER-Medicare cancer registry combined with extensive external validation can identify potential biomarkers applicable in large patient populations. These methodologies form a conceptually innovative framework to analyze various available information from research laboratories and healthcare systems, accelerating the discovery of biomarkers and therapeutic targets to ultimately improve cancer patient survival outcomes.

Biography of the speaker: Nancy Guo, Ph.D., is a SUNY Empire Innovation Professor at Binghamton University. Dr. Guo is a Fulbright US Scholar for Brazil on biomarker discovery. Dr. Guo is experienced in leading foundation AI-based multidisciplinary research as PI of two NIH R01s and two NSF grants. She obtained more than \$46.3 M in federal funding as PI/PD to develop technology and infrastructure to advance precision medicine. She has 62 peer-reviewed journal publications with more than 4,062 citations. Her research has generated 14 patents on cancer drugs and molecular diagnostic assays with FDA "Novel Technology" status. Software products developed by her team have more than 59,976 visits. As the founding director of the Biomedical Informatics Resources Core of West Virginia Clinical & Translational Science Institute from 2009 to 2017, she led state-wide informatics initiatives and enhanced multi-state collaboration. She is fostering academic-industry partnerships for clinical commercialization of AI-based cancer treatment selection and drug development through her current NSF PFI-RP project. She mentored 58 postdocs, MDs, and undergraduate and graduate students to strive as next-generation researchers, tenured faculty, entrepreneurs as PI of NSF and NCI SBIRs, and healthcare professionals recognized with nine national awards. She served as Chair of grant review panels of lung cancer research for the DOD and NCI.

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