

## Galit Shmueli

Institute of Service Science, College of Technology Management  
National Tsing Hua University

Time and location: 03:00 PM - 04:00 PM on Wednesday, Oct 19<sup>th</sup>, 2022; Room S401 PBB

**Title:** Leveraging covariates in randomized experiments guided by causal diagrams

### **Abstract:**

Researchers using randomized controlled trials (RCTs) often subgroup or condition on auxiliary variables that are not the randomized treatment variable. There are many good reasons to condition on auxiliary variables—also referred to as control variables or covariates—in randomized experiments. In particular, designing and conducting RCTs is costly to researchers and subjects, and therefore it is important to derive greater value from RCT data; measuring not just the average treatment effect (ATE), but also finding more nuanced insights about the underlying theoretical mechanisms and generalizing the inferences. Unfortunately, there are many confusing and even contradictory guidelines on the use of subgroups or auxiliary variables in RCTs. In this talk, I will show how researchers can leverage covariates without biasing their causal inferences, by applying a few simple rules based on Judea Pearl's *causal diagramming framework*. The graphical, visual approach is a powerful tool for making researchers' assumptions explicit and transparent, clarifies why an experiment is needed as opposed to an observational study, and provides a conceptual aid to identify needed auxiliary variables. I'll demonstrate how to create a causal diagram and make use of diagram-based causal analysis for extracting more knowledge from RCTs. (In collaboration with Ali Tafti, University of Illinois at Chicago)

**Paper:** Tafti, A., & Shmueli, G. (2020). Beyond overall treatment effects: Leveraging covariates in randomized experiments guided by causal structure. *Information Systems Research*, 31(4), 1183-1199.

**Speaker's bio sketch:** Galit Shmueli is a Tsing Hua Distinguished Professor at the Institute of Service Science, College of Technology Management, National Tsing Hua University, Taiwan. Earlier she was Associate Professor at University of Maryland's Smith School of Business, and then the SRITNE Chaired Professor of Data Analytics and Associate Professor of Statistics & Information Systems at the Indian School of Business. Prof. Shmueli's research focuses on statistical and machine learning methodology with applications in information systems and healthcare, and an emphasis on human behavior. Since her 2010 Statistical Science paper "To Explain or To Predict?" (2000+ citations), she's been investigating how predictive methodology can enhance causal explanatory goals, and how causal explanatory methodology can enhance predictive goals. Prof. Shmueli authors multiple books, including the popular textbook *Data Mining for Business Analytics* and has over 100 publications in peer-reviewed journals and books. Prof. Shmueli teaches courses on data mining, forecasting analytics, interactive visualization, research methods, and other business analytics topics. Her online teaching videos are highly subscribed, and she has won multiple teaching awards. Prof. Shmueli is the inaugural Editor-in-Chief of the *INFORMS Journal on Data Science*, and has served on editorial boards of top journals in statistics and information systems. She is an IMS Fellow and ISI elected member.