



DEPARTMENT OF  
COMPUTER SCIENCE

TEXAS TECH

Whitacre College of Engineering

# Bridging the Algorithm Abyss: Where Surgical Intelligence Meets Translational Medicine

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**Abstract:** Translational medicine consists of transferring scientific discoveries from the “bench” to the “bedside”. While innovative computational methods in genomics have already led to new therapies (e.g., cancer, diabetes), such a technological revolution has yet to be seen in the operating room. Within the continuum of care, the use of AI and machine learning currently finds its place more at the laboratory setting, and less in the operating room. This gap is also seen in military medicine discipline, between the highest level of care, Role 4 (hospitals and laboratories) to Role 1 (the point of injury (PO)). Just like work in the OR, treatment at the POI involves physically interacting with the patients and decision-making. To be able to meet bedside needs incorporating the technological innovations that are exploding apace, a new form of intelligence, involving both physical and cognitive aspects is needed, referred as to shared-intelligence. In this talk, I will present my trajectory in the pursue of shared intelligence along the continuum of care, focusing in the operating room as the main setting to highlight new challenges and discoveries in the field of interventional AI. Specifically, I will discuss work related to telesurgery, skill augmentation, imaging based diagnosis and training. Progress in these directions will contribute to the public purpose of creating truly translational medicine that is more accessible, effective and sensitive to social needs.

**Bio:** Dr. Juan Wachs is the James H. and Barbara H. Greene Professor in Industrial Engineering and Faculty Scholar at Purdue University, Professor of Biomedical Engineering (by courtesy), an Adjunct Associate Professor of Surgery at IU School of Medicine, and Adjunct Professor at Johns Hopkins University. He recently served at NSF as a Program Director for Robotics and AI programs at CISE. He is also the director of the Intelligent Systems and Assistive Technologies (ISAT) Lab at Purdue, and he is affiliated with the Regenstrief Center for Healthcare Engineering. He completed postdoctoral training at the Naval Postgraduate School’s MOVES Institute under a National Research Council Fellowship from the National Academies of Sciences. Dr. Wachs received his B.Ed.Tech in Electrical Education in ORT Academic College, at the Hebrew University of Jerusalem campus. His M.Sc and Ph.D in Industrial Engineering and Management from the Ben-Gurion University of



the Negev, Israel. He is the recipient of the 2013 Air Force Young Investigator Award, and the 2015 Helmsley Senior Scientist Fellow, and 2016 Fulbright U.S. Scholar, the James A. and Sharon M. Tompkins Rising Star Associate Professor, 2017, and the ACM Distinguished Speaker 2018. Since 2020 he has been elected University Faculty Scholar, and since 2024, he received an Endowed Professorship. He is also the Associate Editor of IEEE Transactions in Human-Machine Systems, Frontiers in Robotics and AI.