

## Control of Complex Systems

Lecture Series

### Dr. F.L. Lewis

Moncrief-O'Donnell Endowed Chair

University of Texas at Arlington Research Institute (UTARI)

## Reinforcement Learning for Real-Time Feedback Control and Differential Graphical Games:

### *Applications to Robotics and Distributed Energy Microgrids*

We live surrounded by control systems and are (and should be) largely unaware of them. Since the 1960s, optimal and adaptive feedback control designs have been responsible for much of the successful performance of engineered systems in aerospace, the power systems industry, industrial processes, vehicles, robotics and manufacturing. For safety-critical systems, optimal control solutions come with robustness and performance assurance guarantees. Furthermore, differential multi-player game theory provides rigorous techniques for optimizing the performance of multiple interacting agents in communication systems, economics, formations, and microgrids. However, solutions to these problems are computed offline because they require full knowledge of the system dynamics. In this talk, Dr. F.L. Lewis will bring together automatic feedback control, bio-inspired decision architectures, machine learning, and graph theory to enhance optimal and game theoretic controllers with online learning capabilities. He will discuss example applications, including electric power microgrids and human-robot interaction systems.



Friday, April 20, Noon

EMSL Auditorium

U.S. DEPARTMENT OF  
**ENERGY** **BATTELLE**



**Pacific Northwest**  
NATIONAL LABORATORY

## About Dr. Lewis

F.L. Lewis, of the University of Texas at Arlington (UTA), is an award-winning scholar, technical expert, inventor, author and speaker. Dr. Lewis serves as the Moncrief- O'Donnell Endowed Chair at the UTA Research



Institute, a research and development unit that applies cutting edge technologies to real-world engineering problems. At UTA he's also a distinguished scholar professor, distinguished teaching professor, and head of the Advanced Controls and Sensors Group. Dr. Lewis' work is focused in feedback control, reinforcement learning, intelligent systems, and distributed control systems.

Dr. Lewis has received national and international recognition. He is a member of the National Academy of Inventors, is a Fellow in IEEE, IFAC, the U.K. Institute of Measurement and Control and AAAS, and has won a number of prestigious awards. He has authored seven U.S. patents, nearly 400 journal papers and more than 400 conference papers, plus multiple books, chapters and journal special issues. His H-index is 97. In addition to his work at UTA, Dr. Lewis serves as the Qian Ren Thousand Talents Consulting Professor at Northeastern University in Shenyang, China.

Dr. Lewis earned his bachelor's degree in Physics and Electrical Engineering and his master's degree in Electrical Engineering at Rice University. He also holds a master's degree in Aeronautical Engineering from the University of West Florida, and a doctorate from Georgia Tech.

