



Rutgers ECE Colloquium

Micro-macro PDE Control Under Implementation Limitations of Large-Scale Transport Systems

Wednesday, November 13, 2024 | 10:20 AM | Cor-101



Nikolaos Bekiaris-Liberis, Ph.D.

Associate Professor

Department of Electrical and Computer Engineering

Technical University of Crete

Greece

Abstract: Although “transport” may imply different notions for different scientific fields, the feature of incorporation of interacting system components through which “information” is propagated remains invariant. I will present control-theoretic results for biological transport systems, which describe epidemics spreading dynamics (via people transport) and cardiovascular flow dynamics (via blood transport). In particular, I will present numerical implementations of macroscopic, coupled crowd flow - epidemics spreading processes, subject to different macro-control measures; while studying blood transport stability in the presence of stenosis, which may be utilized to quantify medically relevant diagnostic indices. I will then present computationally tractable control designs for large-scale hyperbolic PDEs (describing biological transport systems dynamics), whose complexity does not grow with the number of PDE systems components. I will also present control designs for systems subject to delays, quantization, and switchings, phenomena that may negatively affect digital implementations of feedback control laws.

Biography: Nikolaos Bekiaris-Liberis received the Ph.D. degree in aerospace engineering from University of California, San Diego in 2013. From 2013 to 2014, he was a Post-Doctoral Researcher with University of California, Berkeley. From 2019 to 2022, he was an Assistant Professor, from 2017 to 2019, he was a Marie Skłodowska-Curie Fellow, and from 2014 to 2017, he was a Research Associate with the Technical University of Crete, Greece, where he is currently an Associate Professor with the Department of Electrical and Computer Engineering. His research interests include nonlinear delay, switched, and distributed parameter systems, and their applications to transport systems.

Nikolaos Bekiaris-Liberis serves as Associate Editor for *Automatica* and *IEEE Transactions on Intelligent Transportation Systems*. He received the Chancellor's Dissertation Medal in Engineering from University of California, San Diego in 2014 and the George N. Saridis Outstanding Research Paper Award in 2019 (from IEEE Intelligent Transportation Systems Society). He was a recipient of a 2016 Marie Skłodowska-Curie Individual Fellowship Grant and he received a 2022 European Research Council (ERC) Consolidator Grant. He is an IEEE Senior Member.