# TIME DELAY SYSTEMS
## Webinar
### TDS

**2023**

# Legendre polynomials for Delay Systems: Modelling and Stability



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### June 23, 2023, Friday @ 4:00 pm (CET)
7:00 am (PDT), 10:00 am (EDT), 10:00 pm (CST)
### Event will take place via Zoom

**ABSTRACT:** Time-delay systems represent a wide class of dynamical systems arising in many applications in electronics, biology, transport, etc.. Their interest in automatic control is natural since they propose many challenging theoretical problems related to their intrinsic infinite-dimensional nature. In particular, their stability analysis has been at the heart of many research works for several decades, and many methods have been developed. Among them, the use of Lyapunov-Krasovskii theorem remains one of the most popular techniques because of its inherent robustness. In this talk, I will review the recent advances on the topic of establishing stability conditions expressed in terms of linear matrix inequalities (LMI). More precisely, I will emphasize the use of the Legendre orthogonal polynomials, to derive efficient modeling of time-delay systems and their interpretations, but also efficient integral inequalities and the associated stability conditions. The structure and the convergence of resulting LMI conditions will also be discussed. Finally, some extensions of this framework to a wider class of systems will be presented. The presentation ends with a recap of the presentation, where several perspectives on future directions of research.

**BIO:** A. Seuret received the Ph.D. degree in Automatic Control from the 'Ecole Centrale de Lille' and the University of Science and Technology of Lille in 2006. From 2006 to 2008, he held one-year postdoctoral positions at the University of Leicester (UK) and the Royal Institute of Technology (KTH, Stockholm, Sweden). In 2008, he joined the CNRS as a junior researcher (Chargé de Recherche) at GIPSA-Lab in Grenoble (2008-2012) and at LAAS in Toulouse (2012-2022). In 2018, he was promoted Senior CNRS Researcher (Directeur de Recherche). Since 2022, he has been a researcher at the University of Sevilla, Spain. His research interests include time-delay, sampled-data and networked control systems, stability and control of systems governed by partial differential equations, hybrid dynamical systems, multi-agent and distributed control and estimation.

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*Questions? Contact: Gabor Orosz, orosz@umich.edu*