IEEE
Advancing Technology
for Humanity

IEEE
Control Systems
Society IIST

IEEE
Control Systems
Society
Kerala Chapter

IEEE
Control Systems
Society CET

VIRTUAL DISTINGUISHED LECTURE PROGRAM

DR. CLAUDIO ALTAFINI
Professor, Division of Automatic Control,
Dept. of Electrical Engineering,
Linköping University, Sweden

Talk Session on

MODELING SELF-ATTENTION IN TRANSFORMERS AS A MULTIAGENT DYNAMICAL SYSTEM: EQUILIBRIA, STABILITY, AND ASYMPTOTIC BEHAVIOR

Author Description

Modelling and controlling nonlinear dynamical systems is my research focus. I've worked on robotics, quantum mechanics, biological systems, and complicated networks. Nearly all of my research in the last few years has focused on modelling and controlling complex networks for engineering and technology, systems biology, and social networks.

Background

Laurea degree in Electrical Engineering from the University of Padova, Italy, in 1996 and PhD in Optimisation and Systems Theory from the Royal Institute of Technology, Stockholm, in 2001. I relocated to SISSA (International School for Advanced Studies) in Trieste, Italy, till 2013. I teach automatic control in Linköping University's electrical engineering department since 2014.

Abstract

Transformer architectures have rapidly become the standard algorithm for many problems in deep learning (e.g., large language models or image classification). At the core of a transformer lies a so-called self-attention mechanism. In this presentation Prof. Altafini will show how to model such self-attention mechanism as a continuous-time multiagent-like dynamical system model living on a sphere. Such dynamics is related to a multiagent version of the Oja flow, a dynamical system that computes the principal eigenvector of a matrix, corresponding for transformers to the value matrix. In the "single-head" time-invariant case, the equilibria of a self-attention dynamics can be classified into four classes: consensus, bipartite consensus, clustering and polygonal equilibria. For this simplified dynamics, multiple asymptotically stable equilibria from the first three classes often coexist. Interestingly, equilibria from the first two classes are always aligned with the eigenvectors of the value matrix, often but not exclusively with the principal eigenvector.

25 FEBRUARY 2026

02:30 PM IST

ONLINE MODE

Certificates will be provided
to all participants

REGISTER NOW!!

ieeecss.iist@gmail.com @ieee.css.iist