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Cosmological Structure Growth in Energy-Momentum Squared Gravity (EMSG)

Dr Payel Sarkar (University of Cape Town)

Friday, 3 July 2026 @ 14h00-15h00 SAST

Venues: NITheCS Seminar Room, Stellenbosch University; and Online

ABSTRACT:

We investigate the cosmological evolution of matter perturbations in the modified quadratic contraction of the energy--momentum tensor gravity. Using the gauge-invariant 1+3 covariant formalism, we study the evolution of the matter density contrast and analyze several growth observables, including the growth factor, growth index. We consider representative modified gravity parameter values n=1/2 and n=1/4, which probe different regimes of the matter--geometry coupling. We show that the growth index decreases with increasing redshift and approaches the standard matter-dominated behaviour at early times, while mild scale-dependent deviations from the ΛCDM model emerge at late times. The model predicts small departures from General Relativity for n=1/4, whereas stronger deviations appear for n=1/2 and larger values of the coupling parameter α. We further compare the theoretical predictions for f σ8 with current observational data and find that viable parameter choices remain within the observational ±2σ bounds. These results indicate that EMSG gravity can provide a viable description of late-time cosmic acceleration and large-scale structure formation while remaining consistent with current growth observations.

BIOGRAPHY:

Dr Payel Sarkar is a Postdoctoral Researcher at the University of Cape Town, South Africa. Prior to this, she held a postdoctoral position at the National Institute of Science Education and Research (NISER), Bhubaneswar, India. She completed her PhD at BITS Pilani, Goa Campus, India, in 2023. From October to December 2023, she was a Visiting Researcher at Kyoto University, Japan.

Her research interests include cosmic inflation, modified gravity theories, cosmological perturbations, and gravitational lensing.

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