Speaker: Ida Mehin Rasulian

Title: Static black hole horizons in cosmology

Abstract:

Despite previous claims that rule out the possibility of a static black hole horizon in cosmology we present a black hole metric that has a static horizon whilst mimicking the cosmological behavior at large scales away from the black hole horizon. By a suitable choice of coordinates, we show that it is possible to have a static black hole horizon in cosmology that does not suffer from issues like singularities in curvature invariants at the horizon. The resulting metric is consistent with the Schwarzschild-de Sitter metric for constant Hubble parameter. It should be noted that this metric does not lead to isotropic pressure, i.e. $p_\perp \neq p_r$ for radial distances comparable to Schwarzschild radius, but for large r the stress tensor (assuming general relativity) tends to the cosmological value. Turning to a more realistic framework, we study the cases of black hole$+$cosmological matter and black hole$+$matter$+$cosmological constant where we assume the pressure component takes its cosmological value and show that although the resulting metric does not have a static horizon, the physical radius of the apparent horizon can tend to a constant value for large cosmological time.