The Einstein-flow in $2 + 1$ dimensions

SPEAKER: DAVID FAJMAN,

University of Vienna, Faculty of Physics

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ABSTRACT

I give a short introduction to the Einstein equations and their interpretation as a geometric flow. I restrict to the case of 2+1-dimensions, which describes the time-evolution of a Riemannian 2-metric and other geometric quantities, which eventually form a 3 dimensional space-time. I discuss some of the interesting problems like nonlinear stability and geodesic completeness of solutions and present some ideas how to solve them by a combination of geometric and analytic techniques. The $2 + 1$ dimensional problem arises as a special case when studying 3+1 dimensional problems with symmetries and most of the problems and techniques carry over to higher dimensional problems. The talk will therefore try to serve as an introduction to follow up talks on Mathematical Relativity in the GAP Seminar. No prior knowledge in this field is required.