

Workshop: Non-regular Spacetime Geometry,  
Wien, March 12, 2023 - March 18, 2023

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**Title: Quasi-Local Mass, Scalar Curvature and a Positive Mass Theorem for Causal Variational Principles**

**Abstract:**

After a short introduction to causal variational principles, I will explain how, starting from a minimizing measure, one can associate to a spatial region a corresponding non-negative quasi-local mass. This notion suggests a synthetic definition of positive scalar curvature. Exhausting the whole space, the quasi-local mass goes over to the total mass, also giving a positive mass theorem. No smoothness assumptions are required. I will outline how to get a connection to the mass of an asymptotically flat static spacetime by constructing a static causal fermion system in such a spacetime. I will also explain in which sense the ADM mass corresponds to the total mass of the resulting causal variational principle.

I am reporting on ongoing joint work with Niky Kamran.