1163-35-925   **Tracey Balehowsky*** (`tracey.balehowsky@helsinki.fi`), **Antti Kujanapää**, **Matti Lassas** and **Tony Liimatainen**. *Determining a Lorentzian metric from the source-to-solution map for the relativistic Boltzmann equation.* Preliminary report.

In this talk, we consider the following inverse problem: Given the source-to-solution map for a relativistic Boltzmann equation on a neighbourhood V of an observer in a Lorentzian spacetime (M, g) and knowledge of $g|_V$, can we determine (up to diffeomorphism) the spacetime metric g on the diamond of causal influence for the set V?

We will show that the answer is yes for certain cases. We first will introduce the relativistic Boltzmann equation and the concept of an inverse problem. We then will highlight the key ideas of the proof of our main result. One such key point is that the nonlinear term in the relativistic Boltzmann equation which describes the behaviour of particle collisions captures information about a source-to-solution map for a related linearized problem. We use this relationship together with an analysis of the behaviour of particle collisions by classical microlocal techniques to determine the set of locations in V where we first receive light particle signals from collisions in the unknown domain. From this data we are able to parametrize the unknown region and determine the metric. (Received September 14, 2020)