The Born-Infeld equation: solutions and equilibrium measures
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In this talk, we deal with the following problem

\[
\begin{cases}
- \text{div} \left( \frac{\nabla \phi}{\sqrt{1 - |\nabla \phi|^2}} \right) = \rho, & x \in \mathbb{R}^N, \\
\lim_{|x| \to \infty} \phi(x) = 0.
\end{cases}
\] (BI)

The equation in (BI) appears for instance in the Born-Infeld nonlinear electromagnetic theory: in the electrostatic case it corresponds to the Gauss law in the classical Maxwell theory and so \(\phi\) is the electric potential and \(\rho\) is an assigned extended charge density.

In the first part of the talk, we discuss existence, uniqueness and regularity of the solution of (BI). In the second part, instead, we deal with existence of equilibrium measures \(\rho^*\), namely distributions that produce least-energy potentials among all the possible charge distributions, and properties of the corresponding equilibrium potentials \(\phi_{\rho^*}\) for (BI).

The results have been obtained in joint works with Denis Bonheure (Université libre de Bruxelles, Belgium), Pietro d’Avenia (Politecnico di Bari, Italy) and Wolfgang Reichel (Karlsruher Institut für Technologie, Germany).