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*On a semilinear PDE with a singular nonlinearity*

I will discuss some recent progress on the semilinear elliptic problem $\Delta u = \frac{\lambda f(x)}{(1+u)^2}$ on a smooth bounded domain $\Omega$ of $\mathbb{R}^N$ with an homogeneous Dirichlet boundary condition. This equation models a simple electrostatic Micro-Electromechanical System (MEMS) device and has been studied recently by Pelesco, and by Guo–Pan–Ward. Guo and Ghoussoub show—among other things—that the branch of minimal solutions $u_\lambda$ is compact up to a certain critical value $\lambda^*$, provided $1 \leq N \leq 7$. In this talk, I will describe an analogous result for the second branch (of "mountain pass" solutions), which holds in the same low dimensions. Our techniques rely on a careful blow-up analysis for solutions satisfying certain spectral properties.

Joint work with N. Ghoussoub and Y. Guo.