A dynamical system approach for Lane-Emden type problems

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In this course we study existence, nonexistence and classification of radial positive solutions of some nonlinear problems of Lane-Emden type. Our approach is entirely based on the analysis of the dynamics induced by an autonomous quadratic system, which is obtained after a suitable transformation. This method allows to treat both regular and singular solutions in a unified way. It applies to define critical exponents, in which existence and nonexistence of solutions are completely characterized, also in the supercritical and subcritical regimes. It produces positive radial solutions in the ball, the whole space, exterior domain, and annulus; based on recent results obtained in [Maia, Nornberg, Pacella, CPDE 2020].

Pre-requisites: The course is designed for graduate students in the areas of Nonlinear Analysis, Partial Differential Equations, and Dynamical Systems. Some knowledge on Partial Differential Equations and Ordinary Differential Equations is recommended but it is not strictly necessary, since we plan to give an overview of the pre-requisites.