

# COLÓQUIO DE MATEMÁTICA

Quarta-feira, 23 de outubro de 2019 às 14h30

## Semilinear Elliptic Problems: Old and New

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Ciências  
ULisboa

Matemática

*Convívio antes do Colóquio na Sala d Docentes do DM,  
com café, chá e bolos (14h até 14h30)*

### Sumário:

Elliptic partial differential equations are a very important class of equations with connections to applied sciences (e.g. physics, biology, engineering) as well as to other fields in mathematics such as Differential Geometry, Functional Analysis, Calculus of Variations and Optimization. Because of this, they are a quite fascinating and increasingly active field of research. Starting with the basics, I will explain what the concept of ellipticity is, what kind of properties do solutions to problems in this class have, and the differences between linear and nonlinear equations. Next, since giving a complete survey of the area would be an impossible task, I will focus mainly on classical semilinear problems of type  $-\Delta u = f(u)$ , as a mean to explain some of the tools and methods (mostly topological or variational) that are available to treat elliptic problems. Some of the questions that will be addressed concern existence and multiplicity of solutions, as well as their qualitative properties such as sign and symmetry. In the last part of the talk I will address recent topics regarding systems and their connection with free boundary and optimization problems. This talk is aimed at a broad audience: in particular, master and PhD students are welcome.