Nonlinear methods for linear equations: the low-regularity theory

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\textbf{Timetable:} 16 hrs First lecture on Tuesday March 5th, 2023, 10:30 (dates already fixed, see on https://dottorato.math.unipd.it/calendar), Torre Archimede, Room 2BC30..

\textbf{Course requirements:} Basic knowledge of classical functional spaces, without PDE requirements.

\textbf{Examination and grading:} The exam will be oral and tailored on the students’ interests.

\textbf{SSD:} MAT/05

\textbf{Aim:} Introduce some classical and modern methods to study regularity properties of solutions to the Laplace equation, focusing on nonvariational techniques based mostly on the maximum principle.

\textbf{Course contents:}
- Introduction and motivations: the importance of the regularity theory for elliptic equations;
- Review of maximum principles and applications;
- Weak-Harnack inequalities via Aleksandrov-Bakel’man-Pucci techniques;
- Harnack inequalities and Hölder a priori estimates;
- The notion of viscosity solution;
- The Bernstein technique to obtain a priori gradient estimates;
- Hölder/Lipschitz regularity estimates via doubling variables: the Ishii-Lions method;
- Lipschitz regularity estimates via doubling variables: the weak Bernstein method.

\textbf{Bibliography:}