Hyperbolic PDES: a (locally smooth) introduction

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Timetable: 22 hrs. First lecture on January 26, 2016, 10:00, (dates already fixed, see the calendar), Torre Archimede, Room 2BC/30

Course requirements: Before the course starts, we will meet interested students in order to adapt the program on audience's interests. We can for example discuss also numerical methods designed for conservation laws. In case of special interest, we can also include an overview on recent research lines.

Examination and grading: Either seminar or homework assignment.

SSD: MAT/05

Aim: This course focuses on hyperbolic PDES, with particular attention on conservation laws and transport. We aim at addressing basic topics accessible with essential background in calculus and functional analysis. The course should enable student to understand and approach relevant issues in the field.

Course contents: A tentative program includes the following. Scalar conservation laws: local existence, method of characteristics, loss of regularity and functional setting, Kruzhkov entropy conditions and equivalent formulations, global existence by vanishing viscosity, compensated compactness. For the scalar case, Riemann problem and other methods of constructing global entropy solutions: Glimm and wave front-tracking schemes. Examples. Classical theory on transport equation with smooth coefficients, Di Perna Lions results in Sobolev spaces, hints on Ambrosio's theory for vector field with bounded variation, an application of quasi-incompressible vector-fields.