

Introduction

This part contains a selection of the lectures of the 11th edition of the *Summer School on Methods and Models of Kinetic Theory* (M&MKT 2022), held in Pesaro (Italy), on June 12-18, 2022, with the participation of more than fifty young and senior researchers, coming from all over the world. The School is mainly aimed at presenting the updated state-of-the-art for important topics of significant interest in the field of kinetic theory and of its applications, considering both theoretical and numerical methods, relevant to the true Boltzmann equation as well as to other kinetic models. It is addressed especially to Ph.D. students, Post-Docs, and young researchers with some past experience, or else with a new interest, in these areas of Mathematical Physics.

The 11th edition of the School was focused on three main courses of 5 hours each:

1. Multi-agent system learning and control: mean-field control and evolutive games,
2. Vector field methods for kinetic equations,
3. De Giorgi methods applied to regularity theory for kinetic equations,

which were delivered by three distinguished experts in the field, Massimo Fornasier (Technische Universität München, Germany), Jacques Smulevici (Sorbonne Université, Paris, France), and Alexis Vasseur (University of Texas, Austin, USA), respectively.

Beside the three courses, short courses were given by Frédérique Charles (Sorbonne Université, Paris, France), Chiara Saffirio (Universität Basel, Switzerland), Josef Weinbub & Mauro Ballicchia (Technische Universität Wien, Austria).

Further information on the school can be obtained from the web site:

<http://mat521.unime.it/MMKT/>

In the frame of the aims and scopes of this Journal, this issue contains three extensive survey papers written by three of the above lecturers, summarizing the contents of their courses at the 2022 edition.

The Scientific and Organizing Committee of the School

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