Preface

These notes grew out of a graduate course on ergodic optimization given by the author at the University of Campinas. Obviously, some background in ergodic theory is required to follow the text. The requisites are relatively light: a reader should be familiar with the basic concepts of ergodic theory, as contained in, for example, the first half of Walters' book [101]. Moreover, these notes are by no means meant to be exhaustive. As a matter of fact, we focus mostly on the interpretation of ergodic optimal problems as questions of variational dynamics (see, for instance, [40, 49, 51, 75]), in a comparable way to the Aubry-Mather theory for Lagrangian systems. The reader shall be conscious that other points of view are also useful in ergodic optimization, like the one based on properties of Sturmian measures and its generalizations (see, for example, [19, 26, 66]).

Ergodic optimization is a theoretical branch primarily concerned with the study of the so-called optimizing probability measures. The goal of this introductory monograph is, hence, twofold. One objective is to present and discuss in details fundamental concepts of the theory, in particular to clarify the relevance of a perspective dictated by the dual system:

$$\text{(optimizing probabilities, sub-actions)}.$$

Sub-actions should be understood as the ergodic optimization analogue to subsolutions of the Hamilton-Jacobi equation. Therefore, another purpose of these notes is to provide pieces of evidence for the widest applicability of the viscosity solution methods or weak KAM solution techniques. There are several good books on this generalized notion of a solution of a partial differential equation, which describe its main properties and usual applications (see, for instance, [36, 45, 56, 78]).

There are a simple couple of reasons for choosing to discuss here ergodic optimal problems in an expanding context. First, the ergodic optimization theory on compact spaces has a more complete and detailed treatment for expanding dynamical systems. Hence, we decided to explain the essential theoretical aspects in

a class of particular importance, namely, in symbolic systems, not only describing important achievements but also presenting some new results. Furthermore, we shall emphasize that the choice of a well-known dynamical framework allows making the exposition more intelligible, which is intended to be largely self-contained.

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