

Preface

This book discusses the theoretical underpinnings of decision forests¹ as well as their practical applications in many automatic image analysis tasks typical of computer vision and medical image analysis.

Decision forests have recently become an indispensable tool for automatic image analysis, as demonstrated by the vast literature on the subject. This book attempts to organize the existing literature within a shared, flexible forest model that is capable of addressing a large and diverse set of image analysis tasks. The versatility of decision forests is also reflected in the provided research code: a compact, flexible and user friendly software library aimed at helping the reader to experiment with forests in a hands-on manner.

This book is directed at both students who wish to learn the basics of decision forests, more established researchers who wish to become more familiar with forest-based learning, and finally practitioners who wish to explore modern and efficient image analysis techniques. The book is divided into three parts:

- Part I presents our coherent model of forests, its theoretical foundations, and its applications to various tasks such as classification, regression, density estimation, manifold learning and semi-supervised classification.
- Part II contains a number of invited chapters that demonstrate the application of forests to practical tasks such as pedestrian tracking, human body pose estimation, pixel-wise semantic segmentation of images and videos, automatic parsing of medical 3D scans, and detection and delineation of brain lesions.
- Part III discusses practical implementation details, describes the provided software library, and presents concluding remarks.

We truly hope that this book can serve as a springboard to further exciting research in automatic image and video understanding.

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¹Throughout the book we use the terms “random forests”, “randomized trees”, “decision forests” or “random decision forests” interchangeably.

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