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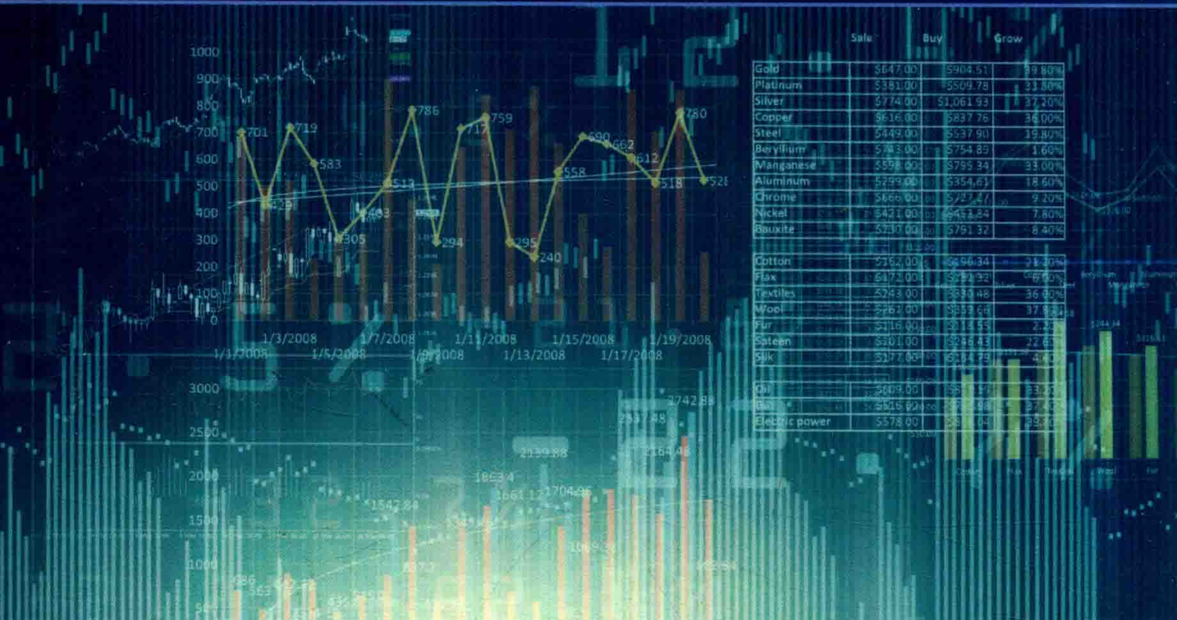

Diane J. Cook • Narayanan C. Krishnan

ACTIVITY LEARNING

Discovering, Recognizing, and Predicting Human Behavior from Sensor Data

WILEY

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Activity Learning

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Preface

Activity learning from sensor data is a research topic that is making its way into many fields including machine learning, pervasive computing, psychology, and sociology. The ability to discover and model activities based on collected sensor data has matured. These methods are now able to handle increasingly complex with increasingly complex situations including unscripted activities, interrupted or interwoven activities, real-time learning, and learning from multiple users or residents. At the same time, there have been advances in the application of the theoretical techniques to challenge real-world problems including health monitoring and home automation.

The goal of this book is to define the notion of an activity model learned from sensor data and to present the key algorithms that form the core of the field. While many current efforts have contributed to the ability to automatically recognize known activities, there are other aspects of activity learning that we want to include in this treatment. These include discovering activity patterns from unlabeled data and predicting when specific activities will occur in the future, as well as mapping sensor event sequences to predefined activity labels. We also want to discuss the challenges that are faced when these theoretical techniques are applied to real-world problems and suggest methods for addressing the challenges.

This book is designed for an interdisciplinary audience who would like to use or design activity learning techniques. As a result, most of the ideas are presented from the ground up, with little assumptions about the background of the reader. Ideally, the book will provide some helpful background and guidance to researchers, undergraduate or graduate students, or practitioners who want to incorporate the ideas into their own work.

The best way to understand activity learning techniques is to look at activity sensor data, play with existing tools, and writing your own code. To help with this process, we provide code for many of the techniques described in this book. A variety of activity sensor datasets are available for your use as well. All of the related book materials can be found online at http://eecs.wsu.edu/~cook/albook.

We would like to thank the many individuals who helped us with this book. Jacqueline Southwick took the activity photographs that we included and the team of Kyle Elsalhi and Anthony Simmons, who generated the Kinect-based motion history image. Numerous individuals contributed to the data collections we made available with this book and who provided feedback on drafts of the book. These include Larry Holder, Maureen Schmitter-Edgecombe, Aaron Crandall, Brian Thomas, Yasmin Sahaf, Kyle Feuz, Prafulla Dawadi, Ehsan Nazerfard, Bryan Minor, Adriana Seelye, Carolyn Parsey, Jennifer Walker, Alyssa Weakley, Sue Nelson, Thomas Cowger, Selina Akter, and Prasanth Lade. Our editors at Wiley provided guidance throughout the entire process and for that we are grateful. Last but not least, we want to thank our colleagues, friends, and family who were unfailingly supportive of this effort. Diane would like to thank her family, Larry, Abby, and Ryan, who kept her going with ideas, encouragement, and lots of humor. She dedicates this book to them. Narayanan dedicates this book to his family, Krishnan, Geetha, and Karthik for their constant encouragement and support.

DIANE J. COOK and
NARAYANAN C. KRISHNAN

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