

# Lecture Notes in Social Networks

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Mohammad A. Tayebi • Uwe Glässer

# Social Network Analysis in Predictive Policing

Concepts, Models and Methods



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Mohammad A. Tayebi  
Computing Science  
Simon Fraser University  
British Columbia, Canada

Uwe Glässer  
Computing Science  
Simon Fraser University  
British Columbia, Canada

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# Foreword

Policing resources across North America have become increasingly under pressure, and police governance authorities and governments are struggling to meet the increasing demands of both frontline policing and the complicated financial and social impacts of organized crime on society. Along with these pressures, the world of intelligence gathering has remained relatively stable and consistent in its use of human source information to inform law enforcement authorities on the location and proliferation of organized crime activities in our societies. The research demonstrated in this text shows an alternative evidence-based approach to the standard intelligence gathering process by enhancing law enforcement's preventative capacity in identifying organized crime groups that previously went undetected under standard police intelligence gathering techniques. The utilization of co-offending networks and geographical analysis provides an unbiased scientific methodology to the intelligence process that in addition to human source techniques increases the productivity and accountability of policing resources in the detection and strength of organized crime groups. Early identification and detection of these groups through predictive policing ensures that both law enforcement and communities can proactively engage and mobilize community efforts to disrupt and remove the threat of organized crime on society. The research conducted by Mohammad A. Tayebi and Uwe Glässer at Simon Fraser University provides an excellent stepping stone for intelligence and law enforcement agencies alike to more thoroughly analyze police/intelligence databases in ensuring the most useful allocation of policing resources

Director  
Criminal Intelligence Services Ontario

Dr. Hugh Stevenson Ed.D.

# Preface

Predictive policing is promising for crime reduction and prevention to increase public safety, reduce crime costs to society, and protect the personal integrity and property of citizens. Strategic law enforcement operations aiming at proactive intervention in criminal activities can be a viable alternative to simply reacting to criminal acts. New methodologies in data science along with emerging applications of big data analytics to crime data promote a paradigm shift from tracking patterns of crime to predicting those patterns. Crime data analysis as presented in this book concentrates on relationships between offenders to better understand their criminal collaboration patterns through social network analysis. Law enforcement agencies have long realized the importance of co-offending networks for designing prevention and intervention strategies. According to Reiss (1988), understanding co-offending is central to understanding the etiology of crime and the effects of intervention strategies.

The objective of this book is to bring into focus predictive policing as a new paradigm in crime data mining and introduce social network analysis as a practical tool for turning crime data into actionable knowledge. The book systematically studies co-offending network analysis for various forms of criminal collaborations, starting with a formal model of crime data and co-offending networks to bridge the conceptual gap between abstract crime data and co-offending network mining. The formal representation of criminological concepts presented here allows computer scientists to think about algorithmic and computational solutions to problems long discussed in the criminology literature. This includes criminal network disruption, suspect investigation, organized crime group detection, co-offense prediction and crime location prediction. For each of the studied problems, we start with well-founded concepts and theories in criminology, then propose a computational model, and finally provide a thorough experimental evaluation, along with a discussion of the results. This way, the reader will be able to study the complete process of solving real-world multidisciplinary problems.

The targeted audience of this book includes researchers in computer science and criminology who are interested in predictive policing as an emerging

multidisciplinary field as well as practitioners in collaborations between law enforcement and academia who search for novel and practical ideas to take predictive policing to the next level.

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British Columbia, Canada

Mohammad A. Tayebi  
Uwe Glässer

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