**Thesis:** Crime Prediction Using Agent-Based Modeling: a Survey

**Abstract:** Crime prediction has been one of the most important topics within computational criminology. Both the spatial and temporal prediction of the occurrences of crime events help criminologists and field practitioners test the foundation of criminology theories, understand crime dynamics, and evaluate the efficacy of different policing policies or urban development strategies with respect to crime rates. In recent years, agent-based modeling (ABM) has gained more popularity than traditional statistical methods for crime prediction due to its ability to capture the dynamics of non-linear interactions between different social entities to reproduce macro-level regularities in a bottom-up generative manner. With the goal of encouraging more inter-disciplinary collaboration between researchers in sociology and computer science to make further progress in this field, this survey first provides an overview of where ABM has been applied to in computational criminology by categorizing models developed based on their distinctive modeling purposes, then presents a detailed walk-through of the key components during the whole model development process, including the incorporation of miscellaneous social data, the construction of the virtual environment, different behavioral designs of the agents, various validation methods. Finally, we discuss the potential of individual-level case-by-case crime prediction that incorporates empirical experience for focused deterrence policing and points out current challenges (e.g., system dependencies, the computing complexity, and the difficulty of integrating machine learning techniques) that needs to be resolved through future endeavors.

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