Predictive Policing: Preventing Crime with Data and Analytics

Dr. Jennifer Bachner
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Predictive Analytics World - Government

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Washington, DC
Challenges in Modern Policing

- Law enforcement agencies being asked to **do more with less**.
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77% reported decreases in grant funding since FY11

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Challenges in Modern Policing

▶ Law enforcement agencies being asked to do more with less.

“77% reported decreases in grant funding since FY11
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▶ Solving and deterring crime are complex problems.
Predictive Policing

- Basic idea: use *data and analytical methods* to deter crime and solve open cases.
Predictive Policing

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- Predict where **crime is likely to occur** and where **suspects are likely to be located**.
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Predictive Policing

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- Predictive analytics can be useful in a wide range of policy and governance areas.
Data Used in Predictive Policing

Table 1: Examples of Variables Used in Predictive Policing

<table>
<thead>
<tr>
<th>Spatial Variables</th>
<th>Temporal Variables</th>
<th>Social Network Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indicators of Areas with Potential Victims/Targets</strong></td>
<td>• Payday schedules</td>
<td>• Kinship</td>
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<tr>
<td>• Shopping Malls</td>
<td>• Time of day</td>
<td>• Friendship</td>
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<td>• Property values</td>
<td>• Weekend vs. weekday</td>
<td>• Affiliation with an organization</td>
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<td>• Hotels</td>
<td>• Seasonal weather (e.g. hot versus cold weather)</td>
<td>• Financial transaction</td>
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<td>• Area demographics</td>
<td>• Weather disasters</td>
<td>• Offender/victim</td>
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<td>• Population density</td>
<td>• Moon phases</td>
<td></td>
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<tr>
<td>• Residential instability</td>
<td>• Traffic patterns</td>
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<tr>
<td><strong>Indicators of Escape Routes</strong></td>
<td>• Sporting and entertainment events</td>
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<td>• Highways</td>
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<td>• Bridges</td>
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<td>• Tunnels</td>
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<tr>
<td>• Public transportation</td>
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<td>• Railways</td>
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Analysis of Space

- Identification of **hot spots**: use past crime data (and sometimes other variables) to identify areas likely to experience crime in the future.
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- Variety of **clustering methods**:
  - Point locations
  - Hierarchical clustering
  - Risk-terrain modeling
Santa Cruz Police Department

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Overview

Space
Time
Social Networks
Considerations
Concluding Thoughts
Analysis of Time and Space

▶ Identification of a serial offender’s next target
Analysis of Time and Space

- Identification of a **serial offender’s next target**
- Identification of a **suspect’s likely location**
CrimeStat: A Spatial Statistical Program for the Analysis of Crime Incidents, Figure 2

Estimating the residence location of a serial offender in Baltimore County (MD)

Baltimore County

Legend
- Yellow dot: Residence of S5B
- Red dot: Incidents committed by S5B

CrimeStat: A Spatial Statistical Program for the Analysis of Crime Incidents, Figure 2

Social Network Analysis

- First: Identify **actors of interest**
Social Network Analysis

- First: Identify actors of interest

- Second: Identify relationships of interest (family, friends, enemies, organizational affiliates, victims, etc.)
Social Network Analysis

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- Second: Identify **relationships of interest** (family, friends, enemies, organizational affiliates, victims, etc.)

- Potential uses: Insert information, identify cause of violence, isolate a suspect
Richmond Police Department

Startup Costs

1. Collecting and managing **large volumes of data**.
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2. Ensuring analysts possess sufficient domain knowledge.
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4. Creating privacy and data security standards.
Effective Management Strategies

- Avoid a top-down implementation.
Effective Management Strategies

▶ Avoid a top-down implementation.

▶ Encourage community policing.
Effective Management Strategies

- **Avoid a top-down** implementation.
- Encourage **community policing**.
- Develop a **hybrid** organizational structure.
Effective Management Strategies

- Avoid a top-down implementation.
- Encourage community policing.
- Develop a hybrid organizational structure.
- Identify and install multi-skilled leaders.
Risks

▶ Overreliance on technology
Risks

- Overreliance on technology
- Neglect of community building
Risks

- **Overreliance** on technology
- Neglect of **community building**
- **Privacy** and security concerns
Putting the Pieces Together

Predictive policing is a multi-person, multi-step, iterative process.

Figure 1: Model of Crime Analysis

- Question Formulation
- Data Identification and Acquisition
- Data Preprocessing
- Data Analysis
- Actionable Recommendation
- Officer Action
- Evaluation of Action
Concluding Thoughts

- Predictive analytics can dramatically improve the efficiency of an organization.
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- Good leadership is essential.
Concluding Thoughts

- Predictive analytics can dramatically improve the efficiency of an organization.
- Good leadership is essential.
- Data collection, sharing and organization is critical.
For more information

- Full report is available online.
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- Thanks for listening!