Re-Shaping the Police Landscape: The Glacier of Forecasting

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2011 Landscape Changes: Sudden and Gradual

Earthquakes
Record Number: 202 = 6+ Richter
- Japan
- New Zealand
- Myanmar (Burma)
- Turkey
- India-Nepal

Glaciers Melting
(faster than expected)
- Greenland
- Himalayas
- Antarctica
- Andes
- Patagonia
Policing Landscape Changes:  
Sudden v. Gradual

Earthquakes
Police killings → Arab Spring

Glaciers Melting?
Slow, steady increase in

Better Evidence:

1. Forecasting
2. Focusing
3. Follow-Through

Elected Police Commissioners—UK
Budget Cuts—UK, US
Police Glaciers

• Growth of Police Knowledge, Research

• Cambridge Police Executive Programme

• Society for Evidence-Based Policing

• More experiments in UK than ever before
Campbell Collaboration

- www.campbellcollaboration.org
- Crime and Justice Coordinating Group
- 29 Completed systematic reviews
- Hosted by Norway
- Swiss and Israeli co-chairs
- New Campbell Centre in China?
- Global basis for peer-reviewed evidence
3 Kinds of Evidence

1. Prediction: risk and harm levels

2. Prevention: Cost-effectiveness evidence

3. Punishment: Managing resources
Predicting Serious Harm—\textit{not just minor crime}\n
- From arrest to parole release
- Who is dangerous, who is not
- Restrain loss of liberty for the worst
- Use restoration, rehabilitation for most
3 Ways to Predict Behaviour

1. Clinical (untested) assessments

2. Checklists validated by testing

3. Data mining validated by testing
## Testing Forecasts: What Actually Happens?

<table>
<thead>
<tr>
<th>Predicted to Happen</th>
<th>Actually Happens</th>
<th>Actually does NOT Happen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predicted NOT To Happen</td>
<td>1. True Positive</td>
<td>2. False Positive</td>
</tr>
<tr>
<td></td>
<td>3. False Negative</td>
<td>4. True Negative</td>
</tr>
</tbody>
</table>
From Clinical to Data Mining

Predicting Domestic Violence
Cambridge MSt Thesis
Tested Predictions
All murder, attempted cases = false negatives
Predictions missed

Chief Sara Thornton, Thames Valley
Forecasting Murder

- JOURNAL OF THE ROYAL STATISTICAL SOCIETY
- Berk, Sherman, et al, 2009
- Philadelphia Probation Cases
- 300-400 murders per year
- 1.5 million population
- Rate = 14 X Scotland’s
Average Charges for MURDER or Attempted Murder Within Two Years of Probation Start

- High: 0.375
- Neither: 0.033
- Low: 0.005
Risk of Murder by Age at Time of Crime (Phila)
Risk of Future Murder By Age of First Adult Disposition
Value of Each Murder Predictor
How Does This Work?
Barnes and Hyatt, 2012

Table 1: Simplified confusion matrix for the most recent Philadelphia forecasting model (i.e., Model C), based on construction sample

<table>
<thead>
<tr>
<th></th>
<th>Actual High</th>
<th>Actual Non-High</th>
<th>Totals</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forecast High Risk</td>
<td>A: 7,112</td>
<td>B: 11,700</td>
<td>18,812</td>
<td>15.7%</td>
</tr>
<tr>
<td>Forecast Non-High</td>
<td>C: 4,468</td>
<td>D: 96,655</td>
<td>101,123</td>
<td>84.3%</td>
</tr>
<tr>
<td>Totals</td>
<td>11,580</td>
<td>108,355</td>
<td>119,935</td>
<td></td>
</tr>
<tr>
<td>Percent</td>
<td>9.7%</td>
<td>90.3%</td>
<td></td>
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</tbody>
</table>
Figure 1: An example of one path through one tree in Philadelphia's latest random forest model.
Announcing England & Wales

• 100,000 cases
• Convictions in year 2000
• Ten years of Followup
• Data Mining for Serious Offending
• Also for identifying low HARM cases
• Even with high risk of repeats (LOW harm)
2-year Definitions: England and Wales

Low Harm = NO new crimes over 2 years

Medium Harm = No SERIOUS crimes 2 yrs

High Harm = Violence, Sex crime, robbery
In England, Who Is Safe to Caution?
Error of Low-Harm Forecast

39,598 forecast to be low harm

799 were actually high-harm = 2% off

98% Accurate

6719 were high or medium = 17%

83% accurate
The Moral Issues

• False Positive—money, fairness

• False negative—danger, harm

• Half of all convictions police-finalized

• Prosecutions are very expensive
Moral Balance

- Fair predictions—not INTUITION (bias)
- Give suspects fair chance at diversion
- Unbiased estimate of their dangerousness
- Reduce costs of prosecution for low-risk
- Save costs for high-harm
- Avoid cautioning high-harm; prosecute
- Overall, fewer prosecuted, or prison
Police Landscape

- Emphasis on risk assessment accepted
- Clinical Risk assessment-- low accuracy
- Data Mining—high accuracy
- Now make it widely available
- Test police offender management strategies
- Legitimacy of best evidence for selection
Thank You

Reshaping the Police Landscape with Forecasting
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