Spatio-temporal metrics that distinguish outcomes of field hockey plays

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Spatio-temporal metrics that distinguish outcomes of field hockey plays

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Introduction

Direction of play

(x, y, t)

\(\theta\)

23 m

\[
\text{= offence} \quad \text{= defence}
\]
Introduction

Question:
What combinations of spatio-temporal metrics distinguish play outcomes?
Method

Data collection

HD cam’, pan-tilt-zoom

4K cam’, 0.3x fisheye lens, fixed
Method

Data processing

- **Positions**
  - $\mathbf{x, y, t}$

- **Distances**
  - $\Delta t = t_2 - t_1$

- **Angles**
  - $\Delta t = \frac{d}{t_2 - t_1}$

- **Spread**

- **Area**

- **Duration**

- **Speed**

- **Context**
  - No. of players
Method

Problem:

• Many metrics \( n_{metrics} = 3,641 \)
• Few observations \( n_{observations} = 660 \)

\[
I\text{-score} = \sum n_j^2 (\bar{Y}_j - \bar{Y})^2
\]

Backward Dropping Algorithm (Wang et al. 2012)
Method

\( I\)-score

1500

2578

65

1111
## Results

<table>
<thead>
<tr>
<th>Rank</th>
<th>Metric Combination</th>
<th>$l$-score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[23,26]</td>
<td>2702.772</td>
</tr>
<tr>
<td>2</td>
<td>[3,11]</td>
<td>2702.772</td>
</tr>
<tr>
<td>3</td>
<td>[4,5,7,8,31]</td>
<td>2681.984</td>
</tr>
<tr>
<td>4</td>
<td>[4,7,8,31]</td>
<td>2681.984</td>
</tr>
<tr>
<td>5</td>
<td>[5,7,8,31]</td>
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<tr>
<td>6</td>
<td>[3,21]</td>
<td>2677.408</td>
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<tr>
<td>7</td>
<td>[4,5,8,31]</td>
<td>2646.662</td>
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<tr>
<td>8</td>
<td>[4,8,31]</td>
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<tr>
<td>9</td>
<td>[5,8,31]</td>
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<tr>
<td>10</td>
<td>[4,5,7,31]</td>
<td>2643.416</td>
</tr>
</tbody>
</table>
Discussion
Discussion

Direction of play

(x, y, t)

(x, y, t)
Conclusion

Problem:
• Too many metrics.
• Too few observations.

Solution:
• Ask someone who knows – genetic analysts.
• Backward Dropping Algorithm

Results
• Metrics associated with outcomes.
• Metric combinations associated with outcomes.
Spatio-temporal metrics that distinguish outcomes of field hockey plays

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