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

\[(x, y, t)\]

\[23 \text{ m}\]

= offence

= defence
Introduction

Positions

(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
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

Distances

Angles

Spread

Area

Duration

Speed

Context

\((x, y, t)\)

\(\Delta t = t_2 - t_1\)

\(\Delta t = \frac{d}{t_2 - t_1}\)

No. of players
Method

Problem:

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

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

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>I-score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[23,26]</td>
<td>2702.772</td>
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<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>
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<td>[4,7,8,31]</td>
<td>2681.984</td>
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<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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<td>7</td>
<td>[4,5,8,31]</td>
<td>2646.662</td>
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<td>8</td>
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<tr>
<td>9</td>
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<tr>
<td>10</td>
<td>[4,5,7,31]</td>
<td>2643.416</td>
</tr>
</tbody>
</table>
Direction of play
Discussion

Direction of play

(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.
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