AI in outcome and toxicity prediction

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Outcome (and toxicity) prediction

Diagnosis


X X X

?
# Model learning on clinical trials

- Models predicting LR, DM or OS

- (neo-)adjuvant chemo given?
  - Neo-adjuvant to what?

- “Trial arm indicates chemotherapy type”
  - Encoded as “1” and “2”
  - Size of trial arm is not equal to published paper

<table>
<thead>
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<th>Trial</th>
<th>#pts</th>
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<tbody>
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<tr>
<td>FFCD 2903</td>
<td>742</td>
</tr>
<tr>
<td>CAO/ARO/AIO 94</td>
<td>799</td>
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<tr>
<td>Polish I</td>
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<td>ACCORD</td>
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<td>Dutch TME</td>
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<tr>
<td>Swedish trial</td>
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</tr>
<tr>
<td>I-CNR-RT</td>
<td>634</td>
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<tr>
<td>Glynne-Jones cohort</td>
<td>113</td>
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<tr>
<td>INTERACT</td>
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<td>Polish II</td>
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<tr>
<td>Nordic trial</td>
<td>207</td>
</tr>
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<td><strong>Total:</strong></td>
<td><strong>9667</strong></td>
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Valentini et al. In submission
Model learning on clinical trials

Valentini et al. In submission
Model learning on clinical trials

• Interactions on variables are important
  • Hypothesis: Influenced by inclusion criteria of trials
  • Only in text of manuscript, not noted in actual (meta) data

• Hence, context of outcome prediction models are important!
  • E.g. treatment guidelines / protocols
Model learning for treatment toxicity

Model assessment

• “Standard” model performance measures
  • Discrimination (C-index / AUC)
  • Calibration (in-the-large & slope & plot)
  • Accuracy / F-score / PPV / NPV and associated curves

• But what if a model doesn’t work?
Assess cohort differences / similarity

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</table>

Can we predict whether a patient belongs to the training or test cohort?

Yes (high AUC): cohorts are different
No (AUC ~0.5): cohorts are similar

Input variables | Predicted
---|---

Model assessment & cohort differences

- **Model works on same patient population**
  - Generalizable model

- **Model works on different patient population**
  - Transferable model

- **Model does not work on same patient population**
  - Valid model?

- **Model does not work on different patient population**
  - Model for specific population?

Clinical Use?

- Do you have all variables available?
- Does it work on “my” patients?
- When is good, good enough?
- Continuous monitoring?

- ....... Needs “commissioning” and continuous QA of models
Thank you

Netherlands
• MAASTRO, Maastricht, Netherlands
• Radboudumc, Nijmegen, Netherlands
• Erasmus MC, Rotterdam, Netherlands
• Leiden UMC, Leiden, Netherlands
• Catharina Hospital, Eindhoven, Netherlands
• Isala Hospital, Zwolle, Netherlands
• NKI Amsterdam, The Netherlands
• UMCG, Groningen, Netherlands

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• UZ Leuven, Belgium
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