Argumentation for Automation of Statistical Model Selection
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Abstract
The increased availability of clinical data provides a valuable opportunity for analysis with a view to support evidence based decision making.

In order to confidently leverage this data in support of decision making, it is essential to analyse it with rigour by employing the most appropriate statistical method.

It can be difficult for a clinician to choose the appropriate statistical method and indeed the choice is not always straightforward, even for a statistician.

The considerations as to what model to use depend on the research question, data and at times background information from the clinician, and will vary from model to model.

Challenges
Develop an intelligent model recommendation methodology that:
• Argues with conflicting conclusions, when more than one model is suitable
• Leverages considerations from statistical theory that will make one suitable model preferred to another
• Validates model assumptions that are external to the data
• Provides an audit trail and justification for model recommendation
• Works with a knowledge base structure that contains relevant model features

Motivation
“Data without a model is just noise”
The End of Theory: The Data Deluge Makes the Scientific Method Obsolete by C. Anderson, Wired 2008

• Data collection as routine
• Expectation to exploit it
• Data is easy to access and query
• No guidance as to what statistical model is most suitable for the analysis
• At times more than one model is possible
• Easy to mis-use and draw misleading conclusions, if the model used is not suitable.

Proposed Approach - Arguments supporting models
• A Statistical Knowledge Base (SKB)
• An Argument Scheme to generate arguments in support of the use of a specific model that achieves the analysis objective of the research question
• Critical questions and contextual preferences over models that are represented as preferences over arguments
• Application of Extended Argumentation Frameworks to reason with arguments and preference arguments to provide a recommended model

Evidence based vs Gut feel

"It would appear Hopkins, that your gut feel was only indigestion"

Proposed Approach - Incorporating preferences

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