eHealth Summit Austria 2016

Selected clinical applications I

or

the way from a Bayesian Network to a Clinical Decision Support System for Tumor Boards

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Complexity of tumor board decisions

Head&Neck-Tumorboard at the University Hospital Leipzig, Germany
Clinical Decision Support Systems using Bayesian Networks
Bayes’sches Netzwerk (J. Pearl)

Graphical Modelling example of laryngeal cancer
Probabilistic Modelling example of laryngeal cancer
Bayes’sches Netzwerk (J. Pearl)

Inference
Clinical Decision Support Systems using Bayesian Networks
Clinical Decision Support Systems using Bayesian Networks
Aim: To model a tumor board decision for laryngeal cancer.

An example of the MEBN therapy decision of laryngeal cancer, >1100 IEs and >1500 dependencies
Concept for a CDSS using BN


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BN limitation of:
Fuzzy values to decrease data validity over time
Limits in BN modelling

- Information about time is needed.
- Recalculating fuzzy values based on past time of examinations

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Additional Tools
- e.g., Arden Syntax
- medexter
- clinical decision support
Concept for a CDSS using BN

Challenges with modelling
Consider a patient with a tumor of the oesophagus. How likely is it that:

- The tumor invades the lymph nodes (N state) is completely absent (N0)?
- The tumor invades the lymph nodes (N state) is partially present (N1)?
- The tumor invades the lymph nodes (N state) is completely present (N2)?
- The tumor invades the lymph nodes (N state) is present at any level (N3)?

- The tumor invades the lymphatic vessels (M state) is absent (M0)?
- The tumor invades the lymphatic vessels (M state) is present (M1)?

- The tumor invades the lymphatic vessels (M state) is present at any level (M2)?

- The primary tumor invades the esophagus at a distance of 7 cm from the lower end:

  - How likely is it that the UICC stage is IV B?
  - How likely is it that the UICC stage is IV A?
  - How likely is it that the UICC stage is I?
Challenges with modelling

1. Describe the study with a set:
2. Indicate the annotations to the study.
3. How often did the diagnosis "hypertension" in your workday appear?
4. Unicity:
   - Did you have an application, when yes, what?
   - Indirect access - how did you know?
   - How did you make the diagnosis?
5. Questionnaire:
   - In how many situations did you have to answer the questions?
   - Did you have to answer all questions or were you interrupted?
6. Variations in the answers:
   - Some answers were similar to other.
7. Test for invalid questions:
   - Was it easy to answer the questions?
   - Did you have to answer all questions or were you interrupted?
8. Other Aspects (medical practice):
   - What is the understanding of the medical practice?
Web-Tools to support expert modelling

In cooperation with

Freie Universität Berlin

Please select the Symptoms of Larynx cancer:
Collaborative expert modelling!
Collaborative Expert Modelling
Concept for a CDSS using BN

Users
UID
Viewpoints


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Therapy decision model with an example of Laryngeal cancer

GUI for analyzing PSBNs

In cooperation with

Gesellschaft für Technische Visualistik

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Thank you!

Questions?
Meet our digital OR!

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