BAYESIALAB

The webinar will start at: **13:00:00** The current time is: **13:00:34**

Central Standard Time UTC-6

Risk Management Using Bayesian Networks and BayesiaLab

Introduction

Your Hosts Today

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Today's Objectives

Methodological Objective

Bayesian Networks for Managing Risk without data!

Substantive Research Objective

 Quantifying and mitigating the risk of speeding violations in a transportation business context

"TOY PROBLEM"



Today's Agenda

Motivation & Background

- Regulations & Risk
- Qualitative Risk Assessment
- Risk Mitigation Proposal

Methodologies

- Bayesian Networks for Reasoning Without Data
- The Delphi Method
- The Bayesia Expert Knowledge Elicitation Environment (BEKEE)

Software Demo

- Building the Qualitative Structure
- Eliciting Probabilities with BEKEE
- Finding the Optimal Policy



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Webinar Slides & Recording Available



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Today's Domain: Transport & Logistics numnum munnum









Risk Management

Premise

- Human drivers are always at a risk of violating traffic rules, including speed limits. **Proposal for Risk Mitigation**
 - Equip vehicle fleet with radar detectors to reduce the risk of speeding violations.

Note



- We are only considering the risks of violating the law and its consequences, such as a penalties, suspension of privileges, arrests, or vehicle seizures.
- We are not looking at accident risks related to speeding, which of course exist.
- We assume that radar detectors are legal for the purpose of this study, which is not the case in many jurisdictions.



Note: We do not advocate speeding or the use of radar detectors. Always obey all applicable traffic laws in your jurisdiction.





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Risk Management

Study Questions

- What is the base risk without radar detectors?
- By how much do radar detectors reduce the risk of speeding violations?
- What is their expected economical value to an organization?
- Do they potentially lead to unintended consequences?



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GET #DATADRIVEN

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MAKING DATA-DRIVEN DECISIONS

BUSINESS

But what if we don't have any data...



"Without data, you're just another person with an opinion."



W. Edwards Deming





Bayesian Networks to the Rescue!

Data

Model Source

Theory

Even without data, humans do possess useful knowledge, qualitative or quantitative, tacit or explicit, about many aspects of the world.

Reasoning Without Data

Description Prediction Association/Correlation

Explanation Simulation Model Purpose

Causation

Optimization Attribution



Reasoning Without Data

One Expert



Last Week



Knowledge Elicitation — Individual Biases

Examples

- Overconfidence
- Confirmation bias
- Framing effect
- Escalation of commitment
- Availability bias
- Illusion of control
- Anchoring bias



Reasoning Without Data



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A Group of Experts

Knowledge Elicitation — Group Biases

Examples

- Groupthink ("toeing the line")
- Social loafing ("hiding in the crowd")
- Group polarization ("taken to the extreme")
- Escalation of commitment ("throwing good money after bad", "sunken costs fallacy")



Origins

- The original Delphi method was developed in the 1940s and 50s by Norman Dalkey of the RAND Corporation.
- The Delphi method was devised in order to obtain the most reliable opinion consensus of a group of experts by subjecting them to a series of questionnaires in depth interspersed with controlled opinion feedback.



Elicit Knowledge from Interacting Groups

- Take the positive, e.g.
 - Knowledge from a variety of sources
 - Creative synthesis
- Prevent the negative, e.g.
 - Groupthink ("toeing the line")
 - Social loafing ("hiding in the crowd")
 - Group polarization ("taken to the extreme")

The Classical Delphi

- Interviews via questionnaires
- Anonymity of participants
- Iteration
- Controlled feedback
- Statistical aggregation



First Experimental Application

"to solicit expert opinion to the selection, from the point of view of a Soviet strategic planner, of an optimal U.S. industrial target system..."





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"In view of the absence of a proper theoretical foundation and the consequent inevitability of having, to some extent, to rely on intuitive expertise—a situation which is still further compounded by its multidisciplinary characteristics—we are faced with two options: we can either throw up our hands in despair and wait until we have an adequate theory enabling us to deal with socioeconomic and political problems as confidently as we do with problems in physics and chemistry, or we can make the most of an admittedly ANALYSIS OF THE FUTURE: THE DELPHT unsatisfactory situation and try to obtain the relevant intuitive insights of experts Olaf Helmer and then use their judgments as

March 1967

systematically as possible."

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The Bayesia Expert Knowledge Elicitation Environment (BEKEE)

Utilizing Bayesian Networks with the Delphi Method

BEKEE Workflow

1. Brainstorming & Model Construction

- Variables of interest
- Causal relationships
- Discretization levels
- 2. Knowledge Elicitation (interactive/offline)
 - Facilitator posts assessment tasks
 - Participants submit assessments
- **3.** Inference & Optimization



1. Brainstorming & Model Construction





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Inference, Analysis, and Optimization



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Building the Bayesian Network Model

Network Data Edit View Learning Inference Tools Window Help





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Network Data Edit View Learning Inference Tools Window Help

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In Conclusion...

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Webinar Series: Friday at 1 p.m. (Central)

Upcoming Webinars:

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- March 23 t.b.d.

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6th Annual BayesiaLab Conference in Chicago November 1–2, 2018

Thank You!



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