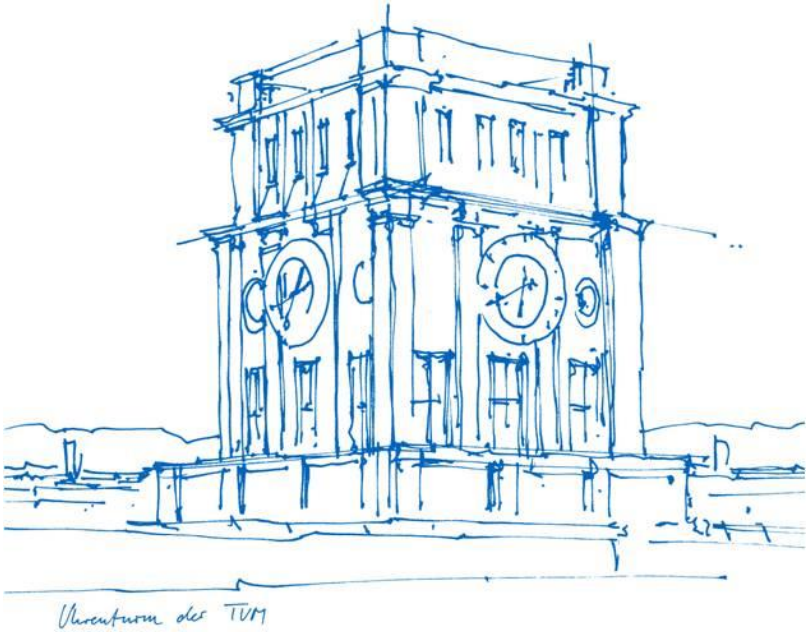
Knowledge Reuse: From Threat to Causal Models and Back!

Preliminary Meeting



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Who we are

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http://www22.in.tum.de/teaching/causal-modeling/

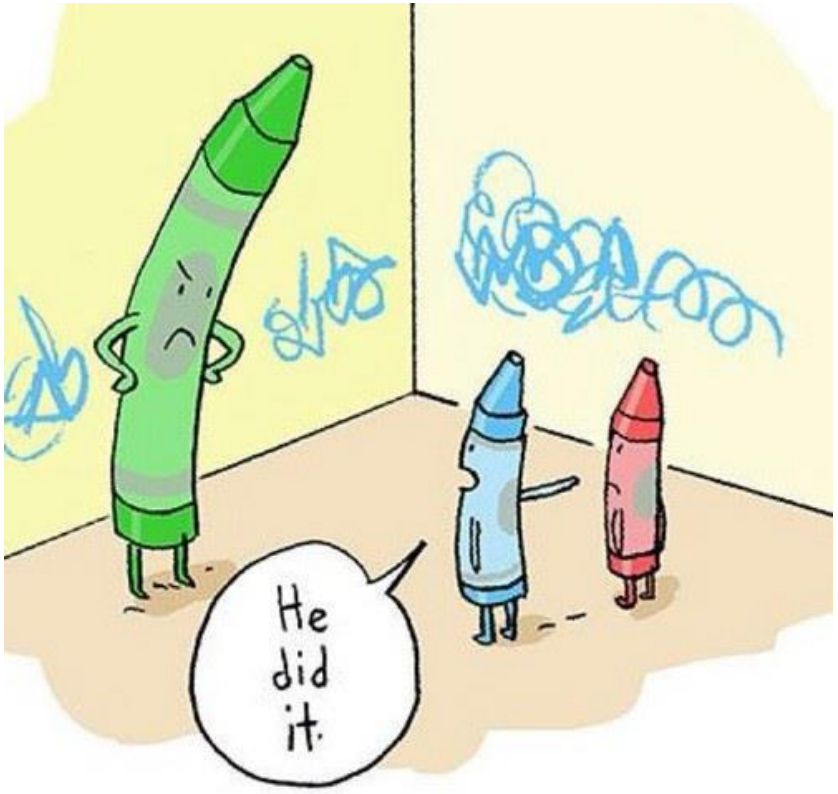
Agenda for today

- Seminar theme
  - Goals
  - Possible Topics
- Road map
- Rules
- Dates


SABNET.JR

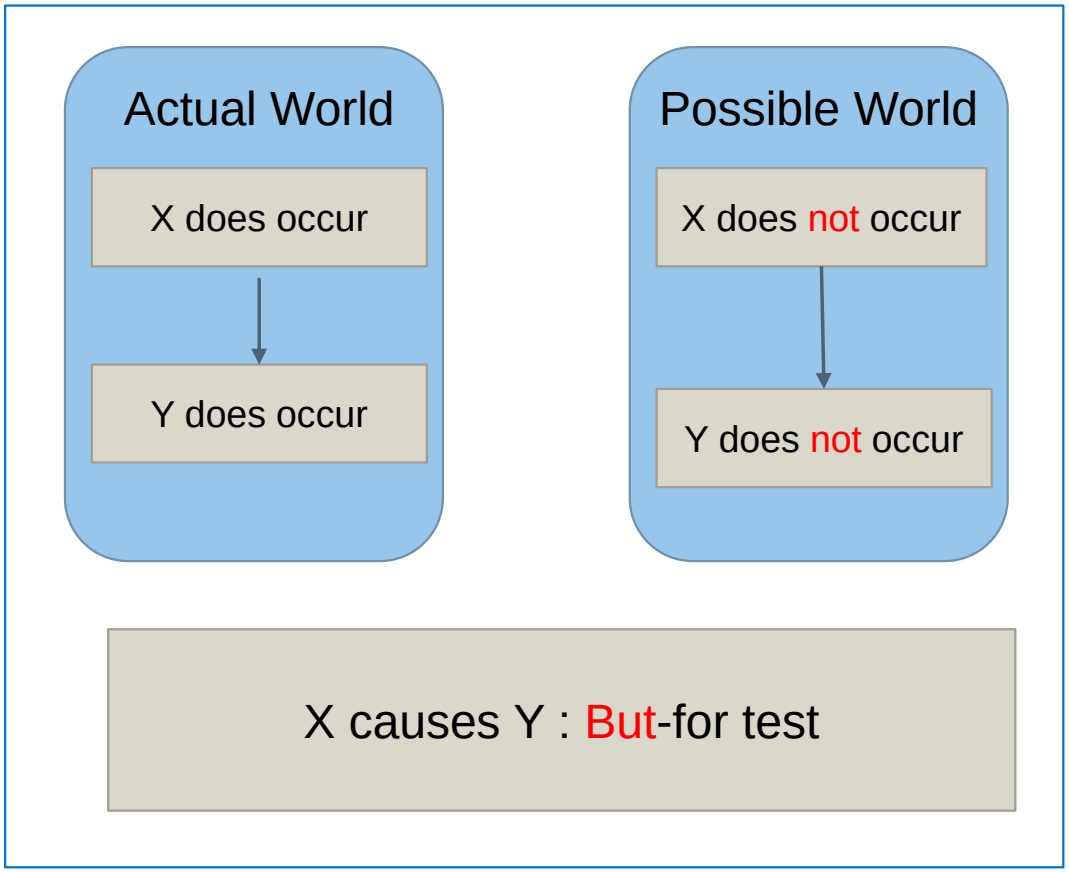
Accountability: how?

- Establish link between behavior and the cause
  - System monitoring
  - Causality analysis



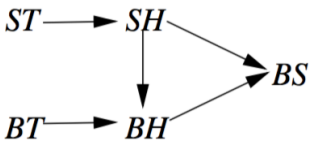
Counterfactual reasoning

Counterfactual Causality

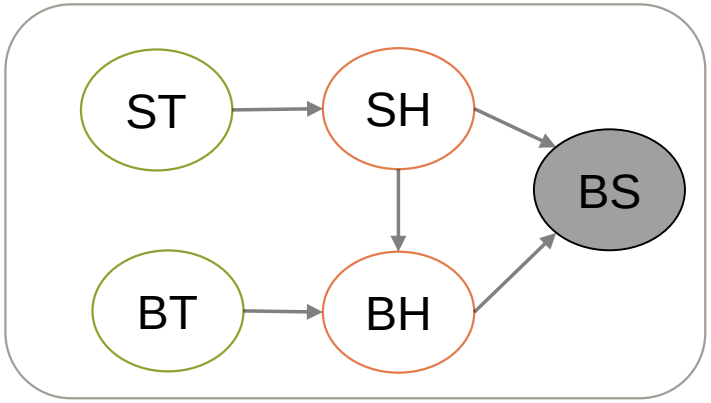


Causal Models

- Signature: S=(U,V,**R**)
  - U: Set of exogenous variables
  - V: Set of endogenous variables
  - **R**: Associates with each variable a set of possible values
- Causal Model: M=(S,**F**)
  - **F**: Associates a function F_X with each $X \in V$
    In words: „F_X tells us the value of X given the values of all other variables in $U \cup V$“
  - Visualization via Causal Networks



Rock-Throwing Example



- ST/BT = Billy/Suzy throws
- SH = ST (Suzy hits)
- BH = BT ∧ ¬SH (Billy hits)
- BS = SH ∨ BH (Bottle shatters)

The real world:

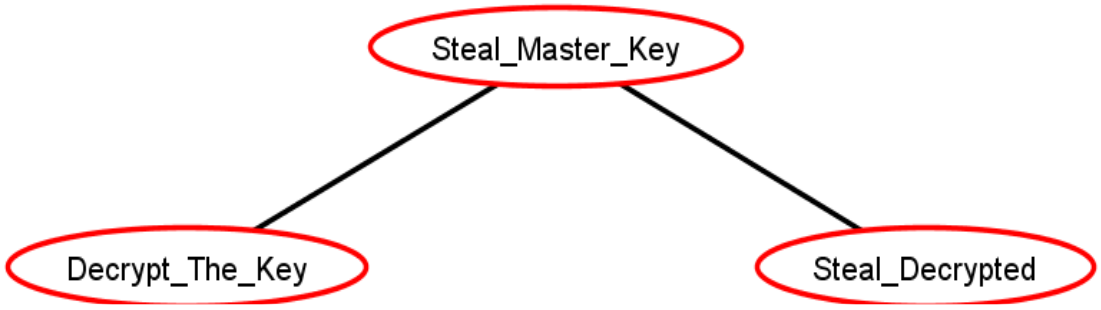
ST = BT = 1

SH = ST = 1

BH = BT ∧ ¬SH = 1 ∧ 0 = 0

BS = SH ∨ BH = 1 ∨ 0 = 1

Threat Modeling: Expose Master Key



Assets

- Documents
- Keys
- Logs

Causal Modeling

- Causality is model relative
  - Variable selection
  - Syntax and semantics
- The idea: reuse DAG-based attack modeling
  - 31 different models : attack/Fault trees, attack graphs, Bayesian networks..
  - Used by engineers and scientists
  - Intuitively, visually representing attack paths for managers
  - Engineers build their countermeasures based on it
  - Formal analysis quantitative and qualitative
  - Tool support
  - Some encodes the causal relation already
- Attack tree maps to causal models
  - Acyclic
  - Boolean
  - Probabilities

Final Topics

Causal modeling +

- Threat and causal models
- Safety Models: fault trees and others
- Attack Tree and Graph Generation
- Graph Transformation Systems
- A theory of malicious insiders

Seminar Goals

- Critical reading and understanding
- Comparing
- Classification
- Writing an exposé
- Presentation skills

Task Overview

- Independent work
  - Read and understand concepts
  - Look for papers/material beyond the initial suggestions
    - E.g. Academic publication portals, TUM library etc.
    - No Wikipedia! (Except if a source is picked – discuss with the supervisor)
    - No blogs!
- Discuss with your colleagues
- Talk with your supervisor whenever required

Roadmap

- Topic selection
- Literature review
- Intermediate submission
- Peer review
- Final submission 50 %
- Talks/Presentation 50 %

Administrative

- Master Seminar
- Maximum participants: 12
- Registration
  - Via http://docmatching.in.tum.de/
  - From **09.02. to 14.02.18**
  - Do you want to be our preference?

Registration

- Choose 3 topics from the list (after matching)
  - Mail Ibrahim@in.tum.de latest by 1st March, 2018
  - Order of preference - 1 highest, 3 lowest
  - Include - Full name, IMAT number, TUM email ID

- Get a topic by email after end of matching round

Thanks!

Rules

- Grading
  - Intermediate submission
    - Table of contents
    - Extended abstract
    - Bibliography
  - Exposé (50%) + Presentation (50%)
  - Penalty for all late submissions

- In case of any issues (E.g. can’t find a paper)
  - Google
  - Ask your colleagues
  - Write to your supervisor

Rules

- Compliance with the prescribed deadlines
- Compliance with all templates
- Presence in all meetings
- Participation in the final presentations in a two (or three) day block-seminar

Exposé

- Max. 15 pages including appendix, LNCS format

- No plagiarism!
  - blatant copy-paste, summarizing others' ideas/results without reference etc. will result in immediate expulsion from the course.

- Discussion of own contribution
- Complete bibliography
- Appendix, if needed

Content

- Don’t deviate from allotted topic
- Logical and contradiction-free reasoning
- Argue with proper sources
- If any contradictions in the source paper, don’t hide them.

Content

- Clear distinction between scientific facts and own logical conclusion
  - E.g. if something is “good” according to you, why?
  - Proper references

- Language
  - Easy to understand, simple (and short) sentences
  - Precise
  - Sensible titles
  - Sensible paragraphing

Possible Structure

- Title & abstract
- Introduction
- Topic content
- Results
- Related work
- Discussion & conclusion
- Bibliography
- Appendix

Presentation

- Ca. 30 minutes of talking
  - Clear, linear storyline.
  - Must match the exposé, but should not be a text dump
  - Possibility of discussing slides with supervisor

- Ca. 10 minutes of discussion
  - Be prepared for questions on the topic
  - Ask questions on the presented topic

Finding Literature

- TUM Library
  - Informatik
  - Others…

- Online portals
  - Springer (www.springerlink.com/)
  - ACM (dl.acm.org/)
  - IEEE (ieeexplore.ieee.org/Xplore/guesthome.jsp)
  - Google Scholar (scholar.google.com)
  - Scopus (scopus.com)