CS5127/6027: Requirements Engineering

(Fall 2024)

Prof. Nan Niu (nan.niu@uc.edu)

Office Hours: 10am-11am, Mondays, Rhodes 832

Today's Menu

Last Lecture (Friday 9/27):

*i** Modeling

ASN2 Releasing

This Lecture (Monday 9/30):

NFRs *[cont'd]*

Next Lecture (Friday 10/4):

Visual Modeling Notations

Quiz6 – completion grade only

- Deadline of Quiz6: *11am*, Wednesday (Oct 2)
  - Needing 4 volunteers, who will meet with me on Wednesday (Oct 2) at 10:10am in MC 527
  - These 4 students will NOT need to do Quiz6 on Canvas, but will receive the Quiz6 credit by joining me for the meeting
  - All the other students shall complete Quiz6 on Canvas before *11am*, Wednesday (Oct 2)

ASN2: 9/27—10/16

- Choose an LLM (or some LLMs)
- Study the relevant NFRs (at least 3 NFRs)
  - Req.s elicitation & modeling
- Build a _____
- Create quality attribute scenarios
- Submit your report (one PDF file) before 10/16

Explainability

→ DARPA XAI (explainable AI): "to produce more explainable models, and enable human users to understand, appropriately, trust, and effectively manage the emerging generation of AI"

→ The ability for "someone to explain something to someone"

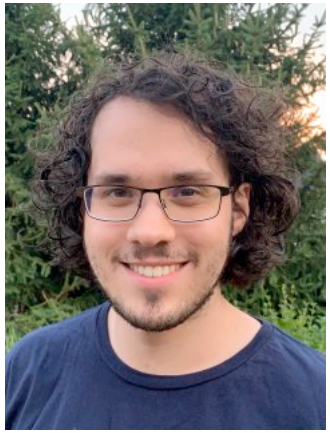
↳ Currently, the XAI literature is filled with "AI researchers explain the inner working [in a salience map, rules, neuron contributions etc.] to AI researchers"

Explainable AI: Beware of Inmates Running the Asylum

Tim Miller* and Piers Howe† and Liz Sonenberg*

Source: https://arxiv.org/abs/1712.00547v2

From 2020's *Req.s Eng.* course



ESEC/FSE 2021

XAI Tools in the Public Sector: A Case Study on Predicting Combined Sewer Overflows

Nicholas Maltbie, Nan Niu, Matthew Van Doren, Reese Johnson

METROPOLITAN SEWER DISTRICT of greater CINCINNATI

Source: *https://homepages.uc.edu/~niunn/papers/FSE21-XAI.pdf*

XAI tools in the public sector

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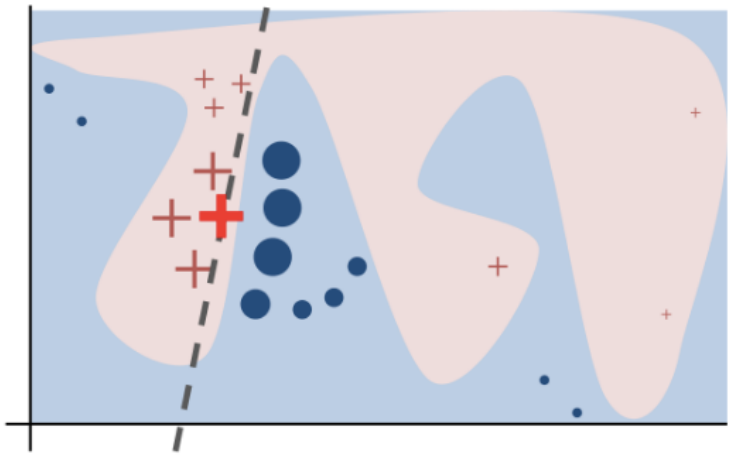
Explainable AI: Beware of Inmates Running the Asylum

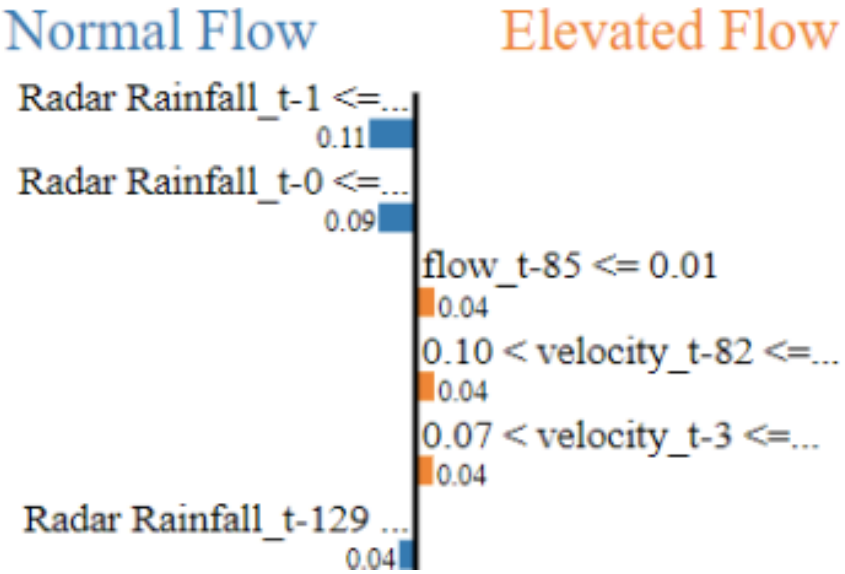
Tim Miller* and Piers Howe† and Liz Sonenberg*

→ We have an ideal case for "someone [XAI tool builders] to explain something [tool's outputs] to someone [domain experts]"

↳ Open-source/free, compatible with LSTM, easy to use

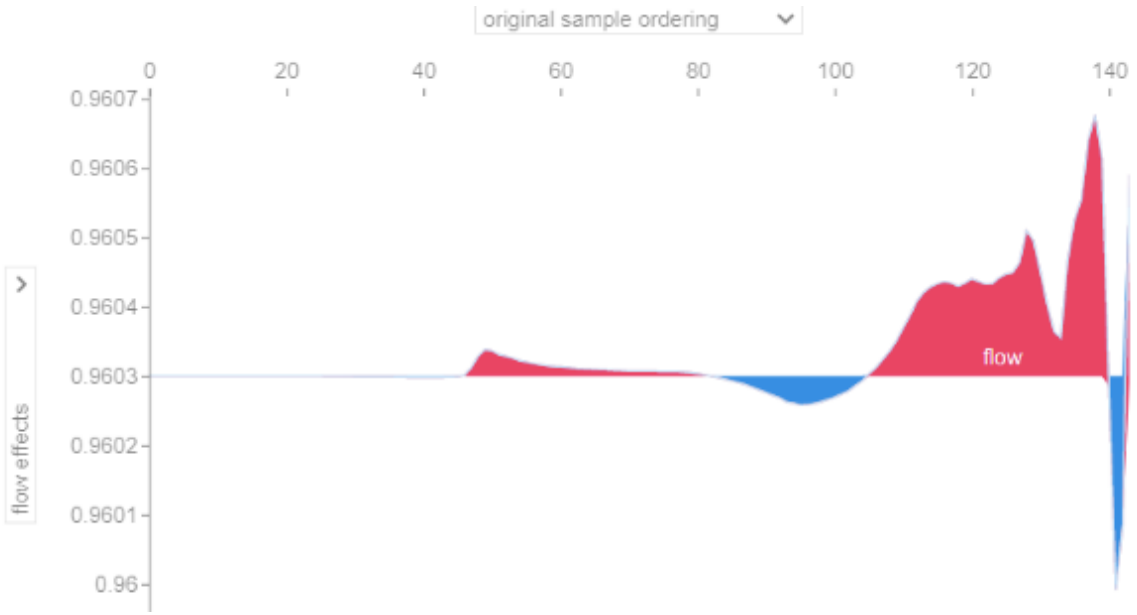
LIME (Local Interpretable Model-agnostic Explanations)



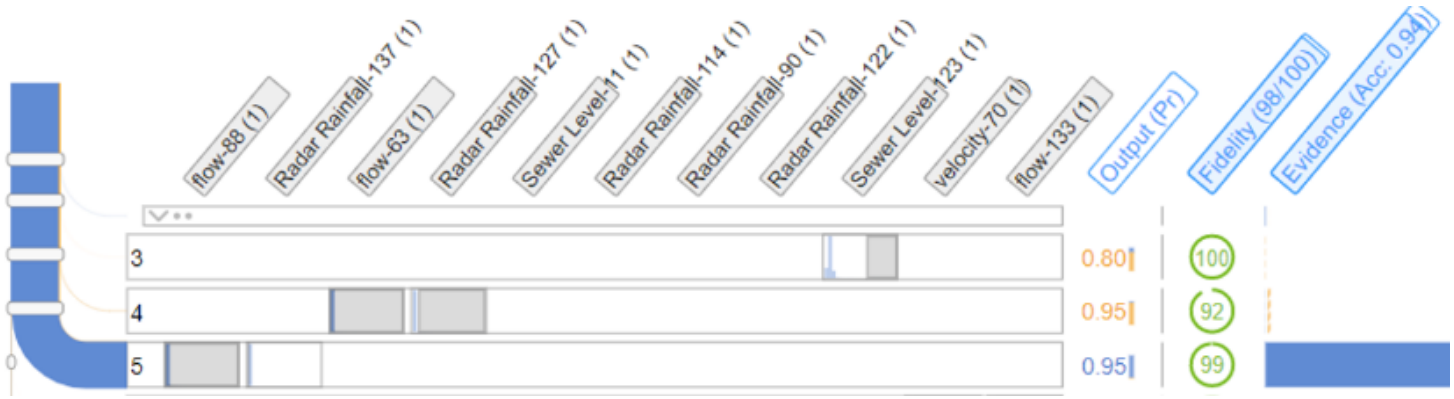


Feature	Value
Radar Rainfall_t-1	0.00
Radar Rainfall_t-0	0.00
flow_t-85	0.01
velocity_t-82	0.10
velocity_t-3	0.07
Radar Rainfall_t-129	0.00

SHAP



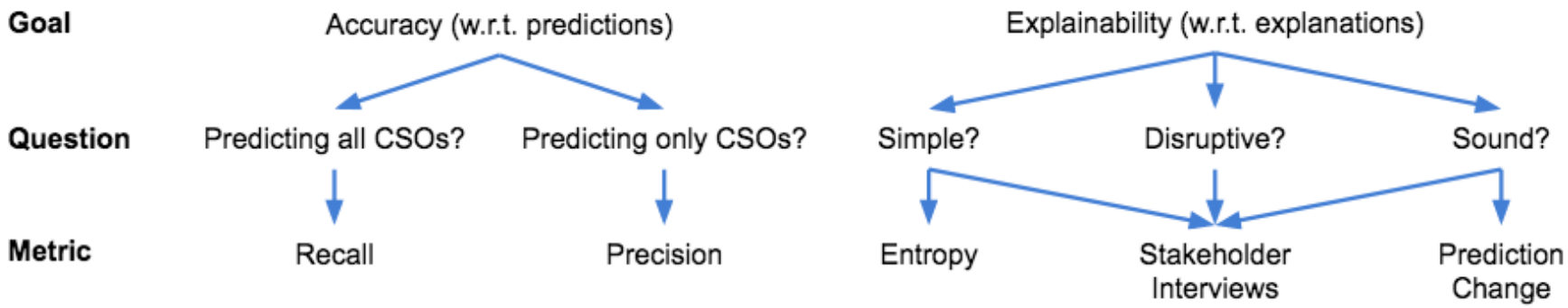
RuleMatrix



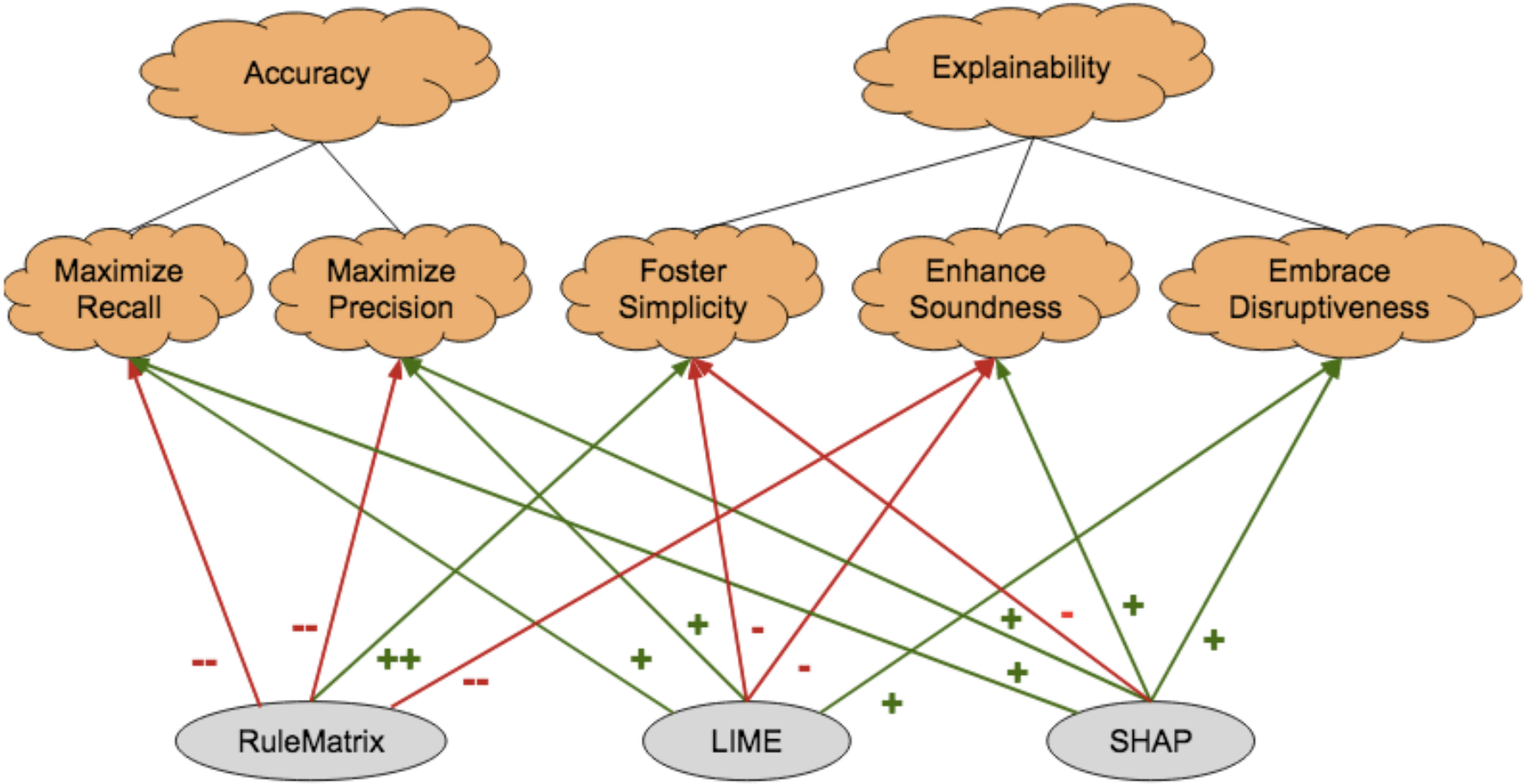
GQM (Goal-Question-Metric)

Vic Basili

David Weiss

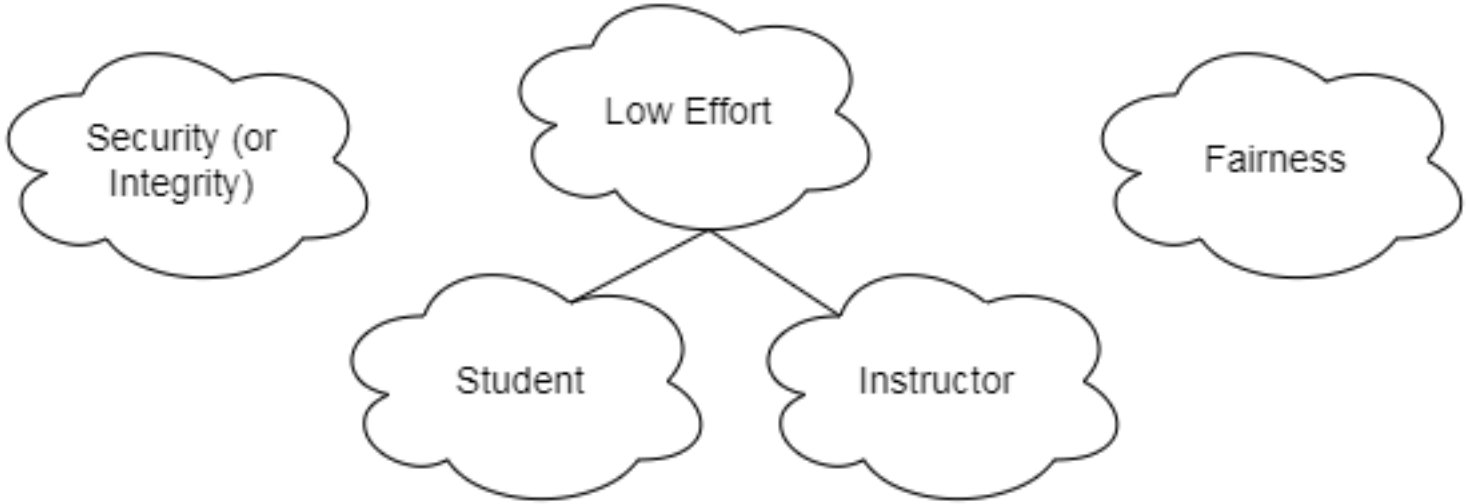


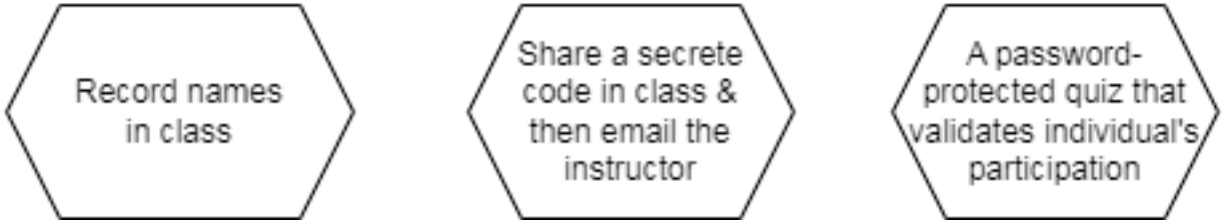
XAI tools: fit for purpose?



Source: https://homepages.uc.edu/~niunn/papers/FSE21-XAI.pdf

Main concerns (softgoals / NFRs)

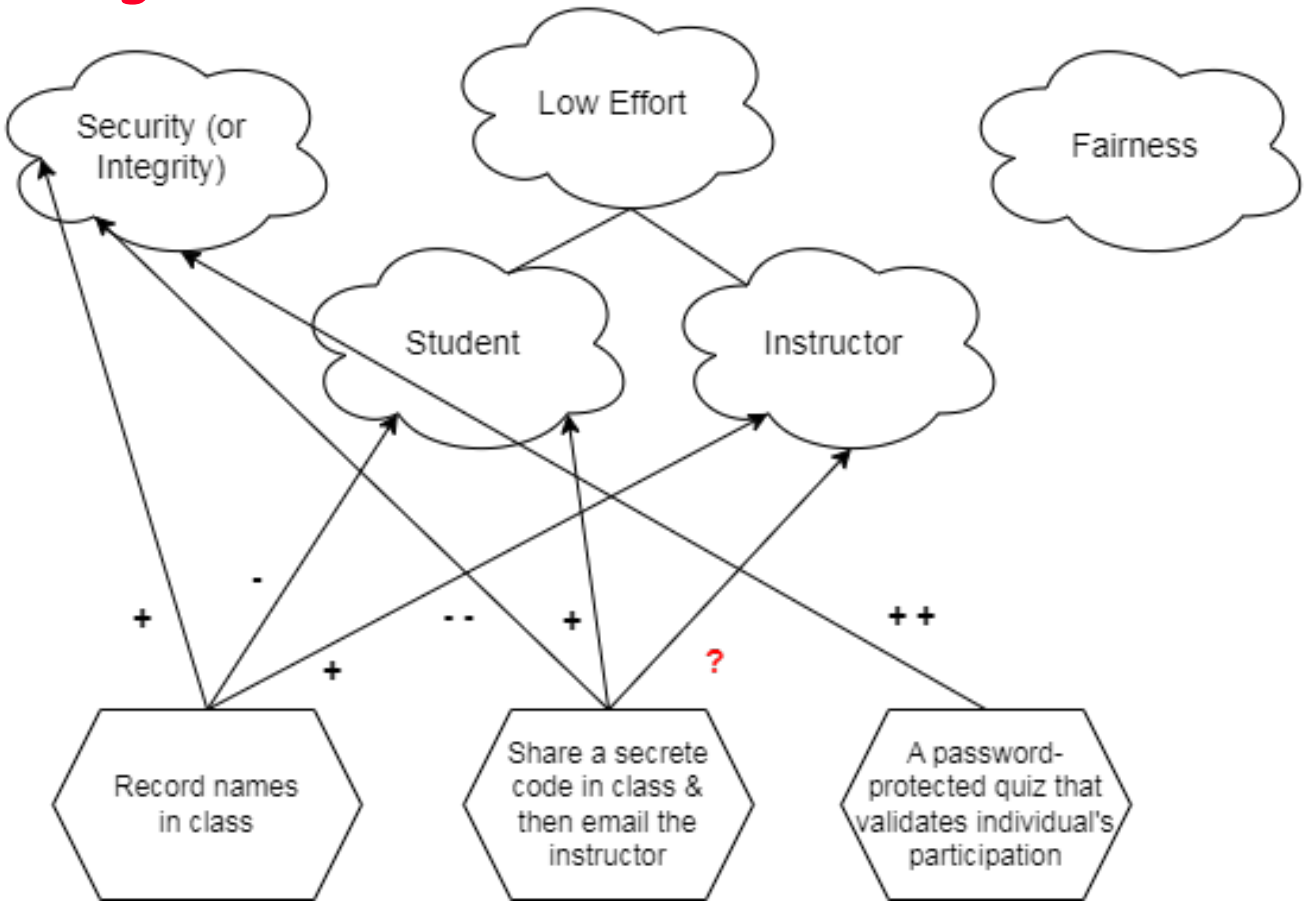




How're they connected?

→ An online modeling/diagramming tool

https://app.diagrams.net



Challenges of NFRs

- Hard to be localized and often contradictory
- Hard to externalize (model)
  - Not directly supported in use cases, class diagrams, ERDs, sequence diagrams, statecharts, and other types of UML models
- Hard to make them measurable
  - You can't control what you can't measure
  - Difficult to evaluate for the customer prior to delivery

Elicitation Techniques (from 9/13)

- → Traditional techniques
  - Introspection
  - Reading existing documents
  - Analyzing hard data
  - Interviews
    - Open-ended
    - Structured
  - Surveys / Questionnaires
  - Meetings
- → Collaborative techniques
  - Group techniques
    - Focus Groups
    - Brainstorming
  - JAD/RAD workshops
  - Prototyping
  - Participatory Design
- → Cognitive techniques
  - Task Analysis
  - Protocol Analysis
  - Knowledge Acquisition Techniques
    - Card Sorting
    - Laddering
    - Repertory Grids
    - Proximity Scaling Techniques
- → Contextual approaches
  - Ethnographic Techniques
    - Participant Observation
    - Ethnomethodology
  - Discourse Analysis
    - Conversation Analysis
    - Speech Act Analysis
  - Socio-technical Methods
    - Soft Systems Analysis

focus

stakeholders in RE.....

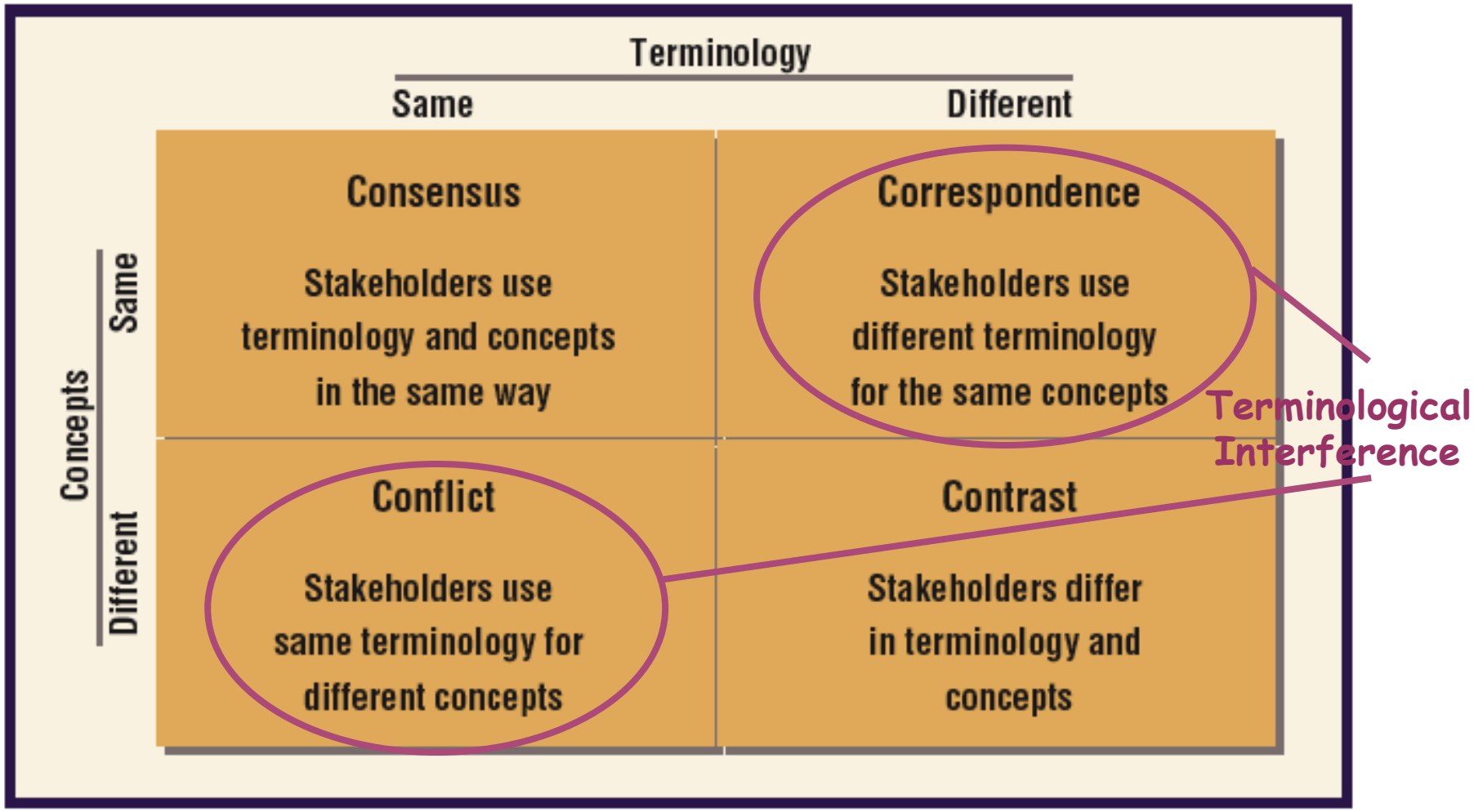
So, You Think You Know Others' Goals?

A Repertory Grid Study

Nan Niu and Steve Easterbrook, *University of Toronto*

Source: *https://homepages.uc.edu/~niunn/papers/SW07.pdf*

Concepts and Terminology



Repertory Grid Technique (RGT)

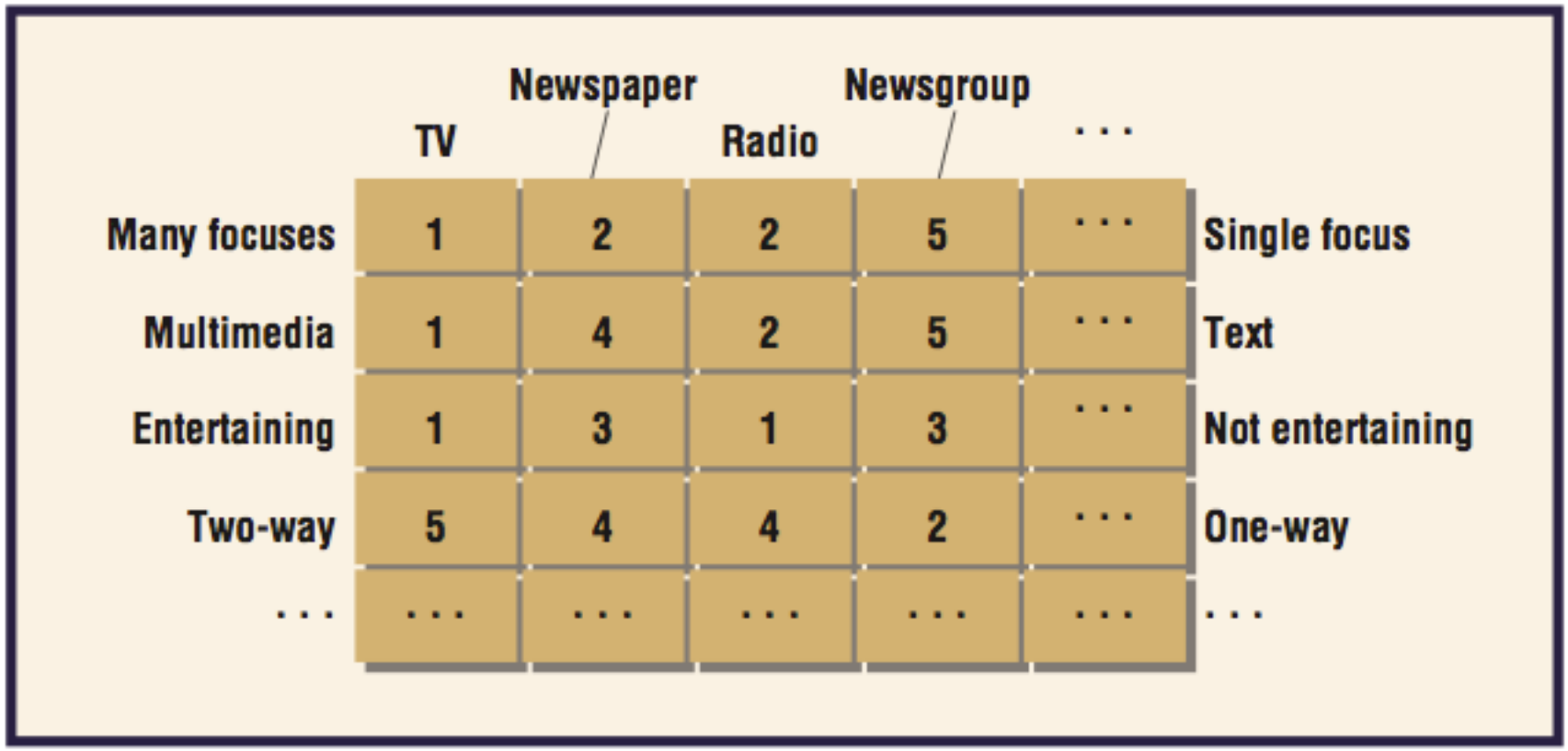
- George Kelly (1955), psychotherapy
- verbalize how people construe certain factors within the area of interest
  - verbalizations: constructs (bipolar in nature)
  - factors: elements

RGT Example

- Information sources
  - TV, Newspaper, Radio, NewsGroup, Web, etc.
  - elements in RGT

- Triad: (A) TV (B) Newspaper (C) NewsGroup
  - construct: many focuses (A,B) vs. single focus (C)
  - as a rating scale (1-5), and each element is assigned a rating on that construct

Sample Repertory Grid



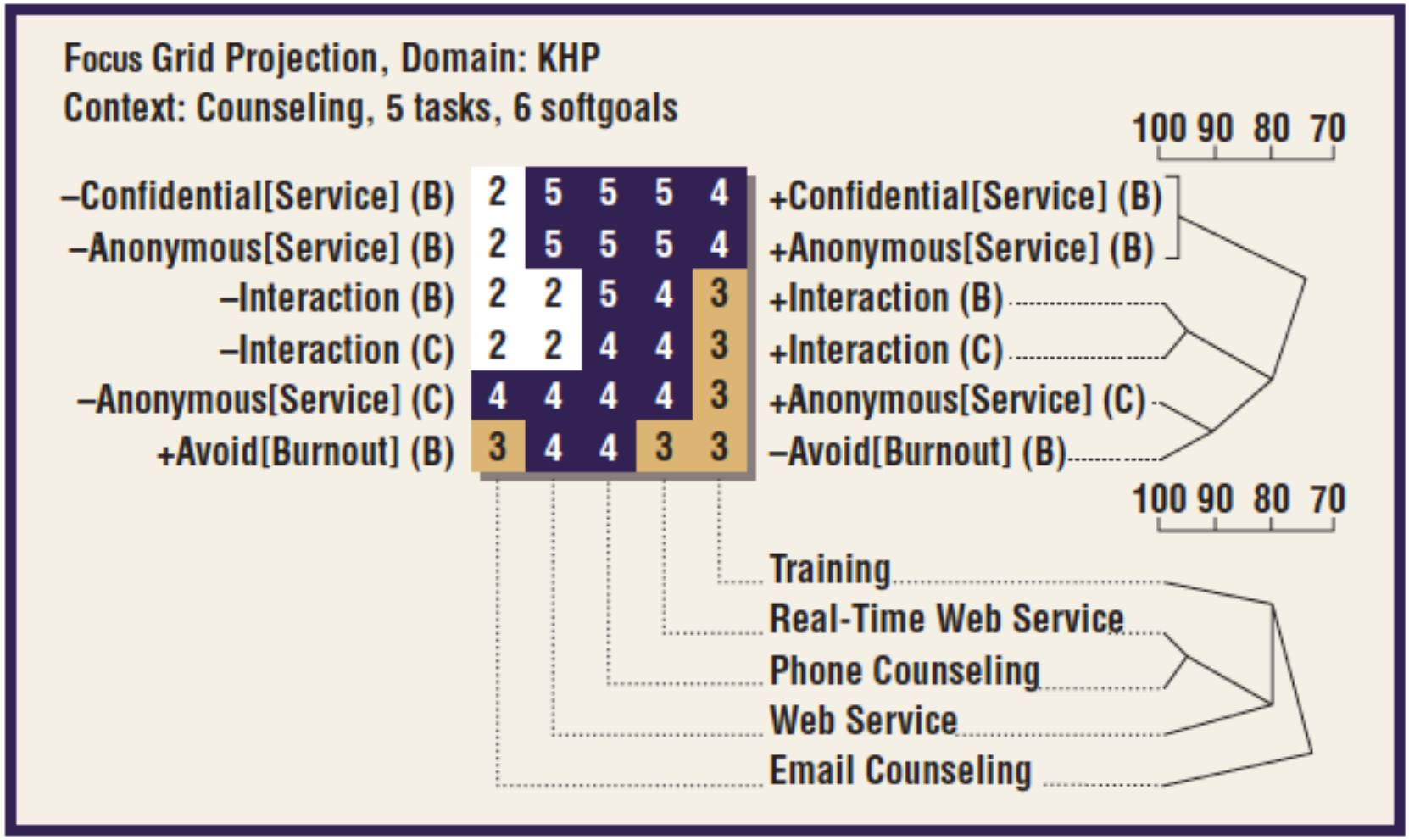
Requirements Goal Models

- Softgoals – Constructs – Unique to personal views
- Tasks – Elements – Shared among stakeholders

- Assume: people focusing on similar topics would agree on the definition of a common set of concrete tasks within the area of interest

- Idea: compare stakeholder's constructs by how they relate to a shared set of concrete entities, rather than by any terms the stakeholders use to describe them

Kids Help Phone



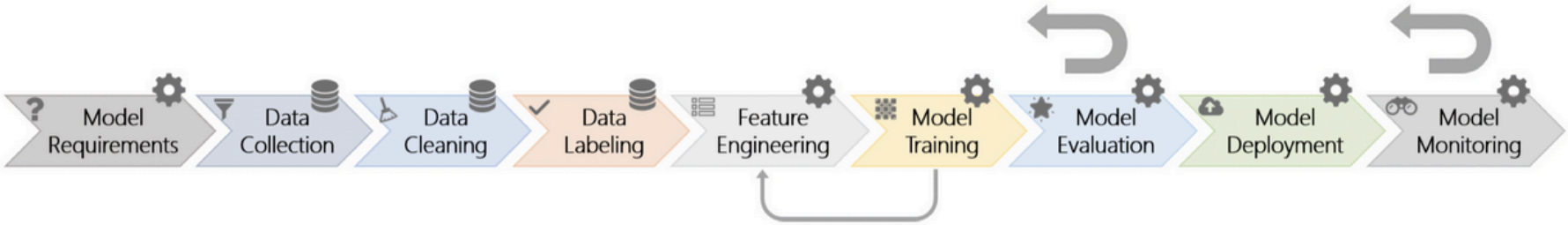
B - Bob C - Cem

Observations

- Trivial correspondence
  - High-level softgoals about counseling: Good, Helpful, Proper, High-Quality, etc.
- Numerical threshold
  - Anonymous[Service] (Cem) versus (Bob)
- Conflicts beyond terminological level
  - (Ana) "Consult New Technique" would "Make-Difficult[Work]", hence hurt "Avoid[Burnout]"
  - (Bob) "Consult New Technique" could help "High[Morale]", thus help "Avoid[Burnout]"

Today's Take-Aways

→ Softgoal tradeoffs & terminological interferences



→ To-do

- Review today's slides
- Continue doing Assignment 2 (due *before* 11:59pm, Oct 16)
- Completing Quiz 6 (before *11am*, this Wednesday, Oct 2)
- Graduate students: Deciding working on the project individually or in a group (due before 11:59pm, *today*, 9/30)
- Attend Friday's class (Oct 4) on "visual modeling notations"