ICARDA
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CGIAR RESEARCH PROGRAM ON Policies, Institutions, and Markets
Led by IFPRI

"Qualitative and quantitative methodologies for the assessment of rangeland governance"
INRAT, 3rd to 5th of December 2019.

BBN : Bayesian Belief Network

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BBN : Introduction

What is Bayesian Belief Network (BBN)?

- **Bayesian Belief Network** (**BBN**) is a probabilistic graphical model of causal relationships.
- BBN allows a representation of the variables conditionally independent ➔ I.e. Represents dependency among the variables.

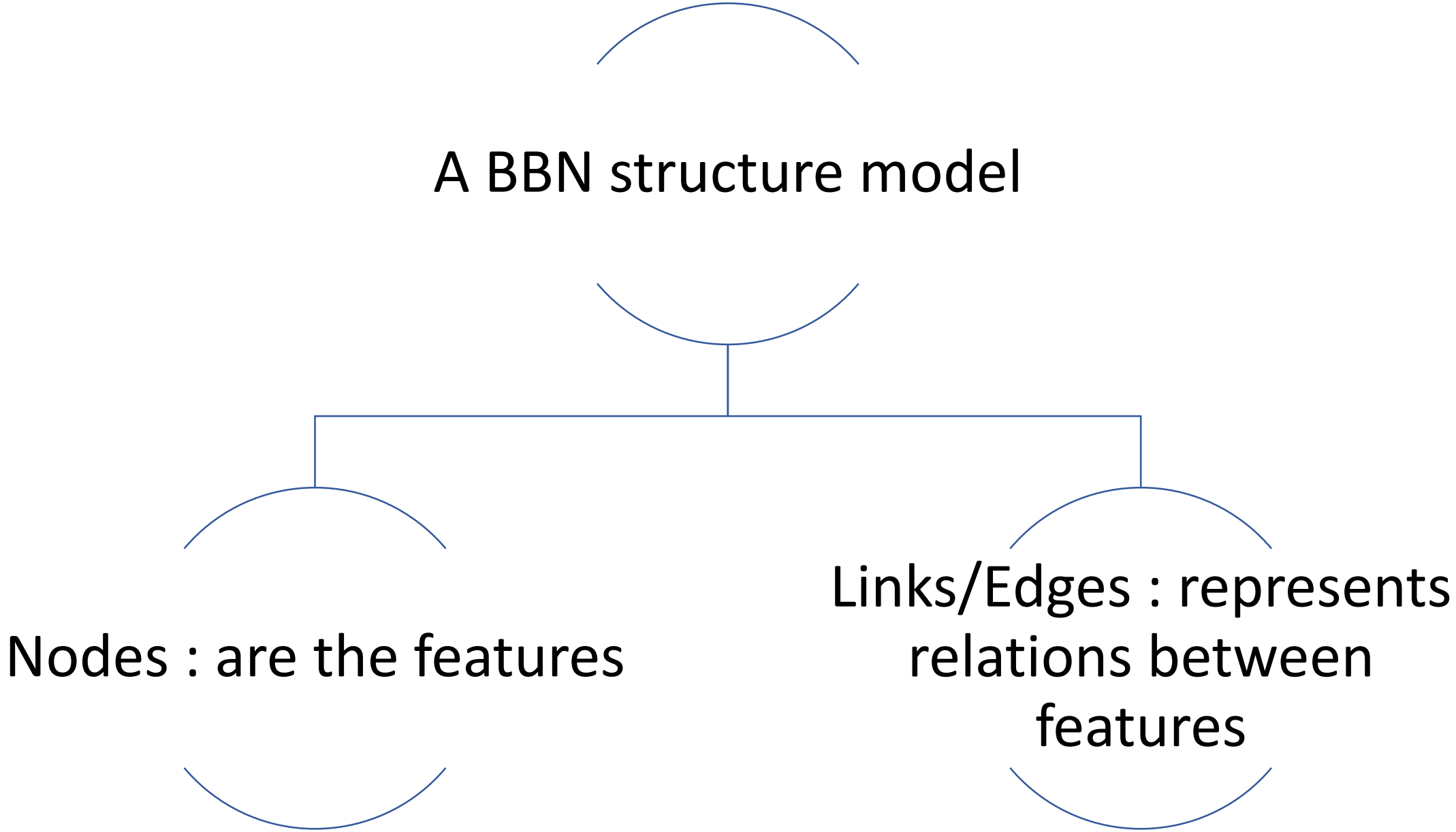
Bayesian belief networks are a convenient mathematical way of representing dependencies between multiple events.

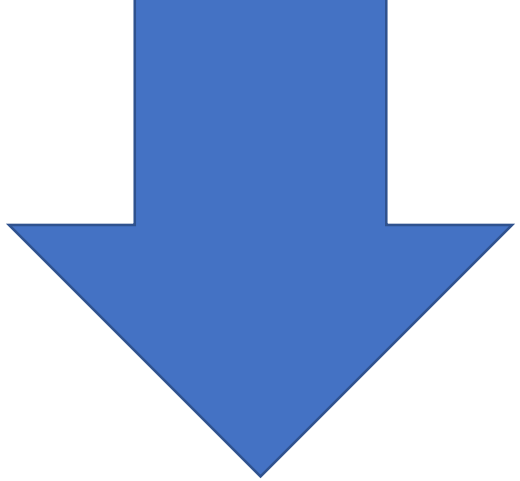
What is Bayesian Belief Network (BBN)?

Two major tasks to understand the BBN :

- The Graphical structure
- The CP table

A BBN structure model





BBN is a set of nodes connected by directed edges

Each node is associated with a ***conditional probability distribution*** which quantitatively expresses the strength of the relationship between that node and its parents.

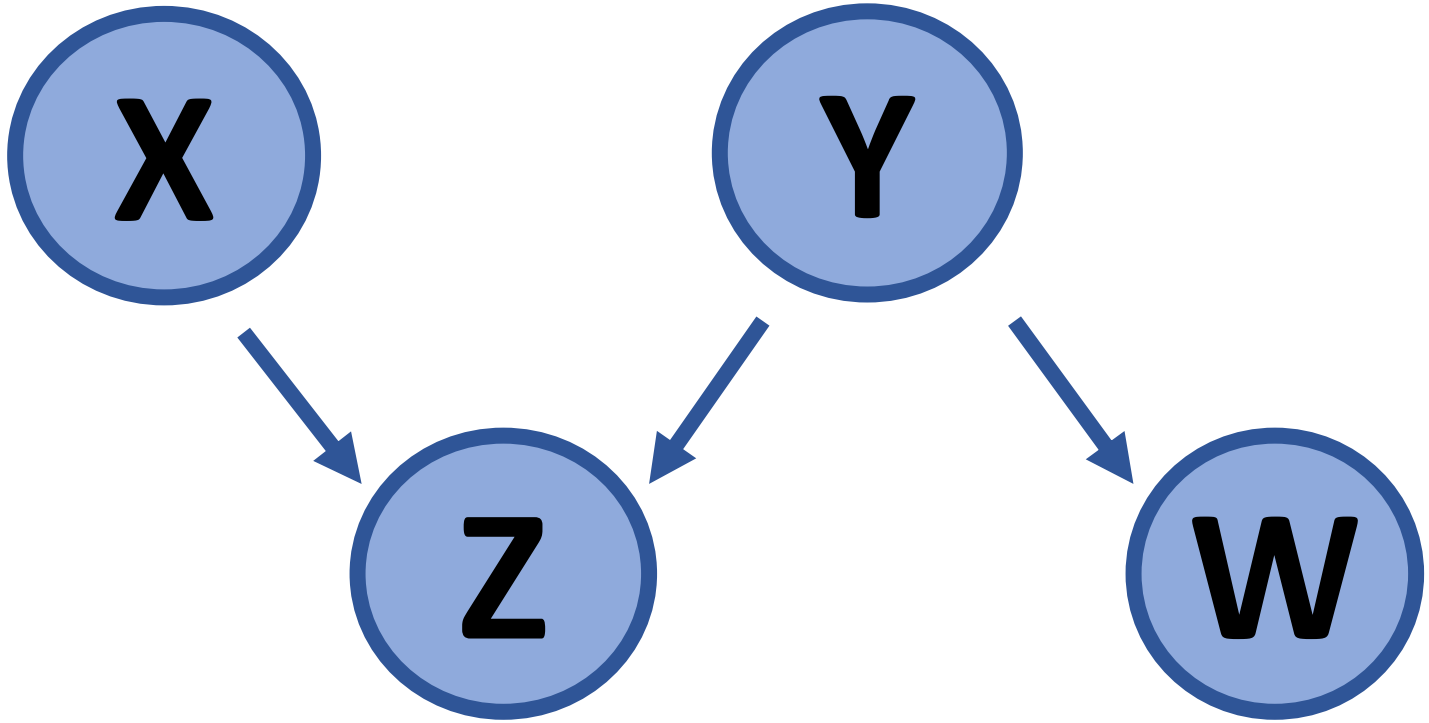
Nodes

- Nodes : are the features.
- Each node is a discrete or continuous random variable.
- Takes multiple states/value/parameters,
- States occur with a certain probability ➔ beliefs (Bayesian Belief Network)
- Beliefs (Conditional distribution) are gathered in a Conditional Probability Table CPT.

Links/Edges

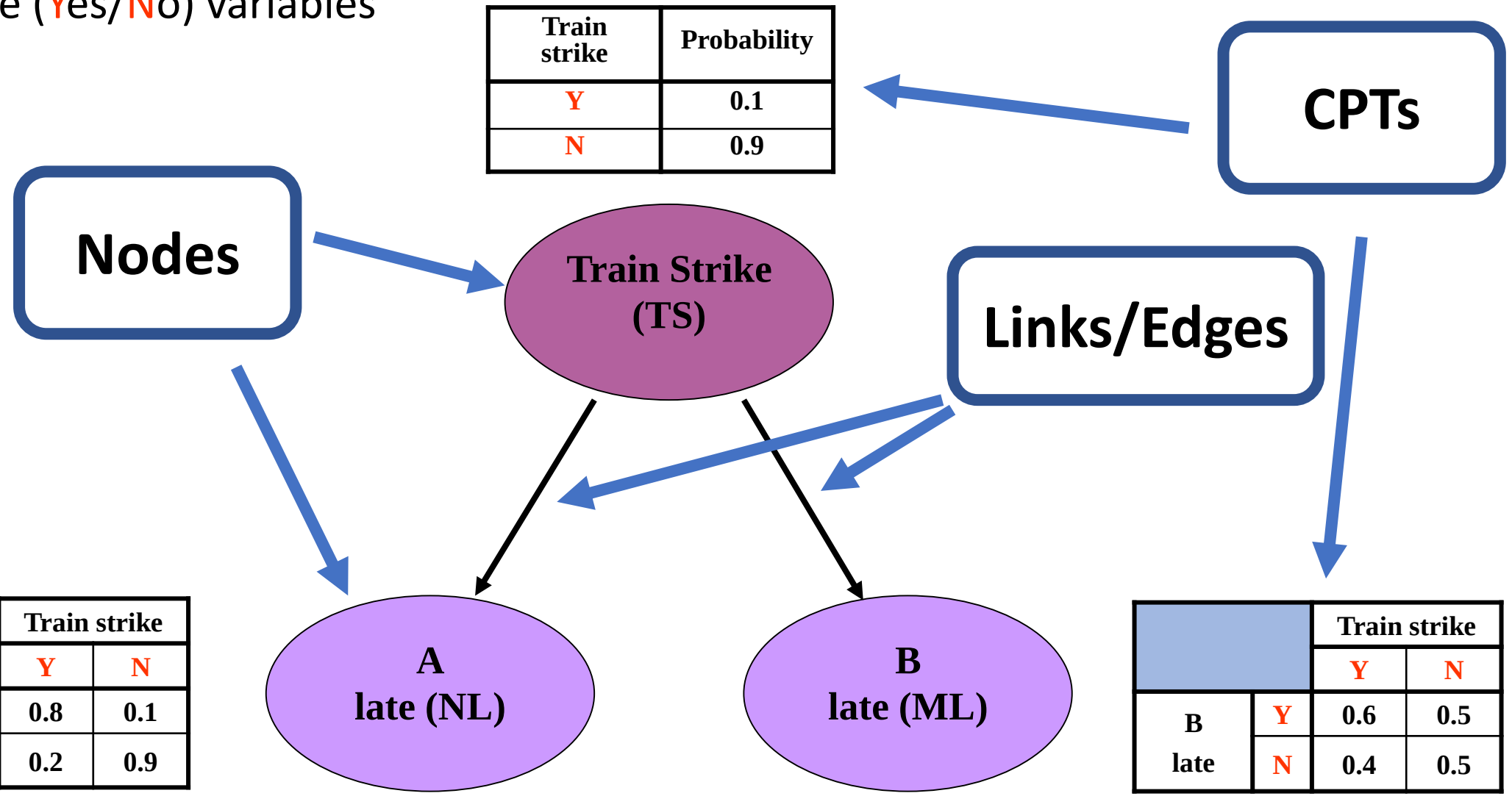
- Dependency
- Represent direct or causal relationships between variables

Do not form cycles



- X and Y are the parents of Z
- W is the child node of Y
- No dependency between Z and W

3 discrete (Yes/No) variables



Why BBN ?

BBN allows to calculate probabilities of different scenarios (events) relevant to the problem and to predict consequences of these scenarios

Parameters (states) estimation

Through likelihood estimation.

- Example :

We have :

- 40 times bad weather
- 60 times good weather

➔ The likelihood of bad weather state is 40% = bad weather is 40% likely to happen

Rangelands Governance and the use of the BBN approach

Rangelands Governance and the use of the BBN approach

- The capacity to assess the influences and interdependencies of different types of factors.
- uncovering aspects of governance that may affect adaptive rangeland resources in time and space.
- Provides a framework to visualized interactions between variables.

Rangelands Governance and the use of the BBN approach

- The possibility to integrate Ecology, Economics and Social Sciences within the same analytical decision model
- The possibility to cover both qualitative (stakeholder's opinions and knowledge) and quantitative data.
- Facilitate focus group discussions ➔ a communication space between the different actors from multi-disciplinary backgrounds

Practical Training

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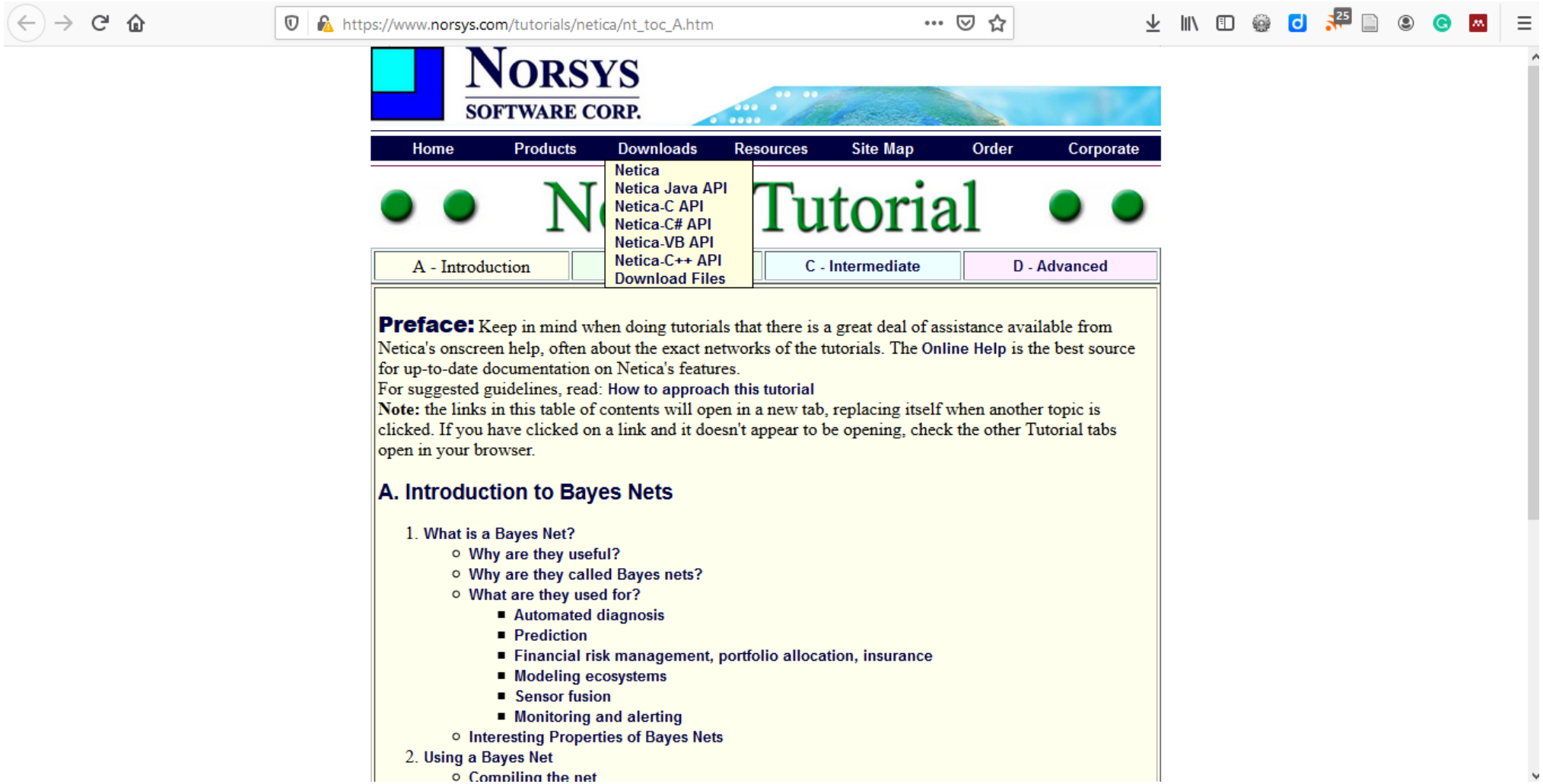

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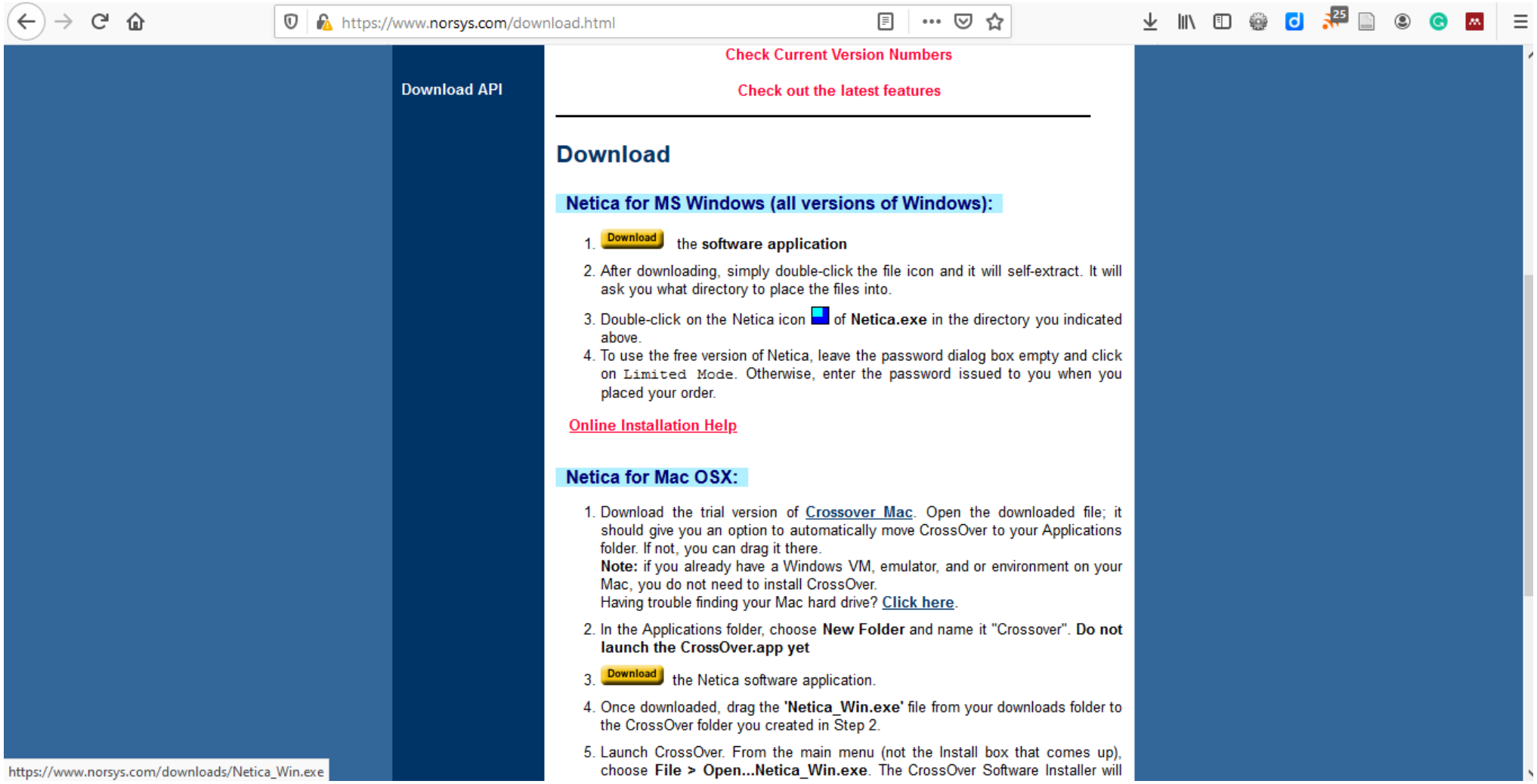

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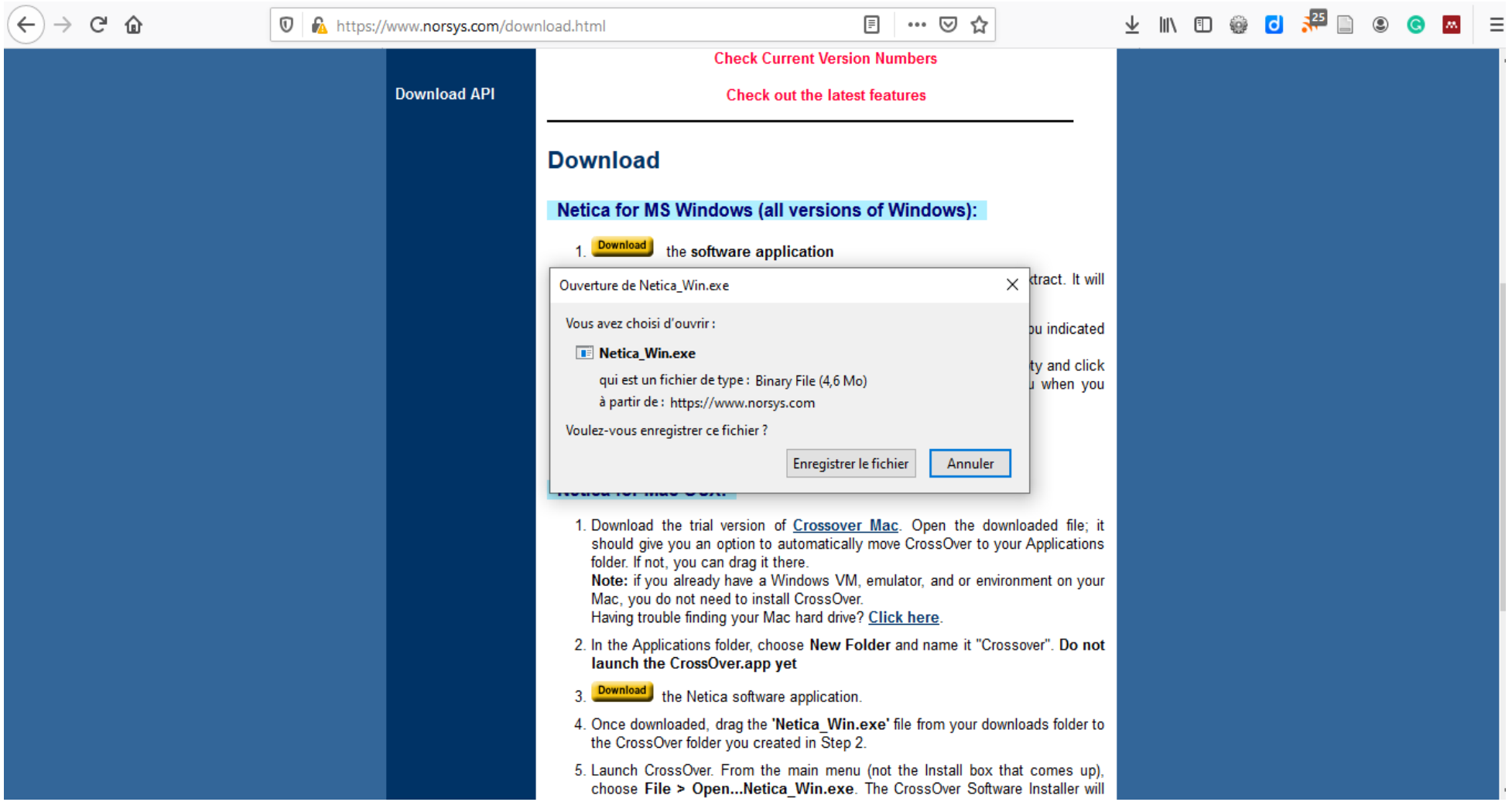
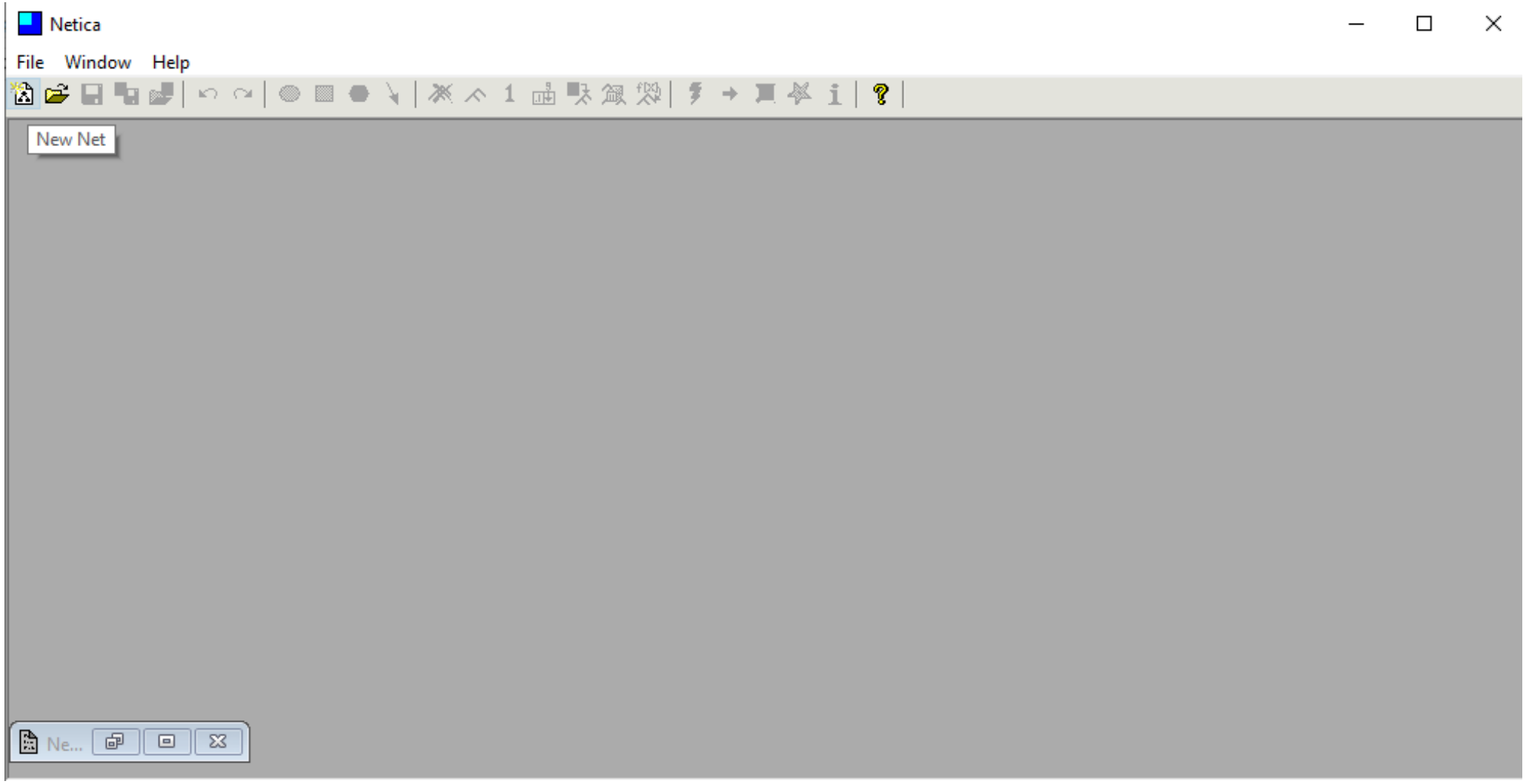
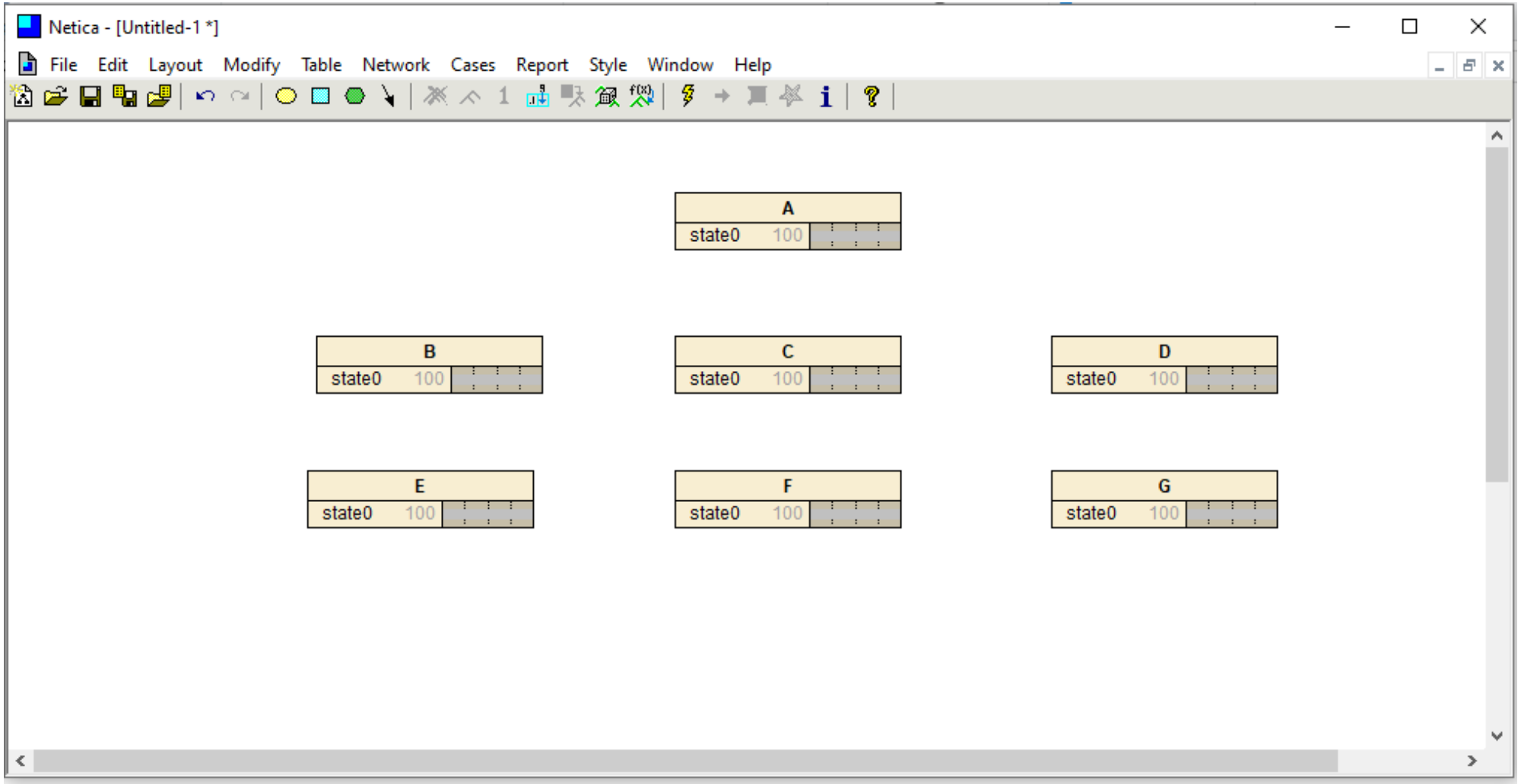


Opening new net



Add Nodes


Netica - [Untitled-1 *]
File Edit Layout Modify Table Network Cases Report Style Window Help
A
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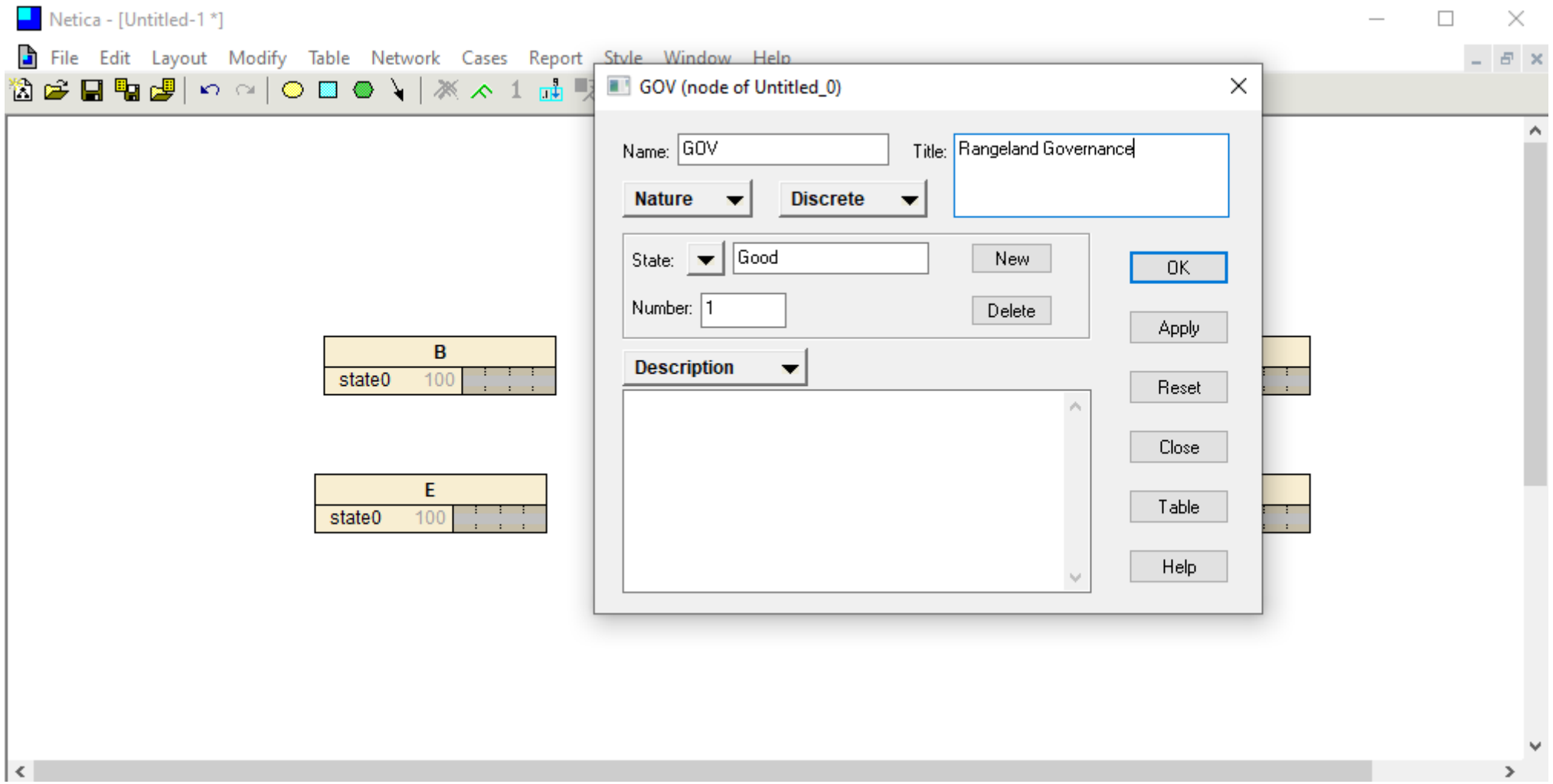
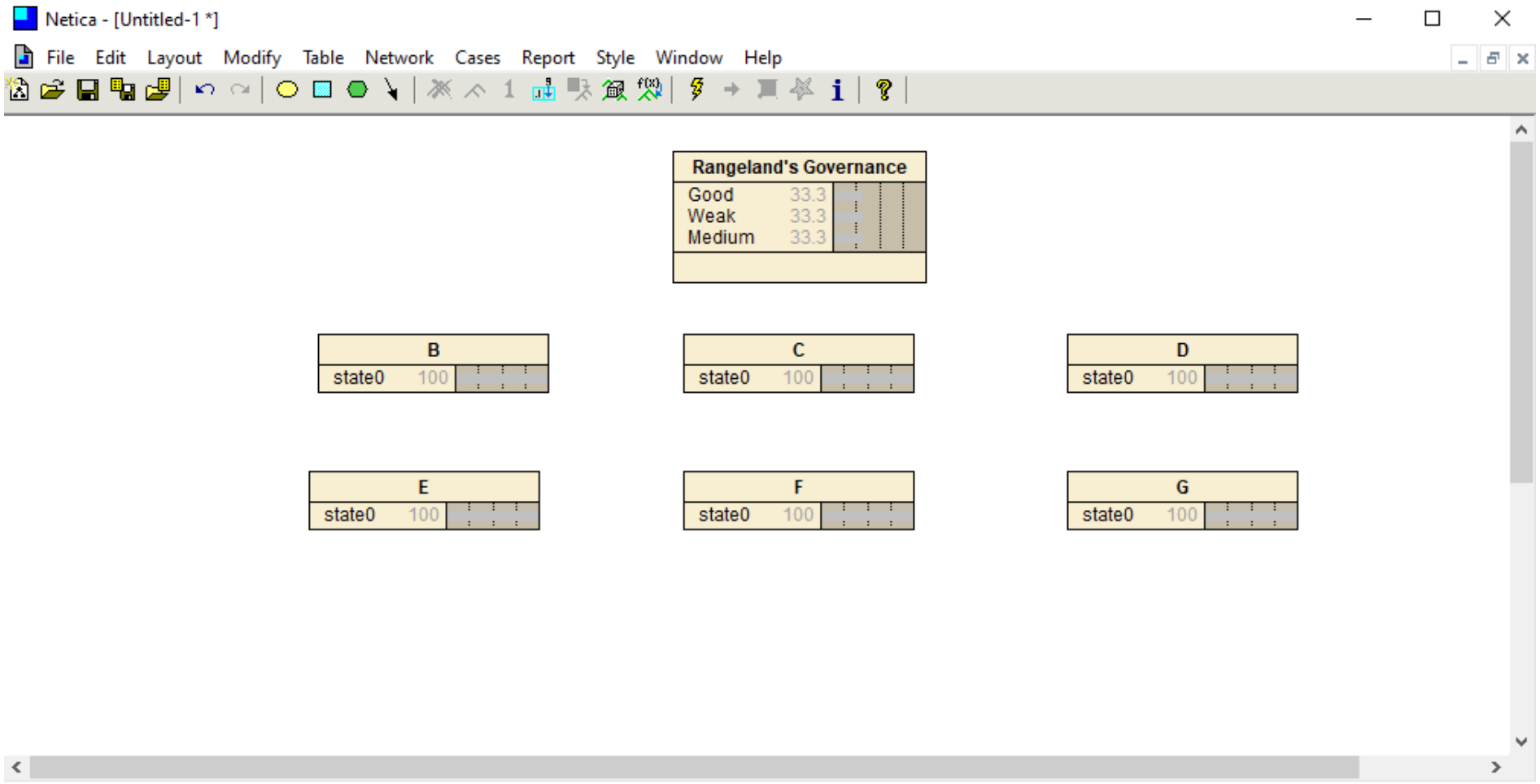
Modify nodes parameters



Modify nodes parameters : Results



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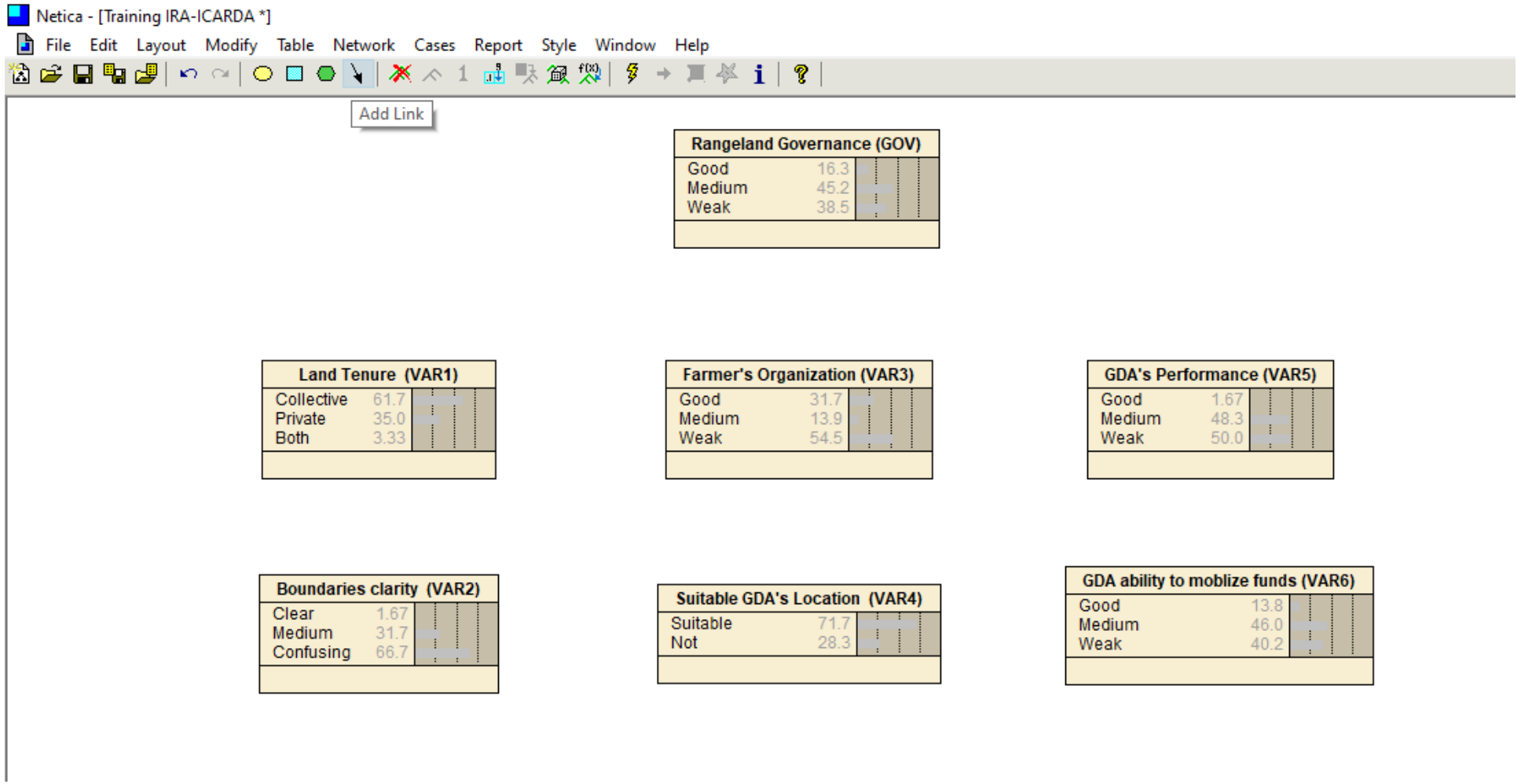
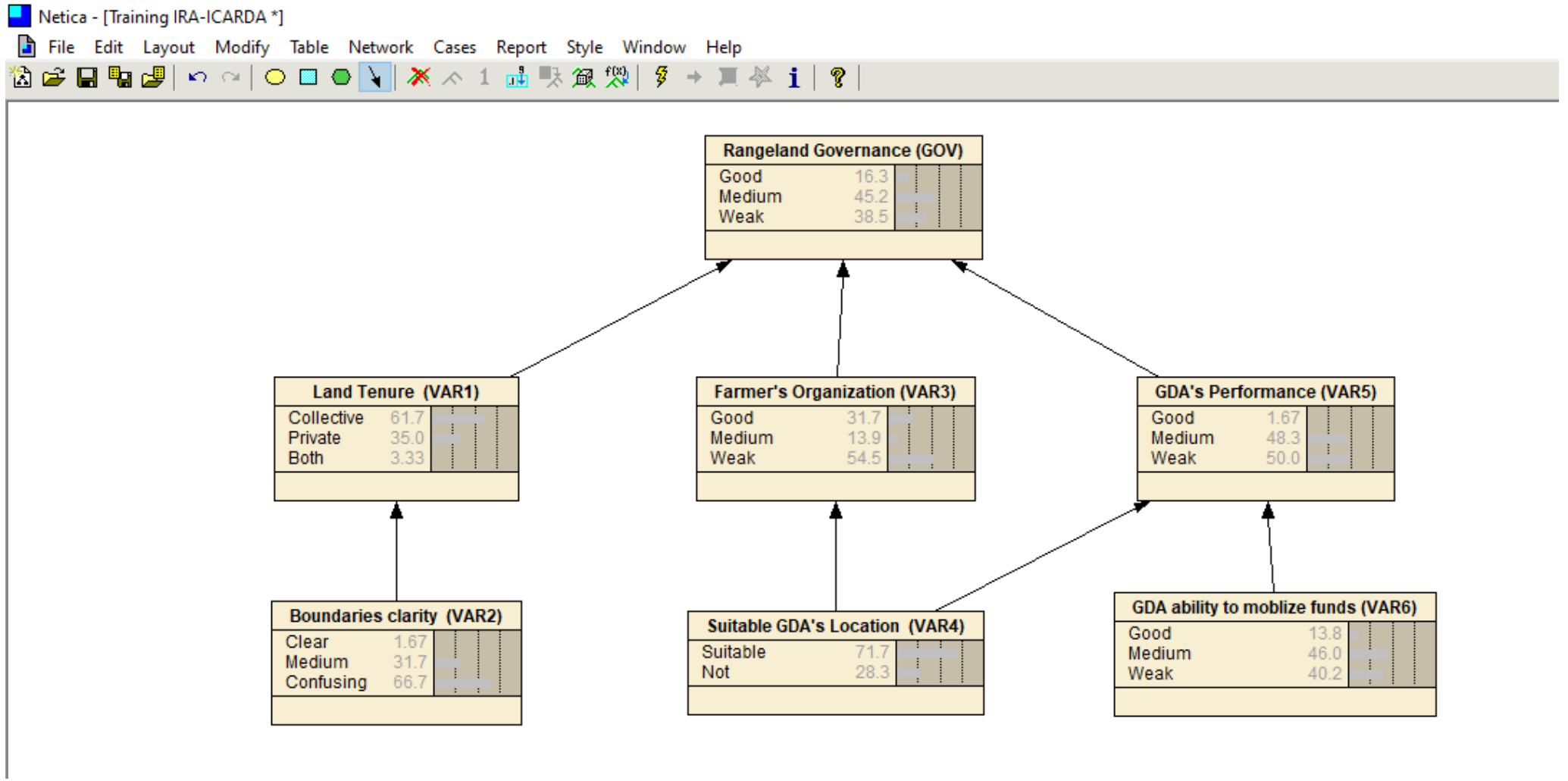
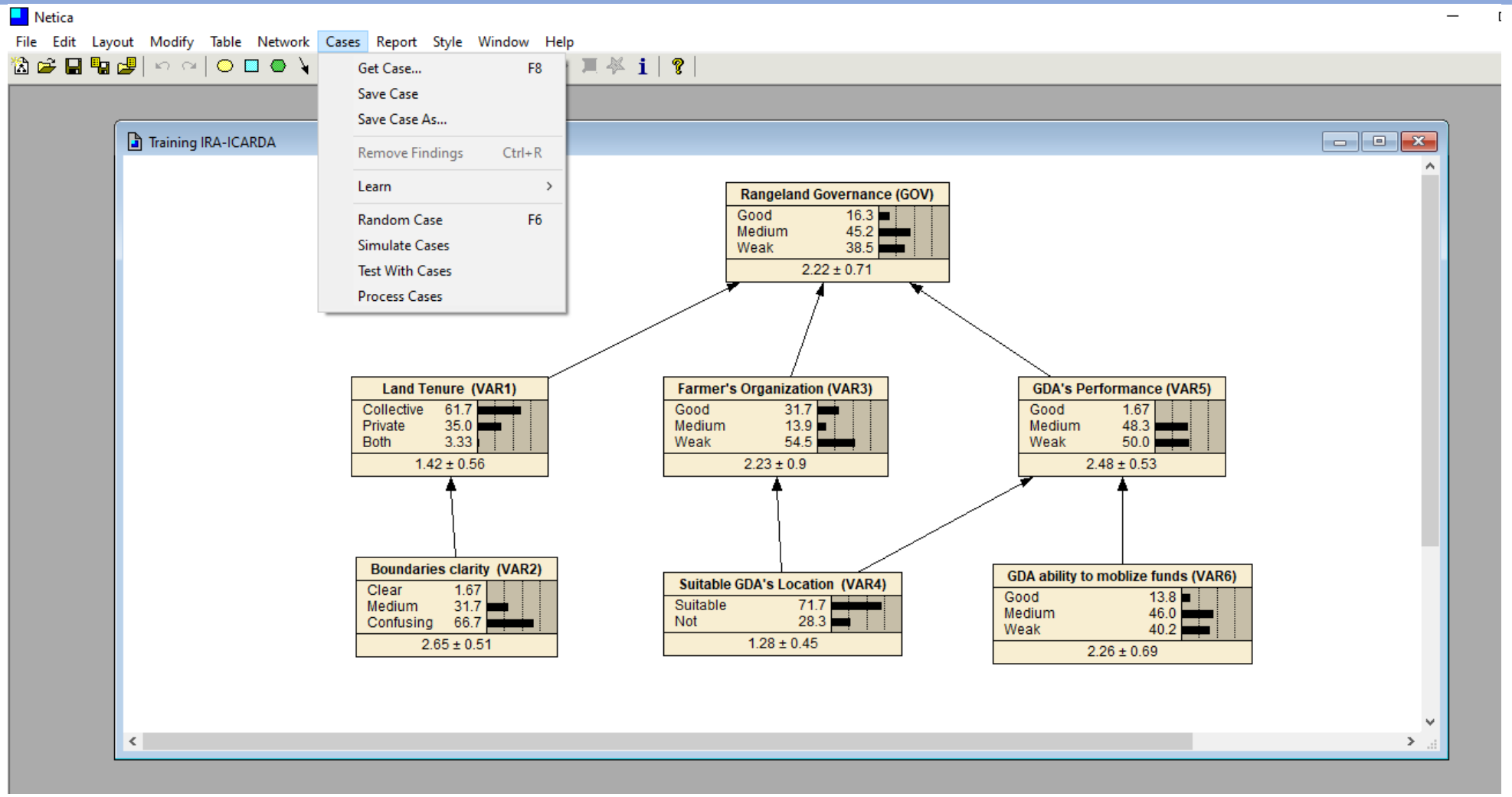


Add edges/ links



Learn cases : Import data file



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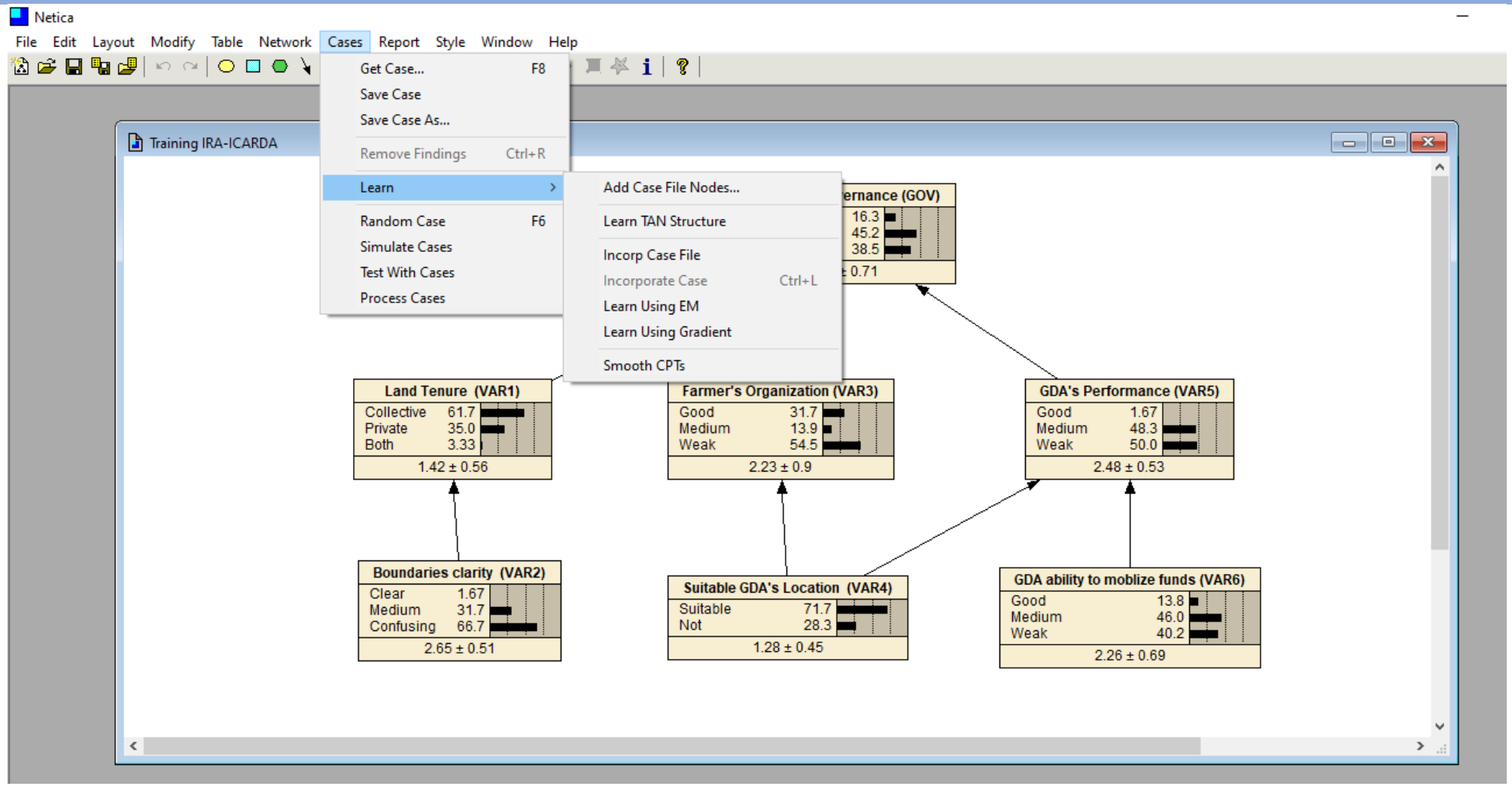

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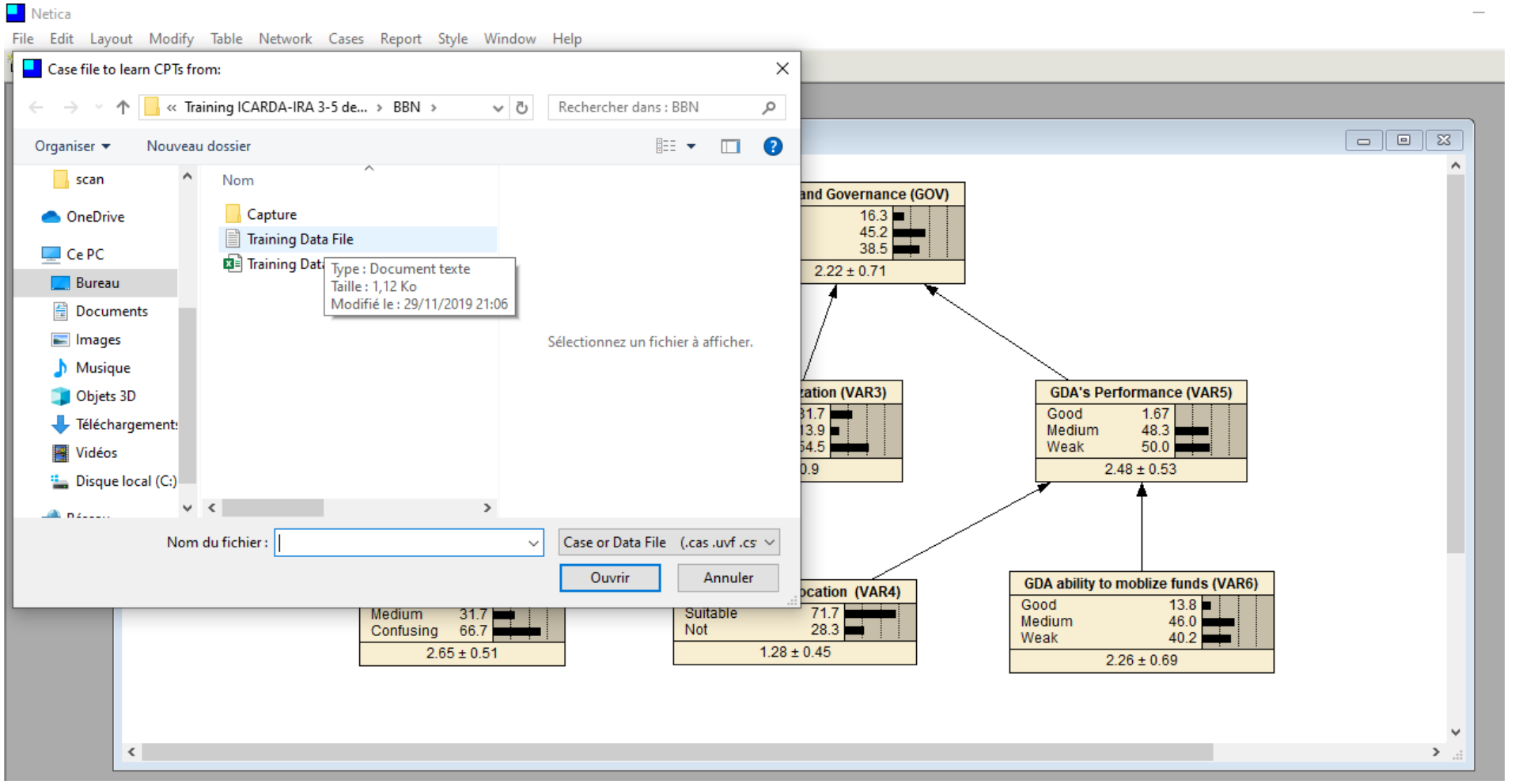

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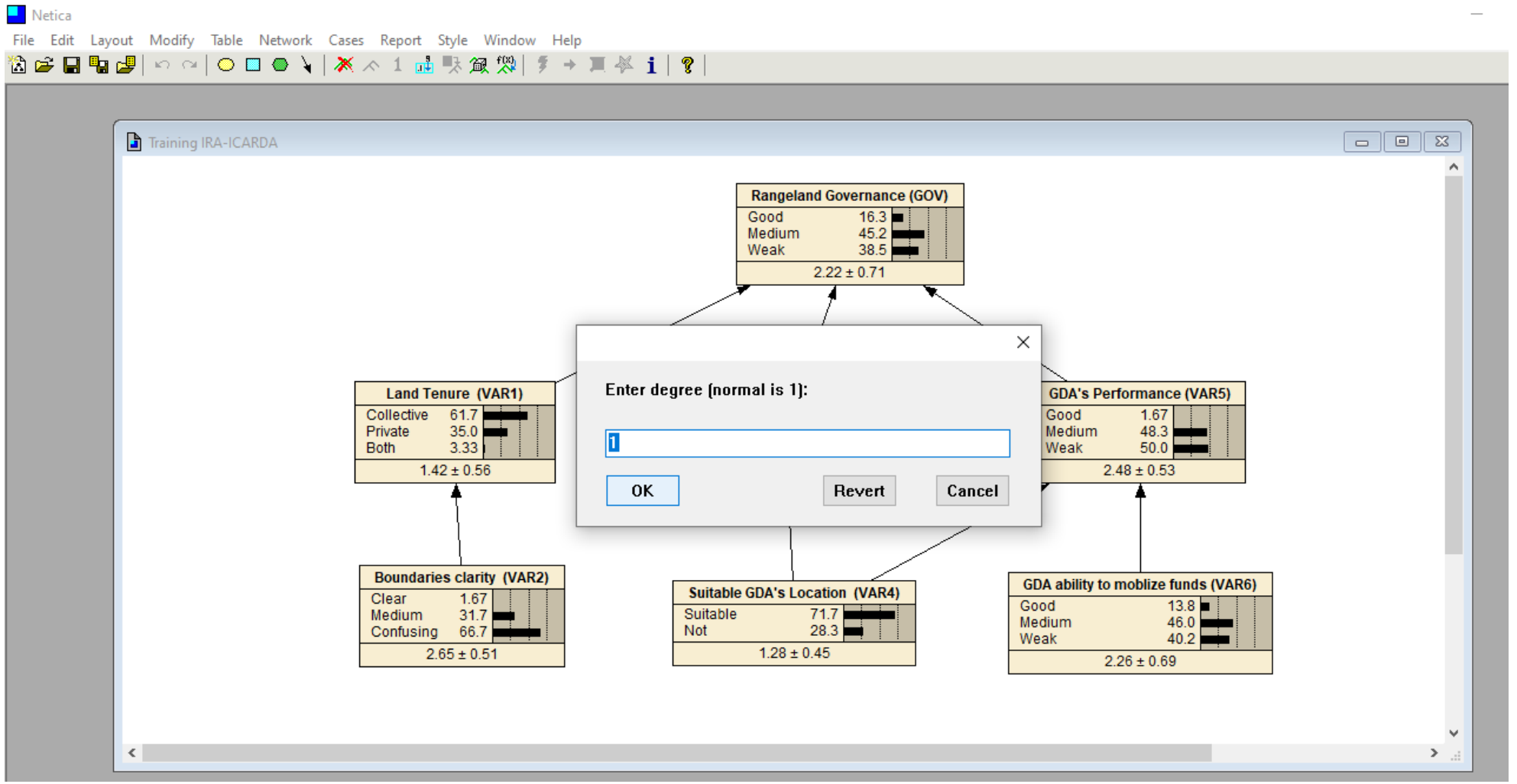

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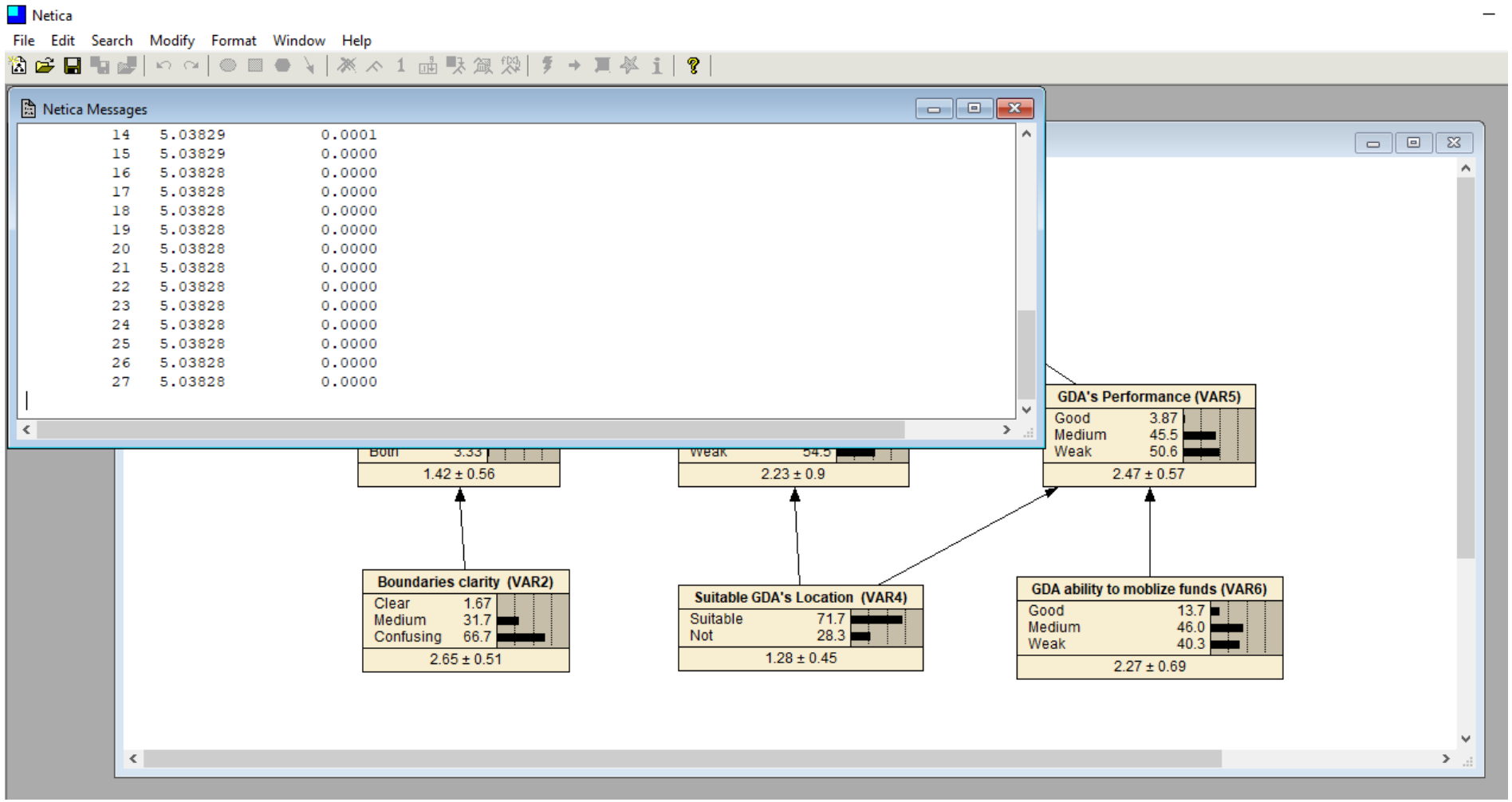

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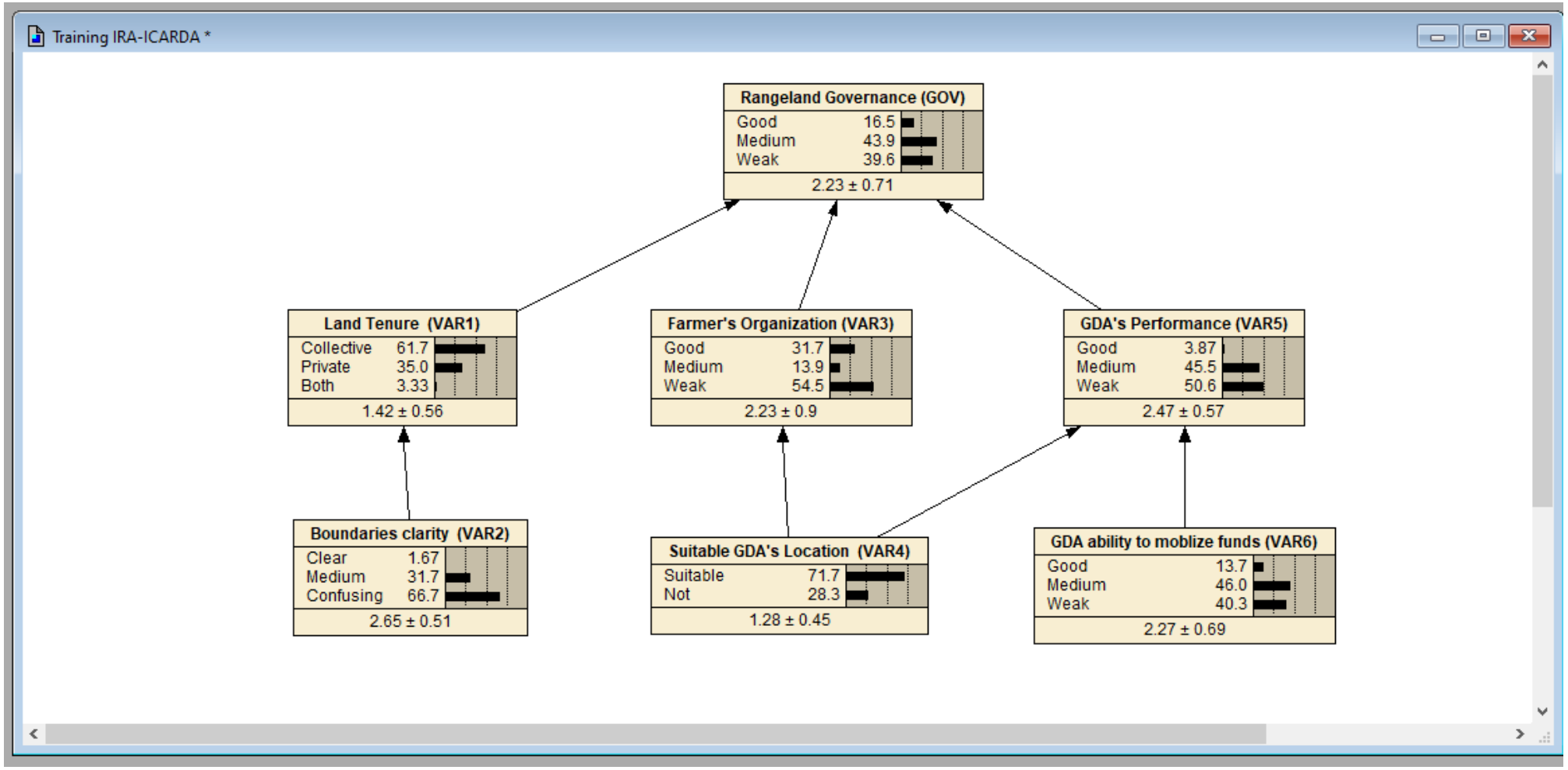
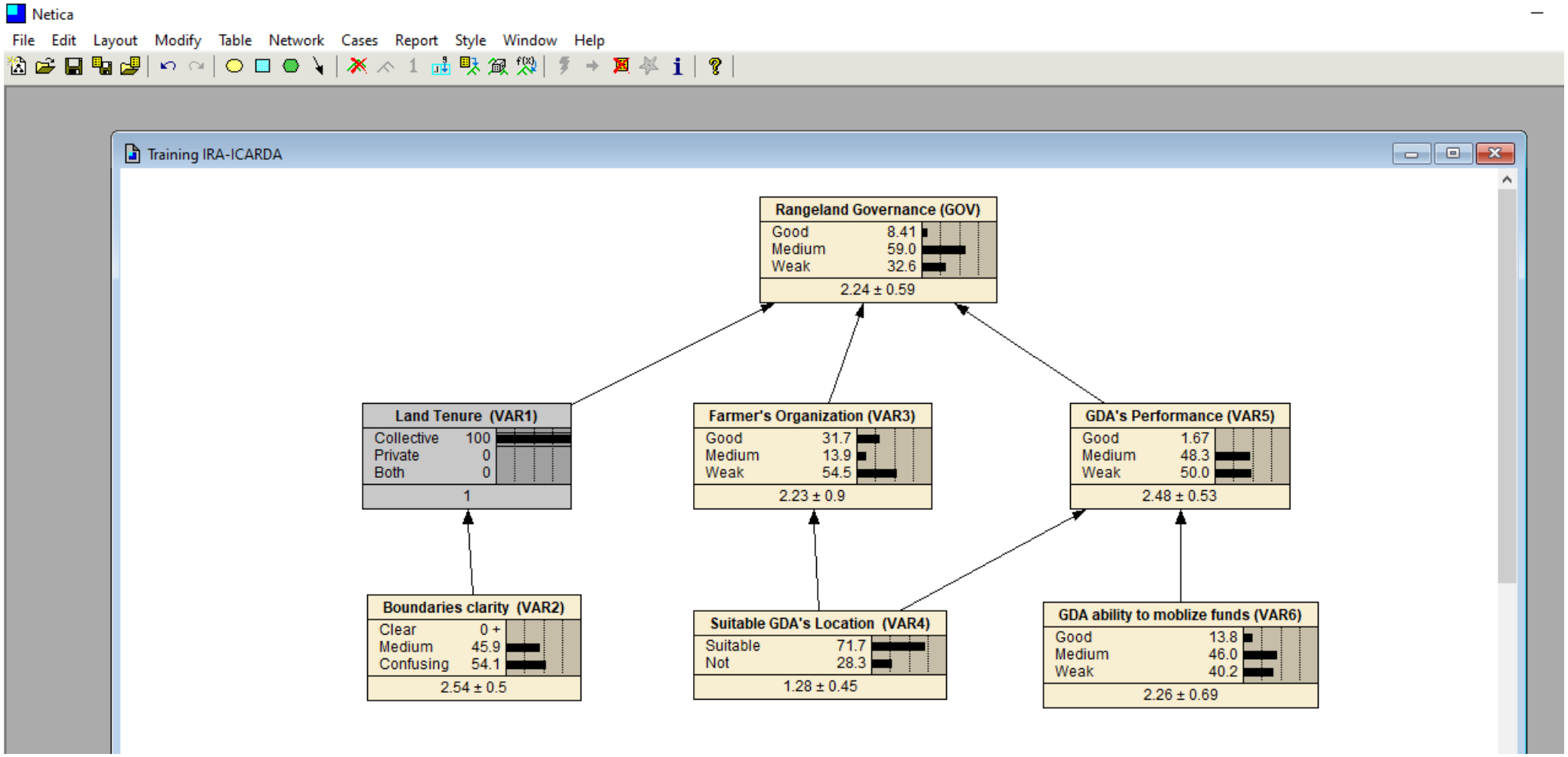
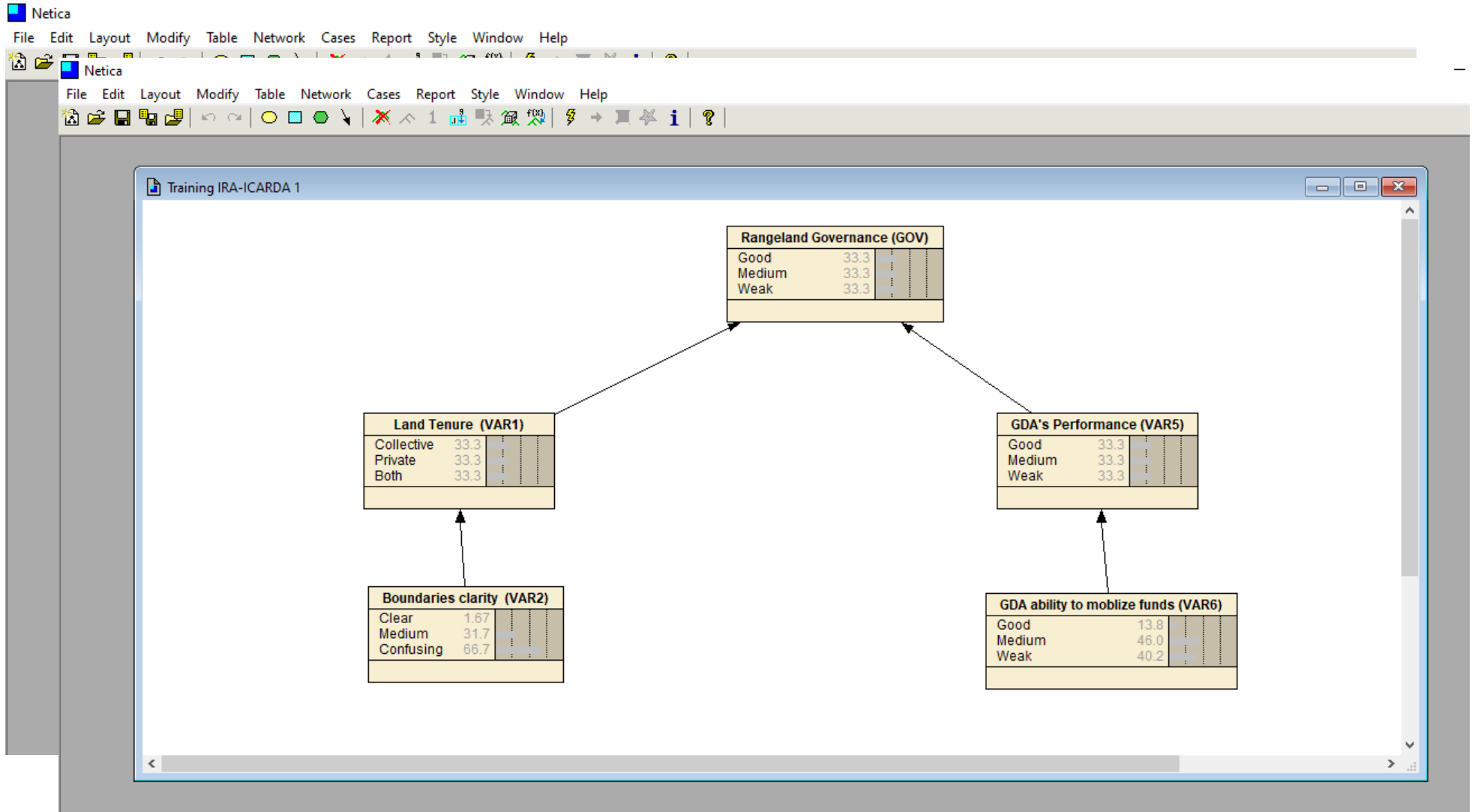


Create scenarios



Combine Nets



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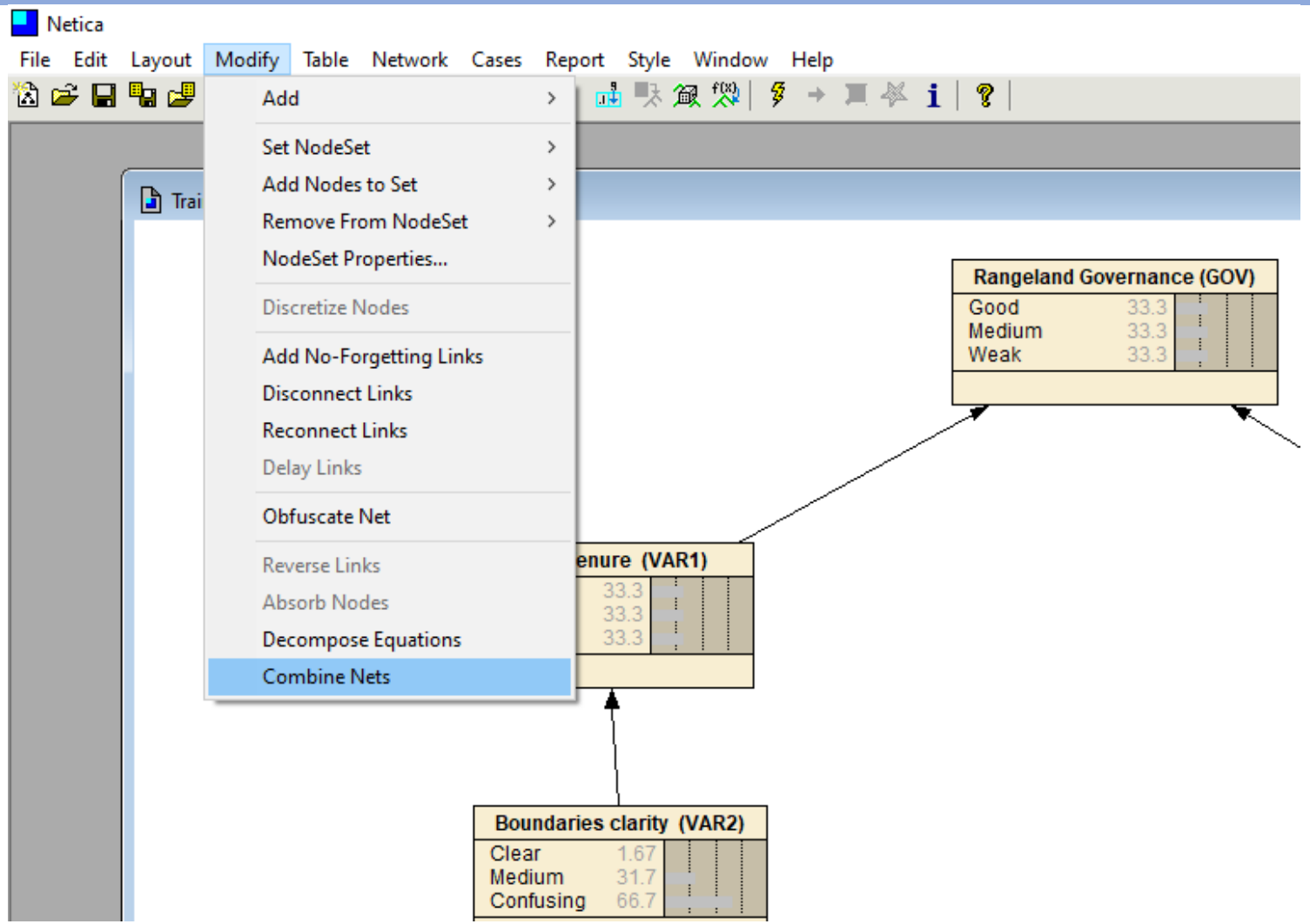

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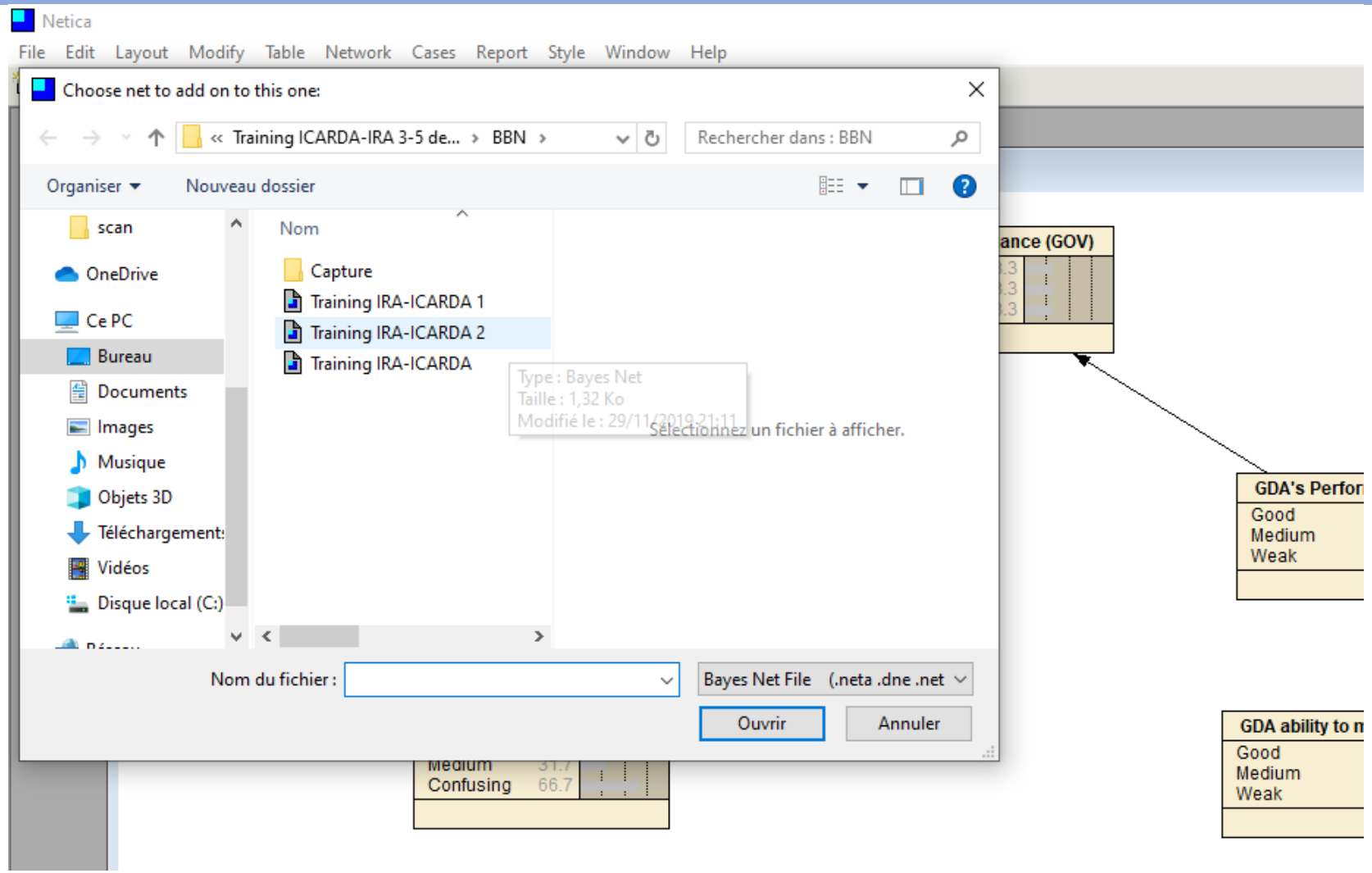

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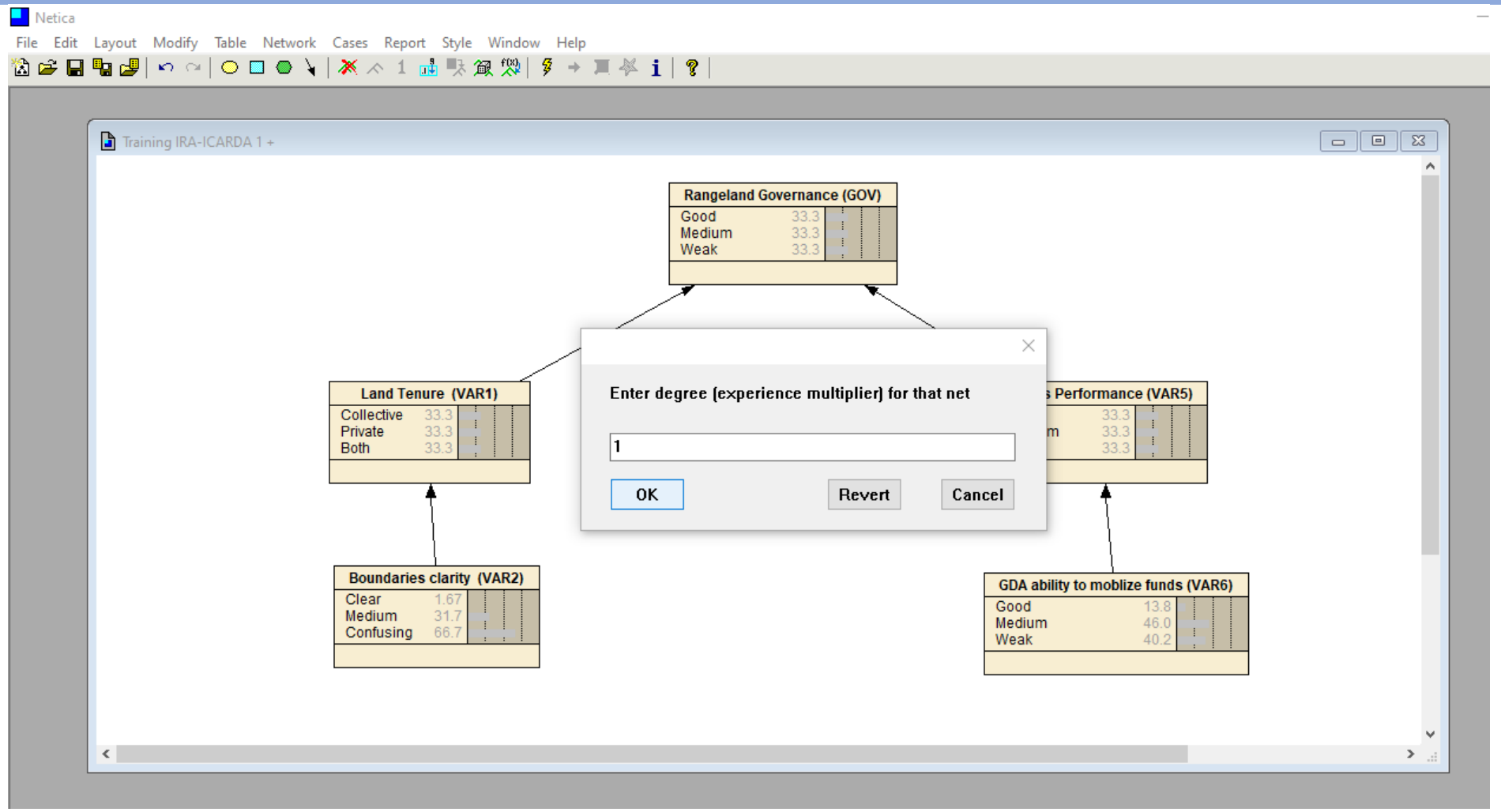

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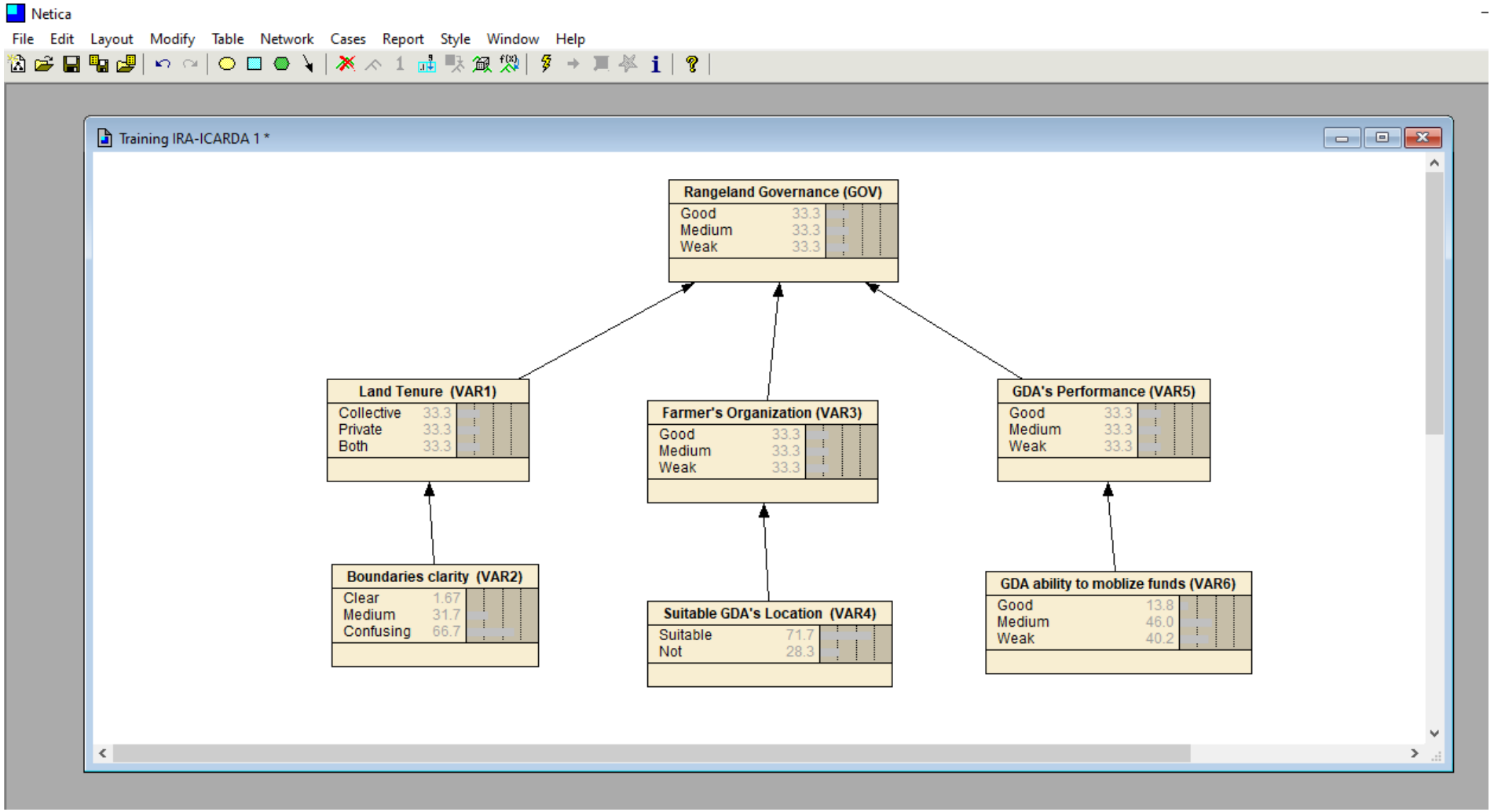
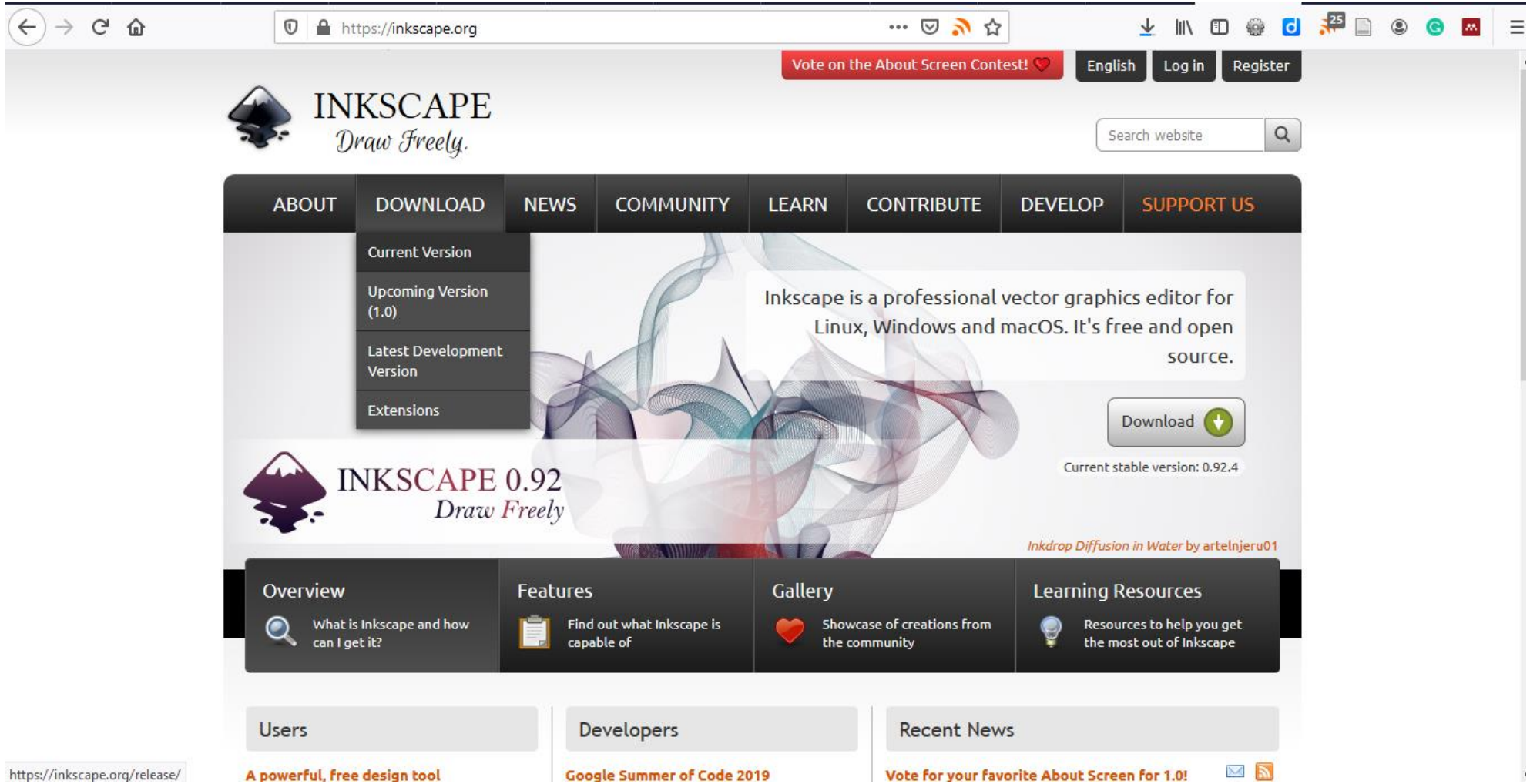


Export Graph



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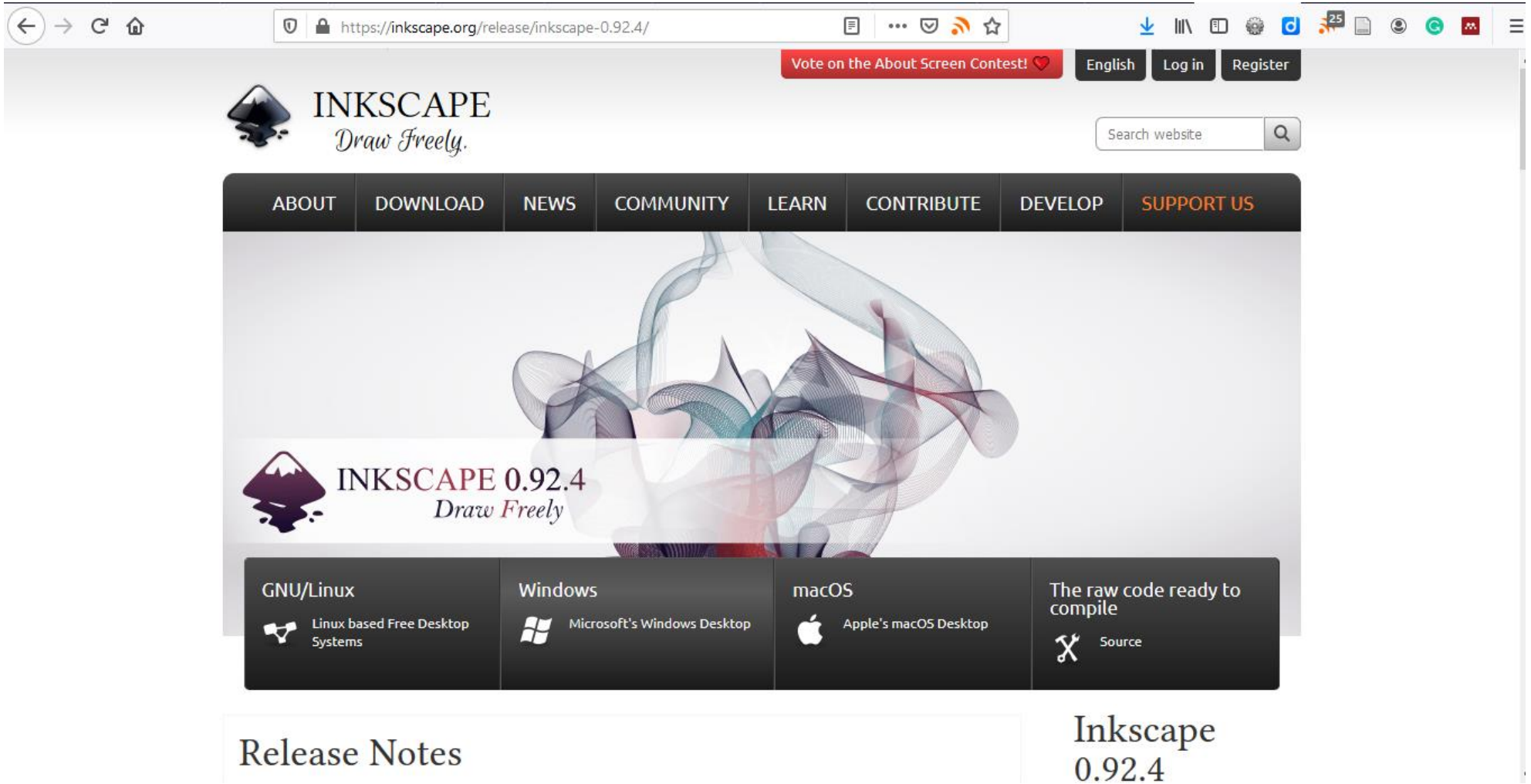

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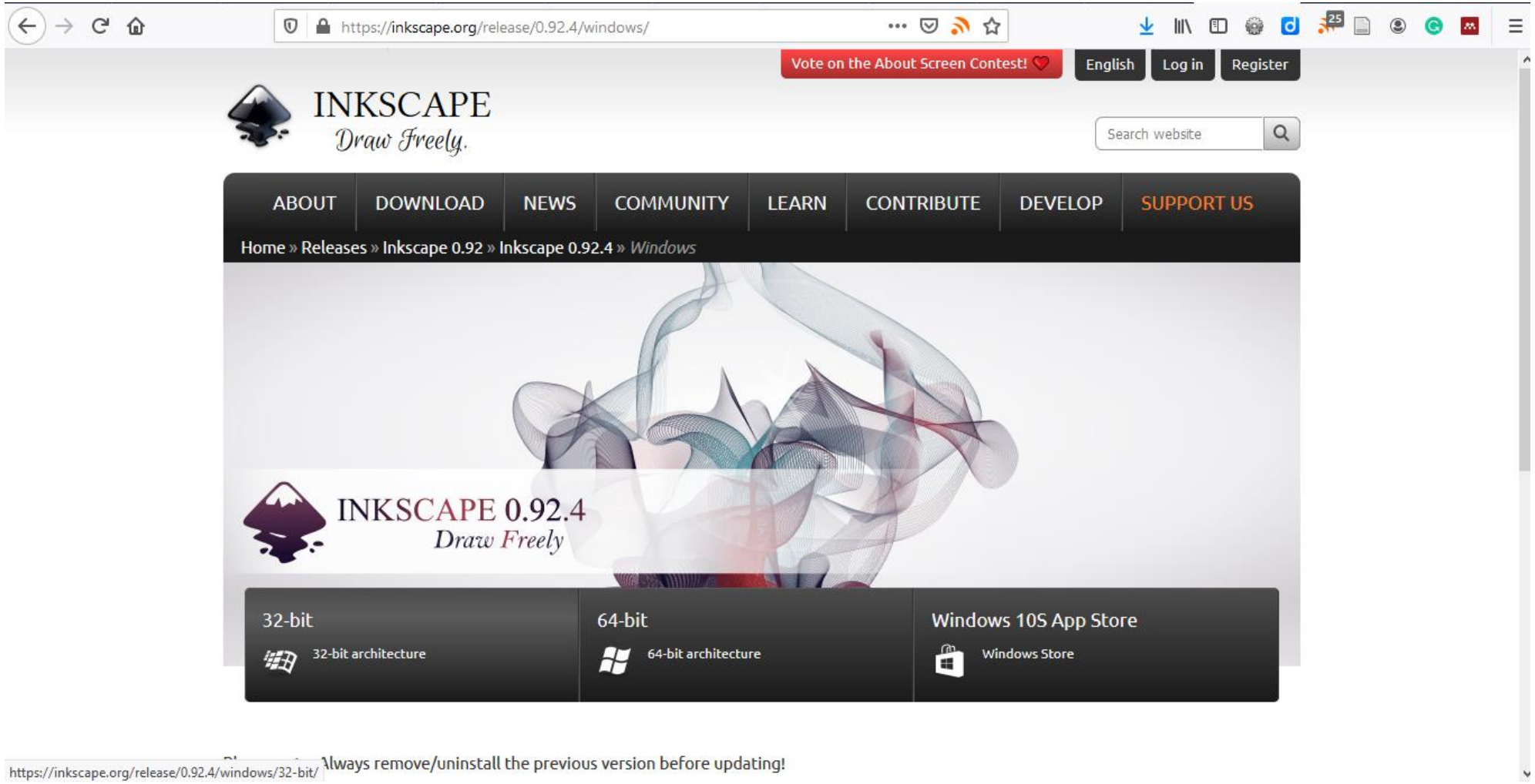

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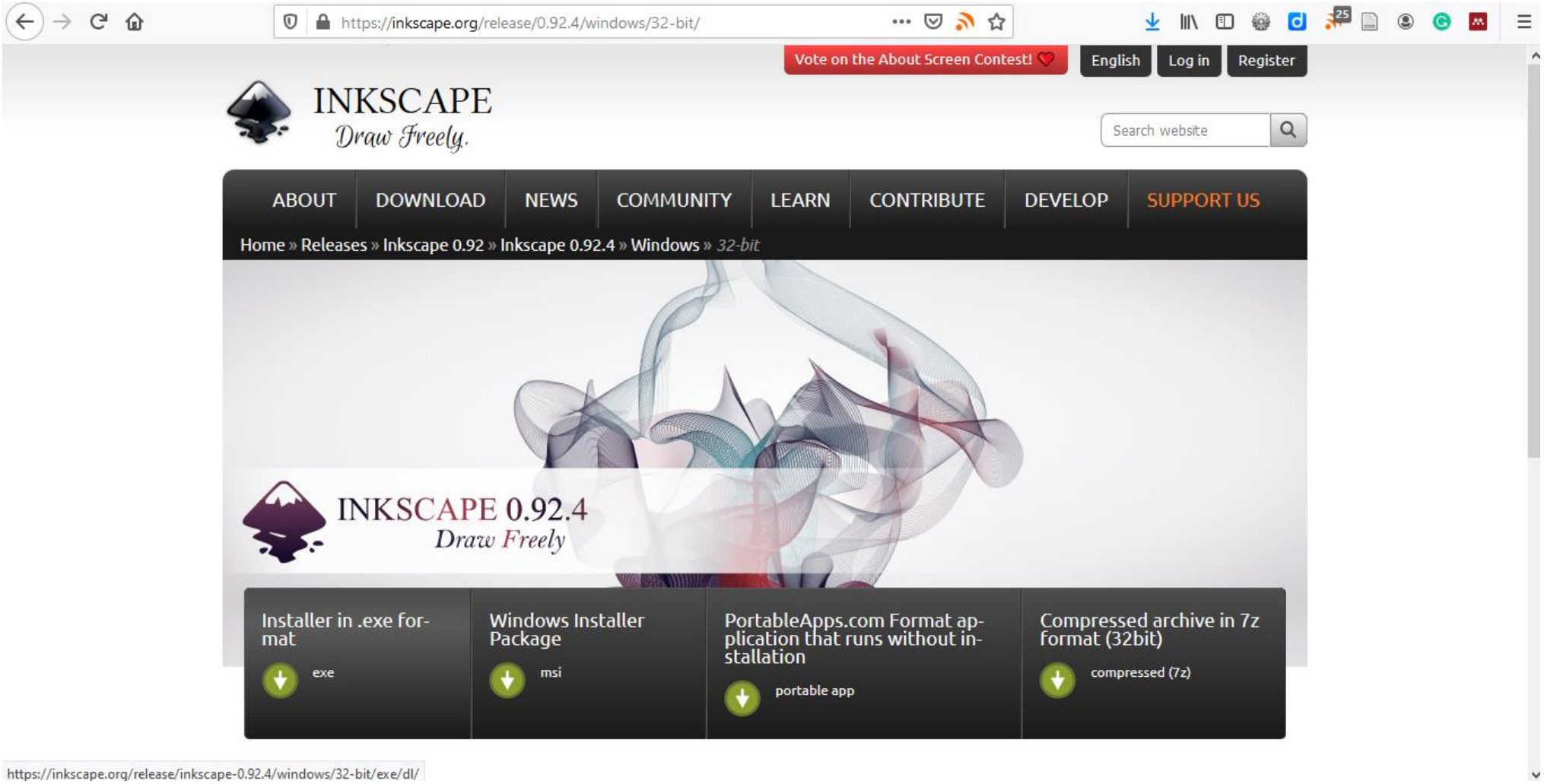

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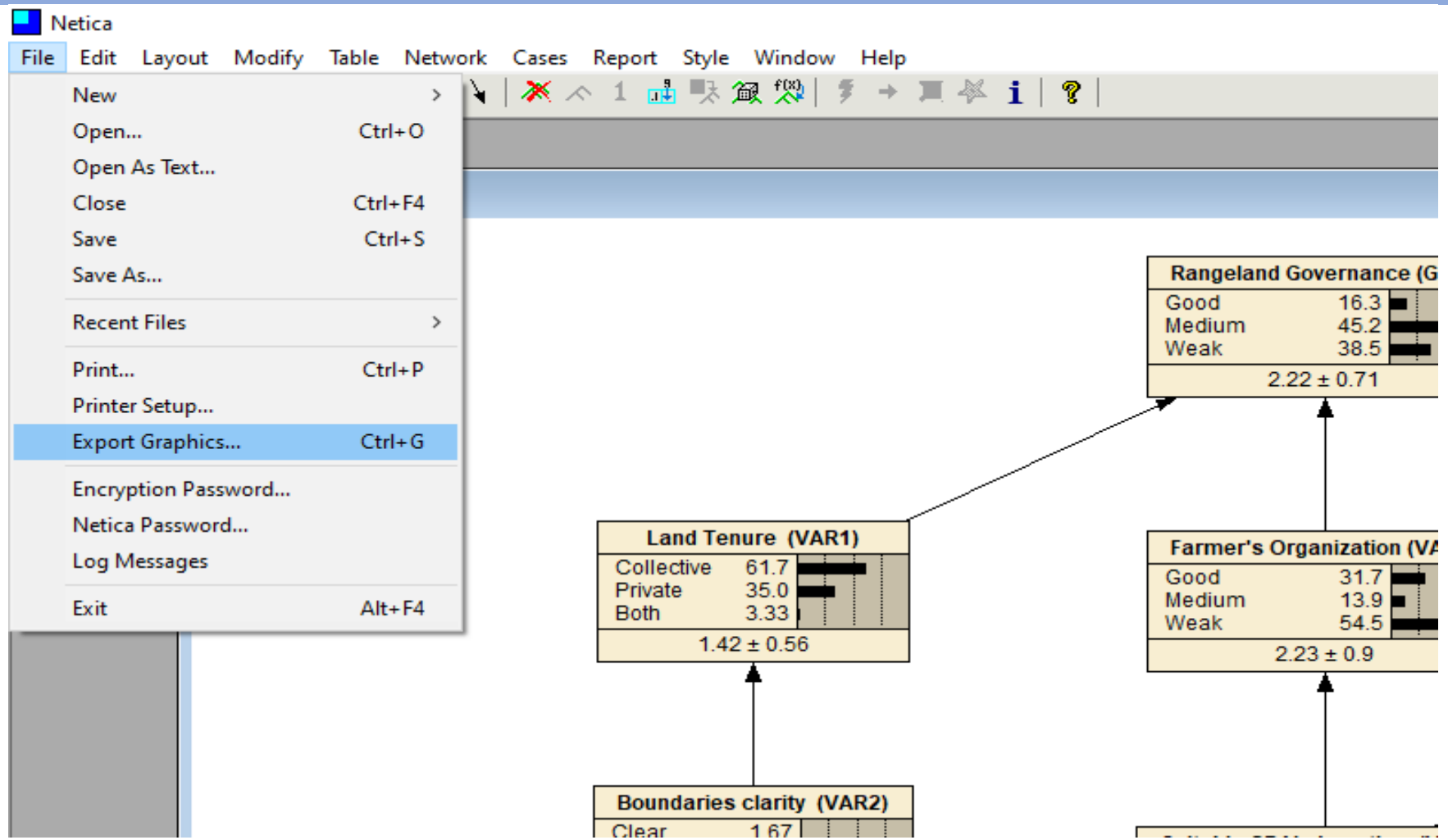

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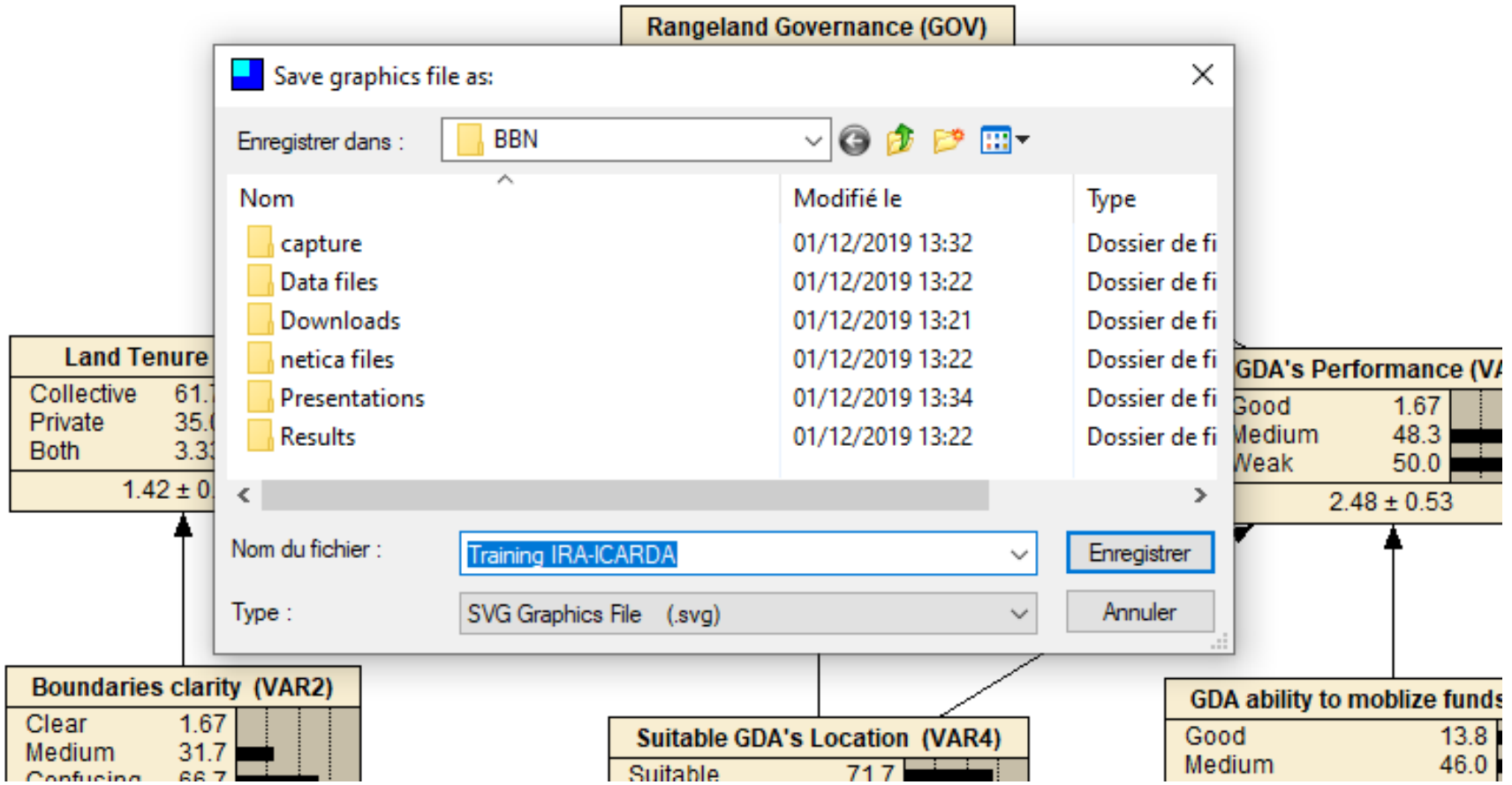

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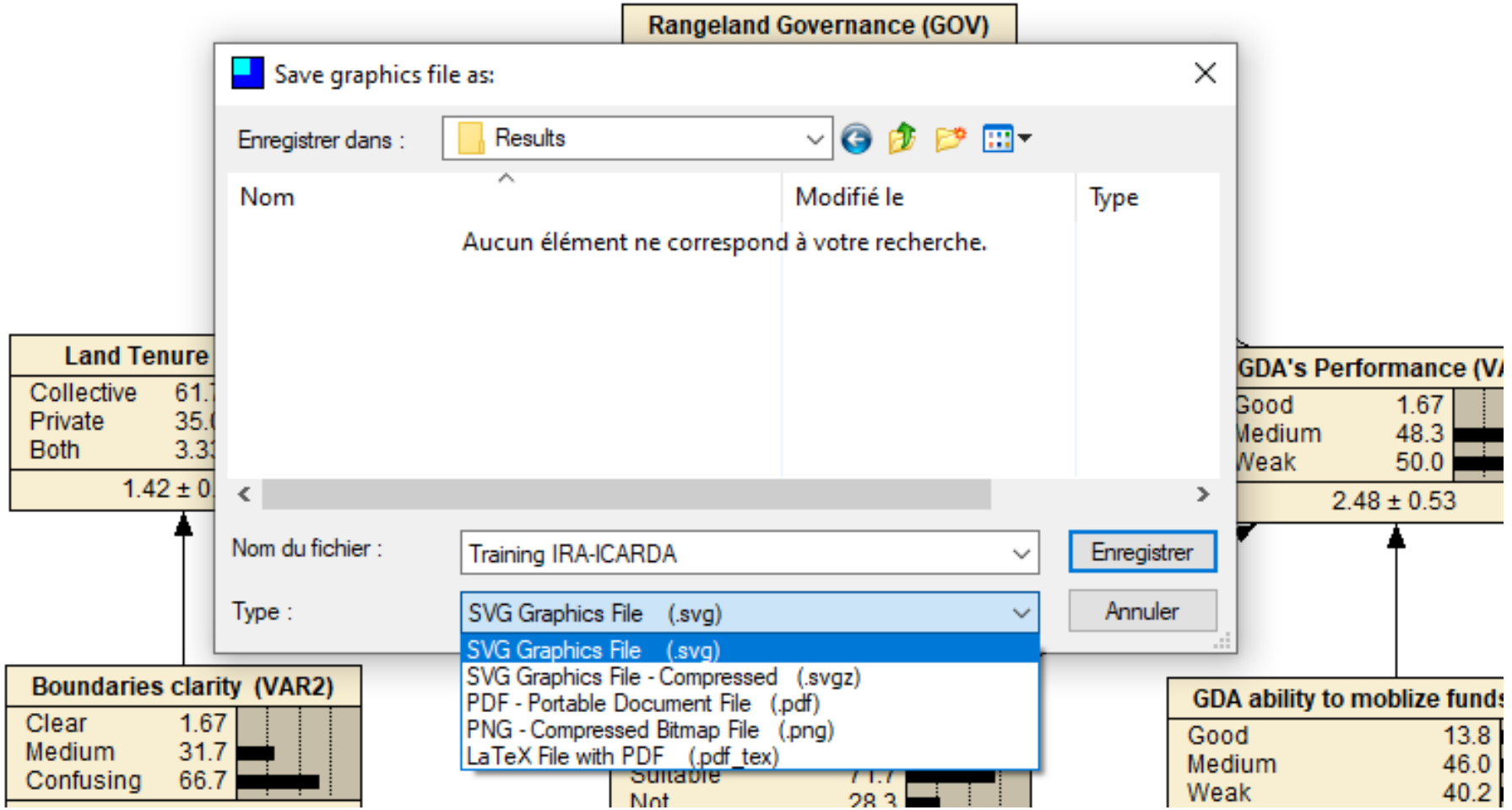

Thank you