

A Linguistic and Decision Making  
Approach to Evaluation:

# Compensatory Fuzzy Logic

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# Measurement Theory Approach

- External validity or consistence (from statistic perspective: for example correlation)
- Internal validity or consistence (is provided from axiomatic perspective of the general model)

# Decision Making Based Evaluation Models :

Modeling Objectives and Preferences of Evaluators as Decision Makers using Normative Decision Making Theory, is a very good way to get internal consistency

# Evaluation

- Necessity to deal with no tangible attributes
- Necessity to join qualitative and quantitative analysis in an internal consistent way as a scientific objective itself and a scientific method to search external validity too

# Strategy

- To search internal consistency and as a consequence external consistency, using Decision Making Theory
- To search including non tangible attributes using natural language

# Selection

- Classical methods of Decision Making have troubles to deal with qualitative analysis.
- Fuzzy Logic is the method with better pragmatic possibilities to deal with natural language (Linguistic variables, connectives, membership functions, modifiers, fuzzy quantifiers),



but . . .

# Decision Making in Fuzzy Logic

- Not yet enough a formal field
- Because there is a lack of good performance in Multivalued Logics
- Therefore it is used:
  - A pragmatic combination of operators without axiomatic formalization (approach without possibilities to get internal consistence), or
  - A Confluence using only one selected operator (approach without possibilities to deal with natural language)

# Compensatory Fuzzy Logic

- Internal and External Consistency is possible
- Decision Making Oriented Method (Decision Making Oriented Axiomatic)
- Sensitivity: Changes in satisfaction of attributes changes the value of indexes using it
- Cardinality: index values can be interpreted in an truth scale, and it is possible to measure how 'better' is an evaluated object than other one.

# Compensatory Fuzzy Logic

- It allows compensation among different attributes; and vetoes.
- Universal proposition truth is normal distributed (Because of that it is possible to estimate his truth value using a sample).

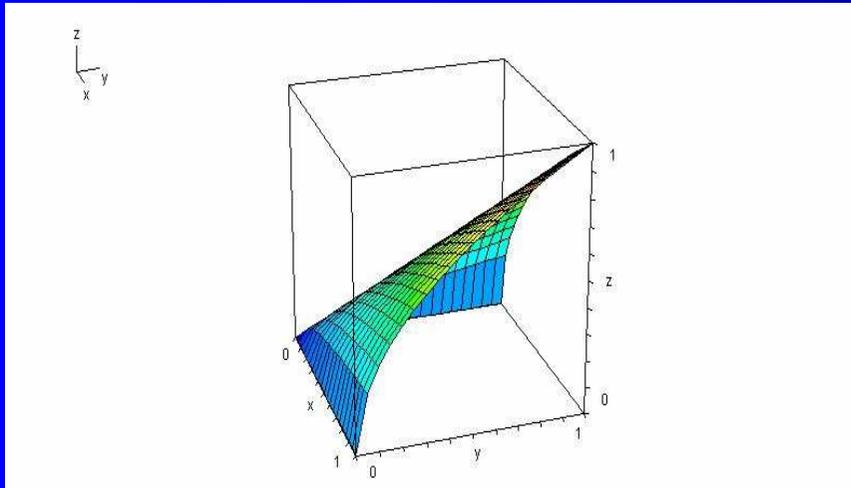
# Compensatory Fuzzy Logic

- It generalizes Classic Logic in a new and complete way
- It has been used in solution of Decision Making Problems in Enterprises Management, Education, Medicine, Risk Evaluation and other fields.

# *Compensatory Conjunction*

## *Geometric Mean*

$$c(x_1, x_2, \dots, x_n) = (x_1 \cdot x_2 \cdot \dots \cdot x_n)^{1/n}$$

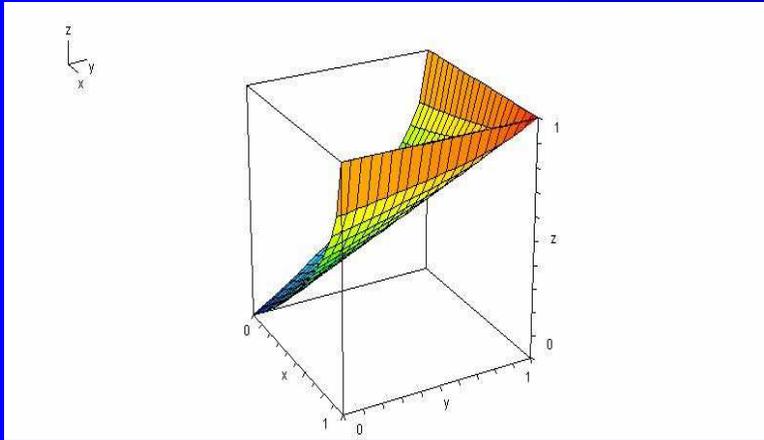


# Negation

$$n(x) = 1-x$$

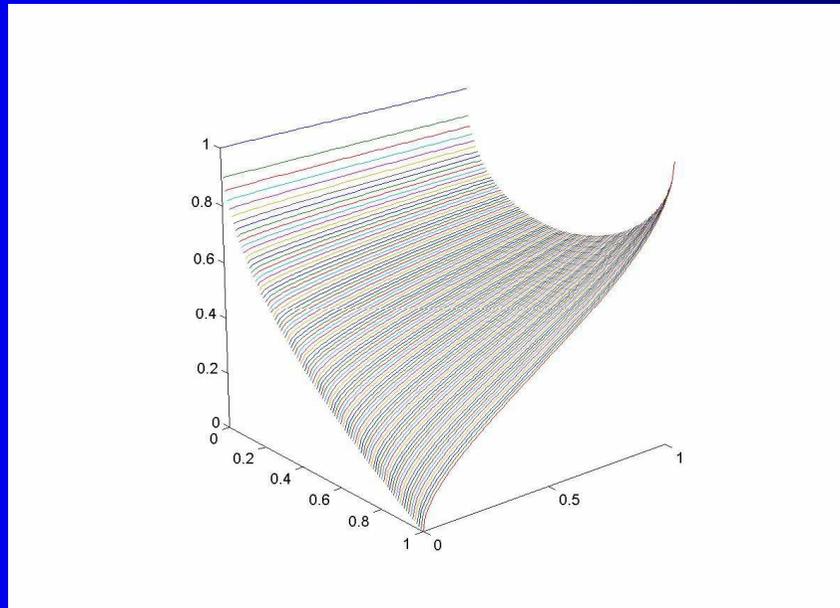
# *Compensatory Disjunction*

$$d(x_1, x_2, \dots, x_n) =$$
$$= 1 - ((1 - x_1)(1 - x_2) \dots (1 - x_n))^{1/n}$$



# *Generalized Zadeh Implication*

$$i(x,y)=d(n(x),c(x,y))$$



# Conclusions

Compensatory Logic is:

- a good way to evaluate in presence of combination of tangible and not tangible attributes

because:

- It allows a linguistic approach of evaluation joining the qualitative and quantitative analysis from the perspective of Decision making, and it makes easier to get internal and external consistency of the evaluation model