PROMETHEE

METHODS

Dynamic MCDA with **PROMETHEE** and **GAIA**

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www.promethee-gaia.net

Who is **PROMETHEE**?

PROMETHEE
METHODS

PROMETHEE
METHODS

Who is **GAIA**?

PROMETHEE
METHODS

What is **PROMETHEE-GAIA**?

PROMETHEE
METHODS

- Outranking methodology vs MAUT
- Ranking: **PROMETHEE**
- Descriptive: **GAIA**
- Extensive sensitivity analysis
- Visual representations
- Software: PromCalc, Decision Lab, **Visual PROMETHEE**

- 30 years of development
- Over 550 related scientific papers
- Ethics
- Sustainable decisions

Not so well known features

PROMETHEE METHODS

- Variable thresholds – preference functions
  - Already in PromCalc
- Missing values
  - Already in Decision Lab
- Hierarchy of criteria
  - Already in Decision Lab
- GAIA 3D
  - In **Visual PROMETHEE**
- GDSS multi-scenarios model
  - Already in Decision Lab
- Bank Adviser and **PROMETHEE** Sort
  - In **Visual PROMETHEE**

New features – **Visual PROMETHEE**

- **PROMETHEE** Rainbow
- Enhanced GDSS-**PROMETHEE** multi-scenarios model
- **GAIA** Webs
- PROMap GIS feature
- Visual stability intervals
- Performance analysis
- **Dynamic (time-dependent) extension**
- Assistants
- Interface
- User experience

Dynamic **PROMETHEE-GAIA**

- Time dimension – Different problems
  - Dated decisions
  - Dated data
    - Individual evaluations have different ages (reliability)
    - Single multicriteria table
  - Multiperiod evaluation
    - Multicriteria data available for several time periods
    - Several multicriteria tables
- Extension of **PROMETHEE** for dated data
  - Taking time into account in preference functions
- Extension of multi-scenarios model for multiperiod evaluation

Weighing the age of evaluations

- Older evaluations get a lower weight.

  ω_t where t is the age of the data

- Different possible weighing schemes
  - Exponential

    $$\omega_t = e^{-at}$$

  - Geometrical

    $$\omega_t = a^t$$

  - Linear

    $$\omega_t = 1 - at$$

  - Constant

    $$\omega_t = 1$$

PROMETHEE for Dated Data

- Preference function computation

$$P_j^{dd}(a,b) = \Omega(a,b)P_j(a,b)$$

where

$$\Omega(a,b) = \min\big(\omega(a), \omega(b)\big)$$

or

$$\Omega(a,b) = \omega(a)\omega(b)$$

- **PROMETHEE-GAIA** analysis as usual

PROMETHEE-GAIA
Multiperiod Analysis

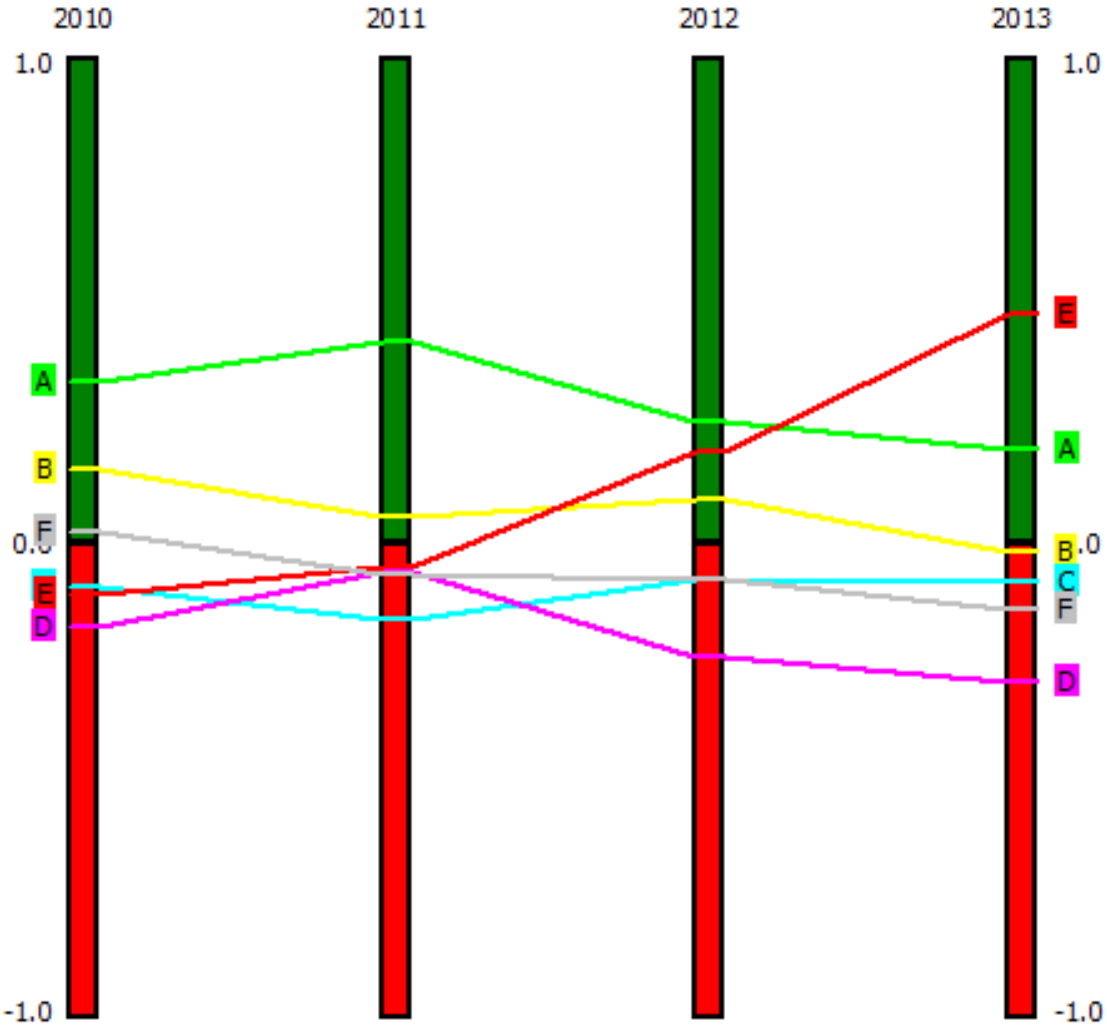
- Multi-scenarios analysis
  - Each period is associated to one scenario.
  - Scenarios are weighted according to age.
- Single period **PROMETHEE-GAIA** analysis
- Multiperiod **PROMETHEE** rankings
- Multiperiod **GAIA** analysis
  - Each action has a path on the **GAIA** plane

Example

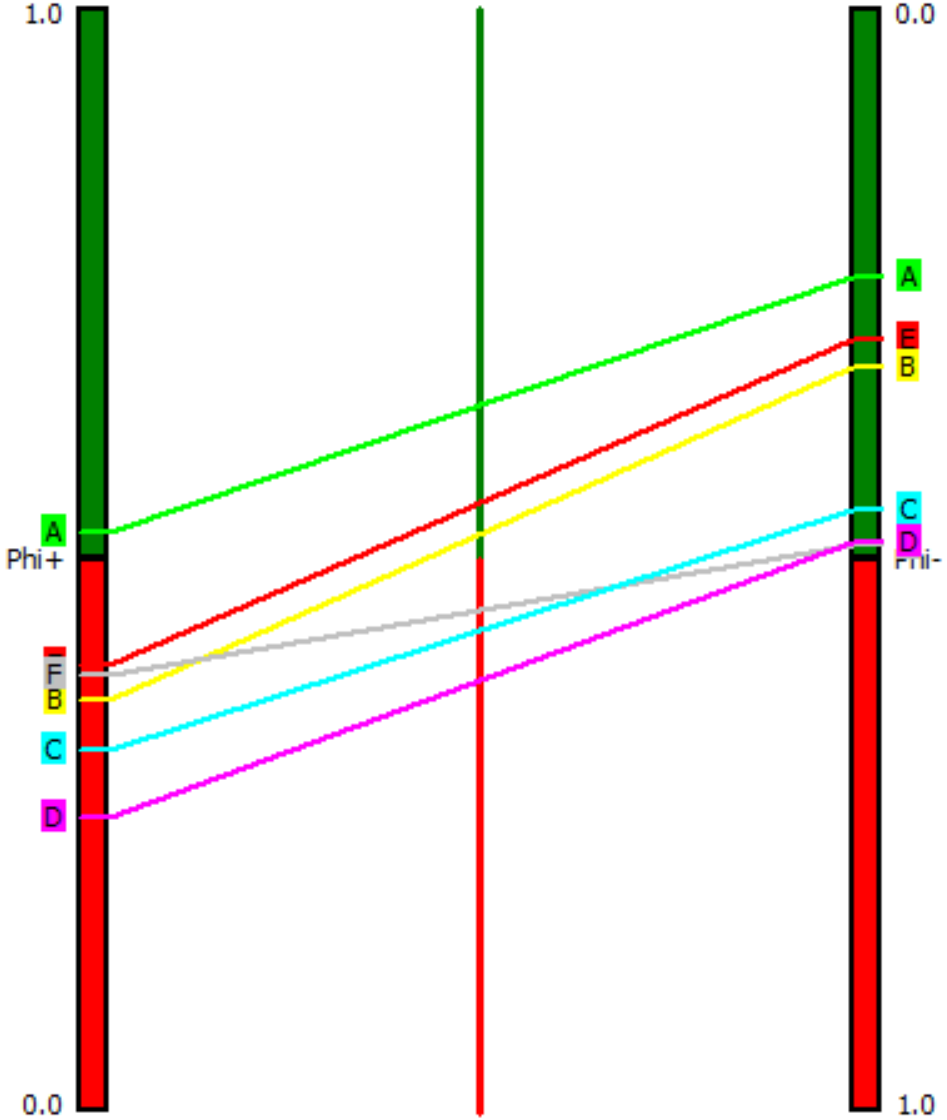
PROMETHEE METHODS

- Multicriteria problem
  - 6 actions: A, B, C, D, E, F
  - 4 criteria: g1, g2, g3, g4
- Four time periods
  - 2013, 2012, 2011, 2010

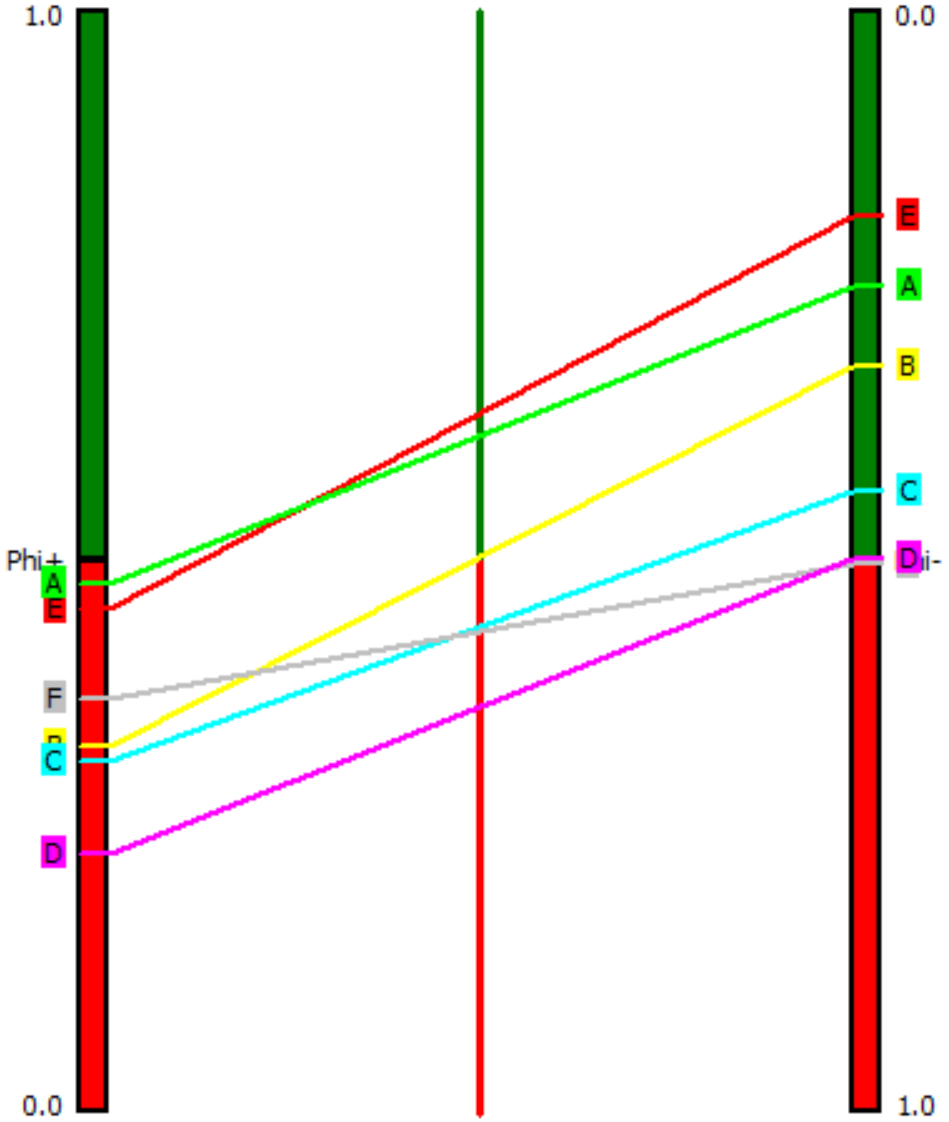
PROMETHEE II Ranking over time



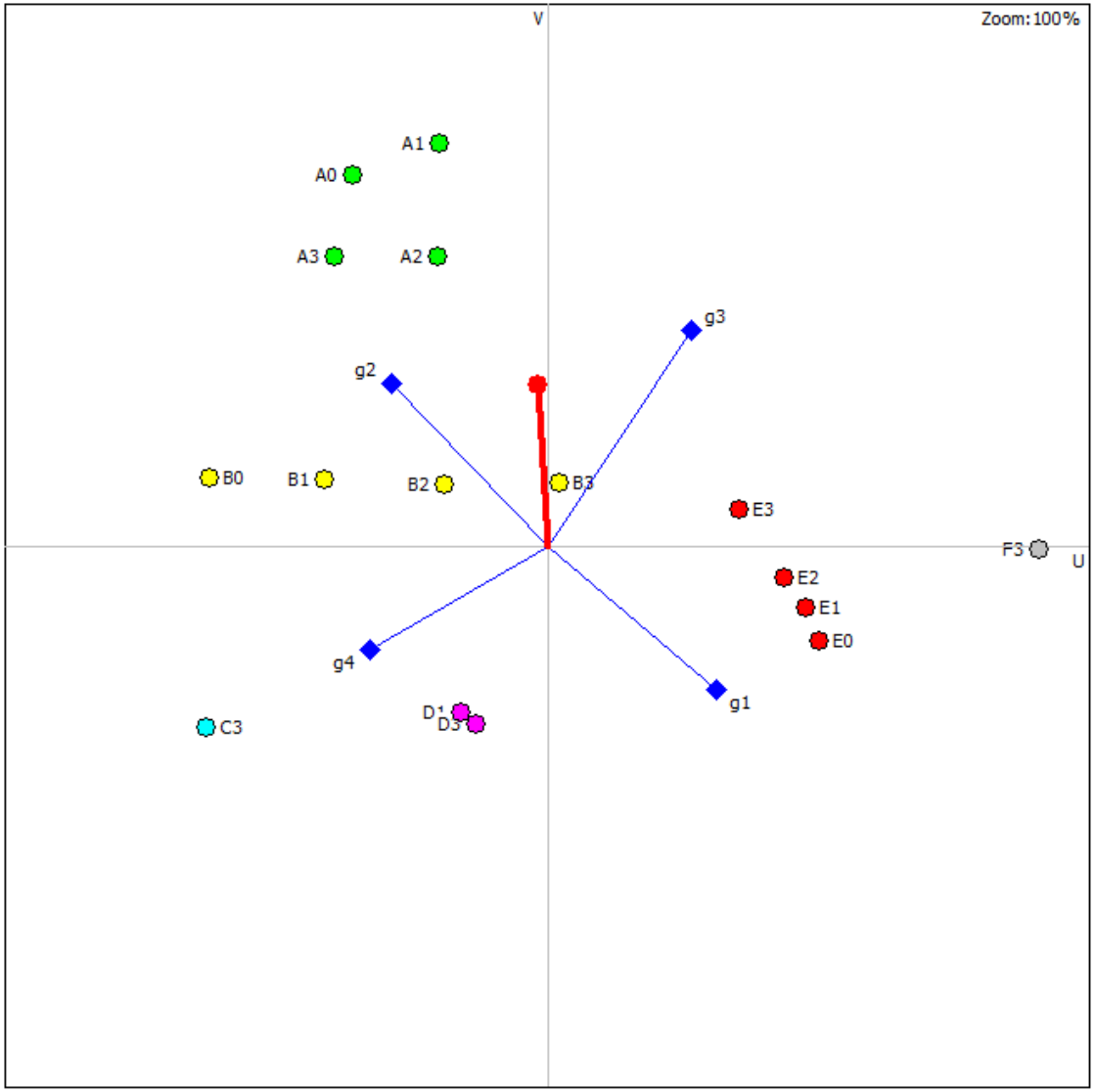
Dynamic **PROMETHEE** Ranking
Equal weights



Dynamic **PROMETHEE** Ranking
Age-decreasing weights



Dynamic **GAIA** Analysis



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- Resources:
  - Blog
  - **PROMETHEE** Bibliographical Database
  - Slides
- FAQ
- Forum
- VPSolutions
  - **Visual PROMETHEE** software
  - Services
- LinkedIn Group
- Twitter

Visual PROMETHEE

- Available in 9 languages:
  - EN, FR, ES, IT, DE, NL, SR, PL, HU
- Full documentation and tutorials
- Academic Edition
  - Free for all non-profit research and teaching
- Business Edition
  - Unrestricted use
- Download: **www.promethee-gaia.net**

VP Services

PROMETHEE
METHODS

- Ask
  - Audit
  - Consultancy
- Learn
  - Training
  - Coaching
  - Course
- Master
  - Extended course
  - Custom coaching
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