

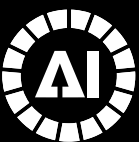
16TH ITU ACADEMIC CONFERENCE

ITUKALEIDOSCOPE

GENEVA2026

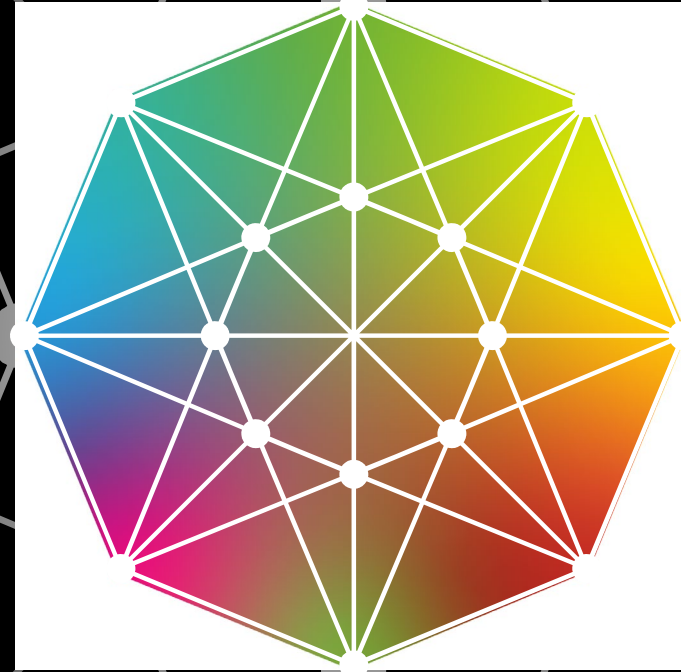
*AI and frontier
technologies for good*

7-9 July 2026
Geneva, Switzerland

Hosted by  **AI for Good**
Global Summit



Integrating Behavioural Economics and IA for threat detection





Jose Vila

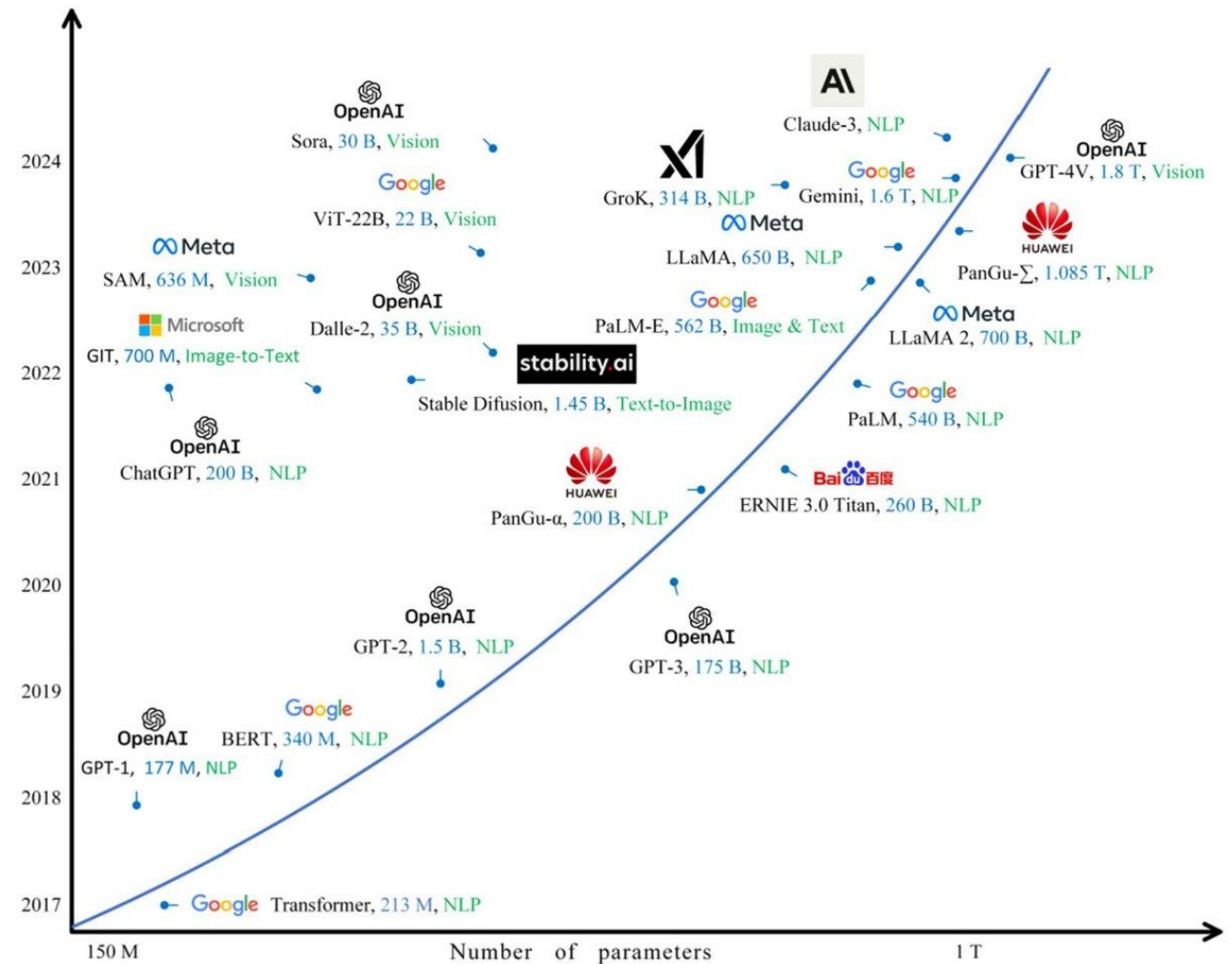
Full professor at University of Valencia

Joint work with Emilio Soria, Regino Barranquero-Cardenosa and Yolanda Gomez

Session S5.3:
Kaleidoscope academic conference – AI and frontier technologies for good

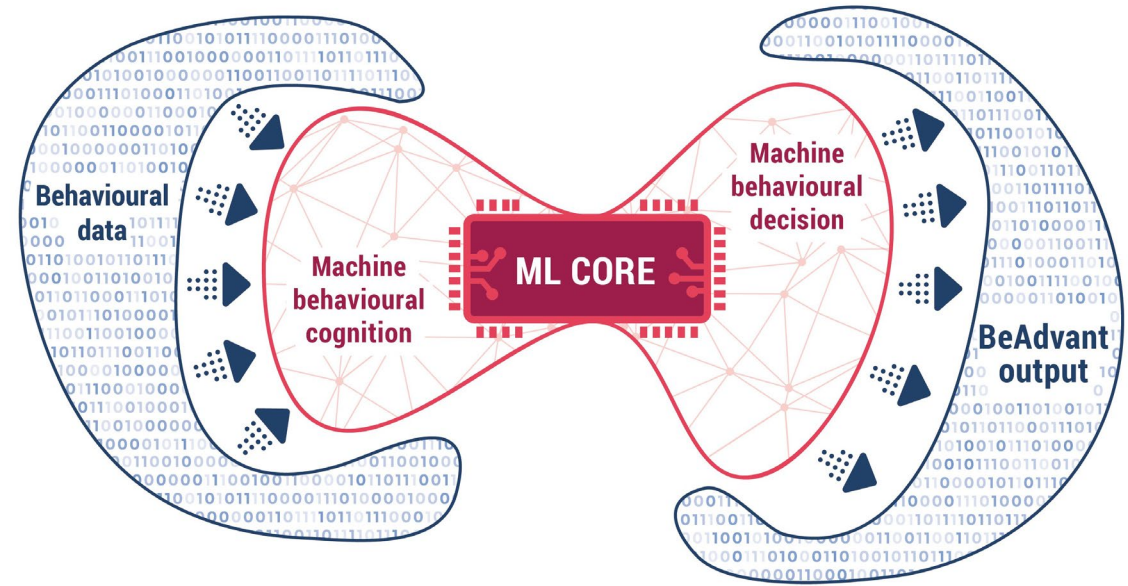
A brute-force approach

- Black-box problem and regulatory compliance
- No sustainability nor green AI
- Training costs
- Over-parametrization problem



An alternative: Levering domain knowledge

Integration of validated models from Behavioral Economics (BE) into ML architectures improves predictive performance, reduces computational costs, and enhances model explainability.



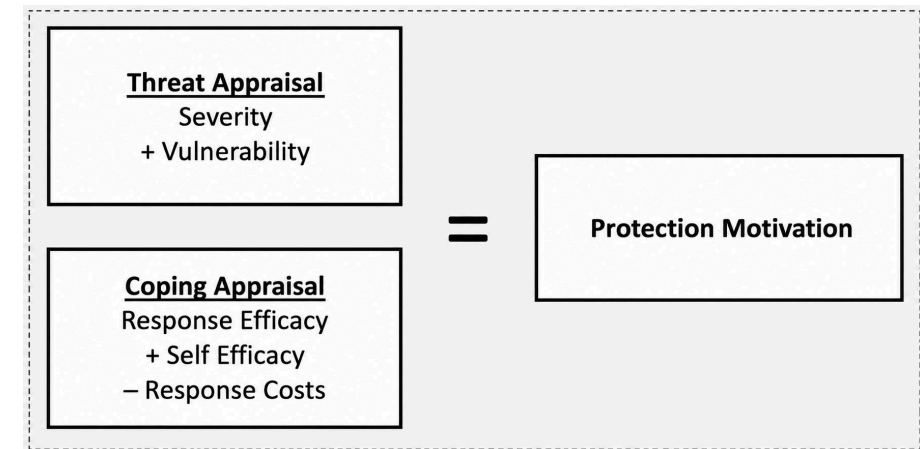
Protection-Motivation Theory (PMT)

Threat appraisal

- **Perceived severity:** The individual's assessment of how serious the consequences of a cyberattack would be.
- **Perceived vulnerability:** The individual's assessment of the likelihood that they will experience a cyberattack.

Coping appraisal

- **Response efficacy:** The perceived effectiveness of the protective behavior
- **Self efficacy:** The individual's confidence in their own ability to successfully implement the protective measures.
- **Response costs:** The perceived costs (financial, time, effort) of implementing the protective behavior.



Cybersecurity shop

Welcome to our Cybersecurity shop! Below, we present the security measures you can buy for CYBECORP. Select the measures you want to buy and press "Continue". Remember that you have a budget of 650 VC and keep in mind that once you press "Continue" you will not be able to go back.

You can reread the instructions at any point by pressing the "Instructions" button on the top right.

Security Measures

Security measures are computer softwares used to prevent, detect and remove malicious software:

Figure 1 illustrates two security measures. The left panel, titled 'Basic security measures', shows a laptop with a shield icon and a padlock, representing a basic security measure. The right panel, titled 'Advanced security measures', shows a laptop with a shield icon and a red padlock, representing an advanced security measure.

Measure	Cost	Attack probability
Basic security measures	0 VC	40%
Advanced security measures	314 VC	20%

Which one do you want to buy?

Cyberinsurance

Cyberinsurance is an insurance product used to protect businesses from Internet-based risks. We offer you three options with different level of coverage:

The diagram illustrates three levels of cyber insurance coverage, each represented by a laptop screen. The first screen, labeled 'No insurance', shows a grey padlock and the text 'CYBER INSURANCE'. The second screen, labeled 'Basic insurance', shows an orange padlock and the text 'CYBER INSURANCE', with a handwritten red 'Basic' note. The third screen, labeled 'Premium insurance', shows a green padlock and the text 'CYBER INSURANCE', with a handwritten red 'Premium' note.

No insurance	Basic insurance	Premium insurance
Opting for no insurance costs 0 VC and covers 0 VC of lost profits in case of attack	The "Basic insurance" costs 140 VC and covers 350 VC of lost profits in case of attack	The "Premium insurance" costs 280 VC and covers 700 VC of lost profits in case of attack
Cost: 0 VC	Cost: 140 VC	Cost: 280 VC
Coverage: 0 VC	Coverage: 350 VC	Coverage: 700 VC

Which one do you want to buy?

ECA Home Events About us

Registration form

User name *

Password *

Password confirm *

First name

Last name

Position

Company information

Company name *

Company email *

Company address

Company city

Company zip

Company phone number

Company country *

☐ I have read and agree to the [Privacy Policy](#) *

* Fields marked with an asterisk are compulsory fields and must be filled out.

Sign in

You

Cybersecurity Manager

security@cybecorp.com

CYBECORP

Avenue Carcer 26 | 46001 Valencia, Spain

+34 96 059 00 80

Your progress:

Online study

Based upon your security decisions and your internet navigation, you have:

Initial endowment:	650 VC	Initial probability of attack:	40 %
Cost of purchasing the insurance product:	-140 VC	Probability increased by your online behaviour:	+33.33 %
Final endowment:	510 VC	Final probability of attack:	73.33 %

Payoff in case of NO cyberattack: **1910 VC**

Probability of cyberattack: **73.33%**

Payoff in case of cyberattack: **860 VC**

1400 VC

510 VC

73.33%

510 VC

550 VC

i A random process will determine if you suffer a cyberattack or not.



Cyberattack

i You have suffered a cyberattack

Company profits:	1400 VC
Amount lost due to cyberattack:	-1400 VC
Amount covered by the insurance:	+350 VC
Final company value:	350 VC

Your total payout:

860 VC

Continue

Bayesian networks

A Bayesian Network (BN) is a probabilistic graphical model that represents a set of variables and their conditional dependencies through a directed acyclic graph.

Network structure

A directed acyclic graph defines the qualitative relationships between variables.

Each node represents a random variable, and directed edges (arrows) between nodes represent direct probabilistic dependencies.

If there is an edge from node X to node Y, we say that X is a parent of Y.

Conditional probability distributions

For each node X_i in the network, there is an associated conditional probability function

$$P [X_i | Parents (X_i)]$$

that quantifies the relationship between the variable and its parent variables.

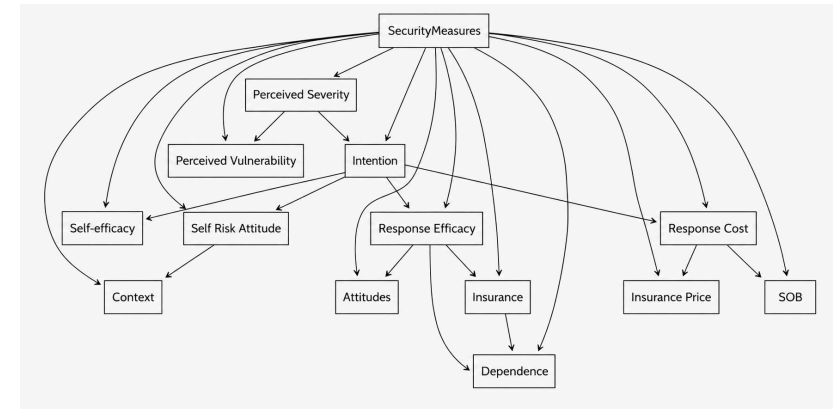
$$P(X_1, X_2, \dots, X_n) = \prod_{i=1}^n P(X_i | Parents(X_i))$$

Pure ML model Tree Augmented Network (TAN)

The network structure is inferred directly from the training data, without incorporating prior behavioral knowledge.

PMT-based model Behavioral economics-informed network.

Integrating validated behavioural economics theory directly into the network architecture.



Pure ML model Tree Augmented Network (TAN)

- **Accuracy: 61 %**
- Application of structure learning algorithm with $O(n^2 \log n)$ complexity for n variables.
- Black box model.

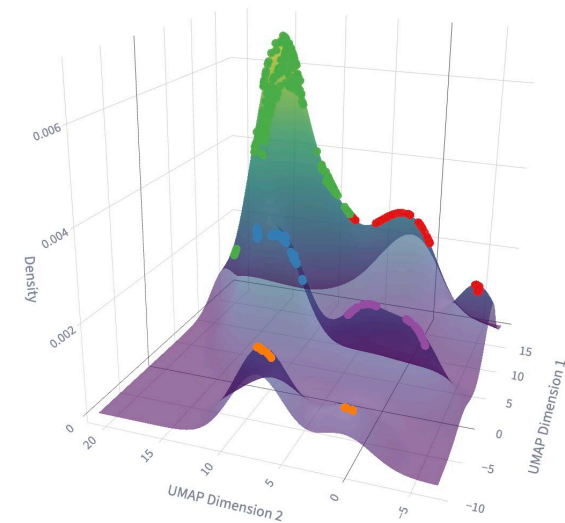
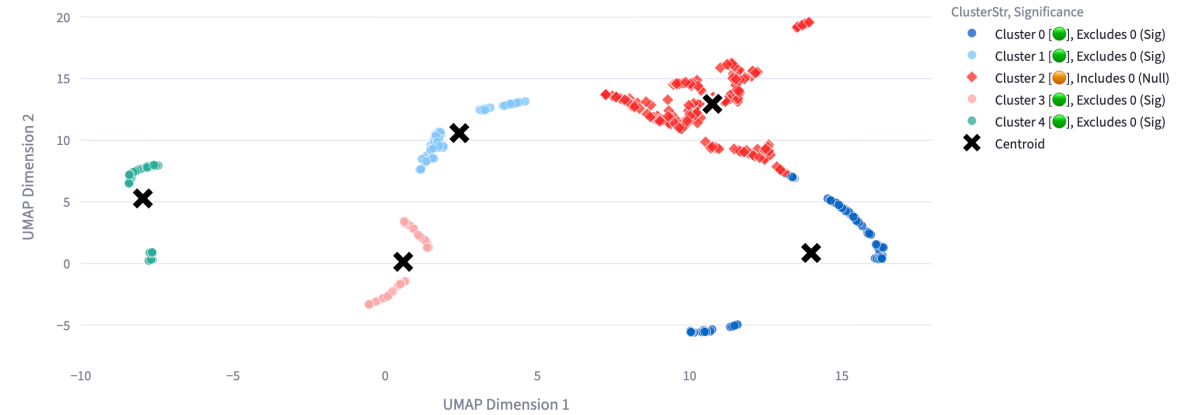
PMT-based model Behavioral economics-informed network.

- **Accuracy: 72% (increase of 11 pp)**
- **Reduction of training time: no need of structure learning algorithm.**
- **Explainable model.**

Other works in progress

Similar results found in ongoing research projects of the team with behavioural data and other AI classical and quantum models.

- Unsupervised models
 - Segmentation models
- Supervised models
 - Neural networks



Thank you!

