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A Universal Framework for Performance Based Ranking Theory Tools and Applications

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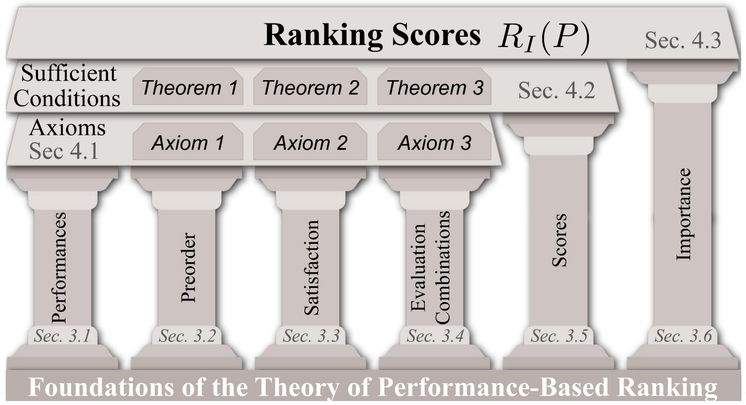
LIÈGE université

Episode 1: The theory

Foundations of the Theory of Performance-Based Ranking

$$R_I(P) = \frac{\mathbf{E}_P[IS]}{\mathbf{E}_P[I]} = \frac{\sum_{\omega\in\Omega} I(\omega)S(\omega)P(\{\omega\})}{\sum_{\omega\in\Omega} I(\omega)P(\{\omega\})}$$



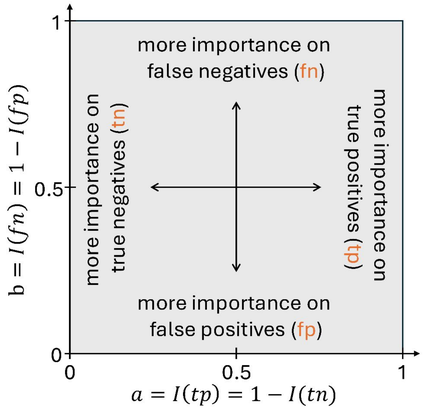
Guidelines

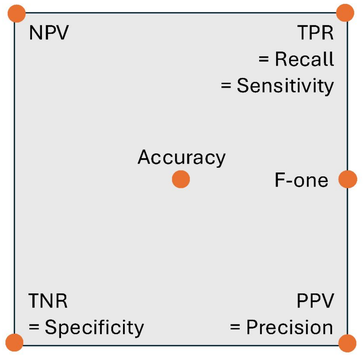
1. Specify the random experience
2. Adopt the probability theory
3. Adopt the order theory: preorder $\lesssim$
4. Model the task: Satisfaction $S(\omega)$
5. Model the evaluation: Φ
6. Model the application: Importance $I(\omega)$
7. Check it makes sense.

Episode 2: The tool

The Tile: A 2D Map of Ranking Scores for Two-Class Classification

$$R_I : P \mapsto R_I(P) = \frac{\sum_{\omega\in\{tn,tp\}} I(\omega)P(\{\omega\})}{\sum_{\omega\in\{tn,fp,fn,tp\}} I(\omega)P(\{\omega\})}$$

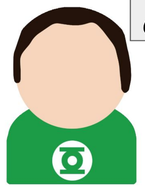


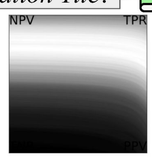


Episode 3: The guide

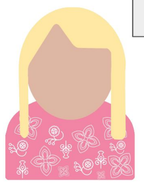
A Hitchhiker's Guide to Understanding Performances of Two-Class Classifiers

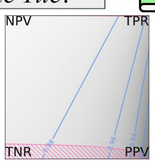
Scenario 1
User profile: the theoretical analyst
I want to understand the theoretical bases of scores used to evaluate and rank methods!
Use the *Correlation Tile*!



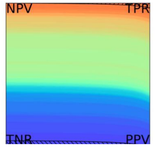


Scenario 2
User profile: the method designer
I want to analyze the performances of my new method and compare it to the state of the art!
Use the *Value Tile*!

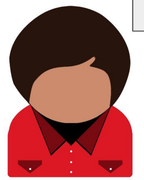


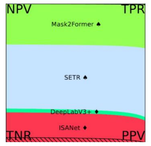


Scenario 3
User profile: the benchmarker
I want to organize an open challenge and compare participating methods!
Use the *Ranking Tile*!



Scenario 4
User profile: the app developer
I want to select the most appropriate method considering my application requirements!
Use the *Entity Tile*!





Generate a complete report!