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Personal Information
Josu Ceberio

- Computer Science, University of the Basque Country (UPV/EHU).
- Master in Computational Engineering and Intelligent Systems, University of the Basque Country (UPV/EHU).

- PhD Student at the Intelligent Systems Group (ISG), University of the Basque Country (UPV/EHU)
- Supervised by Alexander Mendiburu and Jose A. Lozano.
- Predoctoral grant of the Basque Government. 3rd year.
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- ISG research interests: Bioinformatics, High Performance Computing, Machine Learning and Optimization.
"Propose state-of-the-art solutions to permutation problems by means of estimation of distribution algorithms"
Thesis Proposal

The foundations

Permutation-based Combinatorial Optimization Problems
Problems whose solutions are naturally **codified as permutations.**
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Existing EDAs-based approaches do not propose efficient solutions.
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Designed for integer or real encoding problems.
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\[ \Omega = \Omega_1 \times \Omega_2 \times \cdots \times \Omega_n \]

where \( \Omega_i = \{1, \ldots, r_i\} \) and \( r_i \in \mathbb{N}, i = 1, \ldots, n. \)
Existing EDAs-based approaches do not propose efficient solutions.

- Designed for integer or real encoding problems.

- An infinite non-numerable subset of $\mathbb{R}^n$. 
Thesis Proposal

The Hypothesis

Existing EDA-based approaches do not propose efficient solutions.

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where \( \Omega_i = \{1, \ldots, r_i\} \) and \( r_i \in \mathbb{N} \), \( i = 1, \ldots, n \).

An infinite non-numerable subset of \( \mathbb{R}^n \).

Estimation of Distribution Algorithms

Permutation-based Combinatorial Optimization Problems

EDA Scheme

Termination Criteria Satisfied?

Yes

Return Best Solution

No

Select Individuals

Estimate Probability Distribution

Sample Probability Distribution

Evaluate

...
The Hypothesis

"Existing EDAs do not implement suitable probabilistic models able to extract the relevant features of permutation problems"
Estimate an explicit probability distribution on $S_n$. 
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- Thurstone order statistics $\rightarrow$ Plackett-Luce
- Induced by paired comparisons $\rightarrow$ Bradley-Terry
- Distance-based ranking models. $\rightarrow$ Mallows
- Multistage ranking models. $\rightarrow$ Generalized Mallows
Thesis Proposal

The Challenge

Propose Efficient EDA designs
Propose Efficient EDA designs

Analyze the features of the codification

Permutation-based Problems
Thesis Proposal

The Challenge

Propose Efficient EDA designs

Permutation-based Problems
Analyze the features of the codification

Probability Models on Rankings
Study the associated properties
Aims & Objectives

1. Review existing EDAs for Permutation-based Problems

Publications:
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2. Study probability models on rankings and introduce a model in EDAs

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1. Review existing EDAs for Permutation-based Problems
2. Study probability models on rankings and introduce a model in EDAs
3. Propose an EDA based approach that outperforms the state-of-the-art results of a problem

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1. Review existing EDAs for Permutation-based Problems

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4. Study permutation problems and determine the relevant features for applying EDAs.

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Publications:


Ongoing Work:

- Structural analysis of the Linear Ordering Problem.

- Incorporate information about the problem in the search process.

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