



Characterising competition and cooperation potentials in microbial communities using discrete models of metabolism. An exploratory analysis

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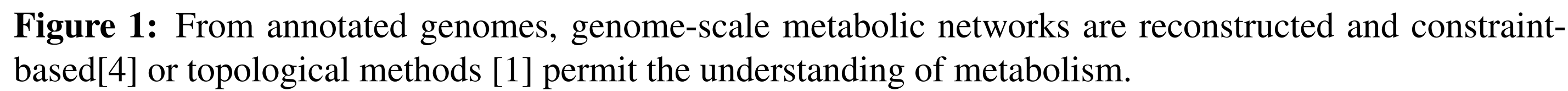
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An exploratory analysis

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Modeling the metabolism enables characterizing of the potential metabolic



The diagram illustrates the trade-offs between numerical and discrete methods in a biological context. Numerical methods, represented by gears and the function f_x , are accurate (shown as a scatter plot with a regression line) but are hardly scalable (represented by a cell with a large 'X'). Discrete methods, represented by a brain with gears, result in accuracy loss (shown as a triangle with a large 'X') but are scalable (represented by a healthy cell). Both methods ultimately lead to pairwise analysis, shown as two cells.

Main Objective

Materials and Methods

Workflow of the proposed method

The workflow starts with a **Problem**, which undergoes **Modeling** to create a **Logic program**. This logic program is then processed by a **Grounder** and a **Solver** to produce **Stable models**. These models are then **Interpreting** to yield the final **Solution**.

Metabolic Network Diagram

The diagram illustrates the metabolic network structure across different organisms (Org 1, Org 2, etc.). Metabolites are represented by blue boxes, and activated reactions are shown as green arrows. Putative exchanged metabolites computed by the exchanged rules are indicated by dashed blue arrows.

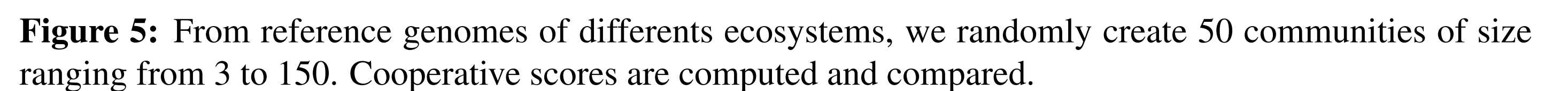
Legend:

- Metabolites (Blue box)
- Activated reactions (Green arrow)
- Putative exchanged metabolites computed by the exchanged rules (Dashed blue arrow)

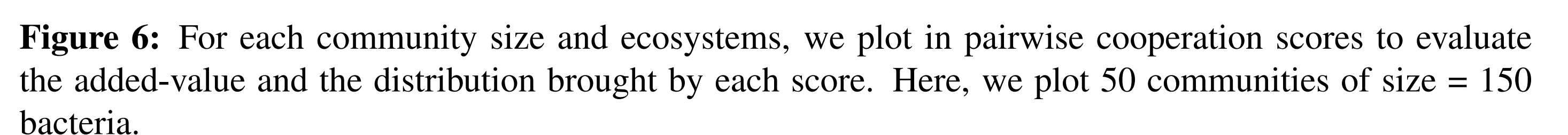
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$$\text{Scope}(\mathbf{G}, \mathbf{S}) = \bigcup_i M_i$$
$$\text{scope}(G_{com}, S) - \bigcup_{i \in G} \text{scope}(G_i, S)$$
$$\text{scope}(G_{com}, R) = \bigcup_{i \in G} \text{scope}(G_i, R)$$
$$\text{scope}(G_s, S), \text{not reactant}(S, G_t), \text{products}(S, G_t)$$

Experimental design for creating a benchmark and testing scores



Distribution brings by cooperation scores



rho scores

3

75

150

gut leaf root

gut leaf root

gut leaf root

pwc: Wilcoxon test; p.adjust: BH

Conclusions and forthcoming research

- ## References

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