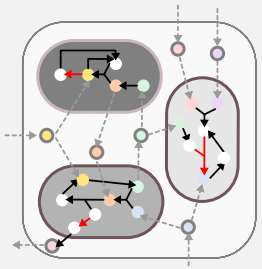
Predict small-scale community metabolism

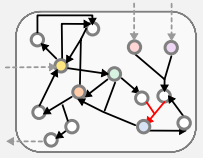
\+
- Mechanistic comprehension
- Large user community
- Link to omics

\-
- Requires high-quality GENREs
- Scalability challenge
- Objective formulation

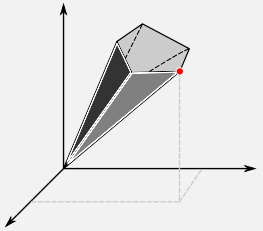


Community of GENREs

Community-wide GENRE

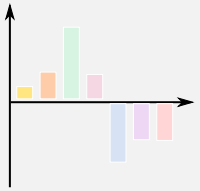


Optimisation of community biomass or individual biomasses



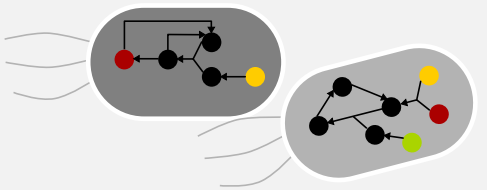
Community growth rate

OptCom, CASINO, MICOM
CODY, EFMtool, Metatool



Metabolite fluxes

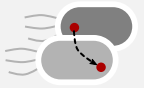
Decipher cooperation and competition potentials



Graph SCC — identification of exogenously-acquired metabolites from GENREs

Netseed

Cooperation potential



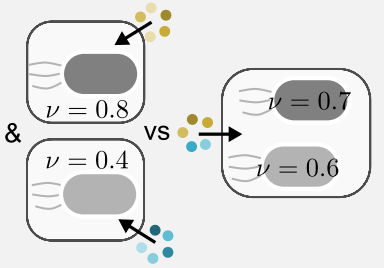
Netcooperate

Competition potential

NetCompt

Comparison of
- Minimal growth requirements
- Growth rates

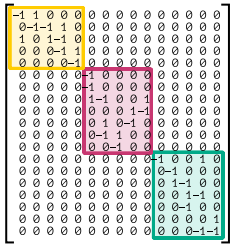
SMETANA
MMinte

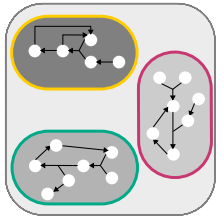


\+
- Fast computation
- Link to omics

\-
- Mostly pairwise
- Scalability to large communities

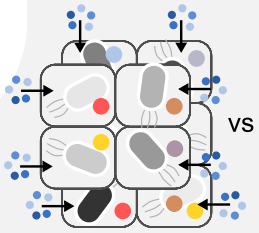
Community stoichiometric matrix





Community of GENREs

Metabolic potential screening from GENREs



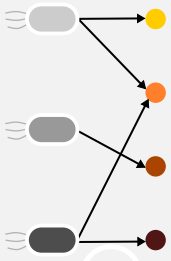
vs

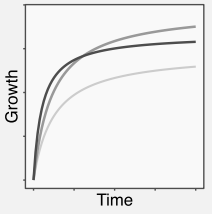
Cross feeding potential

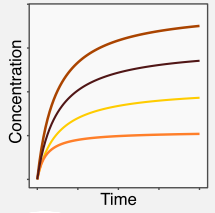
Assess community dynamics

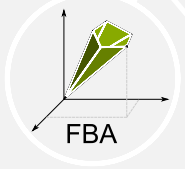
\+
- Prediction accuracy
- Variety of models
- dFBA: Link to omics
- ODE-based: scalability, inference

\-
- dFBA: GENRE curation, scalability
- ODE-based: Non-mechanistic









dFBA

Monod

$$\mu = \mu_{max}\left(\frac{S}{S+K_S}\right)$$

Consumer-resource model

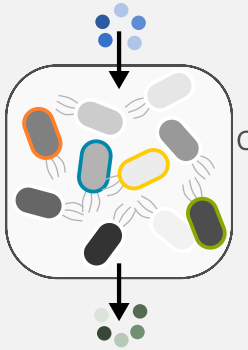
COMETS,
BacArena,
IndiMesh,
µBialSim,
MicroPop,
ADM1,
ASM1

Phenomenological or mechanistic models

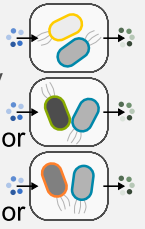
Characterize large-scale community metabolism

\+
- Scalable to large communities
- Suitable to non-curated GENREs
- Link to omics

\-
- Qualitative predictions



Community reduction



Key species associated to functions

MiSCoTo, Metage2Metabo