

This is an assignment for one of my courses, the deadline is today at midnight.

I had other assignments to work on which made me very late for this one and i don't have time to go through all the lectures and labs to learn everything.

I need you to tell me all the information there is to know and in depth about part 4 of this assignment, which is the one I will do myself.

before that, I want you to explain briefly about the first 3 parts, so i don't get lost in the part 4 explanations.

your answer should be 1/3rd about the first 3 parts, and 2/3 about the 4th part.

it should include :

what this assignment is about (goal)

the expected output of my and my teammate parts general explanation, and in depth explanation for part 4a, 4b, and 4c



OVERVIEW: What this assignment is about

The goal of this assignment is to integrate gene expression data into the E. coli core metabolic model using COBRApy (a Python package for constraint-based modeling) and explore how enzyme activity constraints affect flux predictions and metabolic behavior.

You will:

- Visualize metabolic constraints based on gene expression data.
- Modify model constraints to reflect those values.
- Analyze reaction behavior under these constraints.
- Perform FBA (Flux Balance Analysis) and FVA (Flux Variability Analysis).
- In Part 4, focus on biomass production, identifying bottlenecks, and interpreting inactive pathways.

PARTS 1–3: Summary (1/3 of the explanation)

Part 1: Visualize Maximal Reaction Activity on ESCHER Map

You load the e_coli_core_expression.csv data into the non-interactive ESCHER map and analyze it visually.

• 1a: Check whether reaction fluxes along a linear purhway still appear equal. In theory, expression data

+ Poser une question



ChatGPT peut commettre des erreurs. Il est recommandé de vérifier les informations importantes. Voir les <u>préférences en matière de cookies</u>.

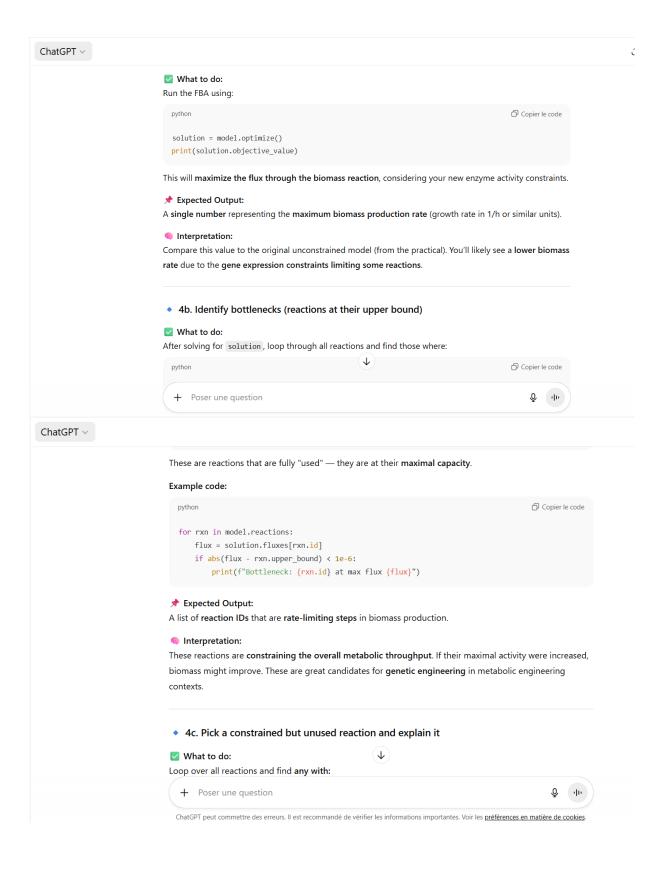
ChatGPT peut commettre des erreurs. Il est recommandé de vérifier les informations importantes. Voir les <u>préférences en matière de cookies</u>.

اا پ

4a. Carry out an FBA optimization of biomass

What to do:

+ Poser une question



- A non-zero upper bound (from the gene expression data),
- But a flux of exactly zero in the FBA solution.

Example code:

```
for rxn in model.reactions:
flux = solution.fluxes[rxn.id]
if flux == 0 and rxn.upper_bound > 0:
    print(f"Unused reaction with capacity: {rxn.id}")
```

Then, pick one and use the ESCHER online map to inspect the reaction's location in the network:

- Is it part of a pathway with missing inputs/outputs?
- Is it a dead-end?
- Is it part of an alternative pathway that's not needed under current conditions?

★ Expected Output:

- One reaction ID (with max activity but zero flux).
- An explanation based on network topology.

Interpretation:

Some reactions are **inactive** not because they are disrinad, but because **the metabolic network chooses more efficient or shorter routes**. This shows how network structure determines which reactions are used.

+ Poser une question





1,

ChatGPT neut commettre des erreurs. Il est recommandé de vérifier les informations imnortantes. Voir les **préférences en matière de cookies**

ChatGPT ~

Interpretation:

Some reactions are **inactive** not because they are disabled, but because **the metabolic network chooses more efficient or shorter routes**. This shows how network structure determines which reactions are used.

What You Submit

You are responsible for Part 4, so your final submission should include:

- 4a: Biomass production rate value.
- 4b: List of bottleneck reactions (with explanation).
- 4c: One constrained but unused reaction with network-based explanation.

Keep your code outputs clean and include brief written explanations for each sub-question.

Let me know if you want me to help you write the code for Part 4 or test some outputs — I can walk you through it line by line.

0 0 7 1 2 ···

+ Poser une question

Q



ChatGPT peut commettre des erreurs. Il est recommandé de vérifier les informations importantes. Voir les préférences en matière de cookies.