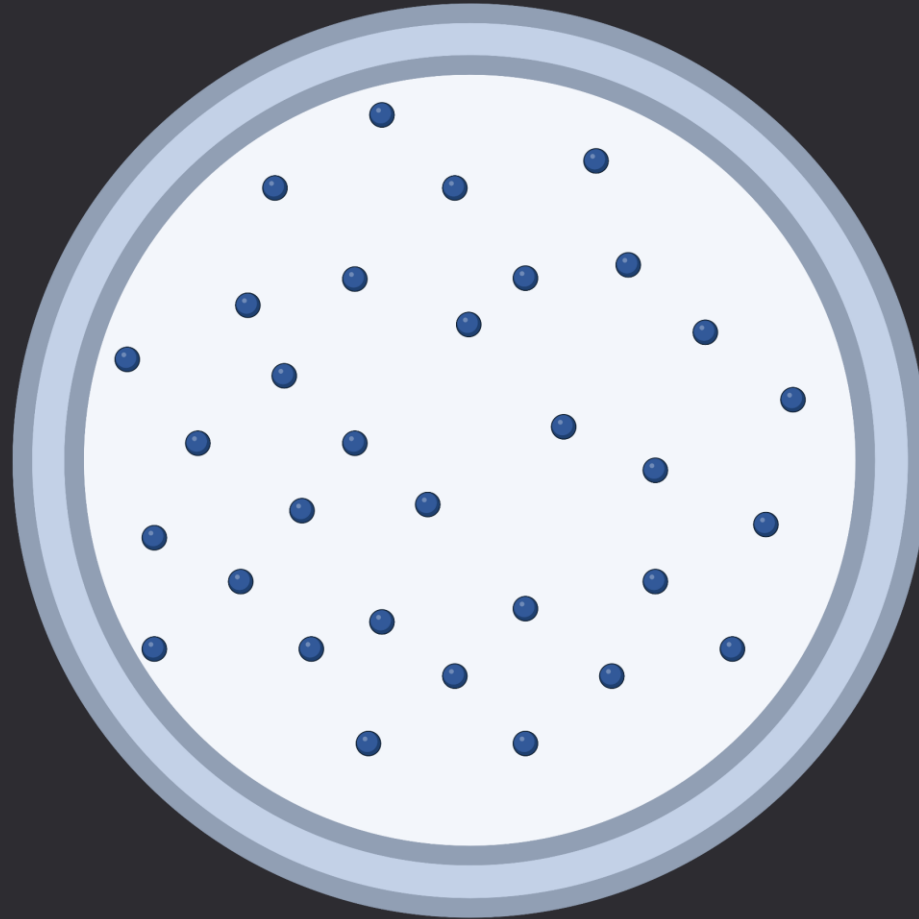


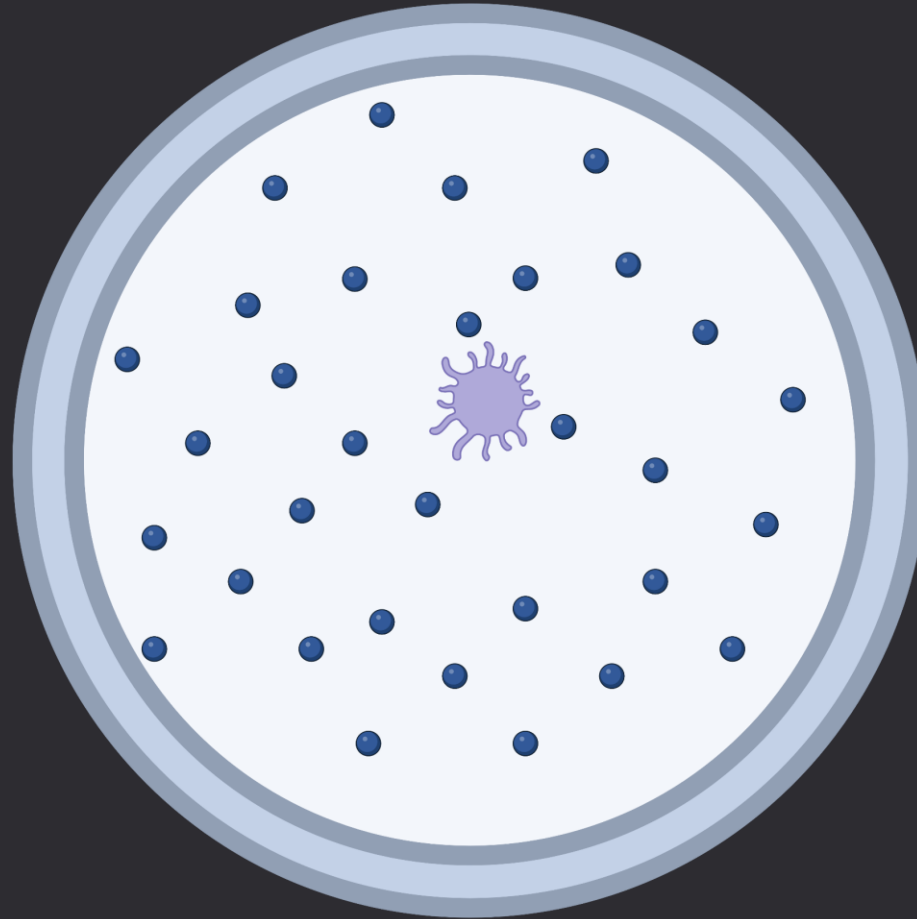
Project Summery

Ilya Schneider

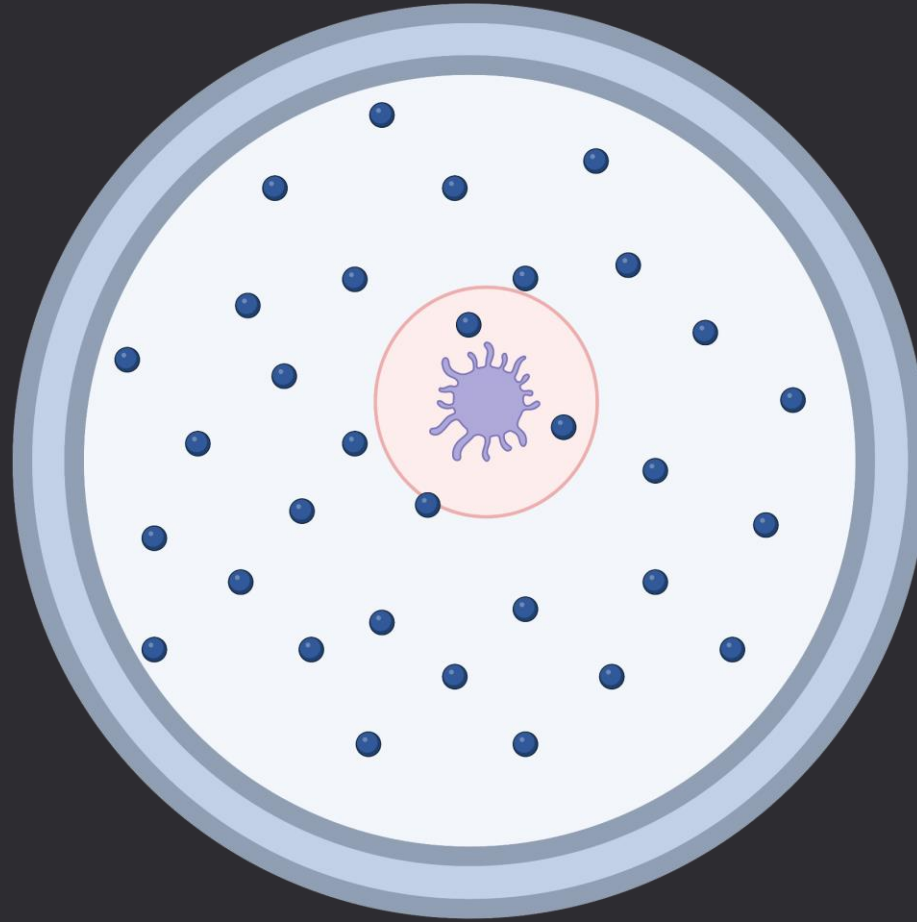
Oral Microbiome Modelling



Oral Microbiome Modelling

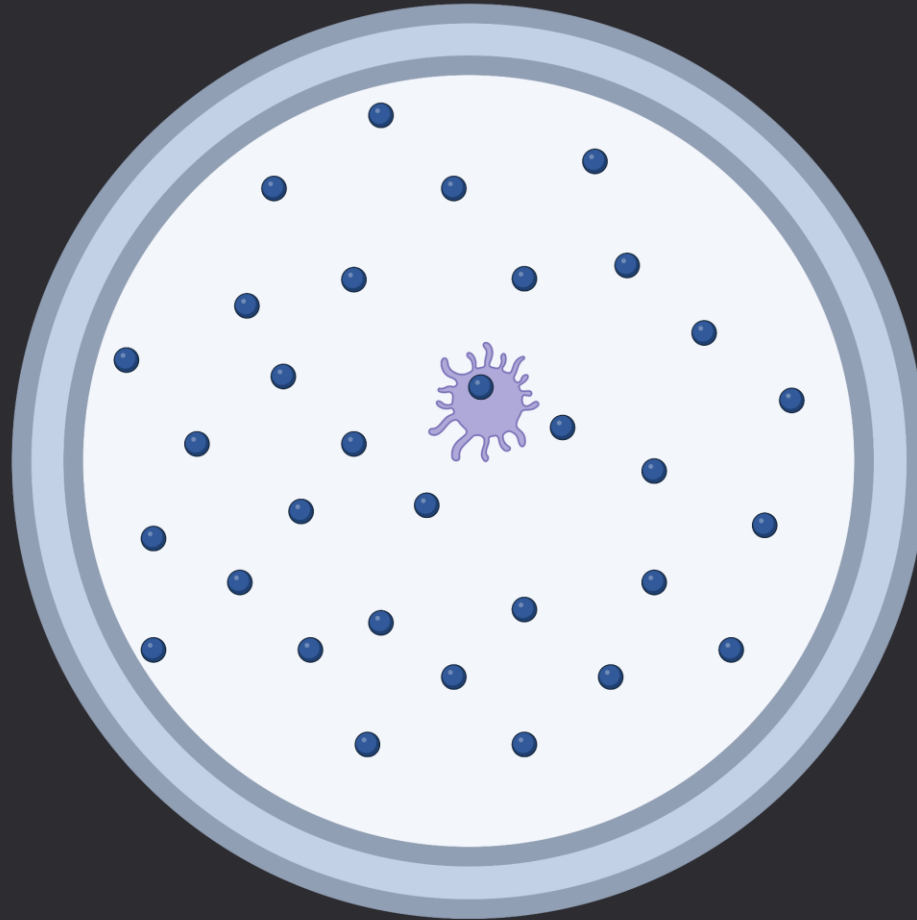


Oral Microbiome Modelling

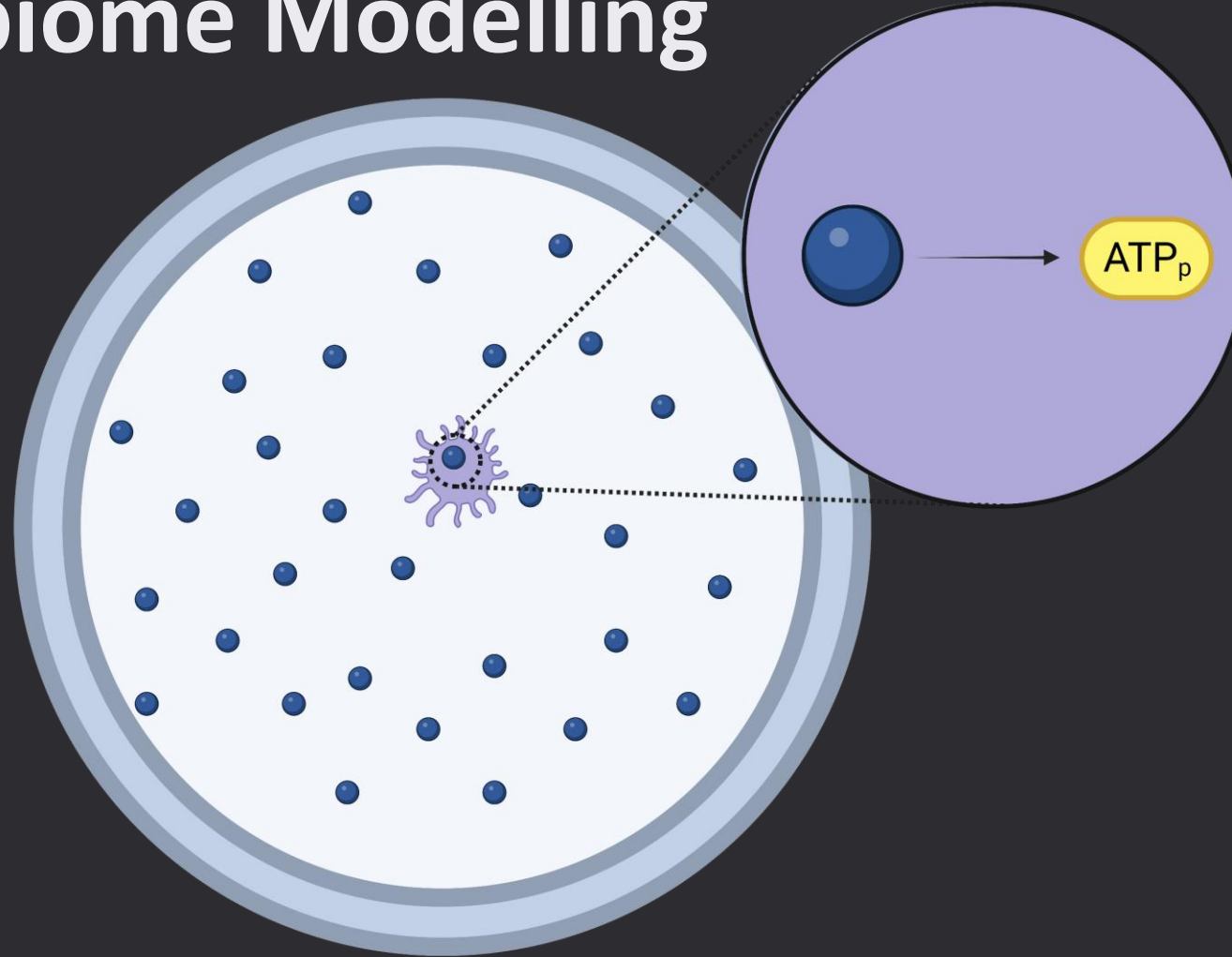


α, β, μ

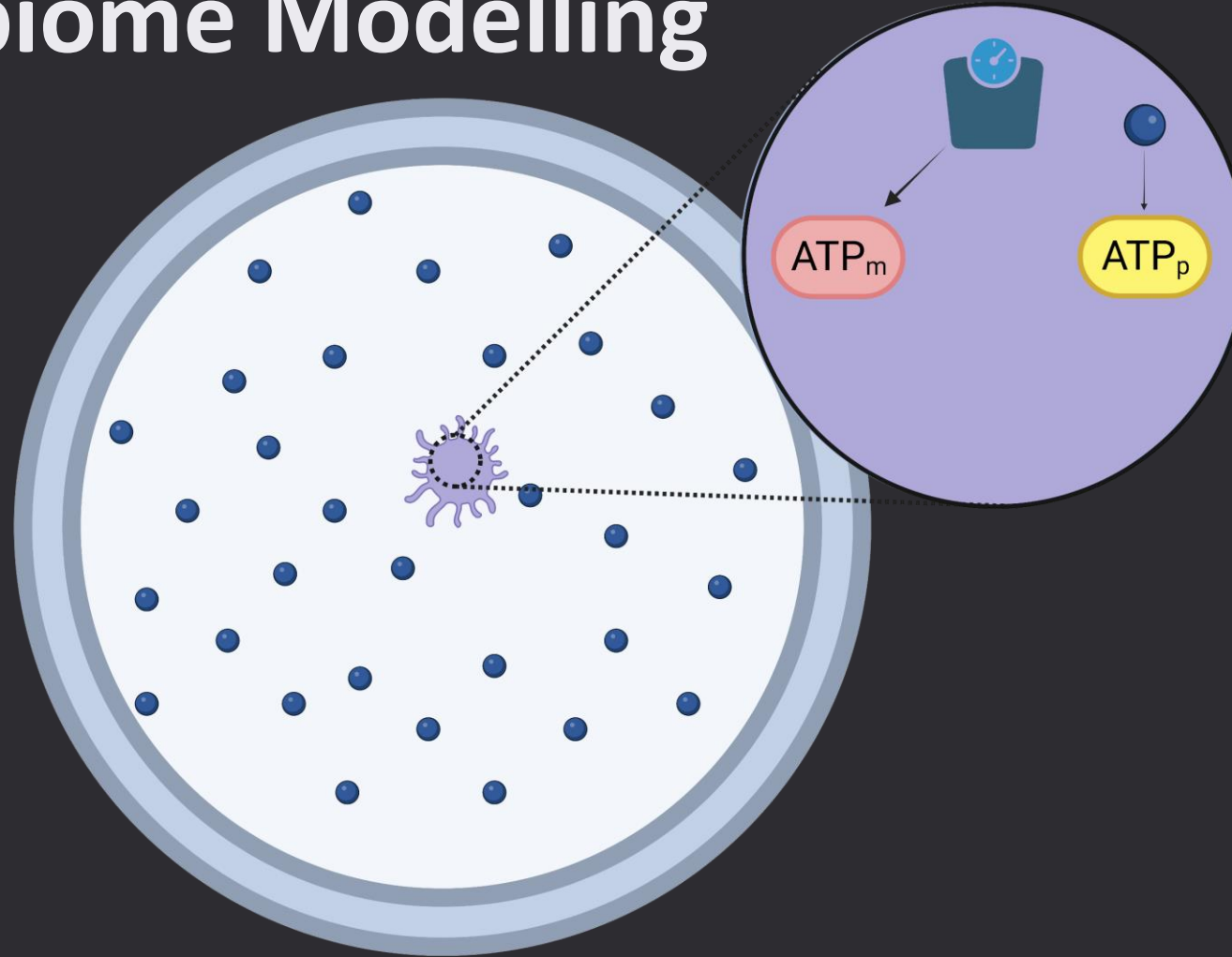
Oral Microbiome Modelling



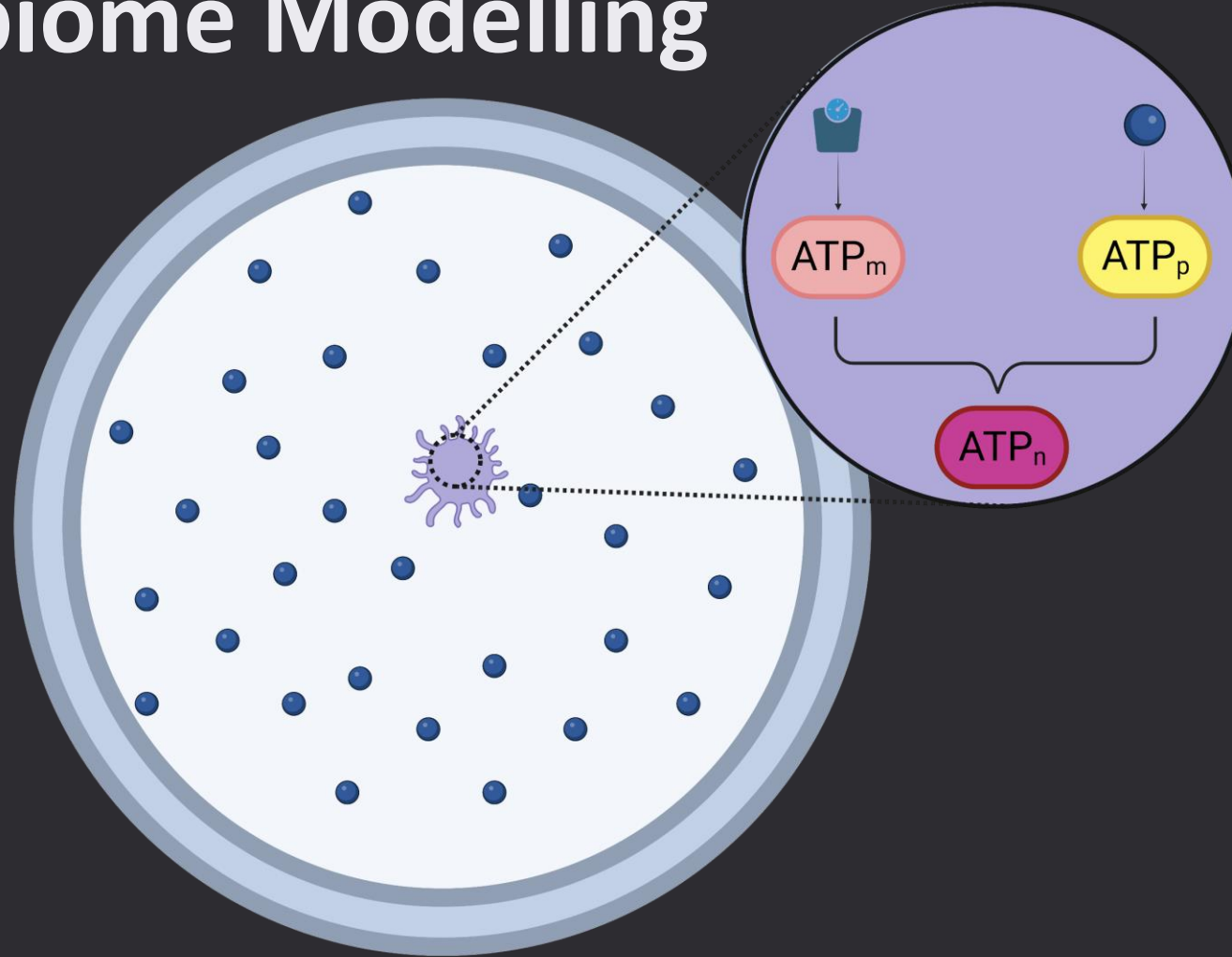
Oral Microbiome Modelling



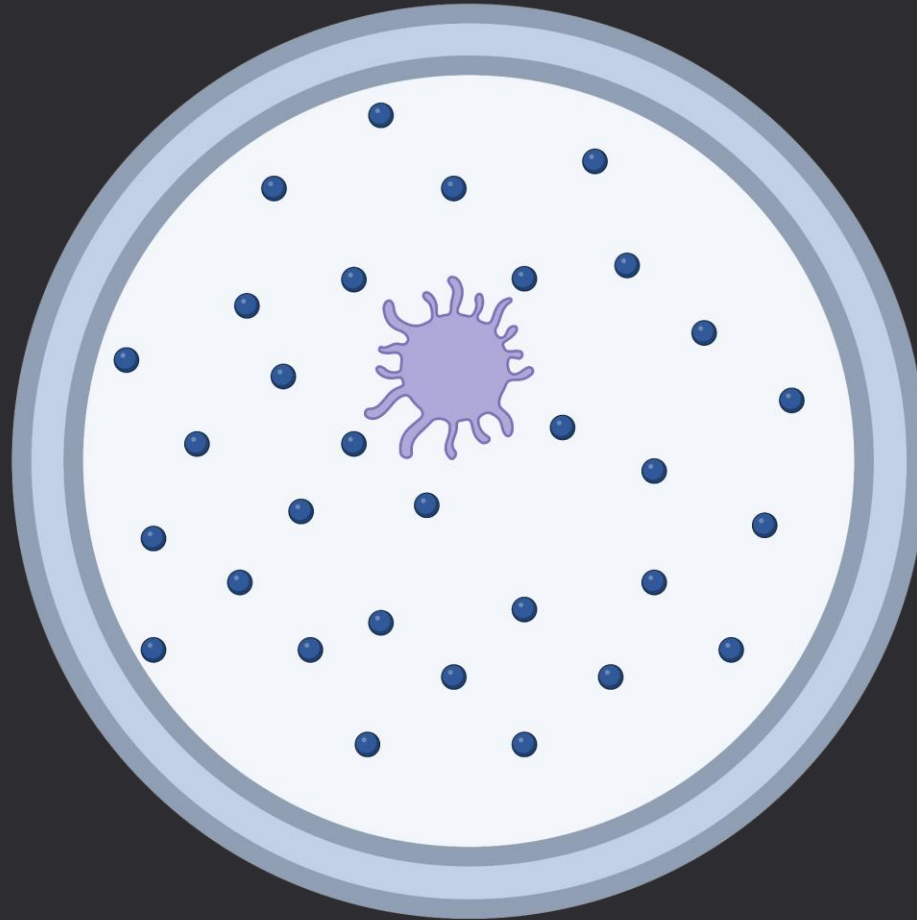
Oral Microbiome Modelling



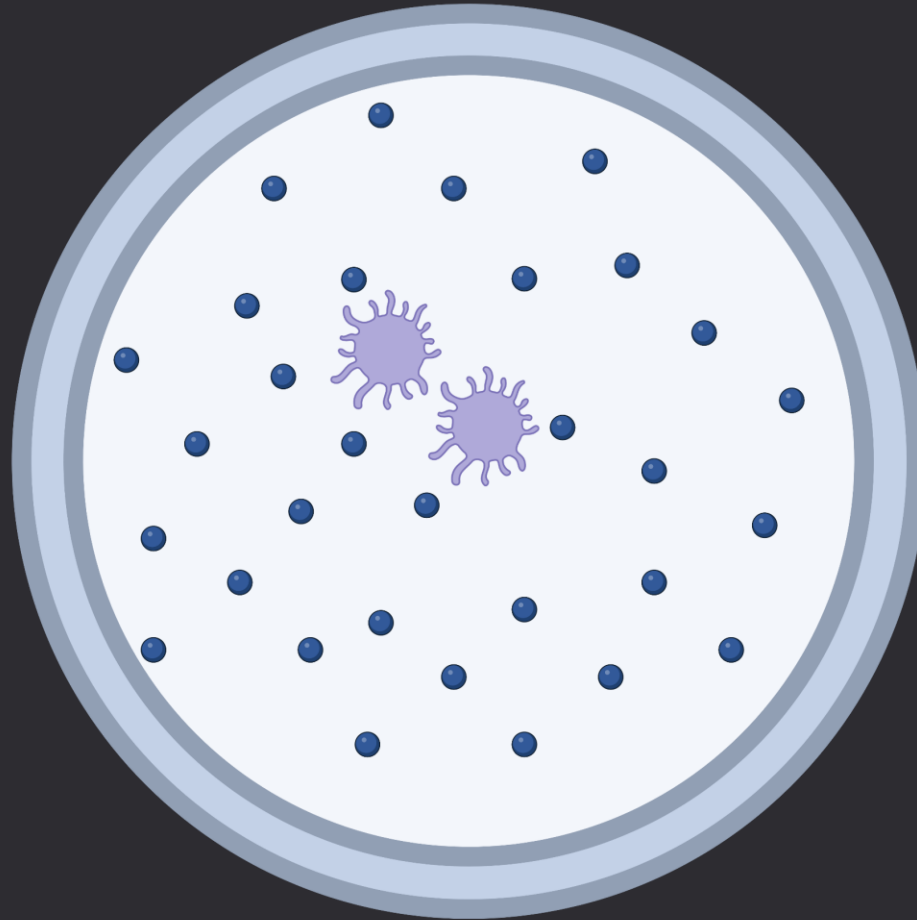
Oral Microbiome Modelling



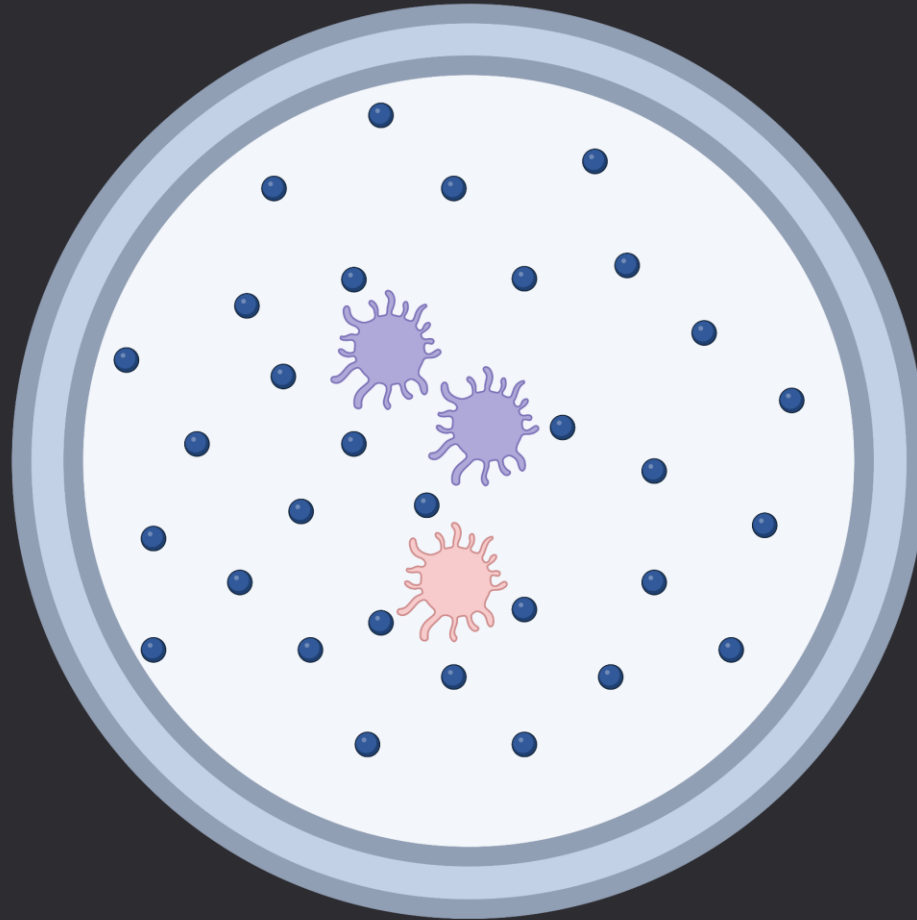
Oral Microbiome Modelling



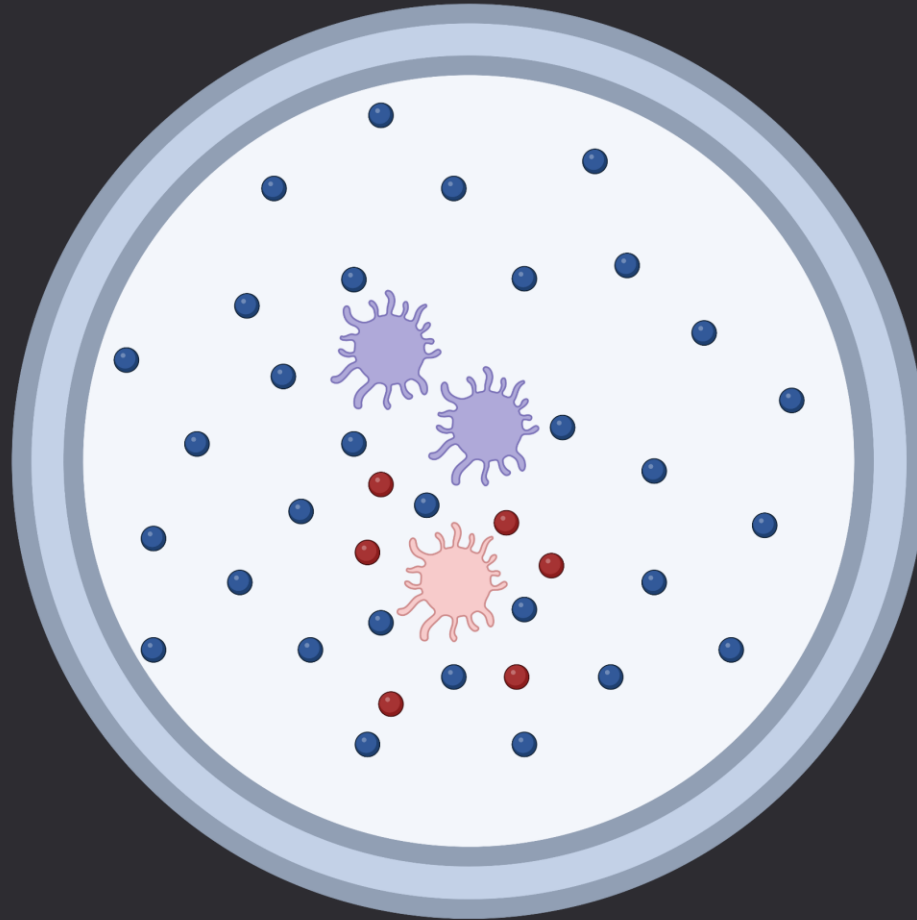
Oral Microbiome Modelling



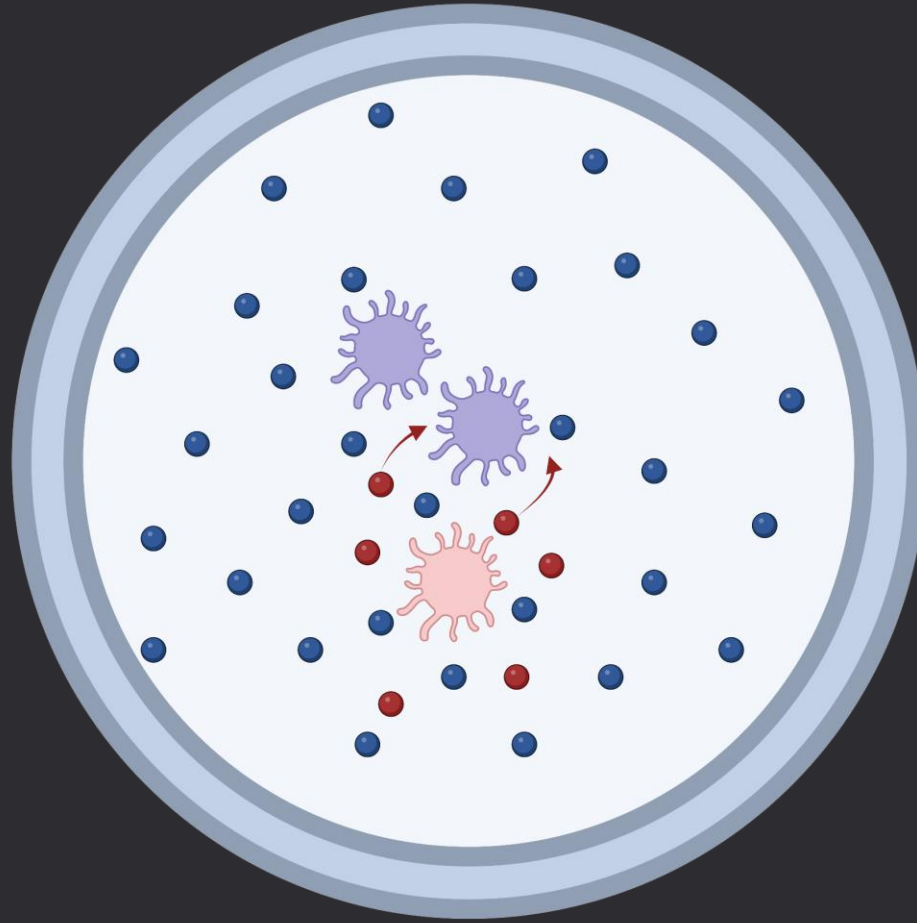
Oral Microbiome Modelling



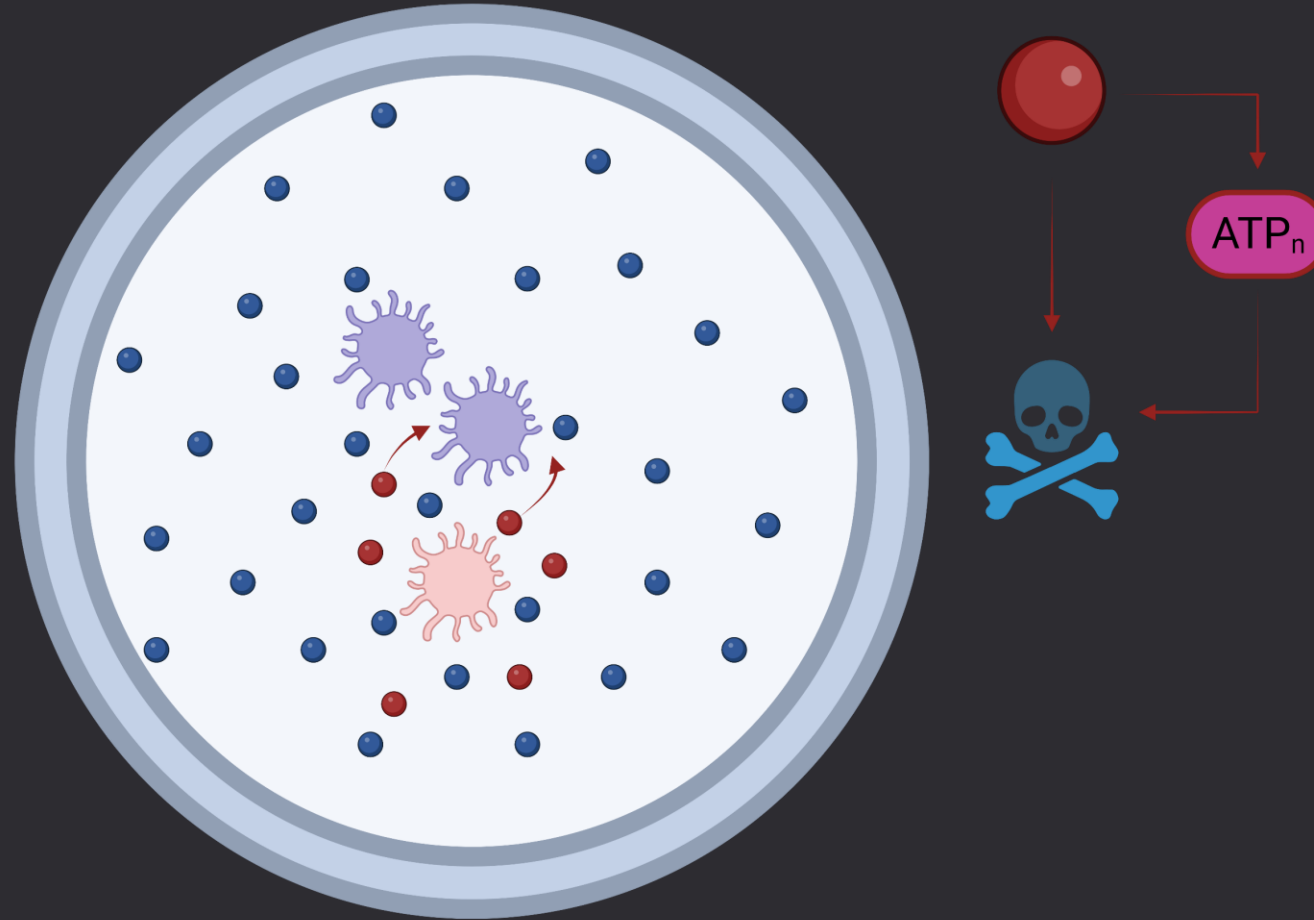
Oral Microbiome Modelling



Oral Microbiome Modelling



Oral Microbiome Modelling



Let's have a look!

Initial Parameters

- Number of Predators
 - Number of Preys
 - Grid Torus
 - Grid Height
 - Grid Width
 - Immediate Killing
 - Aggressiveness
 - Average Viability Time
-

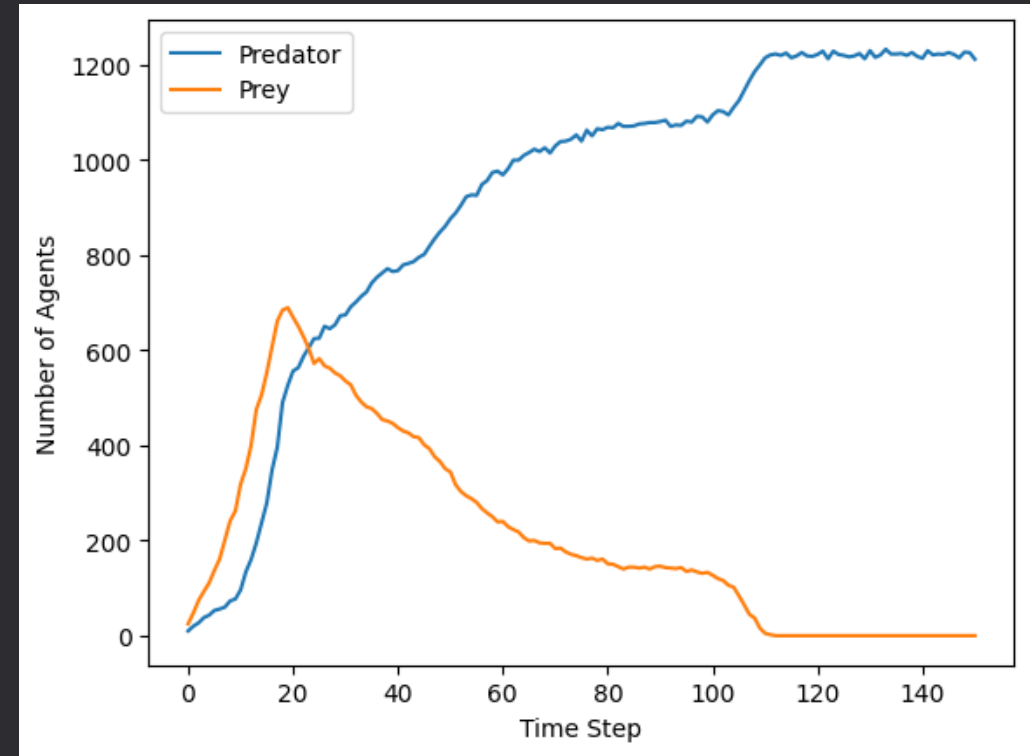
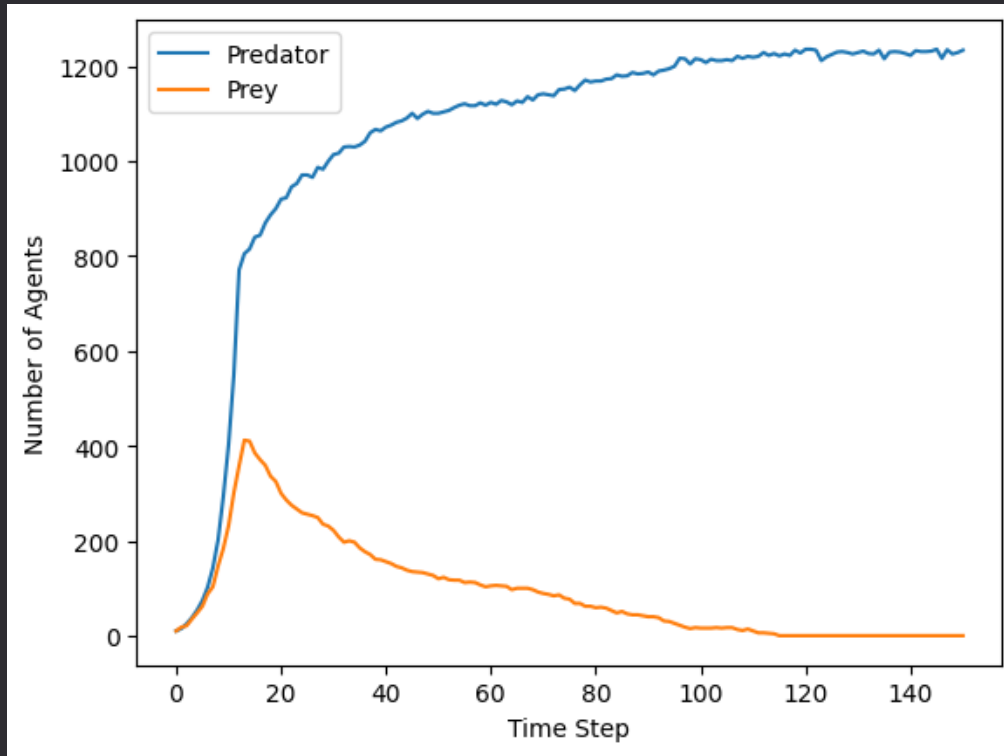
Initial Parameters

- Number of Predators
- Number of Preys
- Grid Torus
- Grid Height →
- Grid Width
- Immediate Killing
- Aggressiveness
- Average Viability Time

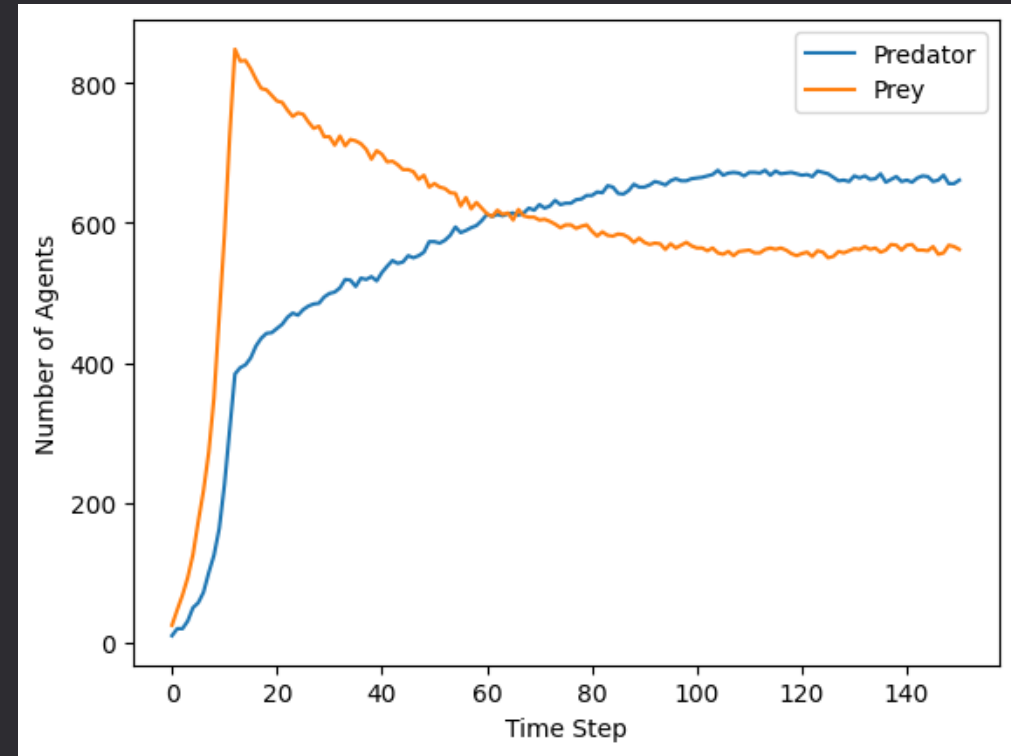
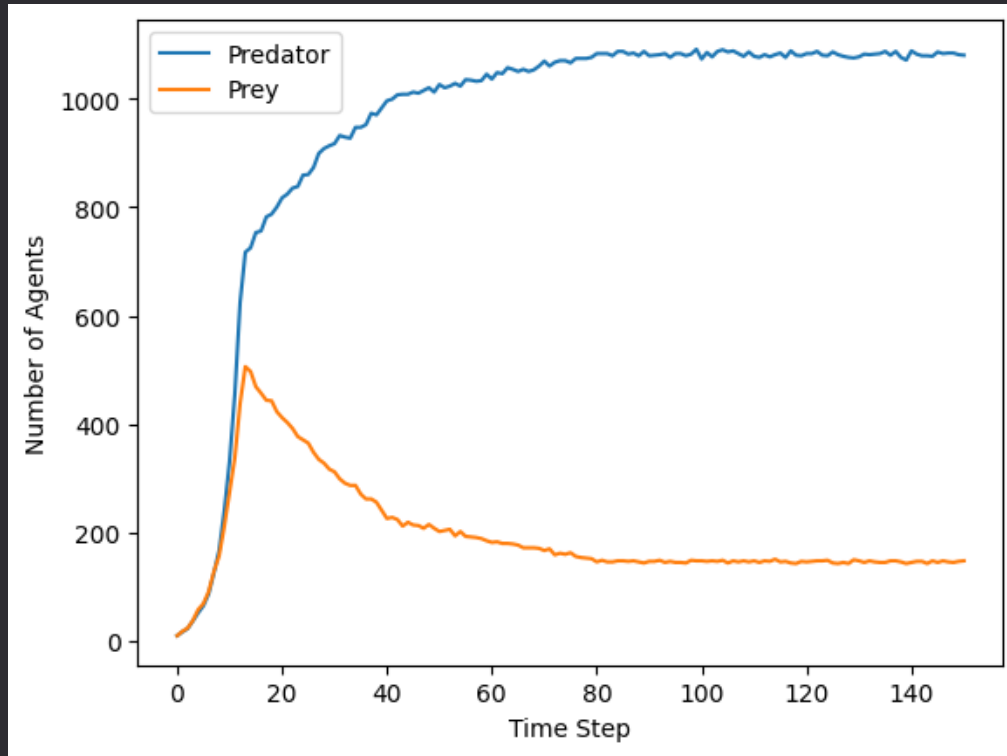
```
params = {"num_type_a_1": (10, 25, 50),  
          "num_type_a_2": (10, 25, 50),  
          "is_torus": False,  
          "grid_height": 25,  
          "grid_width": 25,  
          "immediate_killing": False,  
          "aggressiveness": (1, 2.5, 5, 10, 25, 50),  
          "avrg_viability_time_type_a": (30, 40, 50)}  
  
results = mesa.batch_run(  
    Microbiome,  
    parameters = params,  
    iterations = 10,  
    max_steps = 1500,  
    number_processes = 1,  
    data_collection_period = 10,  
    display_progress = True,  
)
```

**1620
iterations**

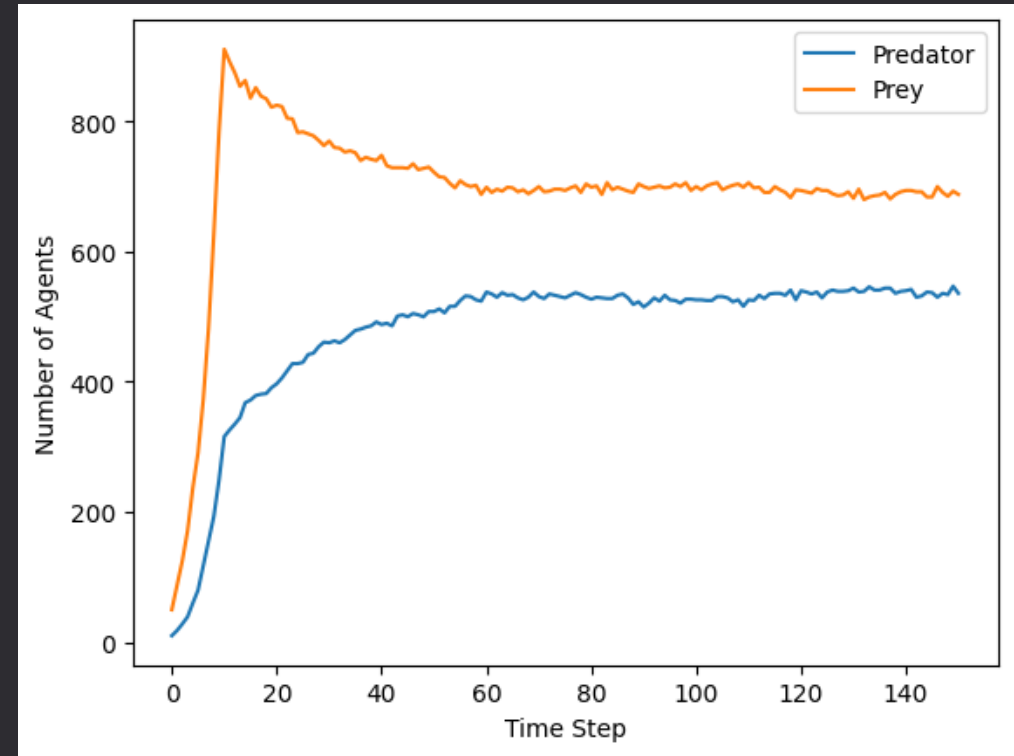
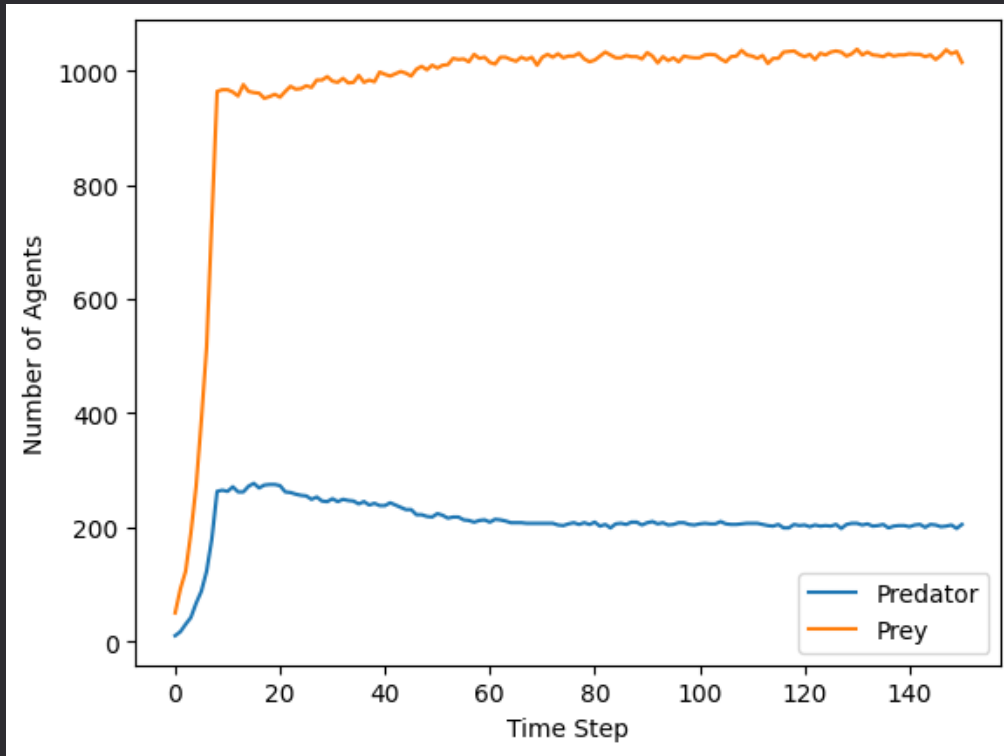
Predator Domination (84.75%)



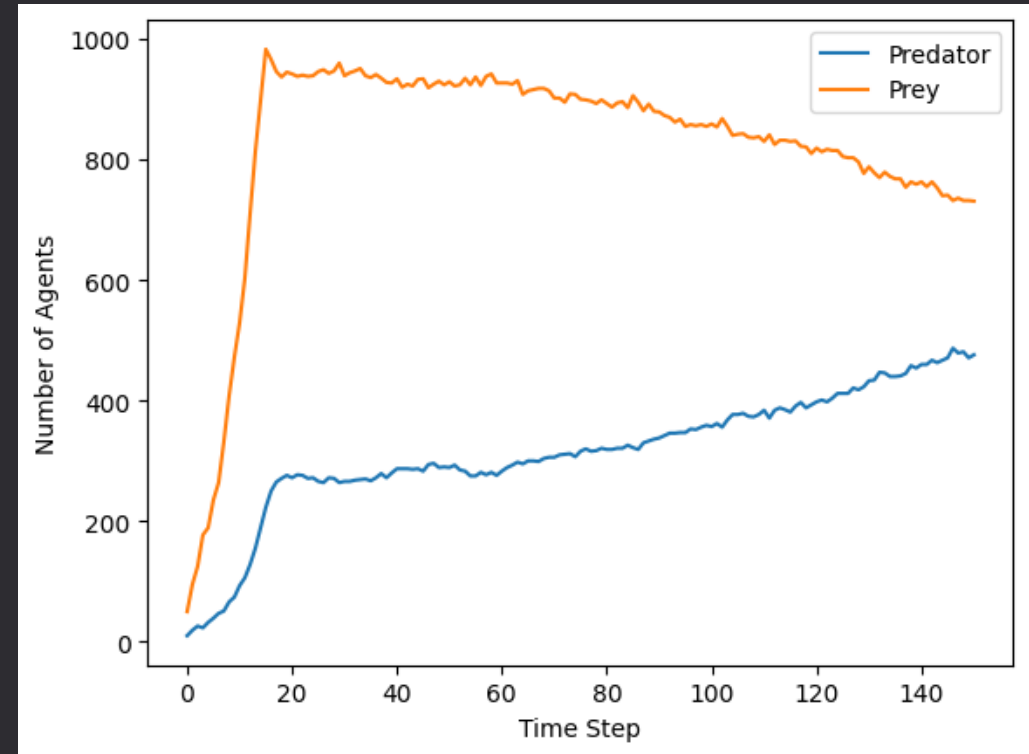
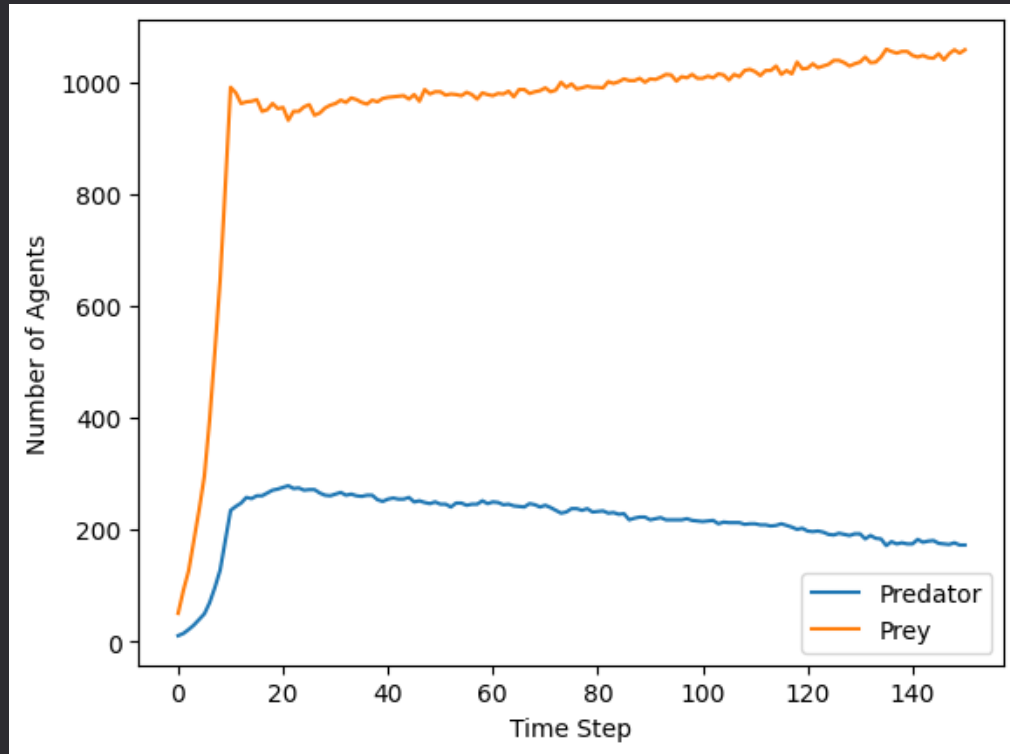
Steady State, Predator Domination (5.86%)



Steady State, Prey Domination (8.70%)



Prey Domination (0.68%)



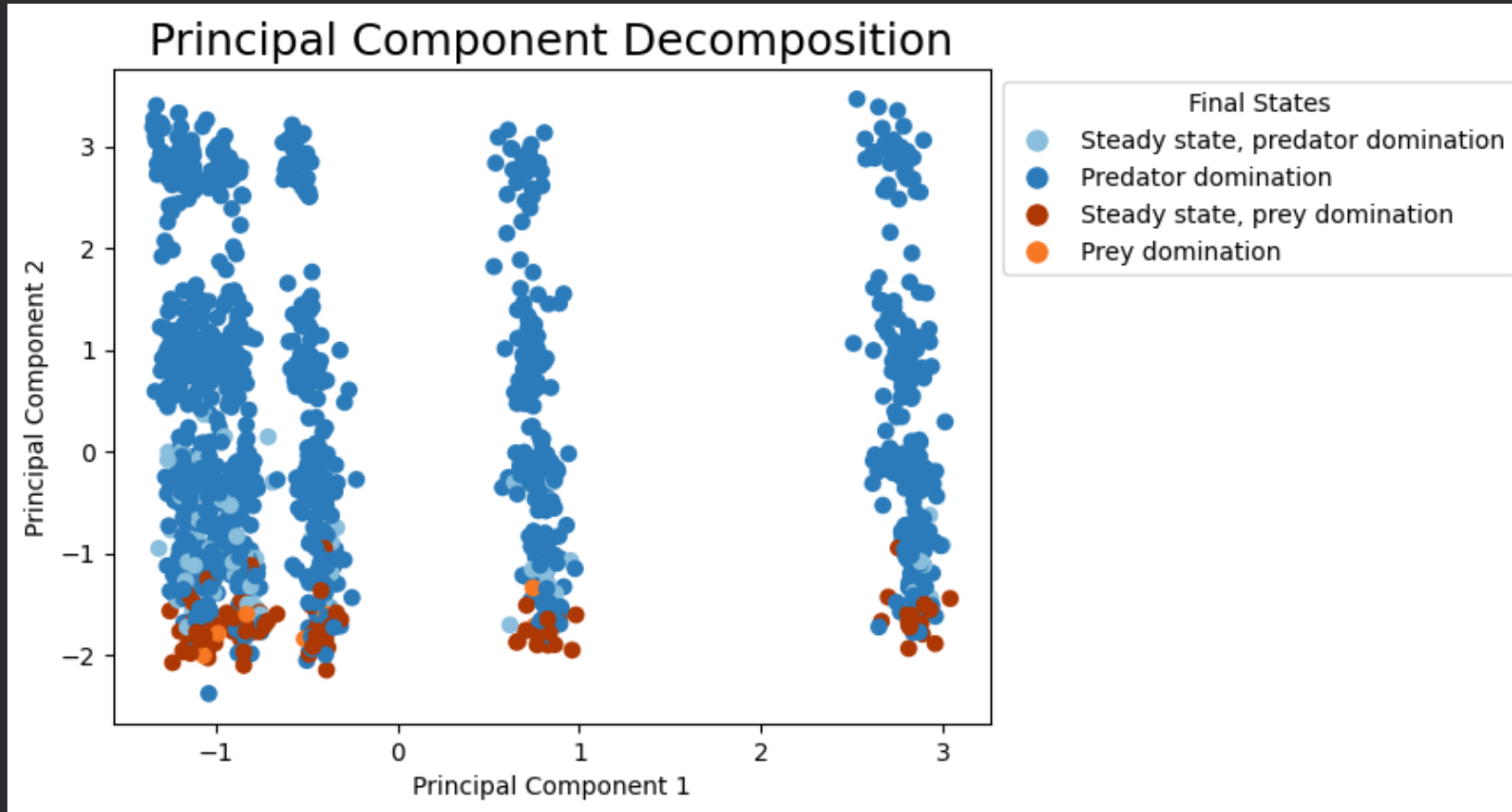
Initial Condition Quantification

- Predator vs Prey Ratio
 - Initial Distance to the Edge for each Species
 - Initial Aggressiveness
 - Prey Competition Index
-

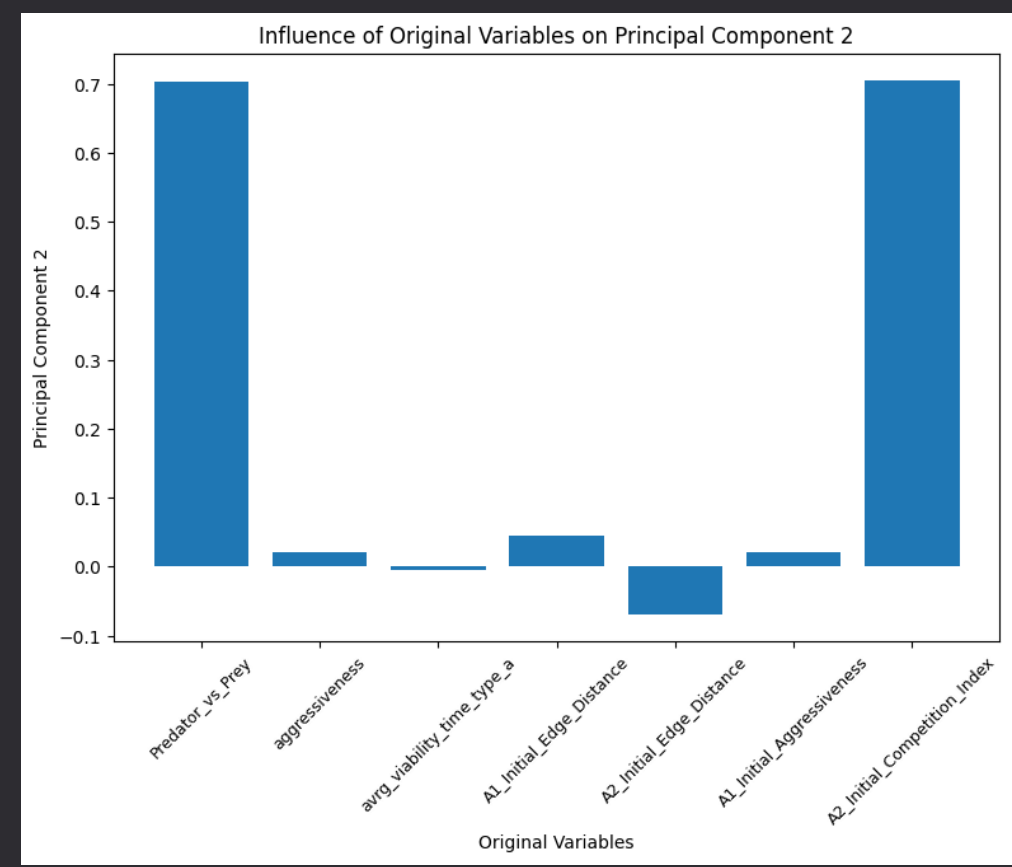
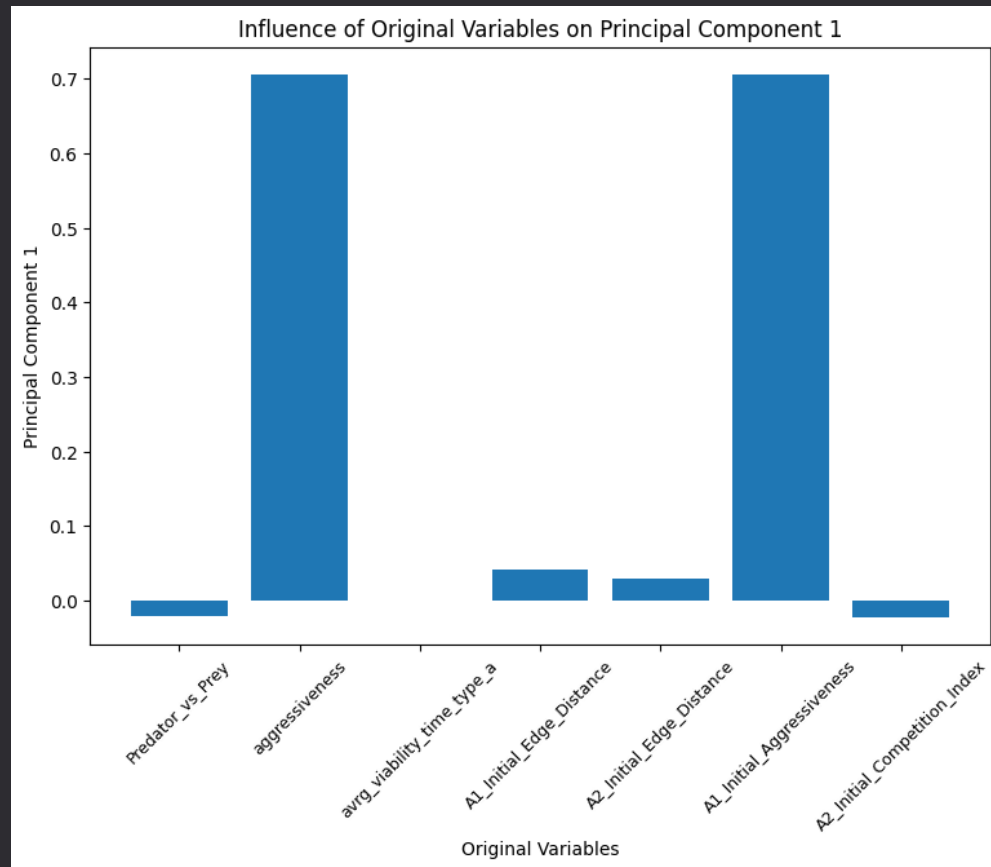
Data Analysis Conclusions

- Higher initial viability time —————→ higher steady state chances
 - Prey survives only in ratios 1:1 and lower
 - Smaller initial competition and the distance to the edge —————→ Prey Domination
But only at the two lowest ratios
 - All final states occur with all possible aggressiveness levels —————→ less influential than expected
-

Dimensionality Reduction PCA

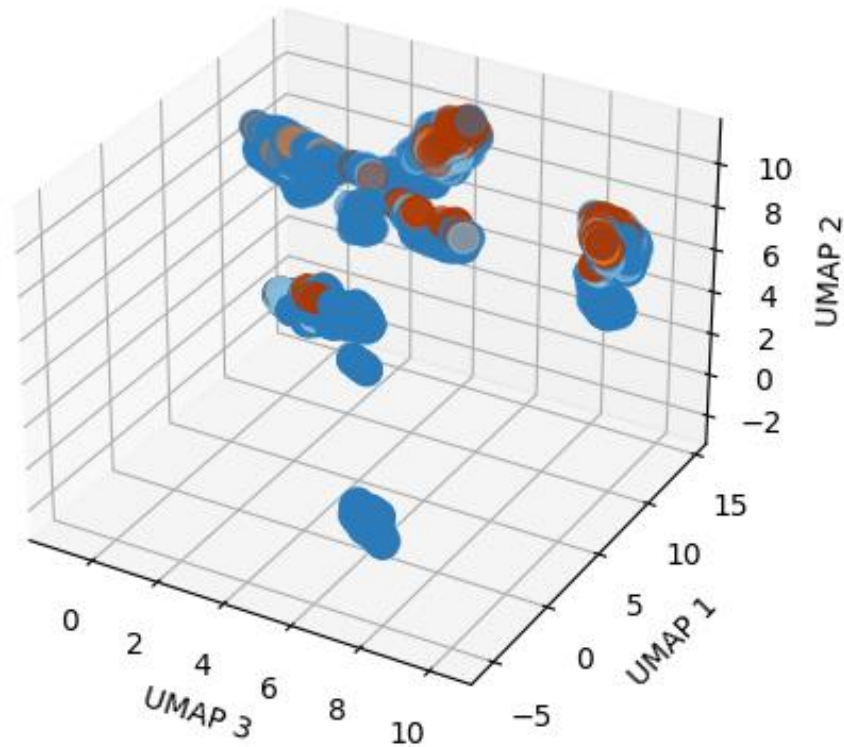


Dimensionality Reduction PCA



Dimensionality Reduction UMAP

UMAP Decomposition



Final States

- Steady state, predator domination
- Predator domination
- Steady state, prey domination
- Prey domination

Applications

- Species Coexistence
 - Species Survival
 - Coexistence Perturbation
-

Let's have a look!

Thanks!
