

# In silico prediction: pathogens in synthetic communities

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# Overview

## 1 Introduction

## 2 Research Question

## 3 Material and Methods

## 4 Results

# Predictive modelling

## Motivation

- Interest: predictive modelling
- Gathering the data

Combining Wet Lab Experiments  
with In silico prediction

# Main idea

Predicting invasion potential on basis of microbial ecosystem composition.

But what about the microbial relevance?

# Microbial Relevance

## Microbial Ecology

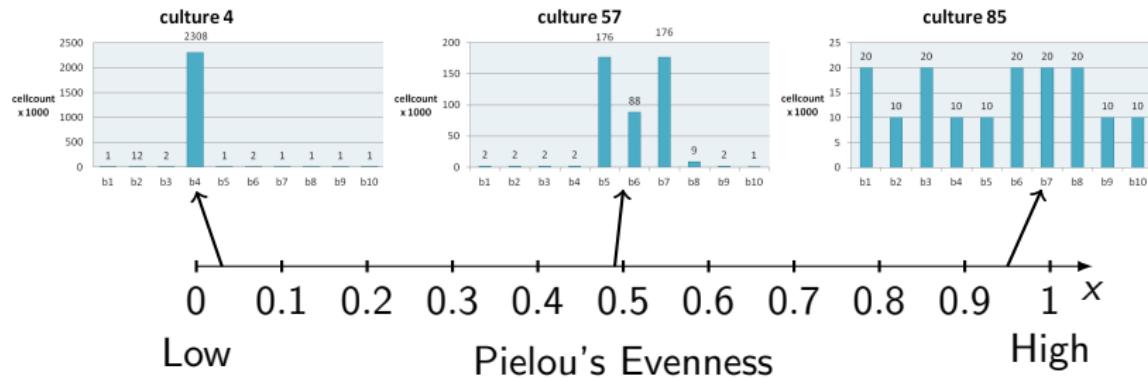
- Pathogen Behaviour after invasion
- Does evenness play a role?

## Predictive Modelling

- Quite Robust Against varying data
- Cover enough points in the feature space

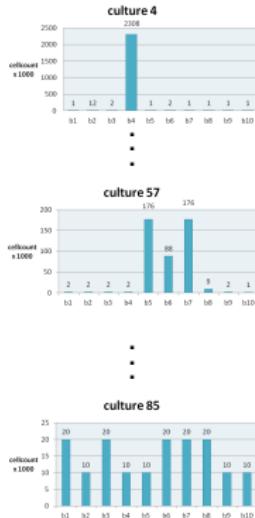
# Concept of evenness

Relative abundance of species in a community.



# Concept of evenness

## Pielou's evenness Range



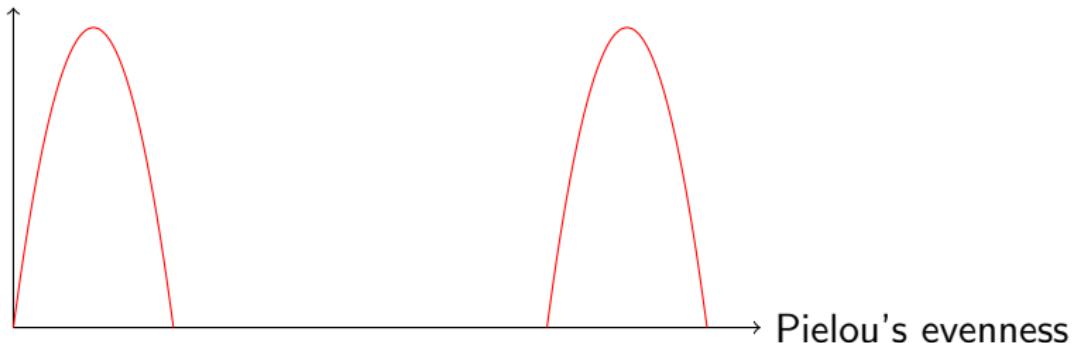
~ Pathogen behaviour after invasion

# Null hypothesis

## Null hypothesis

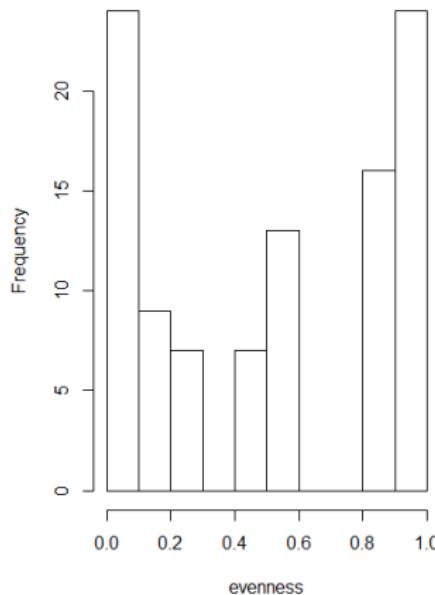
$$H_0 : \mathcal{P}(\text{Invasion} \cap \text{evenness} = \text{High}) = \mathcal{P}(\text{Invasion} \cap \text{evenness} = \text{Low})$$

Ideally a 2-factor design tests for this hypothesis.  
frequency

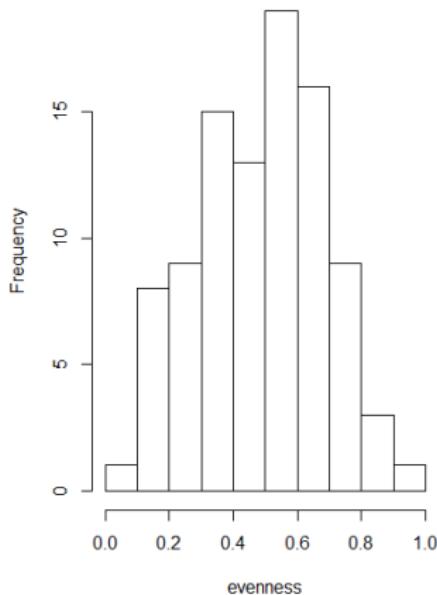


# Microbial aspect + Predictive aspect?

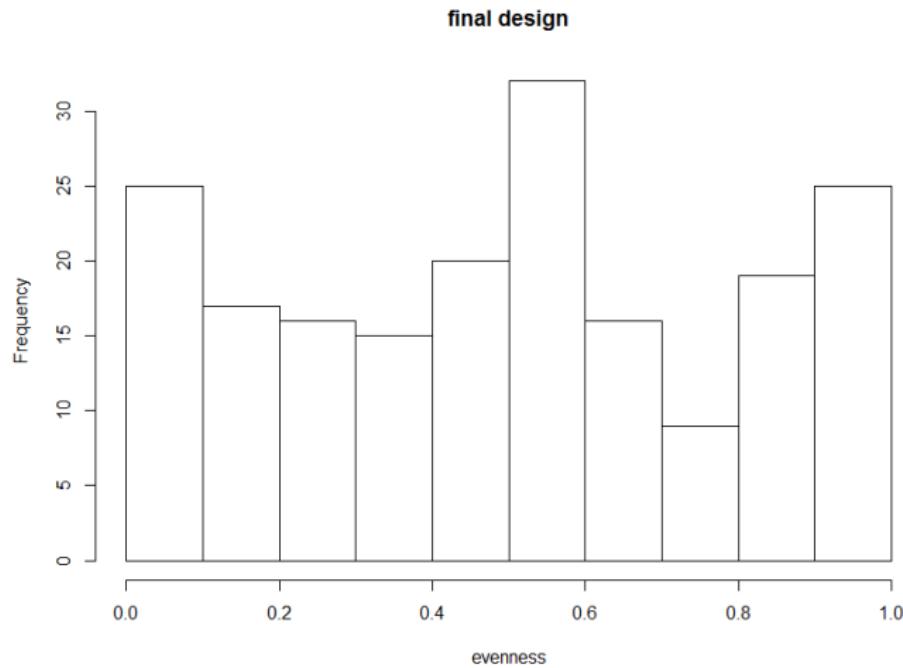
100 stratified data points



94 random data points



# Final distribution



# Selection Bacteria

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## Bacteria

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Pseudomonas sp. (10 TYP)  
Bacillus sp. (1 Bacillus)  
Serratia sp. (14.3 ISO1)  
Burkholderia Cepacia (Burkholderia)  
Paracoccus sp. (42 Paracoccus)  
Enterococcus sp. (59 Enterococcus)  
Agrobacterium sp. (Beijerinckia)  
Rhizobium Duejenense (63 Rhizobium)  
Delftia  
Aeromonas sp. (K62)

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Table: Selected Bacteria

The bacteria are gathered from a waste water treatment plant. (cf. preliminary selection by Elham)

# Which pathogen?

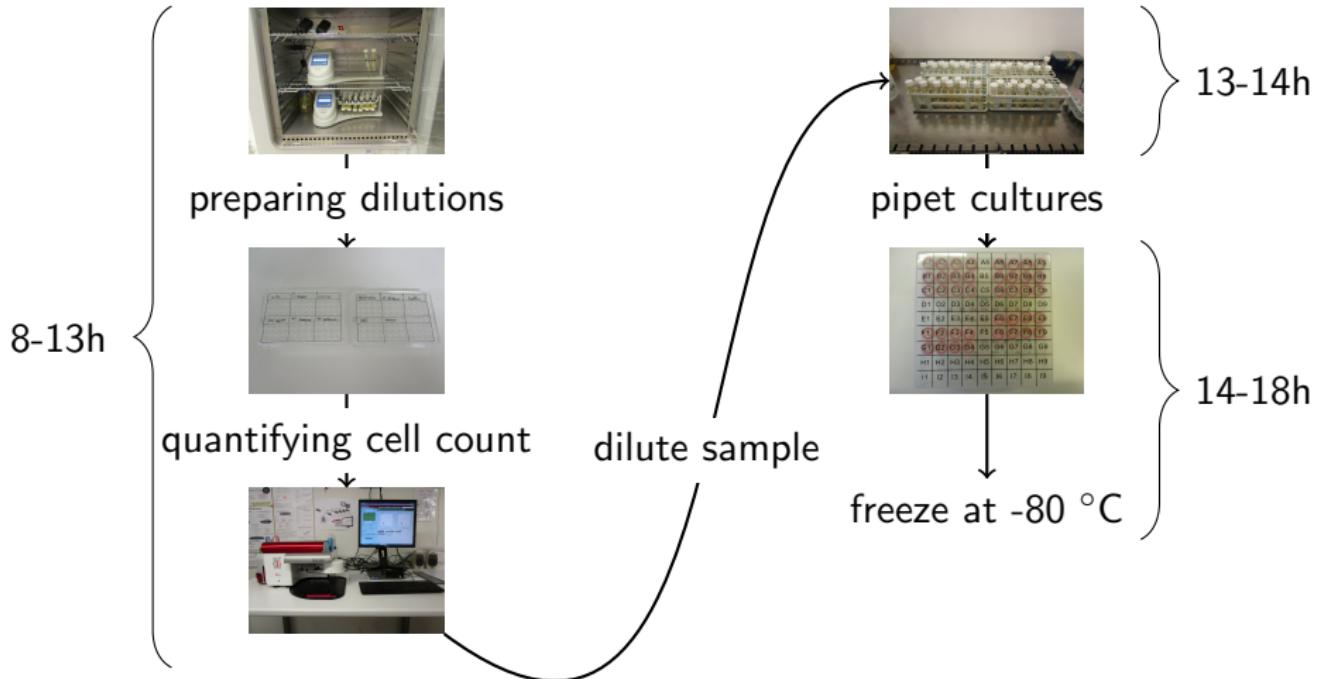
- Investigate 5 - 10 pathogen from one phylogenetic family (Gammaproteobacteria)
- Adjust number and selection after first results
- Possibly follow-up with pathogen from different group

# Limiting conditions

- Sample Throughput
- Pipetting complexity
- Quantifying the initial cell count

Solution: Preparing all cultures in advance and freezing them.

# Preparing and freezing cultures



# Introducing pathogen

- ① Make the pathogens Streptomycin resistant
- ② Introduce pathogen in each of the 194 cultures
- ③ Plate in agar with Streptomycin
- ④ Count colonies after 48h

# Progress so far?

- 194 cultures prepared and in the freezer
- A couple of pathogens made Streptomycin resistant
- Start with first pathogen this week

# Conclusion

## Optimistic Prognosis

- Results of 5 to 10 pathogen mid November
- First Predictive model before end of December

# The End