Los Alamos NATIONAL LABORATORY

Machine Learning for Identifying Plant-Microbiome Interactions

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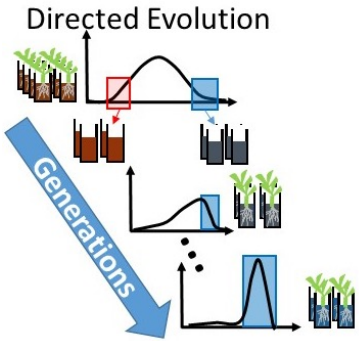
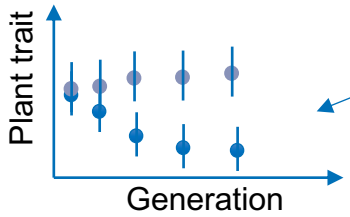
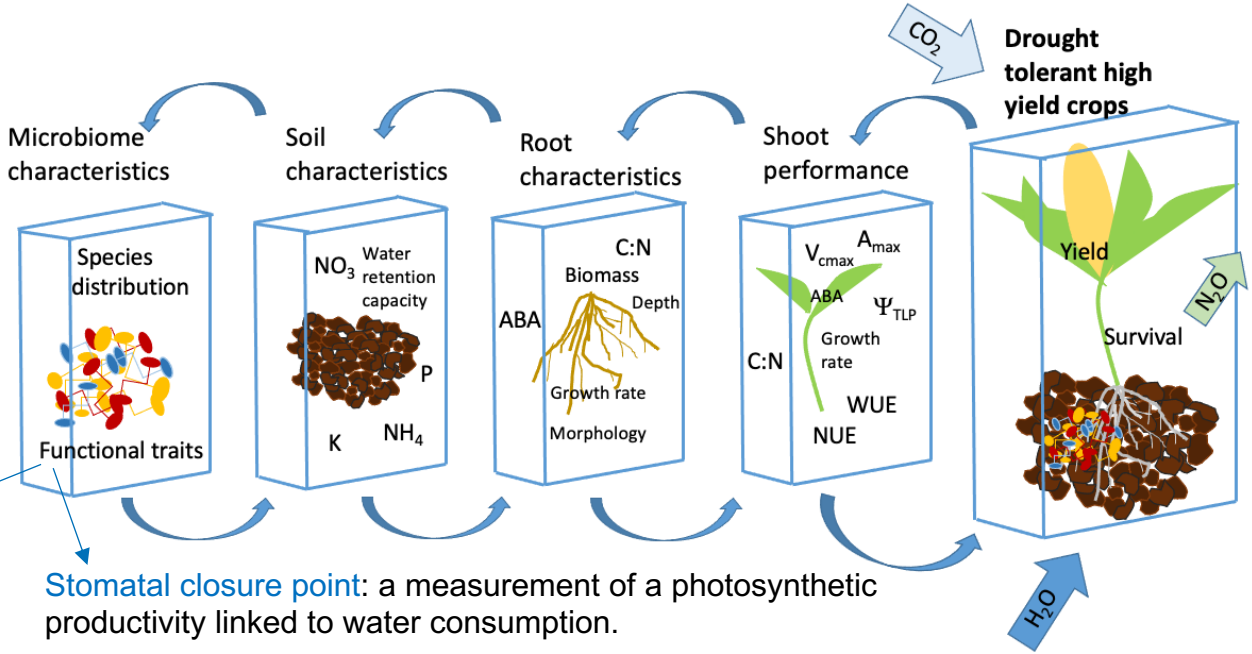
Improving plant drought tolerance is essential for matching the future food and biofuel needs

Goal: find the links between microbiome and experimental setup variables and plant traits and chemistry.



Optimizing Directed Evolution



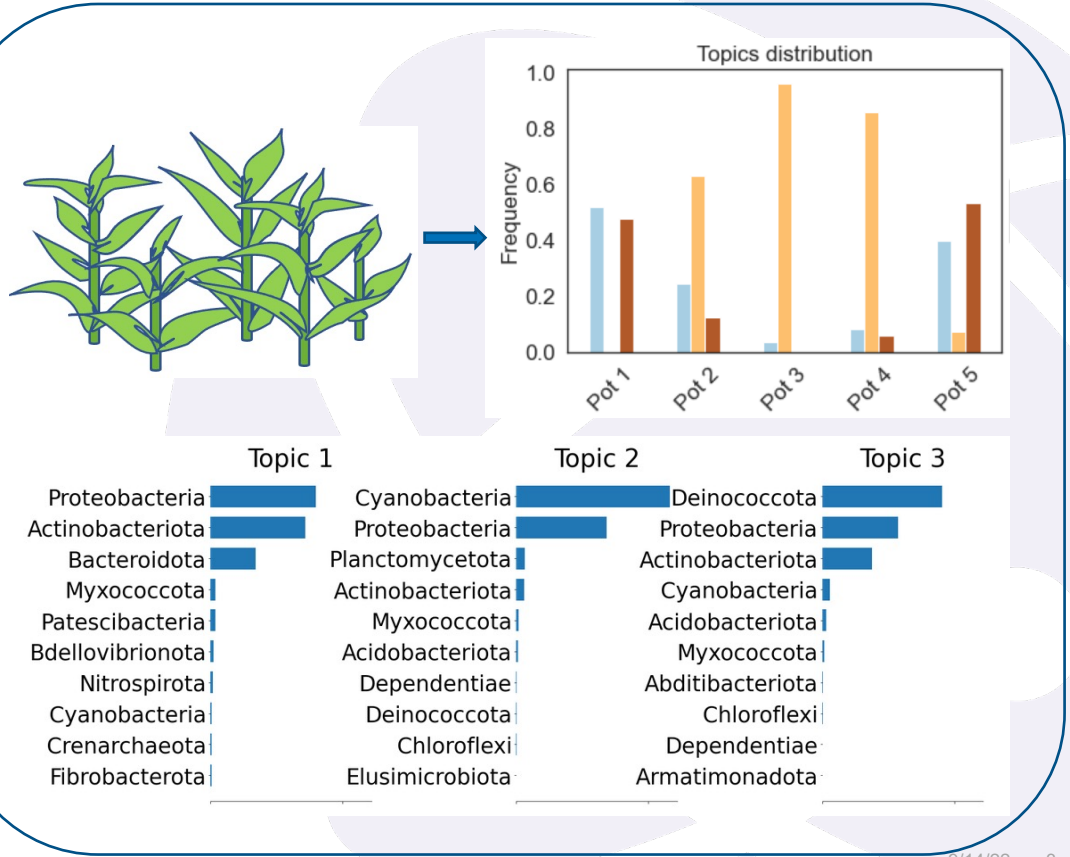


Stomatal closure point: a measurement of a photosynthetic productivity linked to water consumption.

Increased Water Use Efficiency helps to withstand drought.

Probabilistic topic modeling

- Analyzed microbiomes using Latent Dirichlet Allocation, probabilistic generative model developed for language modeling of a set of documents
- Found strong associations between topics and experimental conditions and plant traits



Establishing links via Bayesian networks

- Unsupervised framework
- Handles uncertainty
- Constrainable
- Can answer the questions of interest:

How do certain soil source and abundances of bacteria affect a Stomatal closure point (SCP)?

Probability (SCP < average *given that* Soil type is Forest *and* Topic 1 > average) = 0.32
Probability (SCP < average *given that* Soil type is Agricultural *and* Topic 1 > average) = 0.49.