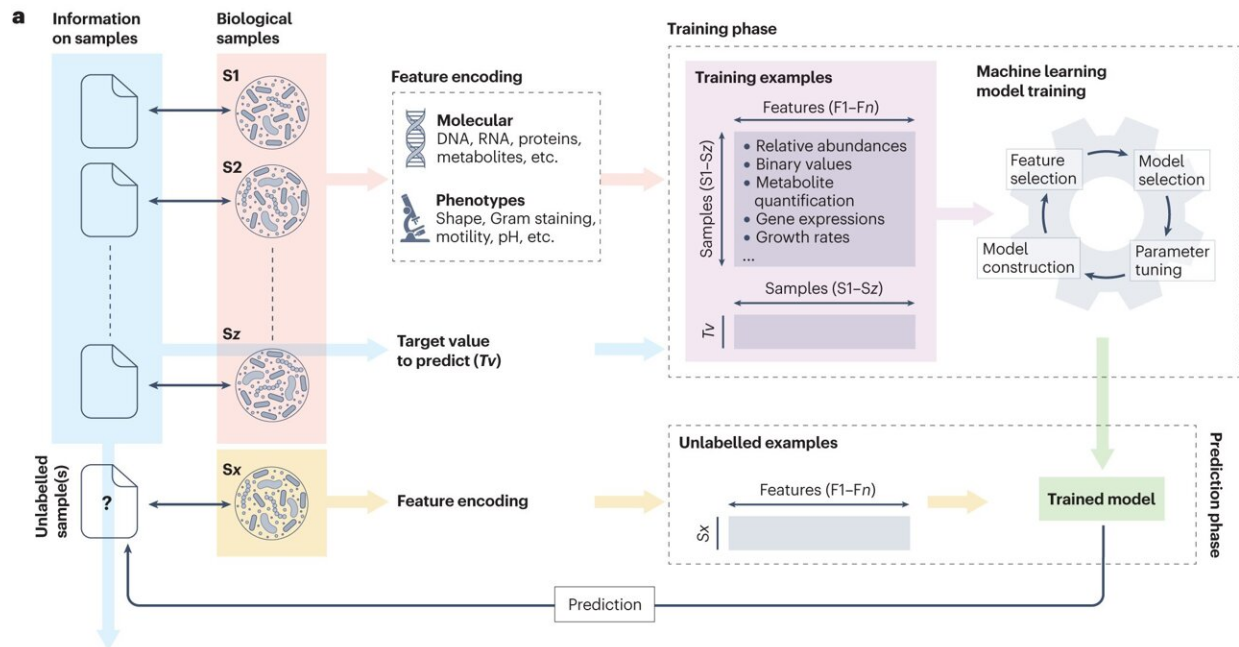


# Review examines machine learning concepts for microbiologists

December 6 2023

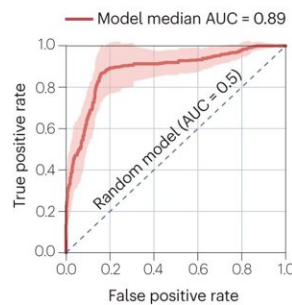


## Types of target values to predict

- Categorical**
  - ○ △
  - Disease/unaffected, case/control, antibiotic resistance, Gram (+/-), sex (female/male), motility (yes/no), etc.
- Continuous**
  - ▬
  - Growth rates, gene expressions, metabolites, proteins, age, weight, BMI, etc.

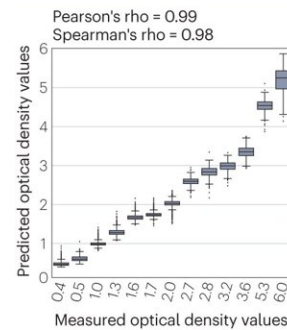
## b Predict patients with colorectal cancer from stool microbiome

Random forest classifier  
 Number of samples: 107  
 Number of features: 737 microbiome species-level relative abundances  
 Target variable: colorectal cancer or control



## c Estimate growth rates from gene expression

Random forest regressor  
 Number of samples: 20,736 *B. subtilis* cells  
 Number of features: 3,848 gene expression values  
 Target variable: optical density measures



General workflow and examples for machine learning applications in

microbiology. Credit: *Nature Reviews Microbiology* (2023). DOI: 10.1038/s41579-023-00984-1

In a [review](#) in *Nature Reviews Microbiology*, Professor Levi Waldron and colleagues highlight the increasing importance of machine learning in microbiology, where it is used for tasks such as predicting antibiotic resistance and associating human microbiome features with complex host diseases.

Together with co-authors from the University of Trento and the European Institute for Oncology in Italy, Waldron examines the main machine learning concepts, tasks, and applications that are relevant for experimental and clinical microbiologists. The review provides the minimal toolbox for a [microbiologist](#) to be able to critically evaluate and apply machine learning in their field.

"It was exciting to try to distill the essential concepts of machine learning for a broad audience of microbiologists, and to do it as part of a team with so much expertise," says Waldron. "I think this review will also be interesting for other public health professionals outside the field of [microbiology](#), who just would like a conceptual, comprehensible, but rigorous overview of machine learning."

**More information:** Francesco Asnicar et al, Machine learning for microbiologists, *Nature Reviews Microbiology* (2023). [DOI: 10.1038/s41579-023-00984-1](#)

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