

Microbiome Data Science: from the Earth Microbiome to the Global Virome

Nikos C. Kyrpides,
DOE Joint Genome Institute
Lawrence Berkeley National Laboratory

The field of microbiome research is experiencing a transformative shift towards Data Science, propelled by the massive influx of microbiome data. This burgeoning volume of data presents both formidable challenges in terms of establishing standards and management frameworks, and simultaneously unlocks unprecedented opportunities for groundbreaking discoveries. Our current exploration into computational analysis of microbiome samples, including those from previously uncultured organisms, is significantly enriching our understanding of microbial community structures and functions. This, in turn, is broadening our grasp of the genetic and functional diversity within individual microorganisms. In this talk, I will elucidate our cutting-edge computational methodologies, underscoring the pivotal role of big data processing and integration in mining metagenomic datasets. Such approaches are instrumental in unveiling novel insights and fostering discoveries. I will detail our latest strategies for data analysis and share illustrative science vignettes that highlight the exploration of microbial, viral, and functional diversities. Through this talk, I aim to showcase the transformative potential of integrating big data with microbiome research, paving the way for scientific breakthroughs in understanding the complexity and dynamism of microbial ecosystems.