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Fighting Antimicrobial Resistance, Functional Data Analysis, and the Future of Multifactor Experiments

Antibiotic resistance is one of the greatest health threats facing the world. The University of Oxford are pioneering a novel approach by targeting the RecBCD enzyme —a key regulator of DNA repair in bacteria. Central to this was the development of a robust, high-throughput biochemical assay, which meant navigating a complex 11-factor space.

Initially limited by manual pipetting and single-variable experimentation, we adopted design and analysis of multidimensional experiments and automated liquid handling hardware. This enabled execution of hundreds of experimental runs at low volumes, dramatically increasing throughput and insight, and transforming assay development from a weeks-long process into a single day of experimentation.

Functional Data Analysis was instrumental in modeling enzyme kinetics, allowing us to visualize and interpret complex time-course data with ease. This enabled rapid optimization of assay conditions and a deeper understanding of the biochemical dynamics at play.

This project exemplifies the cutting edge of biological experimentation, where automation, high-dimensional design, and advanced analytics converge to accelerate discovery. The synergy between DOE and lab automation not only enabled us to develop a scalable assay for drug screening but also points to a future where biological research is faster, more reproducible, and more insightful than ever before.

Special/ Invited session

Classification

Mainly application

Keywords

functional data analysis, design of experiments, laboratory automation

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