

Speaker 1: Dr. Simone Marini

Title 1: AI and Bioinformatics against antimicrobial resistance: Current tools, challenges, and future directions

Abstract : Antimicrobial resistance (AMR) represents one of the most pressing global health threats, with resistant pathogens causing millions of deaths annually and compromising the effectiveness of modern medicine. As traditional laboratory-based susceptibility testing

becomes increasingly inadequate for rapid clinical decision-making, genomics-based approaches powered by artificial intelligence and machine learning offer promising alternatives for AMR prediction and surveillance.

We will explore the current landscape of bioinformatics tools and AI methodologies applied to genomic data for AMR detection and prediction. We will examine the fundamental principles underlying classification models used in this domain. Key considerations

for establishing robust datasets will be discussed, including feature and class encoding.

Despite significant advances, current AI approaches face substantial limitations including model interpretability, generalizability across diverse bacterial populations, and the challenge of rare resistance mechanisms. We will critically assess these constraints

and explore emerging solutions. We will conclude by outlining future research directions that could enhance the clinical translation of AI-driven AMR prediction tools, ultimately supporting more effective antimicrobial stewardship and improved patient outcomes.