AI-Enabled Raman Spectroscopy for Precision Diagnosis and Therapy

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Raman spectroscopy combined with artificial intelligence (AI) is emerging as a powerful tool for precision diagnostics and therapy guidance. Vibrational spectroscopic techniques provide label-free, molecularly specific information from biological samples, while AI enables robust pattern recognition, quantification, and clinical interpretability. This lecture presents recent advances in AI-assisted Raman spectroscopy for intraoperative tumor diagnosis and infectious disease management. Particular emphasis is placed on translating vibrational spectroscopic data into real-time clinical decision support. Strategies to integrate Raman-based technologies into routine clinical workflows and to bridge the gap between laboratory development and clinical application will be discussed.

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