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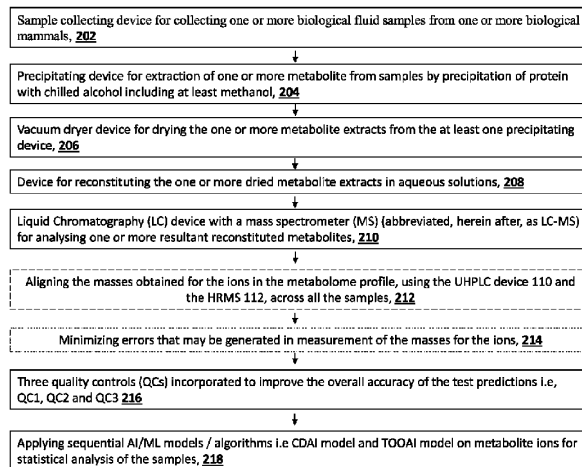


FIG.- 2.

(57) Abstract: The present invention describes a comprehensive system and method for the simultaneous early detection of multiple cancers in a single analysis. The system involves a Liquid Chromatography-Mass Spectrometry (LC-MS) device coupled with processors and AI/ML algorithms. The LC-MS device analyses metabolite ions from dried extracts of biological fluid samples, aligning and normalizing the data while minimizing errors. Quality control processes, including a neural network model and critical ion monitoring, ensure accurate detection. The system employs AI/ML processes to create two models: the Cancer Detection AI (CDAI) Model for identifying cancerous samples, and the Tissue of Origin Identification (TOOAI) Model for distinguishing specific cancer types. The models are applied to test samples, providing scores based on tissue of origin probabilities. The invention aims to revolutionize early cancer detection through advanced analytical and machine learning techniques.

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