Task 3: Ethics in Personalized Medicine

Ethical Analysis: Bias and Fairness in AI-Driven Personalized Medicine

The integration of Artificial Intelligence (AI) into personalized medicine, particularly using datasets like The Cancer Genome Atlas (TCGA), offers transformative potential in tailoring cancer treatments. However, it also introduces critical ethical concerns, especially related to bias and fairness.

A key issue is population underrepresentation. Many TCGA datasets lack sufficient diversity, particularly from African, Indigenous, and other minority ethnic groups. For example, African and Hispanic populations are significantly underrepresented in various TCGA cancer cohorts. When AI models are trained predominantly on data from European or North American populations, their predictive accuracy can suffer when applied to underrepresented groups. This disparity can lead to misdiagnoses, suboptimal treatment recommendations, or exclusion from AI-powered advancements, thereby reinforcing existing health inequities.

Another concern is data quality variability. Socioeconomic and regional factors often influence how genomic and clinical data is collected and reported, potentially introducing systemic biases that AI models unknowingly learn and perpetuate.

FAIRNESS STRATEGIES

To promote fairness, several strategies must be adopted. Firstly, diversifying training datasets is essential. This includes purposeful collection of genomic and clinical data from global and underserved populations. Secondly, algorithmic transparency and auditing should be standard practice—models must be explainable and regularly evaluated for performance across demographic subgroups. Thirdly, inclusive governance frameworks involving ethicists, patients, and clinicians from diverse backgrounds can help guide AI development and deployment in healthcare settings.

Ultimately, while AI holds great promise in precision oncology, ensuring ethical integrity requires deliberate efforts to address biases at every stage—from data collection to clinical integration. Doing so will not only improve model performance but also ensure equitable access to life-saving innovations in personalized medicine.