Ethics in Personalized Medicine

1. Identify potential biases in using AI to recommend treatments (e.g., underrepresentation of ethnic groups).

   Using AI models trained on the Cancer Genomic Atlas (TCGA) to recommend treatments offers powerful opportunities for personalized cancer care. However, significant ethical challenges arise, particularly around bias and fairness. A key issue is the underrepresentation of certain ethnic and racial groups in TCGA; many genomic datasets disproportionately sample individuals of European descent. This lack of diversity can lead AI models to learn patterns that are less accurate or even misleading for underrepresented populations. Consequently, treatment recommendations may be less effective or carry higher risks of adverse outcomes for these groups, exacerbating existing health disparities.

   Beyond ethnicity, other factors such as socioeconomic status, gender, and age can also introduce biases if they are unevenly represented in the training data. For instance, if the dataset contains fewer cases of aggressive cancers in young patients, AI recommendations may underperform for younger demographics. Another ethical concern is the opacity of complex AI models, which makes it difficult for clinicians and patients to understand why a specific treatment was recommended—a challenge that undermines trust and informed consent.

2. Suggest fairness strategies (e.g., diverse training data).

   To promote fairness, strategies should include curating more diverse datasets by proactively recruiting patients from underrepresented groups and supplementing TCGA with global genomic data. Implementing techniques like re-weighting or stratified sampling can help balance the influence of minority subgroups during training. Developing explainable AI (XAI) models is also critical, as it allows clinicians and patients to understand and question AI-generated recommendations. Finally, ongoing monitoring of AI systems in clinical practice can identify and correct biases as new data emerges, ensuring equitable and effective personalized treatments for all patients.