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Task 3: Ethics in Personalized Medicine — Analysis

Topic: Using AI on the Cancer Genomic Atlas dataset to recommend treatments

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1. Potential Biases in AI Recommendations

- **Underrepresentation of ethnic groups**
  Some ethnic groups may have fewer samples in the genomic dataset, leading AI models to learn patterns mostly from dominant groups. This can cause **less accurate or unfair treatment recommendations** for minorities.
- **Data imbalance**
  Certain cancer types or stages might be overrepresented, causing AI to perform well only on those and poorly on rarer cases.
- **Sampling bias**
  Patients from certain regions, age groups, or socioeconomic backgrounds may be missing, which reduces the model's generalizability.

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2. Fairness Strategies

- **Diversify training data**
  Collect and include genomic data from underrepresented ethnic groups and demographics to balance the dataset.
- **Data augmentation**
  Use techniques to synthetically balance classes where real data is scarce.
- **Bias detection and mitigation tools**
  Regularly test the AI model for biases using fairness metrics (e.g., disparate impact) and adjust the model accordingly.
- **Explainable AI (XAI)**
  Use AI methods that provide understandable reasons for predictions to identify and address bias.
- **Stakeholder involvement**
  Engage diverse medical professionals and patient advocates during model development.