AI Bias and Fairness in Cancer Treatment Recommendations Using TCGA

The Cancer Genomic Atlas (TCGA) is a powerful dataset for training AI models to recommend cancer treatments. However, its use raises concerns about fairness and bias, particularly regarding underrepresented ethnic groups. TCGA data predominantly reflects patients of European descent, which can skew AI predictions and treatment recommendations. This underrepresentation may lead to inaccurate risk assessments, misdiagnoses, or suboptimal treatment plans for minority populations.

For example, genetic variants common in African, Asian, or Indigenous populations may be overlooked, resulting in models that fail to generalize across diverse patient groups. Additionally, socioeconomic factors and access to healthcare—often correlated with ethnicity—are rarely encoded in genomic datasets, further compounding disparities.

To address these biases, several fairness strategies should be implemented:

- **Diversify Training Data**: Incorporate genomic and clinical data from a broader range of ethnicities and geographic regions. Collaborations with global health institutions can help enrich datasets.
- **Bias Auditing**: Regularly evaluate model performance across demographic subgroups to identify disparities in prediction accuracy or treatment efficacy.
- **Algorithmic Fairness Techniques**: Apply fairness-aware machine learning methods, such as reweighting samples or adversarial debiasing, to mitigate learned biases.
- **Transparent Reporting**: Publish model limitations and demographic breakdowns of training data to inform clinicians and researchers.
- **Community Engagement**: Involve diverse patient communities in the design and validation of AI tools to ensure cultural relevance and trust.

Ultimately, fairness in AI-driven cancer treatment hinges on inclusive data practices and conscientious model development. Without these safeguards, AI risks perpetuating existing healthcare inequalities rather than alleviating them.