Ethics in Personalized Medicine: AI Bias Analysis

Dataset: Cancer Genomic Atlas (TCGA)

Analysis of Potential Biases and Fairness Strategies in AI for Personalized Medicine

AI-driven personalized medicine utilizes genomic datasets like the Cancer Genomic Atlas (TCGA) to improve cancer treatment recommendations. However, ethical challenges arise, particularly concerning bias and fairness in AI systems.

Potential Biases:

A key source of bias is the underrepresentation of ethnic groups in TCGA and similar genomic datasets. These datasets have historically focused on individuals of European descent, leaving minority populations underrepresented. As a result, AI models trained on this skewed data may produce inaccurate or less effective treatment recommendations for these groups. For example, genetic variations influencing drug responses may differ between ethnicities, but these differences may not be captured by non-diverse datasets.

Additionally, algorithmic bias can occur during feature selection or model training. If socio-economic, environmental, or cultural factors - often intertwined with ethnicity - are not properly considered, the AI system may inadvertently reinforce healthcare disparities.

Fairness Strategies:

1. Inclusive Data Collection: Actively expand datasets to include diverse ethnic and socio-economic

groups, ensuring broader representation.

2. Bias Audits: Regularly test AI models for performance disparities across different demographic groups to detect and mitigate biases.

3. Fairness-Aware Algorithms: Utilize techniques such as re-weighting or adversarial debiasing to ensure equitable outcomes across populations.

4. Transparent Reporting: Clearly communicate data limitations, model assumptions, and potential biases in AI-generated recommendations to maintain accountability and trust.

Conclusion:

Addressing bias in AI-driven personalized medicine is both a technical and ethical responsibility. Ensuring fairness strengthens trust, improves clinical outcomes, and promotes equitable healthcare for all patients, regardless of background.