# CIBMTR - Equity in post-HCT Survival Predictions

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Background

Allogeneic hematopoietic cell transplantation (HCT) can be used to replace an individual's faulty hematopoietic stem cells with stem cells that can produce normal immune system cells.
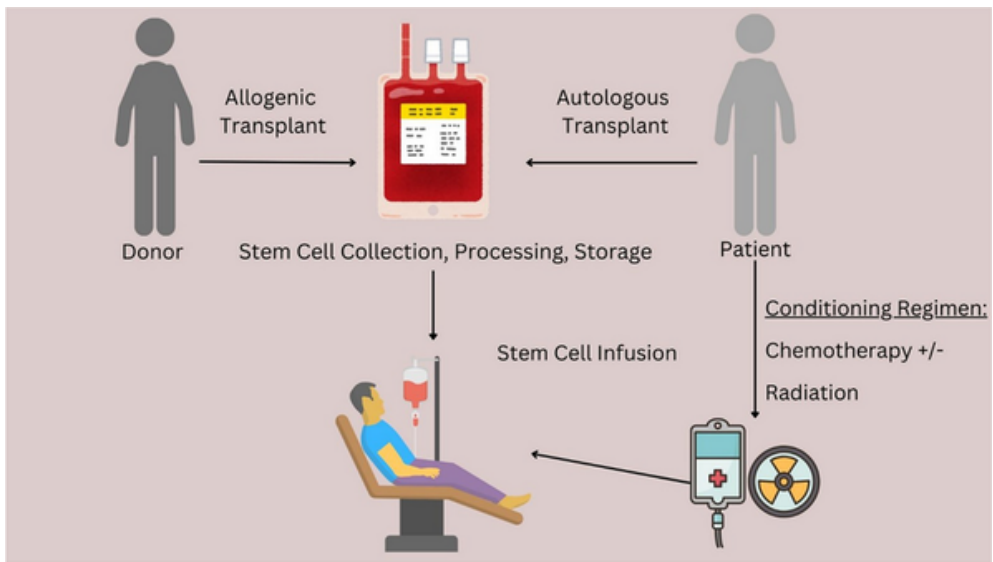
Problem

Current predictive models often fall short in addressing disparities related to socioeconomic status, race, and geography. Addressing these gaps is crucial for enhancing patient care, optimizing resource utilization, and rebuilding trust in the healthcare system.

Simulation

Gradient boosting machine (GBM): is well-suited to the CIBMTR. It handles mixed data types without extensive preprocessing, offers robustness against overfitting via regularization.

Cellular Automata Model Design: was selected for the event-based simulation to model the spatial and temporal dynamics of patient outcomes.

Architect

Results

Metric	Simulation 1	Simulation 2
Execution Time	~45 seconds	~12 seconds
Data Points Processed	28,803 patients	1,600 cells $\times$ 80 steps
Iterations/Scenarios	5	4
Output Files Generated	2 (PNG)	2 (PNG)
Stability Check	PASS (CV = 0.012)	N/A
Accuracy Target	FAIL (67.8% < 70%)	N/A
Emergent Behavior	Graceful degradation	Cascade collapse

Simulation 1 results are moderately good, **Simulation 2** results are successful in revealing critical system dynamics.
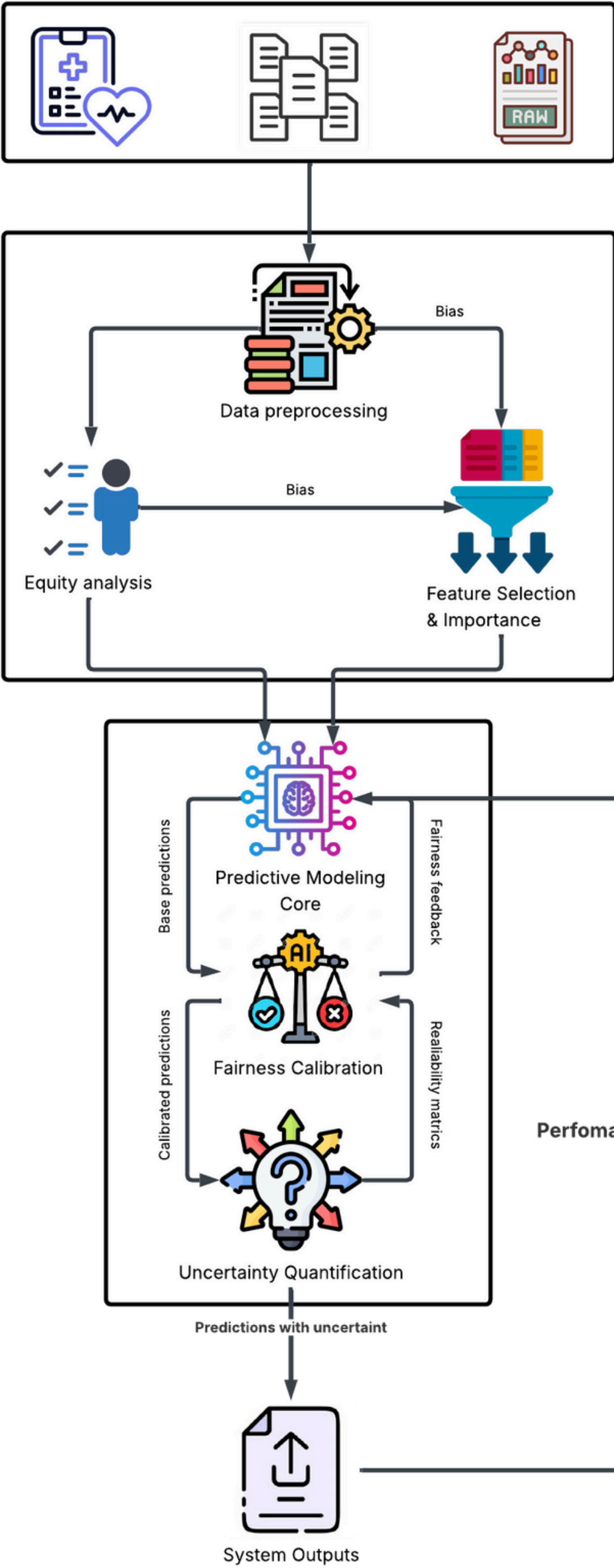
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