

Genomics meets Artificial Intelligence to transform Drug Discovery for Precision Medicine

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The convergence of genomics and artificial intelligence is revolutionizing precision medicine. GPU-accelerated sequencing pipelines, optimized for high-performance computing infrastructure (HPC), now analyze whole genomes at varying depths in hours rather than days. In parallel, AI tools such as AlphaMissense, AlphaGenome, and EVO2 provide functional genomics annotations, while AlphaFold and Boltz-2 have revolutionized protein structure prediction. In this context, our clinical and computational genomics project demonstrates this integration across neurodegenerative, oncological, and rare disease cohorts, generating over 6000 genomes (40x germline and 100x somatic) with petabyte-scale data. Combining AI-driven pathogenicity prediction with drug repurposing and HPC enables personalized therapeutic strategies from patient sample to patient treatment in a few days. This multi-disciplinary approach, which bridges genomics and transcriptomics with biomarker discovery, structural biology, and drug discovery/repurposing, advances personalized diagnostics, prognostics, and therapeutics.

References

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