# AlphaGenome Atlas

***Prelims:*** *Current events of national and international importance | Science and Technology*

## Why in News?

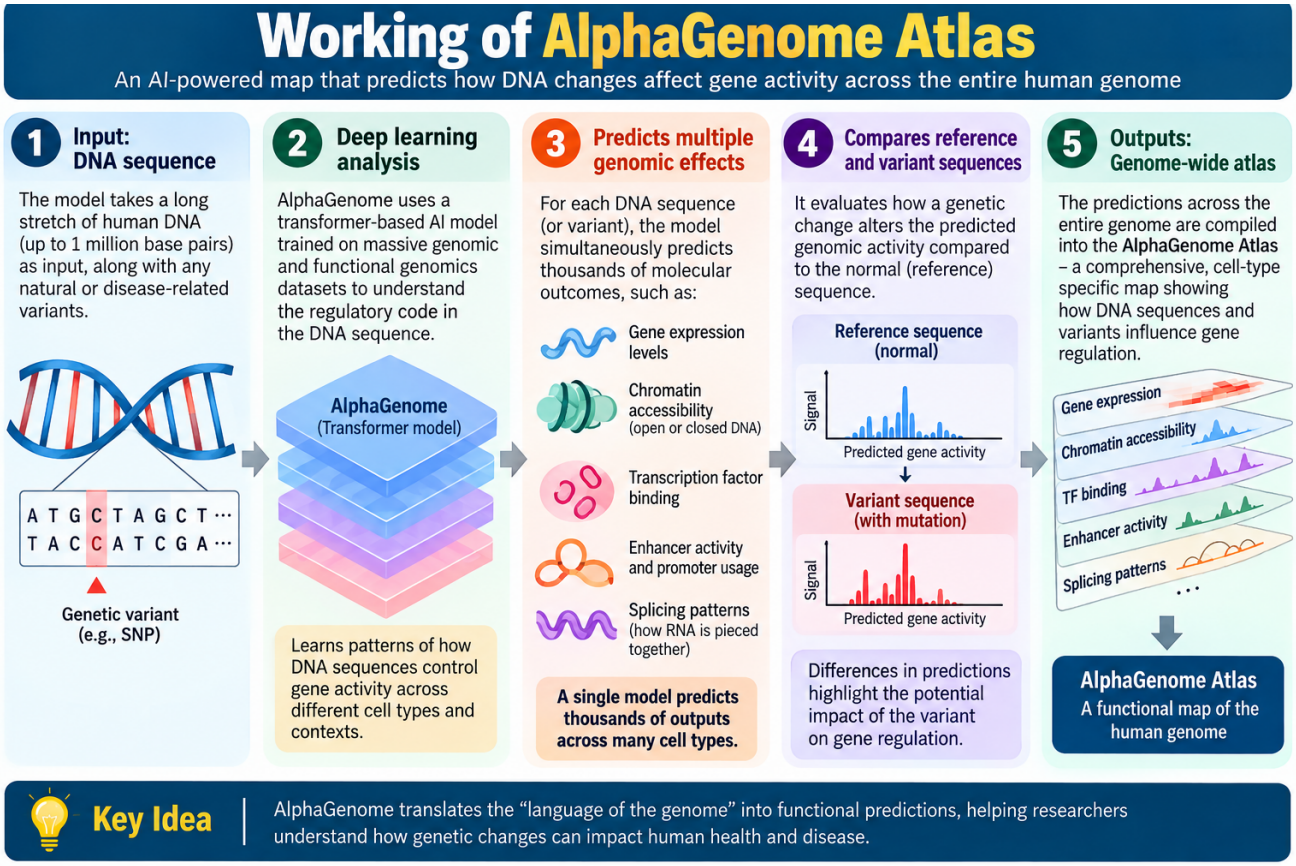
*Google DeepMind officially launched AlphaGenome Atlas, a searchable interactive map predicting the functional and molecular impacts of all single-letter DNA changes across the entire human genetic sequence.*

## AlphaGenome Atlas

- **Comprehensive Precomputed Database -** A ~1-petabyte digital repository powered by DeepMind's *AlphaGenome* AI architecture.
- **Predictive Mapping -** The Atlas precomputes and maps all 9 billion single-nucleotide variants (SNVs) across coding and non-coding regions.
- **No-Code Academic Access -** Made freely accessible to academic researchers through a web-based portal and API requiring no specialized coding or local high-performance computing infrastructure.

## Key Technical Capabilities

- **Unlocking the "Dark Genome"**
  - Protein-coding genes account for only **~2%** of human DNA.
  - It maps remaining **98% (non-coding DNA),** evaluating regulatory elements such as promoters, enhancers, and chromatin accessibility that govern when and where genes switch on or off.
- **AlphaGenome Variant Impact (AVI) Score**
  - Introduces a single unified scoring metric that combines functional regulatory forecasts from *AlphaGenome* with protein-altering predictions from *AlphaMissense*.
  - Enables scientists to instantly rank and prioritize candidate mutations for downstream laboratory validation.
- **Feature Attribution & Motifs -** Catalogs over 2,500 recurring functional DNA sequence motifs and provides detailed attribution breakdowns (e.g., highlighting errors in RNA splicing or altered gene expression).




## Significance

- **Accelerating Rare Disease Diagnostics-** Helps pinpoint disease-causing non-coding variants hidden among thousands of harmless background mutations in patients with unsolved genetic disorders.
- **Prioritizing Drug Targets -** Speeds up early-stage pharmaceutical discovery by mapping how point mutations impact cellular function across hundreds of human and mouse cell types and tissue models.
- **Hypothesis Generation Tool -** Serves as an expressive, high-throughput predictive engine rather than a direct clinical diagnostic tool, providing researchers with a structured starting point before committing laboratory time and capital.

**Reference**

Times of India | Google launches Alpha Genome Atlas

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