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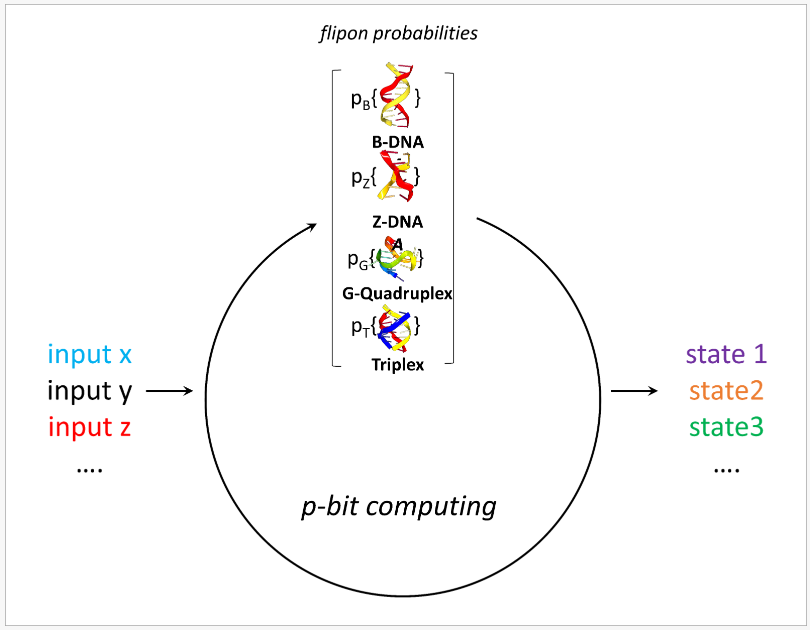
Programming Genomes, the next AI frontier

Recent advances show that genomes are programmable in ways never previously imagined and amenable to AI implementations



Flipons enable mapping of different inputs to alternative states. The different flipon types include left-handed Z-DNA, triple-stranded DNA triplexes, and four-stranded G-quadruplexes. In multicellular organisms, the desired output varies by tissue

CHARLESTOWN, MA, UNITED STATES, March 26, 2025 /EINPresswire.com/ -- We all learned that genomes are made up of B-DNA. The idea that DNA is dynamic and adopts different conformations adds color to this black-and-white view of our cells. The sequences that change shape are called flipons. By flipping from B-DNA to a different structure, they change the readout of genetic information. The probability of the flip changes according to context and can be set to maintain a particular state of a cell. This design is precisely that used by p-bit computers that are neither binary nor quantum in their operation. Instead, they rapidly solve a problem by efficiently searching the solution space.

In a paper released today in The Royal Society Journal Interface, Dr. Herbert describes how genomes implement p-bit computing, and how flipons enable this programmability. He explains how AI models can utilize the trove of biological data to design algorithms that allow the programming of cell states and the resetting of those states that predispose individuals to disease. Therapeutically, flipon probabilities can be altered using small sequence-specific RNAs or small drug-like molecules.

The paper serves as a Rosetta Stone, translating concepts from the field of computing to that of genetics. Previous studies have demonstrated the power of AI in predicting protein structures, while other studies have shown the reprogramming of adult cells into stem cells. The aim now is to combine these approaches to program a genome to specify a cell state precisely
About InsideOutBio: InsideOutBio is a start-up focused on developing a novel class of proprietary

therapeutics that 'lights up' tumors, enabling the immune system to kill by reprogramming self/non-self pathways within cancer cells. Dr. Herbert leads discovery at InsideOutBio. His work on Z-DNA was foundational to the discovery of flipons. These statements about InsideOutBio comply with Safe-Harbor laws. They are forward-looking and involve known and unknown risks and uncertainties. They are not guarantees of future performance, and undue reliance should not be placed on them.

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