



DEPARTMENT OF PHYSICS
INDIAN INSTITUTE OF TECHNOLOGY KANPUR

SPECIAL PHYSICS COLLOQUIUM

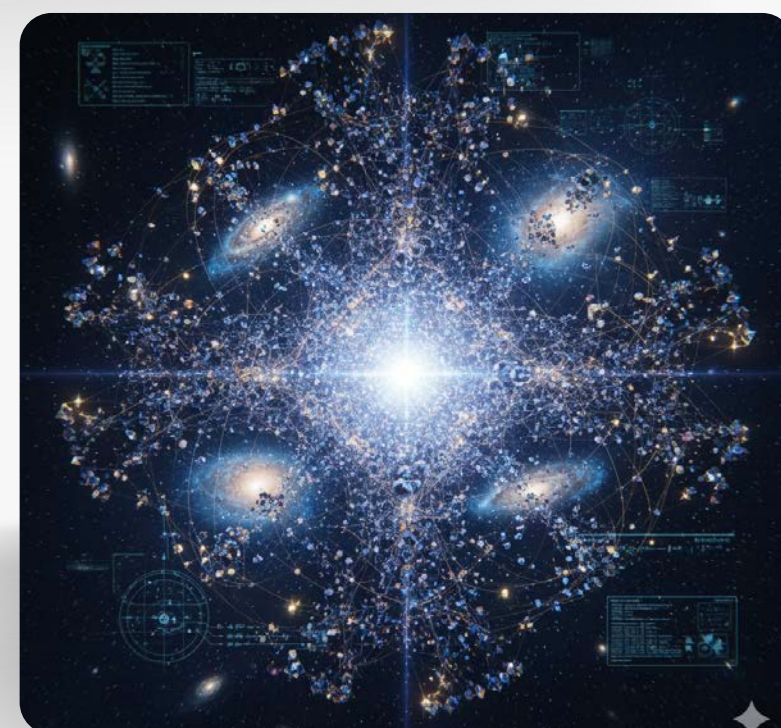
Building Our Universe with Qubits

ABSTRACT

THE STANDARD MODEL OF PARTICLE PHYSICS HAS BEEN REMARKABLY SUCCESSFUL IN EXPLAINING A WIDE RANGE OF EXPERIMENTAL RESULTS. IT IS BUILT ON THE ASSUMPTION THAT OUR UNIVERSE CONSISTS OF QUANTUM DEGREES OF FREEDOM EXISTING AT EVERY POINT IN SPACE AND EVOLVING IN TIME ACCORDING TO THE LAWS DEFINED BY THE MODEL. THESE ASSUMPTIONS INEVITABLY INVOLVE INFINITIES, WHICH POSE SIGNIFICANT COMPUTATIONAL CHALLENGES AND HAVE LONG HINDERED PROGRESS IN CALCULATING QUANTITIES OF INTEREST WITHIN THE STRONGLY INTERACTING SECTOR OF THE STANDARD MODEL THAT DESCRIBES NUCLEAR PHYSICS.

UNTIL NOW, WE HAVE RELIED ON CLASSICAL COMPUTATIONAL PARADIGMS TO ADDRESS THESE INFINITIES. HOWEVER, THE ADVENT OF QUANTUM COMPUTERS OFFERS NEW WAYS TO APPROACH THE PROBLEM. THE QUANTUM COMPUTATIONAL PARADIGM COMPELS US TO CONSTRUCT THE QUANTUM DEGREES OF FREEDOM OF OUR UNIVERSE FROM QUBITS. IN THIS TALK, I WILL INTRODUCE THE BASIC IDEAS BEHIND THIS PROGRAM AND PRESENT RECENT RESULTS SUGGESTING THAT KEY FEATURES OF THE STANDARD MODEL—SUCH AS ASYMPTOTIC FREEDOM AND THE EMERGENCE OF GAUGE STRUCTURE—MAY ARISE IN NOVEL WAYS WHEN REFORMULATED IN TERMS OF QUBITS.

ALL ARE CORDIALLY INVITED



SPEAKER



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FB 382 (PROF. AMAL KUMAR
RAYCHAUDHURI SEMINAR ROOM)



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