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# A note on quantum cosmology through canonical quantization

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**Abstract: In spite of huge successes, Einstein's "General theory of Relativity" is plagued with unavoidable singularity. It can not describe the phenomena near and beyond the `Planck era'. The Planck Era is the very early phase of the universe, lasting from the moment of the Big Bang until approximately $10^{-43}$ seconds (Planck time). During this extremely hot and compressed situation, the four fundamental forces, (i.e., gravity, strong nuclear, weak nuclear, and electromagnetic) were unified into a single force. To bypass this problem a suitable `Quantum theory of gravity' is crucial. Despite repeated attempts, full quantum theory of gravity is till fur away. At this point, `Quantum Cosmology' was used, to explore physical insight nearand beyond Planck era to some extent.Canonical quantization of gravitational action is one such way to study quantum cosmology. In this article I have discussed this technique and recent advancement in this field.**

**Keywords: GTR, ADM Formulation, Wheeler-DeWitt Equation, Canonical Quantization**

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## 1. Introduction

One of the well-known discoveries of 20-th century physics, is the `General Theory of Relativity' (GTR). In 1915, Einstein replaced Newtonian theory of gravitation by the famous GTR, where space and time are dynamical quantities, being shaped by the energy-momentum tensor of the surrounding.GTR is described by the following tensorial field equation(Weinberg, 1972; Misner, 1973)

$$R_{\mu\nu} - \frac{1}{2} g_{\mu\nu} R = 8\pi G T_{\mu\nu} \tag{1}$$