

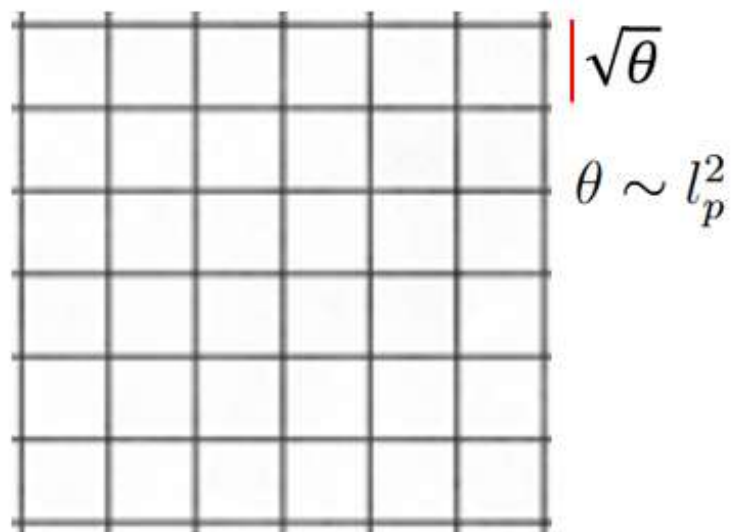
A BRIEF INTRODUCTION OF MY RESEARCH

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Noncommutative spacetimes

A noncommutative (NC) spacetime satisfies $[\hat{x}^\mu, \hat{x}^\nu] \neq 0$

No punctual structures. $\rho(r) = M\delta^3(r)$ is no longer valid!



new distributions [3,4]:

$$\rho_\theta(r) = \frac{M}{(4\pi\theta)^{3/2}} \exp\left(-\frac{r^2}{4\theta}\right)$$

$$\rho^{(\Theta)} = \frac{M\sqrt{\Theta}}{\sqrt{\pi^3}(r^2 + \pi\Theta)^2}$$



...(III)

Applications

- Removal of BHs singularities [1]
- Semiclassical effects [2]
- Cosmological inhomogeneities [3]

Example: Noncommutative Schwarzschild BH

$$ds^2 = - \left(1 - \frac{4M}{r\sqrt{\pi}} \gamma(3/2, r^2/4\theta) \right) dt^2 + \left(1 - \frac{4M}{r\sqrt{\pi}} \gamma(3/2, r^2/4\theta) \right)^{-1} dr^2 + r^2 d\Omega^2$$

Here, $\gamma\left(\frac{3}{2}, \frac{r^2}{4\theta}\right) \Big|_{\frac{r^2}{4\theta} \ll 1} \approx \frac{r^3}{12\sqrt{\theta^3}} \left(1 - \frac{7}{20} \frac{r^2}{\theta} \right)$



$$f(r) = 1 - \alpha r^2 + \mathcal{O}(r^4)$$



Perspectives and ongoing research...

- 1) Investigate the role of NC spacetimes within modified gravity theories.
- 2) Elucidate the underlying mechanism for the regularization of BHs in NC regular spacetimes.
- 3) Expand analysis within BH Thermodynamics in AdS-NC spacetimes [4].

THANK YOU!

Bibliography

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