

VAIBHAV KALVAKOTA

1. RESEARCH INTERESTS

My works are in the aspects of high energy physics and mathematical General relativity. Currently, my work is on understanding timelike entanglement entropy in de Sitter, which is given the interpretation of pseudo entropy due to a complex-valued contribution, to better understand holographic entanglement entropy in de Sitter. I am interested in using tools such as half-de Sitter and more speculatively $T\bar{T}$ deformations to see how pseudo entropy in de Sitter obtains its configuration among other things. Along with this, some of my other works-in-progress in the order of relevance are: (1) a review with a collaborator on de Sitter quantum gravity and holography, (2) on violations of semiclassical singularity theorems in Lovelock gravity, and (3) on the Bartnik minimization conjecture. Previously I have also worked on gravitational entropy in the Newman-Penrose formalism, wormhole solutions in Lovelock gravity and on gravitational waves analysis (pyCBC-CWB and Bilby) to better manipulate EMRIs (Extreme Mass-Ratio Inspirals).

2. PUBLICATIONS

- (1) A. Verma and V. Kalvakota, “*Musings on de Sitter and Holography*¹”. To appear. [arXiv:230m.nnnn\[hep-th\]](#).
- (2) V. Kalvakota, “*Holographic Quantum Gravity and Horizon Instability*”. (Apr. 2023). [arXiv: 2304.01292 \[hep-th\]](#). This Essay won Honourable Mention in the 2023 GRF competition and has been invited for publication in IJMPD.
- (3) V. Kalvakota, “*Singularities from Hyperentropic regions using the Quantum Expansion*”. (Jan. 2023). [arXiv: 2301.02579 \[gr-qc\]](#). A talk was given at [ICTS-TIFR Strings](#). on 1st March, 2023: Recording available at https://www.youtube.com/watch?v=dH2IhL_s3o8. A revised version will be submitted to JHEP in August, 2023.
- (4) V. Kalvakota, “*Weyl entropy behaviour and Naked Singularities*”. Presentation at 32nd meeting of the Indian Association for General Relativity and Gravitation: Tensions in Standard Cosmology. Nov. 2022. [arXiv: 2211.11017 \[gr-qc\]](#).
- (5) V. Kalvakota, “*Does the Weyl invariant proposal give an accurate description of gravitational entropy?*”, related talk given at International Conference on New Frontiers in Physics in July, 2022.
- (6) V. Kalvakota, “*An outlook of shape functions and $f(R)$ gravity for Morris-Thorne wormhole solutions*”. (Jan. 2022). Technical review on collaborative works.
- (7) V. Kalvakota. “*Singularities and wormholes*”, Essay written for 2021 Gravity Research Foundation competition.

Date: April, 2023.

¹Preliminary work in progress

3. TALKS

- (1) *Holographic Quantum Gravity and Horizon Instability*, Presentation at International Conference on New Frontiers in Physics XII (Aug. 2023). Based on [arXiv: 2304.01292](https://arxiv.org/abs/2304.01292) [hep-th].
- (2) *Aspects of Generalized Second Law and the Covariant Entropy Bound*, ICTS-TIFR Strings. on 1st March, 2023: Recording available at https://www.youtube.com/watch?v=dH2IhL_s3o8. Based on [arXiv: 2301.02579](https://arxiv.org/abs/2301.02579) [gr-qc].
- (3) *Weyl entropy behaviour and Naked Singularities*, Presentation at the 32nd meeting of the Indian Association for General Relativity and Gravitation at IISER Kolkata (Dec. 2022). Based on [arXiv: 2211.11017](https://arxiv.org/abs/2211.11017) [gr-qc].
- (4) *Does the Weyl invariant proposal give an accurate description of gravitational entropy?*, Presentation at International Conference on New Frontiers in Physics XI (Aug. 2022).

4. RELEVANT INFO

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5. ACADEMIC AND EXTRACURRICULAR

Academic: Won several Olympiads at school and state level in subjects pertaining to astronomy, science and mathematics. Gave three school-talks on cosmology (two at city level): [1] on black holes, non-technical talk about gravitational waves on the discovery of GW150914 in 2016, [2] in 2017 on singularities and cosmology, slightly technical talk, and [3] small virtual talk in 2020 after Penrose's Nobel prize. Scored distinction in TERI-based Green Olympiad, as a part of interest in climate change and effects on biodiversity. Discussed millisecond Pulsar timing array projects in detection of gravitational waves and prospects of collaborations such as IPTA and EPTA, along with the then still-on-paper Indian-LIGO detector in 8th grade (2018) during Yashwant Gupta's (NCRA, IUCAA) visit to our school (The Lexicon International school, Pune). Visited ICTS-TIFR for delivering a talk on singularities from the covariant entropy bound in March, 2023. Graduated 12th grade in May, 2023.

Extracurricular: Interested and working in general relativity from four years; previously worked on expanding the Petrov type of gravitational entropy proposals from solely type **D** and **N** to type **III**, **D**, **N** and **O** spacetimes, and more recently on singularity theorems in semiclassical gravity. Attending talks from CMSA, ICTS-Strings and recent conferences to keep up with recent progresses in hep-th, gr-qc, and math.DG. Have an understanding (somewhat naive) of the following: python, where I have used `pyCBC-CWB` and `Bilby`, earlier experience with `IMRPhenom` updates, cryptography algorithms and some aspects of quantum computing. Interested in being a part of activism on climate change and nuclear disarmament policies. Also fluent in DAW (digital audio workspace) based music composition (particularly using Pro Tools).