

PHY652A : Endterm projects (only for registered students)

Blue texts are links.

- Deadlines: Topic choices are due by September 16, 2023. Please tell me by email your choice of topic.
- Project reports are due on November 01, 2023. The report should be named as :
`2023M-652A-YourLastName-YourFirstName.pdf`
- Paper vivas / presentations are on November 08 and 10, 2023. The format will be the following : Prepare a 20 minutes chalkboard talk on the topic. The viva will happen during the presentation. Total duration of each presentation including question / answering will be 40 minutes. Questions will mainly be asked by myself and Prof. Apratim Kaviraj. Others are welcome to attend. Please present only what you completely understand.
- The endsem project report will be a short paper explaining the distilled summary of a topic related to CFTs. The paper should be approximately 3 pages in a TeX format available for download [here](#). You may include arbitrarily many figures and appendix sections, which need not count toward the page limit. Please only write what you can completely defend. This document will have your name on it, and I plan to upload it in the course webpage for others to read. Complicated technical details can be relegated to the Appendix. There should be a clear logic to your report. Pay attention to citing references carefully.
- Some topic suggestions (Lists of and links to references below are intended as entry points to the literature, and not as complete citations of all good work on the subject. For each paper you should of course always also read all papers that cite it, as well as all of the papers to which it refers. The order below is not meaningful.¹) :
 1. Conformal quantum mechanics. You can look into [here](#) and [here](#). **Claimed by Debmalya**
 2. Topological entanglement entropy using CFTs, look into [here](#) and into [this paper](#).
 3. Thermal conformal bootstrap. You can look into [this paper](#) and into [this](#).
 4. Random matrix behaviour in CFTs. Start with [this paper](#) and [this one](#). **Claimed by Arpan**
 5. Zamolodchikov recursion relations for conformal blocks. [This](#) is the original paper. There are multiple citations, including a numerical implementation of the algorithm present [here](#) (see among the ancillary files). [This](#) is a discussion in context of Virasoro characters.

¹This list will keep getting updated.

6. Modular linear differential equations. [This](#) reference started this fruitful endeavour. You can check citations of the paper when you go deeper. **Claimed by Jignesh**
7. Truncated conformal space approach. [This](#) is the original paper. See [here](#) for a recent application.
8. Percolation through CFTs. [This](#) thesis and its references should be a good starting point. **Claimed by Sariful**
9. Turbulence using CFT. The first paper to discuss this is [this](#) one. Check its citations as well. **Claimed by Pushkar**
10. Causality constraints in CFTs : [HJK](#) paper. **Claimed by Prakriti**
11. Spinning conformal correlators : you can understand and present from [this](#) paper. **Claimed by Shibam**
12. Scale vs. conformal invariance, for 4D you can refer to [this](#) paper. Consult references and citations of the paper. **Claimed by Aryabrat**
13. $\mathcal{N} = 4$ SYM. You can consult chapter 4 of [this](#) PDF. Look also into chapters 4 and 5 of [this](#) one. **Claimed by Yash**
14. Non-relativistic CFTs. Good references are: [this](#), [this](#) and Sridip Pal's [thesis](#). **Claimed by Sharang**
15. More CFT examples in $1/N$. Look into [this](#) PDF and its references. Most important paper is [this](#) one. Some technical ones are [this](#) and [this](#) one.
16. Starting with a review of Liouville CFTs e.g., by using [this paper](#), try to formulate the critical Ising model on a random lattice. **Claimed by Suman**
17. Momentum space Ward identities ([for example](#)) and connection with dS , you can follow [this paper](#) . **Claimed by Adarsh**
18. Quantum gravity partition function in three dimensions. This started mainly with [this](#) paper. Attempts to resolve the pointed out problems were carried out in [this](#), [this](#) and more recently in [this](#) paper.