

End-of-Term Project

Due: Topic choices are due Monday, November 10, 2008. Papers are due on the day of the last lecture.

The end of term project for 8.821 will be a half-hour presentation or short (say 5 pages) paper summarizing a topic of interest, relevant to our class.

The topic needn't be about string theory or gauge/gravity duality specifically. An appropriate topic could also be a system that you think may be amenable to study with a gravity dual and want to learn more about.

Your goal in deciding what to say should be to try to save the rest of us from having to read the papers. Give some context, say what the crucial point is, say what the implications are.

If you are planning to give a talk, I can't recommend highly enough the advice from Geroch, gr-qc/9703019.

Please tell me (by email or in person) what topic you plan to study as soon as possible; also tell me whether you wish to give a talk or write a paper. Below are some topic suggestions, involving wildly varying levels of difficulty. The list is certainly not in any sense exhaustive. Creative topics are encouraged.

Some topic suggestions:

Lists of 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 which cite it¹, as well as all of the papers to which it refers. The order below is not meaningful, though I've tried to group related topics together. I will keep adding to this file.

1. [**claimed by Ali Nassar**] holographic RG flows and an 'a-theorem' [d'Hoker-Freedman review, hep-th/0201253, §9-10]
2. string duals of gauge theories with matter in the fundamental [Karch-Katz, hep-th/0205236; Sakai-Sugimoto, hep-th/0412141, hep-th/0507073] and thermal aspects [see refs in review by Erdmenger et al 0711.4467]

¹For most of the papers listed below, a relatively complete citation list can be found using Spire: <http://www.slac.stanford.edu/spires/hep/>.

3. [**claimed by Francesco D'Eramo**] more systematic understanding of the real-time AdS/CFT prescription [Son et al, hep-th/0205051, hep-th/0212072; Skenderis-van Rees, arXiv:0805.0150; Iqbal-Liu, 0809.3808.]
4. [**claimed by Dave Guarrera**] gravity duals of supersymmetric confining gauge theories with chiral symmetry breaking [Klebanov-Strassler, hep-th/0007191; Maldacena-Nunez, hep-th/0008001; Klebanov review, hep-th/0205100]
5. AdS/QCD [Erlich, Katz, Son, Stephanov, hep-ph/0501128; Karch, Katz, Son, Stephanov, hep-ph/0602229]
6. [**claimed by Mohamad Faghfoor Maghrebi**] entanglement entropy from the gravity dual [Ryu-Takayanagi, hep-th/0603001, hep-th/0605073 and citations thereof; see in particular Fursaev, hep-th/0606184]
7. 2d strong-coupling transport in a magnetic field [Hartnoll, Kovtun et al, 0704.1160, 0706.3215]; constraints from EM duality in the bulk [Witten, hep-th/0307041, Kovtun et al, hep-th/0701036]
8. holographic models of superfluidity and superconductivity [HHH, 0803.3295, 0810.1563, Kovtun et al 0809.4870, Shieh et al 0809.4494]
9. expanding strongly-coupled plasma [Janik-Peschanski, hep-th/0512162, hep-th/0606149, 0706.2108]
10. charged particles in strongly-coupled plasma: jet quenching [Liu-Rajagopal-Wiedemann, hep-ph/0605178, hep-ph/0612168],
and/or
string dragging [Karch et al hep-th/0605158; Casalderrey-Solana, Teaney, hep-ph/0605199; Gubser et al, hep-th/0605182, hep-th/0605292]
11. attempts to see a fermi surface in the gravity dual [Sung-Sik Lee 0809.3402; Rozali et al 0708.1322; Karch-Son-Starinets, Parnachev-Kulaxizi...]
12. finite- N effects: the stringy exclusion principle [Maldacena-Strominger, hep-th/9804085] and giant gravitons [McGreevy-Susskind-Toumbas, hep-th/0003075; Myers et al, hep-th/0008015; Itzhaki et al, hep-th/0008016.]
13. [**claimed by Daniel Park**] a solvable limit of AdS/CFT [BMN, hep-th/0202021; last section of hep-th/0309246; Gubser-Klebanov-Polyakov, hep-th/0204051]

14. spin chains and the dilatation operator [Minahan-Zarembo, hep-th/0212208 and its vast ocean of citations, especially Kruczenski, hep-th/0311203]
15. cusp anomalous dimension from string theory [Kruczenski, hep-th/0210115]
16. BPS Wilson loops [Erickson-Semenoff-Zarembo, hep-th/0003055, Drukker-Gross, hep-th/0010274]
17. $c \leq 1$ strings and matrix models, an example of holography [Kiritsis, chapter 15, review by Yu Nakayama, hep-th/0402009]
18. AdS_3 and 2d CFT [MAGOO §5, *e.g.* Maldacena-Ooguri, hep-th/0001053, hep-th/0005183, hep-th/0111180]
19. holography for large- N vector models? [Klebanov-Polyakov, hep-th/0210114]
20. behind the horizon by analyticity [Maldacena, ‘eternal BH in AdS’, hep-th/0106112; Shenker et al, hep-th/0306170; Festuccia-Liu, hep-th/0506202]
21. **[claimed by Vijay Kumar]** matrix models of black hole information consumption [Festuccia-Liu, hep-th/0611098; Iizuka-Polchinski et al, 0801.3657, 0808.0530]
22. string theory and the physics of hadrons [Polchinski-Susskind, hep-th/0112204, Polchinski-Strassler et al, hep-th/0109174, hep-th/0209211, hep-th/0603115]
23. microscopic accounting of Bekenstein-Hawking entropy for BPS black holes [Strominger-Vafa, hep-th/9601029 et cit.]
24. Birkhoff/no-hair, quasinormal modes, and thermalization [Horowitz-Hubeny, hep-th/9909056]
quasinormal modes and hydrodynamic modes [Kovtun-Starinets, hep-th/0506184]
25. computation of hydrodynamic green functions [Policastro-Son-Starinets, hep-th/0205052, 0210220]
26. anything else we don’t get to in lecture that’s on the syllabus.