

TFI 2010

ROBERTO AUZZI

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Thursday, June 24 - 15:15

On metastable vacua in perturbed $\mathcal{N} = 2$ theories

We study supersymmetry breaking in metastable vacua on the Coulomb branch of perturbed $\mathcal{N} = 2$ gauge theories, with gauge group $SU(2)$ and different matter content ($N_f = 0, 2, 4$). The theory is deformed with a superpotential which is a cubic polynomial in $u = \text{Tr } \Phi^2$, where Φ is the adjoint superfield. The allowed region of the perturbation parameters in this $\mathcal{N} = 1$ theory is plotted as a function of the moduli space coordinate. In the asymptotically free cases a significant fine-tuning in the perturbation parameters is needed to achieve metastable vacua in the weakly coupled region of the moduli space; a lower degree of fine-tuning is required in the strongly coupled regime. In the conformal case ($N_f = 4$ fundamentals) we find that also an explicit mass for the hypermultiplets must be introduced in order to generate metastable vacua. In the case of $N_f = 2$ fundamentals it is possible to achieve a metastable vacuum also in the neighborhood of the Argyres-Douglas fixed point (even if a large degree of fine-tuning is needed in this limit). Direct gauge mediation is discussed; gaugino masses of the same order of the SUSY-breaking can be obtained.

AIYALAM P. BALACHANDRAN

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Thursday, June 24 - 18:00

Quantum Gravity and Noncommutative Spacetimes

Quantum geons are topological excitations in quantum gravity. They were discovered by Friedman and Sorkin. They enjoy many remarkable properties. For example some of them can be quantised to have spin $1/2$ even though we look at Einstein Lagrangian without matter fields. Here we show how their underlying spacetime can be deformed into a noncommutative algebra. That introduces noncommutativity at Planck scales, and profoundly affects causality and statistics at these scales. The physical consequences of these effects are briefly discussed and a way to develop their quantum field theory is outlined.

Thursday, June 24 - 18:45

Giorgio, Liz and I

ANTONIO BASSETTO

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Thursday, June 24 - 11:30

(A Few) Virtues and Mysteries of SUSY $\mathcal{N} = 4$

Digression on YM_2 : WL and WL correlators on a sphere. Expansions in terms of characters and of instantons. The zero-instanton sector and its relation to a perturbative treatment. Generalizing to loop correlators \rightarrow multimatrix models. Supersymmetric WM loops on S^2 : the DGRT coupling. The relation between YM_2 and SUSY $\mathcal{N} = 4$: weak coupling tests on loops and loop correlators. A comment on the strong coupling situation.

FIorenzo Bastianelli

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Friday, June 25 - 10:15

Worldline approach to higher spin fields

Spinning particle models can be used to describe higher spin fields in first quantization. Models defined by $O(n)$ extended local supersymmetry on the worldline are used to describe standard higher spin fields in four dimensions and, more generally, conformal higher spin fields in arbitrary dimensions. Similarly, particles with $U(n)$ extended local supersymmetry on the worldline are used to identify a new class of gauge invariant equations satisfied by higher spin fields on complex manifolds. The corresponding gauge symmetries are rather unusual, though reminiscent of those satisfied by Fronsdal equations.

MATTEO BERTOLINI

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Thursday, June 24 - 9:30

General Semi-Direct Gauge Mediation

I give an overview of known models of gauge mediation of supersymmetry breaking, focusing the attention on one specific framework, semi-direct gauge mediation, which arises quite generically in string/D-brane models. Using a general gauge mediation formalism I discuss the generic phenomenological properties of this scenario, and the way to take advantage of its apparent problems, as well as possible interesting ways to evade them.

FRANCESCO BIGAZZI

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Thursday, June 24 - 10:15

D3-D7 Quark-Gluon Plasmas

I will present a class of analytic supergravity solutions dual to strongly coupled thermal gauge theories coupled to massless fundamental flavors. The solutions include the backreaction of the latter up to second order in the parameter that weighs the internal flavor loops. I will discuss how the fundamental fields affect the thermodynamical and hydrodynamical properties of the plasmas as well as their interaction with external probes. I will also present novel solutions accounting for the introduction of a finite quark density.

MARIANO CADONI

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Thursday, June 24 - 14:30

Condensed matter holographic duals of charged AdS black holes

I will outline the use of holographic methods for reproducing condensed matter phenomena out of AdS gravity. Holographic superconductors and “exotic metal” dual to charged dilatonic AdS black holes are discussed in detail.

GIANGUIDO DALL’AGATA

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Friday, June 25 - 9:30

A supergravity dual for 4d CFT’s universal sector

We analyze a consistent truncation of type IIB supergravity reduced on squashed Sasaki-Einstein manifolds. The resulting 5d gauged supergravity captures the holographic dual of a universal sector of single trace operators existing in any 4d superconformal field theory. We also discuss some possible extensions and applications for the conifold theory.

PAOLO DI VECCHIA

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Friday, June 24 - 17:15

How does the string in flat space know about curved space?

In this seminar we will show how, by computing string amplitudes in flat space, one gets information on curved space properties of D branes. In particular, by string scattering on Dp branes we deduce the deflection angle of a particle in the metric of a Dp brane for large impact parameter. Next order corrections in the impact parameter and string corrections are also discussed.

SERENA FAGNOCCHI

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Saturday, June 26 - 10:30

Quantum correlations in Analogue Models of Gravity in Bose-Einstein condensates

Thanks to the kinematical analogy between gravity and hydrodynamical systems, it will be possible to simulate in laboratory the behavior of some gravitational systems, and the associated quantum effects. Among them, the Hawking radiation for black holes, the quantum emission due to cosmological expansion, the dynamical Casimir effect - so far with no experimental data confirming their existence - could be observed in Bose-Einstein condensates with the present technology. To this purpose, the crucial role played by the measurements of the quantum correlations associated to each effect is described.

SERGIO FERRARA

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Saturday, June 26 - 11:45

Black Holes in $\mathcal{N}=8$ Supergravity and its Quantum Aspects

We discuss possible scenarios for a nonperturbative completion of $\mathcal{N}=8$ Supergravity in four dimensions. We argue that perturbatively finite supergravity may have quantum black holes which do not require extra dimensions nor inclusion in Superstring Theory.

LUCIANO GIRARDELLO

Università di Milano-Bicocca, luciano.girardello@mib.infn.it

Friday, June 25 - 16:30

Metastable Vacua in Superconformal SQCD-like Theories

We study dynamical supersymmetry breaking in vector-like superconformal $\mathcal{N} = 1$ gauge theories. We find appropriate deformations to overcome the problem of the instability of the non supersymmetric vacuum in such theories. The request for long lifetime translates into constraints on the physical couplings which, in this regime, can be controlled through a-maximization and efficient RG analysis.

SVEN BJARKE GUDNASON

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Friday, June 25 - 14:30

Non-Abelian vortices and lumps, their moduli spaces and substructures

I will give a brief introduction to the field of non-Abelian solitons and especially vortices and review some of the latest results. Then I will discuss also the case of a Chern-Simons term instead of the Yang-Mills term in the theory and the implication for the vortices. Finally I will discuss the relation to non-Abelian monopoles and possibly quark confinement.

ALBERTO LERDA

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Saturday, June 26 - 12:30

Stringy instanton corrections to gauge couplings

We discuss D-brane models where gauge theory couplings receive non-perturbative corrections from stringy instantons. These corrections are obtained by explicitly evaluating the integral over the stringy instanton moduli space with localization methods. These D-brane models possess perturbatively computable heterotic duals whose couplings under the duality map match precisely the stringy instanton effects. This agreement represents a very non-trivial test of the exotic instanton calculus.

FRANCISCO MORALES

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Saturday, June 26 - 9:45

String sketches of dynamical supersymmetry breaking

We study semirealistic brane intersecting setups exhibiting dynamical supersymmetry breaking.

MARTA ORSELLI

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Thursday, June 24 - 12:15

A decoupling limit of AdS/CFT

We identify a regime of the AdS/CFT correspondence in which we can quantitatively match $\mathcal{N}=4$ super Yang-Mills (SYM) for small 't Hooft coupling with weakly coupled type IIB string theory on $\text{AdS}_5 \times S^5$. We approach this regime by taking the same decoupling limit on both sides of the correspondence. We show that in this limit the spectrum, and consequently the thermodynamics, of gauge theory and string theory match. We moreover derive a Penrose limit of $\text{AdS}_5 \times S^5$ which leads to a new pp-wave background with two explicit space-like isometries where type IIB string theory can be quantized. This is important in connection with subsectors of $\mathcal{N}=4$ SYM that are crucial for approaching non-perturbative physics of type IIB string theory in $\text{AdS}_5 \times S^5$, such as D-branes and black holes.

SARA PASQUETTI

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Friday, June 25 - 12:15

The ABC of AGT

In the context of the recent conjecture by Alday-Gaiotto-Tachikawa we show how A and B model topological string amplitudes are related to correlations functions in two-dimensional Conformal Field Theories.

SILVIA PENATI

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Friday, June 25 - 11:30

$\mathcal{N}=2$ Chern-Simons Matter Theories: RG flows and IR behavior

Motivated by the AdS4/CFT3 correspondence, I consider two-level supersymmetric Chern-Simons matter theories perturbed by the most general marginal superpotential compatible with $\mathcal{N}=2$ supersymmetry. This class of models contains as particular cases perturbations of the ABJM/ABJ theories with and without flavors and $\mathcal{N}=2,3$ theories with different CS levels. Within a perturbative approach, I discuss the complete spectrum of fixed points and their IR stability.

RICCARDO RICCI

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Friday, June 25 - 15:15

Generalized scaling and integrability from $\text{AdS}_5 \times S^5$

According to AdS/CFT a remarkable correspondence exists between strings in $\text{AdS}_5 \times S^5$ and operators in $\mathcal{N}=4$ SYM. A particularly important case is that of fast-spinning folded closed strings and the so called twist-operators in the gauge theory. This is a remarkable tool for uncovering and checking the detailed structure of the AdS/CFT correspondence and its integrability properties. In this talk I will show how to match the expression of the anomalous dimension of twist operators as computed from the quantum superstring with the result obtained from the Bethe ansatz of SYM. This agreement resolves a long-standing disagreement between gauge and string sides of the AdS/CFT duality and provides a highly nontrivial strong coupling test of SYM integrability.

YOGENDRA N. SRIVASTAVA

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Thursday, June 24 - 19:15

A GI in Perugia

MASSIMO TARONNA

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Saturday, June 26 - 9:00

String Lessons for Higher-Spin Interactions

I shall address the issue of consistent higher-spin interactions taking String Theory as a “theoretical laborator”, presenting handy expressions for all three and four-point amplitudes at tree level for the first Regge trajectory of the open bosonic string. I will also show some related properties of field theory amplitudes involving exchanges of infinitely many higher-spin excitations.