XV AVOGADRO MEETING on Strings, Supergravity and Gauge Theories

Report of Contributions

https://agenda.infn.it/e/XVAvogadro

Contribution ID: **6** Type: **Gong Show/Poster**

Discrete Symmetries in Dimer Diagrams

Thursday, 19 December 2019 10:05 (7 minutes)

Following the paper called Discrete Symmetries in Dimer Diagrams, we apply dimer diagram techniques to uncover discrete global symmetries in the fields theories on D3-branes at singularities given by general orbifolds of general toric Calabi-Yau threefold singularities. The discrete symmetries are discrete Heisenberg groups, with two generators A,B with commutation AB=BAC, with C a central element. These generators depend on the abelian orbifold. This fully generalizes observations in particular orbifolds of the flat space, the conifold and other toric Sasaki-Einstein manifolds. The generator A is realized as a shift in the dimer diagram, associated to the orbifold quantum symmetry; the action of B is determined by equations describing a 1-form in the dimer graph in the unit cell of the parent theory with twisted boundary conditions; finally, C is an element of the (mesonic and baryonic) non-anomalous U(1) symmetries, determined by geometric identities involving the elements of the dimer graph of the parent theory. These discrete global symmetries of the quiver gauge theories are holographically dual to discrete gauge symmetries from torsion cycles in the horizon. Our findings allow to easily construct the discrete symmetries for infinite classes of orbifolds.

Primary authors: Mr MININNO, Alessandro (Instituto de Fisica Teorica UAM-CSIC); Prof. URANGA, Angel (Instituto de Física Teórica UAM-CSIC); Dr GARCÍA-VALDECASAS, Eduardo (Université libre de Bruxelles (on leaving from Instituto de Fisica Teorica UAM-CSIC))

Presenter: Mr MININNO, Alessandro (Instituto de Fisica Teorica UAM-CSIC)

Session Classification: Gong Show/Poster

Contribution ID: **7** Type: **Gong Show/Poster**

Machine learning for QFT

Thursday, 19 December 2019 10:19 (7 minutes)

Machine learning has revolutionized most fields it has penetrated, and the range of its applications is growing rapidly. The last years has seen efforts towards bringing the tools of machine learning to lattice QFT and to string theory. After giving a general idea of what is machine learning, I will present two recent results on lattice QFT: 1) computing the Casimir energy for a 3d QFT with arbitrary Dirichlet boundary conditions, 2) predicting the critical temperature of the confinement phase transition in 2+1 QED at different lattice sizes.

Primary author: Dr ERBIN, Harold (Università di Torino)

Presenter: Dr ERBIN, Harold (Università di Torino)

Session Classification: Gong Show/Poster

Contribution ID: **8** Type: **Gong Show/Poster**

Higgs Branch and Hasse diagrams

Thursday, 19 December 2019 11:36 (7 minutes)

We look at the geometric structure of the Higgs branch of supersymmetric gauge theories with 8 supercharges in various dimensions. In particular, the partial ordering between different subspaces of the Higgs branch which can be neatly encoded in a diagram called a Hasse diagram. Recent introduction of magnetic quivers allows a very efficient construction of such diagrams, giving consistent (and more) information compared to the traditional method of partial Higgsing.

Primary author: ZHONG, Zhenghao (Imperial College)

Presenter: ZHONG, Zhenghao (Imperial College)

Session Classification: Gong Show/Poster

Contribution ID: **9** Type: **Gong Show/Poster**

Effective actions from superstring field theory: algebraic structure and localization

Thursday, 19 December 2019 11:29 (7 minutes)

Starting with a general string field theory action which possesses an A_∞ (or L_∞) structure, we derive an effective action for the massless degrees of freedom. We show that the vertices of this effective action again exhibit an A_∞ (or L_∞) structure. Repeating this procedure for the WZW-like heterotic and open superstring field theories formulated in the large Hilbert space, we find that the computation of the quartic vertex of the effective action for massless modes at zero momentum localizes on the boundary of the worldsheet moduli space. We show that our results can be used to efficiently deal with several concrete superstring backgrounds of interest.

Primary authors: Mr VOSMERA, Jakub (CEICO, Institute of Physics, Czech Academy of Sciences); Dr ERBIN, Harold (University of Turin, INFN Turin); Prof. MACCAFERRI, Carlo (University of Turin, INFN Turin); Dr SCHNABL, Martin (CEICO, Institute of Physics, Czech Academy of Sciences)

Presenter: Mr VOSMERA, Jakub (CEICO, Institute of Physics, Czech Academy of Sciences)

Session Classification: Gong Show/Poster

Contribution ID: **10** Type: **Gong Show/Poster**

Moduli Portal in Dark Matter production

Thursday, 19 December 2019 11:22 (7 minutes)

We investigate the production of hidden sector Dark Matter (DM) in type IIB LVS scenarios. We study the possibility of Moduli fields playing the role of a portal during the production. By matching the observed DM abundance we make predictions for the masses of different DM types.

Primary authors: BROECKEL, Igor (Istituto Nazionale di Fisica Nucleare); CICOLI, Michele (BO)

Presenter: BROECKEL, Igor (Istituto Nazionale di Fisica Nucleare)

Session Classification: Gong Show/Poster

Contribution ID: **11** Type: **Gong Show/Poster**

A Monte Carlo Approach to the Worldline Formalism in Curved Space

Thursday, 19 December 2019 11:15 (7 minutes)

Numerical Worldline (WL) Monte Carlo (MC) techniques for particle path integrals in flat spacetimes have been deeply developed in order to extract physical information from QFT systems. It is however possible to extend such procedures to the case of (Euclidean) curved spaces, where the proper-time discretization of a bosonic worldline point-particle is treated similarly to a time-slicing regularization for the associated quantum path integral. In particular, it induces a well-known counterterm in the theory which, together with curvature effects arising directly from the curved metric tensor, plays the role of an additional potential. To test the setup, the numerical evaluation of the heat kernel of a free scalar point-particle on a 4-hyperboloid is presented; such system was already studied analytically, and the expressions of the associated effective potential and of the metric tensor were provided in closed form. The curved space problem was turned into a flat space one, allowing for a direct comparison between WLMC techniques in curved (the test) and in flat (the check) space.

Primary author: Dr MURATORI, Maurizio (University of Modena and Reggio Emilia)

Presenter: Dr MURATORI, Maurizio (University of Modena and Reggio Emilia)

Session Classification: Gong Show/Poster

Contribution ID: **12** Type: **Gong Show/Poster**

Subregion action complexity in AdS_3 and in the BTZ black hole

Thursday, 19 December 2019 11:08 (7 minutes)

We analytically compute subsystem action complexity for a segment in the BTZ black hole background up to the finite term, and we find that it is equal to the sum of a linearly divergent term proportional to the size of the subregion and of a term proportional to the entanglement entropy. This elegant structure does not survive to more complicated geometries: in the case of a two segments subregion in AdS_3, complexity has additional finite contributions. We give analytic results for the mutual action complexity of a two segments subregion.

Primary author: Mr BAIGUERA, Stefano (Niels Bohr Institute Copenhagen)

Presenter: Mr BAIGUERA, Stefano (Niels Bohr Institute Copenhagen)

Session Classification: Gong Show/Poster

Contribution ID: **13** Type: **Gong Show/Poster**

Tree-level Scattering Amplitude of closed string Tachyons in Orientifold theories

Thursday, 19 December 2019 11:01 (7 minutes)

The famous paper 1 by Kawai, Lewellen and Tye (KLT) showed that n-closed strings scattering amplitudes at tree-level on the sphere can be calculated and written in terms of n-open strings scattering amplitudes on the disk, using well known techniques of complex analysis. Their results can be summarised (schematically) by "$Gravity = (Gauge)^2$". In the context of Orientifold theories, tree-level scattering amplitudes involving closed string Tachyons were considered in order to extend their relationship with scattering amplitudes of open string Tachyons. String g_s-perturbation theory for orientifold theories involves both $oriented$ and $unoriented$ surfaces, having Euler characteristic $\chi = 2 - 2g - b - c$ with g-genus, b-boundaries and c-crosscaps. Oriented theories at tree-level are analysed in 1 and [2,3], where only oriented surfaces enter the calculations, respectively Sphere (S2) and Disk (D2). Following [1,2,3], we investigate the less studied tree-level string scattering amplitudes on an unoriented surface, the Real Projective Plane (RP2) [4], and the relation between n-closed strings and $2n$-open strings is found.

Primary authors: Dr ALDI, Alice (INFN-Sezione Roma 2); Prof. PRADISI, Gianfranco (Università degli studi di Roma "Tor Vergata", INFN-sezione Roma 2); Prof. STIEBERGER, Stephan (Max-Planck--Institut für Physik)

Presenter: Dr ALDI, Alice (INFN-Sezione Roma 2)

Session Classification: Gong Show/Poster

Contribution ID: **14** Type: **Gong Show/Poster**

The L-infinity origin of tree-level scattering amplitude recursion relations

Thursday, 19 December 2019 10:54 (7 minutes)

Higher algebraic structures are ubiquitous in fundamental physics. For instance, A_∞- and L_∞-algebras emerge in the context of string field theory. Importantly, via the Batalin-Vilkovisky formalism, any Lagrangian field theory admits an L_∞-algebra that governs all of its physics including field equations, symmetries, and Noether identities. In this talk, I will explain the connection between higher algebraic structures and tree-level scattering amplitudes. In particular, I will prove that powerful recursive methods, such as the Berends-Giele gluon scattering recursion relation, emerge very naturally and straightforwardly in any Lagrangian field theory when using the L_∞-algebra language.

Primary authors: MACRELLI, Tommaso (University of Surrey); Dr SAEMANN, Christian (Heriot–Watt University); Dr WOLF, Martin (University of Surrey)

Presenter: MACRELLI, Tommaso (University of Surrey)

Session Classification: Gong Show/Poster

Contribution ID: **15** Type: **Gong Show/Poster**

Spin Fields as Point-like Defects on the Worldsheet

Thursday, 19 December 2019 10:47 (7 minutes)

We show a new method to compute the correlator of an arbitrary number of (excited) spin fields based on a time dependent defect CFT procedure, with the possibility to extend it to (excited) twist fields, both in the Abelian and non Abelian cases.

We consider two-dimensional fermions in the presence of point-like defects in the time-like direction corresponding to spin fields which provide non trivial boundary conditions. We solve them and the equations of motion to define a basis of modes in the Euclidean formulation. We compute the algebra of creation and annihilation operators necessary to build the Fock space in the presence of defects. With the definition of the in-vacuum, we then compute the contractions of the fields and the stress-energy tensor which shows that we are indeed considering a CFT, notwithstanding the time dependent defects. We then proceed to build the Hermitian conjugate vacuum in order to compute the correlators of the spin fields.

Primary authors: FINOTELLO, Riccardo (Università degli Studi di Torino); PESANDO, Igor (TO)

Presenter: FINOTELLO, Riccardo (Università degli Studi di Torino)

Session Classification: Gong Show/Poster

Contribution ID: **16** Type: **Gong Show/Poster**

Elliptic blowup equations for 6d SCFTs

Thursday, 19 December 2019 10:40 (7 minutes)

After the atomic classification of 6d (1,0) SCFTs, one important question is how to compute the elliptic genera and refined BPS invariants of all such theories. In a series of papers, we develop the elliptic blowup equations to answer this question universally. Such equations can be regarded as an elliptic version of Gottsche-Nakajima-Yoshioka's K-theoretic blowup equations. I will focus on the rank one (1,0) SCFTs with matters and show how blowup equations determine the elliptic genera and refined BPS invariants.

Primary author: SUN, Kaiwen (SISSA)

Presenter: SUN, Kaiwen (SISSA)

Session Classification: Gong Show/Poster

Contribution ID: **17** Type: **Gong Show/Poster**

On Electromagnetic and Color Memories in Even Dimensions

Thursday, 19 December 2019 10:33 (7 minutes)

Asymptotic symmetries at null infinity do not seem to play a fundamental role in higher dimensions: in constrast with the four-dimensional case, in $D > 4$ it is indeed possible and natural to describe radiative solutions to Maxwell's and Einstein's equations without ever enlarging the asymptotic symmetry group beyond the standard global symmetries. Similarly, memory effects do not show an immediate link with nontrivial symmetries acting asymptotically, thus pointing to their absence in higher dimensions. However, these conclusions seem at odds with the connection asymptotic symmetries and memory effects share with soft theorems, whose validity extends beyond $D = 4$.
We investigate this issue studying memory effects associated to Abelian and non-Abelian radiation getting to null infinity, in arbitrary even spacetime dimensions. Together with classical memories, linear and non-linear, given by permanent kicks in the velocity of probe particles, we also discuss the higher-dimensional counterparts of quantum memory effects, manifesting themselves in modifications of the relative phases describing a configuration of several probes.
Adopting the Lorenz gauge, we illustrate how one can interpret such memory effects as the action of suitable residual symmetries acting near null infinity and propose a strategy for defining infinite-dimensional asymptotic symmetries of Maxwell's theory in any dimension, eiher even and odd.

Primary authors: CAMPOLEONI, Andrea (Université de Mons); HEISSENBERG, Carlo (Nordita, Stockholm); DARIO, Francia (Centro Fermi, Roma Tre University and INFN)

Presenter: HEISSENBERG, Carlo (Nordita, Stockholm)

Session Classification: Gong Show/Poster

Contribution ID: **18** Type: **Gong Show/Poster**

Pseudo-Democratic Superstring Field Theory

Thursday, 19 December 2019 10:26 (7 minutes)

In recent progress in second quantization of the RNS string a crucial role is played by line integral Picture Changing Operators (PCO) which avoid the singularities associated with local PCOs.
We show how this approach can be generalized to a "democratic" theory involving vertices with arbitrary picture number. The usual cohomology problem in the Large Hilber Space can then be reformulated in terms of a dual problem with a two parameters gauge symmetry. The interactions then emerge in a way analogous to Berkovits' picture zero NS theory and do not exhibit an explicit A_∞ structure (possibly recoverable by field redefinitions). Batalin-Vilkovisky quantization is therefore expected to be nontrivial.

Primary author: GIACCARI, Stefano Gregorio (Holon Institute of Technology (HIT))

Co-author: Dr KROYTER, Michael (Holon Institute of Technology (HIT))

Presenter: GIACCARI, Stefano Gregorio (Holon Institute of Technology (HIT))

Session Classification: Gong Show/Poster

Contribution ID: **19** Type: **Gong Show/Poster**

Remark on the synergy between the heat kernel and the parity anomaly

Thursday, 19 December 2019 09:58 (7 minutes)

In this paper, we demonstrate that not only the heat kernel techniques are useful for the computation of the parity anomaly, but also the parity anomaly turns out to be a powerful mean in studying the heat kernel. We show that the gravitational parity anomaly on 4D manifolds with boundaries can be calculated using the general structure of the heat kernel coefficient a5 for mixed boundary conditions, keeping all the weights of various geometric invariants as unknown numbers. The symmetry properties of the η-invariant allow to fix all the relevant unknowns. As a byproduct of this calculation we get an efficient and independent crosscheck (and confirmation) of the correction of the general structure of a5 for mixed boundary conditions.

Primary authors: Mr KURKOV , Maxim (Università di Napoli "Federico II"); Mr LEONE, Lorenzo (University of Massachusetts Boston)

Presenter: Mr LEONE, Lorenzo (University of Massachusetts Boston)

Session Classification: Gong Show/Poster

Contribution ID: **20** Type: **Gong Show/Poster**

Warped throats, supersymmetry breaking and infinite distances

Thursday, 19 December 2019 09:51 (7 minutes)

I will explore the interplay between warped throats and some recently proposed quantum gravity conjectures, namely the Weak Gravity Conjecture (WGC) and the Distance Conjecture (DC). Motivated by the properties of systems of fractional branes at singularities, I will argue for a local version of the AdS-WGC, forbidding stable non supersymmetric Anti-de Sitter vacua, to large classes of locally AdS warped throats with supersymmetry breaking ingredients, and I will discuss some instability mechanisms in detail. Finally, I will show that warped throats of the Klebanov-Strassler (KS) kind describe fully backreacted solutions of transplanckiam axion monodromy, where the axion traverses arbitrarily large distances in field space, and comment upon the relation with the DC.

Primary authors: URANGA, Angel (Universidad Autonoma de Madrid); Dr GARCÍA-VALDECASAS, Eduardo; BURATTI, Ginevra (Instituto de Física Teórica UAM-CSIC); CALDERÓN, José (Instituto de Física Teórica UAM-CSIC)

Presenter: BURATTI, Ginevra (Instituto de Física Teórica UAM-CSIC)

Session Classification: Gong Show/Poster

Contribution ID: **21** Type: **Gong Show/Poster**

Holographic complexity

Thursday, 19 December 2019 09:44 (7 minutes)

My name is Ayoub Mounim. I am a Phd student in Naples and I am currently working on Holographic complexity.
The idea is that this should be a new entry in the holographic dictionary. In the bulk side we define a new gravitational observable given by the value of the on-shell action computed in a bounded subregion of Ads space known as "Wheeler-DeWitt patch". This particular region is bounded by null boundaries and this brings some subtleties in the calculations. This quantity is then conjectured to be the holographic dual of the "complexity" of the corresponding quantum field theory state that lives on the boundary of the space. What do we mean by complexity of a quantum field theory is still to be defined. We know how to define the computational complexity of a quantum state form quantum information theory, what we are doing is trying to adapt this concept to quantum field theories and better explore this conjecture.

Primary author: Dr MOUNIM, Ayoub (infn)

Presenter: Dr MOUNIM, Ayoub (infn)

Session Classification: Gong Show/Poster

Contribution ID: **22** Type: **Gong Show/Poster**

2d free field correlators, 3d dualities and E-string on Riemann surfaces

Thursday, 19 December 2019 09:37 (7 minutes)

Infra-red dualities for supersymmetric quantum field theories and their dimensional reductions can be effectively investigated using supersymmetric localization. With this technique we can compute exactly some protected quantities, like partitions functions e superconformal indices, that don't depend on the gauge coupling and should thus match between the dual theories. Morover, it allowed us to discover interesting correspondences, such as gauge/CFT correspondeces. I will discuss a particular relation of this kind, between $S^2 \times S^1$ partition functions of $3d\,\mathcal{N} = 2$ theories and $2d$ CFT correlators in the free field realization. This connection can be used to guess new $3d$ dualities starting from known identities for free field correlators. I will also show that these results can be further uplifted to $4d$. Unexpectedly, some of the resulting $4d\,\mathcal{N} = 1$ models turn out to correspond to the theories obtained from compactifications of the $6d\,\mathcal{N} = (1,0)$ E-string theory on Riemann surfaces with fluxes for its E_8 global symmetry. They enjoy interesting global symmetry enhancements that can be predicted from their $6d$ origin.

Primary author: SACCHI, Matteo (Bicocca)

Presenter: SACCHI, Matteo (Bicocca)

Session Classification: Gong Show/Poster

Contribution ID: **23** Type: **Gong Show/Poster**

3d S-Fold SCFTs and Supersymmetry enhancement

Thursday, 19 December 2019 09:30 (7 minutes)

A large class of 3d SCFTs can be engineered inserting a local SL(2,Z) duality wall into the Type IIB brane system leading to the so called S-fold SCFTs. These theories are intrinsically non Lagrangian, due to the gauging of the global symmetries of a $T(U(N))$ SCFT, thus playing the role of non-conventional matter. In this talk I will discuss the main features of S-fold SCFTs, focusing on their moduli space and how mirror symmetry relates them. The construction of these theories can be extended to various gauge groups, and in particular I will discuss the ones involving G_2 gauge group. Moreover, the issue of the amount of supersymmetry these theories possess in the IR will be addressed employing the computation of the supersymmetric index. In the end I will also mention some aspects of theories arising on the S-duality wall of $4d\ \mathcal{N} = 2\ SU(N)$ gauge theory with $2N$ flavours.

Primary author: GAROZZO, Ivan (Bicocca)

Presenter: GAROZZO, Ivan (Bicocca)

Session Classification: Gong Show/Poster

Contribution ID: **35** Type: **Gong Show/Poster**

Fuzzy dark matter from the axiverse: how viable?

Thursday, 19 December 2019 10:12 (7 minutes)

In recent years the idea of bosonic ultralight CDM (also called fuzzy dark matter, FDM) has been proposed, in one of its prominent versions it states that DM is made of ultralight axion-like particles that form halos as Bose-Einstein condensates. In this theory each axionic particle can develop structures on de Broglie scale thanks to gravitational effects. A prominent soliton, i.e. a state where self-gravity is balanced by the effective pressure arising from the uncertainty principle, develops at the center of every bound halo. The extremely high value of the decay constant together with the possible multiple axionic nature of FDM have been claimed to be a possible sign in favour of the string axiverse, where a plenitude of axion like particle naturally arise in 4D effective theory. I will point out that obtaining a fuzzy dark matter axion with the correct mass and decay constant is a big challenge for string theory, being also its existence in contrast with WGC .

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Session Classification: Gong Show/Poster