Boundary and Defect Conformal Field Theory: Open Problems and Applications

Thursday, September 7, 2017 - Friday, September 8, 2017

Scientific Program

Talks

Natan Andrei (Rutgers)
Title: "Quantum Impurities in Interacting Environment"
talk slides

Agnese Bissi (Harvard)
Title: "Loop Corrections to Supergravity"
talk slides

John Cardy (Berkeley and Oxford)
Title: "RG Flows and Boundary States in 2d Systems"
Abstract: We propose using smeared boundary states $e^{-\tau H}|\cal B\rangle$ as variational approximations to the ground state of a conformal field theory deformed by relevant bulk operators. This is motivated by recent studies of quantum quenches in CFTs and of the entanglement spectrum in massive theories. It gives a simple criterion for choosing which boundary state should correspond to which combination of bulk operators, and leads to a rudimentary phase diagram of the theory in the vicinity of the RG fixed point corresponding to the CFT.
talk slides

Patrick Dorey (Durham)
Title: "Breaking Integrability at the Boundary"
talk slides

Nadav Drukker (King's College London)
Title: "Energy-momentum Multiplets for Supersymmetric Defects and the Displacement Operator"
talk slides

Johanna Erdmenger (Wuerzburg)
Title: "A Kondo Model Within Gauge/Gravity Duality"
Abstract: An AdS/CFT gravity dual of a particular variant of a single-channel Kondo model with SU(N) spin is introduced and used to calculate spectral functions, the impurity entropy and quantum quenches. This model describes a magnetic impurity interacting with a strongly coupled electron system. It has a boundary RG flow triggered by the Kondo operator. At large N, it is convenient to write the spin operator as a bilinear in two Abrikosov auxiliary fermions. The screened phase is characterised by a condensate of an operator involving an electron and an Abrikosov fermion. The spectral function displays Fano and Kondo resonances characterised by the quasinormal modes (QNM) of the dual gravity solution. The QNM's also determine the late-time behaviour after a quantum quench. The impurity entropy agrees with large N field theory results, subject to identifying a particular geometrical scale with the Kondo correlation length.
talk slides

Daniel Friedan (Rutgers and Iceland)
Title: "A New Kind of Quantum Field Theory of (n-1)-dimensional Defects in 2n Dimensions"
Abstract: I describe a project to develop a new kind of constructible conformal field theory in 2n dimensions. For each ordinary 2d cft, there is to be a corresponding new cft of (n-1)-dimensional defects in any 2n-dimensional conformal space-time manifold M. The quantum fields live on "quasi Riemann surfaces", which are certain complete metric spaces of integral (n-1)-currents in M. These metric spaces have analytic structure analogous to ordinary Riemann surfaces. The new cfts are to be constructed on the quasi Riemann surfaces by analogy with the construction of ordinary 2d cfts

on ordinary Riemann surfaces. The global symmetry group of the ordinary 2d cft will become the gauge group of a local gauge symmetry in the new cft. I envision a wide expanse of new quantum field theory to explore. See http://www.physics.rutgers.edu/~friedan/#res for the slides of the talk and other material.
talk slides

Dmitri Fursaev (Dubna State)
Title: "BCFTs: Anomalies, Entanglement, and Holography"
talk slides

Anatoly Konechny (Henriot-Watt and Maxwell Inst.)
Title: "RG Boundaries and Interfaces in Ising Field Theory"
Abstract: Perturbing a CFT by a relevant operator on a half space and letting the perturbation flow to the far infrared we obtain an RG interface between the UV and IR CFTs. If the IR CFT is trivial we obtain an RG boundary condition. The space of massive perturbations thus breaks up into regions labelled by conformal boundary conditions of the UV fixed point. For the 2D critical Ising model perturbed by a generic relevant operator we find the assignment of RG boundary conditions to all flows. We use some analytic results but mostly rely on TCSA and TFFSA numerical techniques. We investigate real as well as imaginary values of the magnetic field and, in particular, the RG trajectory that ends at the Yang-Lee CFT. We argue that the RG interface in the latter case does not approach a single conformal interface but rather exhibits oscillatory non-convergent behaviour.
talk slides

Charlotte Kristjansen (NBI Copenhagen)
Title: "One- and Two-point Functions in AdS/dCFT and Integrability"
Abstract: We consider one and two-point functions in a certain defect version of N=4 SYM which has a well-known holographic dual. One-point functions of scalar operators are expressed in a closed form at tree level and at one loop using the planar integrability of N=4 SYM. In particular, we find a precise match with a string theory prediction for the one-point function of a chiral primary in a certain double scaling limit. In addition, we exploit the operator product expansion (OPE) and the boundary operator expansion (BOE), which form the basis of the boundary conformal bootstrap equations, to extract conformal data both about the defect CFT and about N=4 SYM theory without the defect. From the knowledge of the one- and two-point functions of the defect theory, we extract certain structure constants of N=4 SYM theory using the (bulk) OPE and constrain certain bulk-bulk-to-boundary couplings using the BOE.
talk slides

Yu Nakayama (Rikkyo)
Title: "CFTs on Real Projective Space"
Abstract: I will discuss how to solve CFTs on d-dimensional real projective space from the bootstrap method. After seeing how it worked in Ising model in d=2 dimensions, we present numerical predictions in d=3 dimensions as well as analytical solutions in d=4-epsilon dimensions. I also discuss the connection between crosscap states and bulk local operators in holography.
talk slides

Shinsei Ryu (Chicago)
Title: "BCFT and SPT phases"
Abstract: I will discuss an application of BCFT to understand the physics of symmetry-protected topological (SPT) phases in (1+1) and (2+1) dimensions. For the case of (1+1)d SPT phases, BCFT arises in the effective description of the entanglement spectrum, and can be used to extract the topological invariants of the SPT phases. In the (2+1)d setting, the edge states of (2+1)d SPT

phases can be described by a CFT. Quantum anomalies (of various kinds) of the CFT can be used as an diagnose of the corresponding bulk (2+1)d SPT phases.
talk slides

Cornelius Schmidt-Colinet (LMU Munich)
Title: "Double Trace Interfaces"
Abstract: In the case where the two boundary conditions for a scalar field on AdS_d both lead to unitary CFTs on the AdS boundary, we consider the situation where both CFTs are present and separated by the corresponding renormalization group interface. We compute the scalar two-point correlation functions and the interface free energy at large N in AdS, and perform some checks on the CFT side.
talk slides

Volker Schomerus (DESY)
Title: "Harmony of Defects"
Abstract: Boundaries and more general defects can play an important role in the conformal bootstrap. Correlation functions involving such non-local objects involve a large variety of different conformal blocks. I describe a systematic theory of such blocks in any dimension.
talk slides

Christoph Schweigert (Hamburg)
Title: "CFT with and without Boundaries: From a Holographic Pictures to Logarithmic Conformal Field Theories"
Abstract: We recall how boundary states (and general correlators of a 2d RCFT) can be understood in terms of knots and links in 3-manifolds. We then explain how some recent results on such correlators in logarithmic conformal field theories.
talk slides

Balt van Rees (Durham)
Title: "On QFTs in AdS"
talk slides

Gerard Watts (King's College London)
Title: "Defects in the Tri-critical Ising Model"
talk slides