Title: Session 1 - Yangrui Hu

Speakers: Yangrui Hu

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Perimeter-B
Representation
CCFT
Correlators
Nonlinear
Light-ray Operators
Superconformal
ANEC
Polytopic
Amplitudes
Offshell
Colliders
Component
Virasoro
Recursion
Born-Infeld
Algebra
Celestial
SYK
Superfield
Deformation
Holography
Conformal Block
Supergravity
Yangrui Hu Oct 24 2022

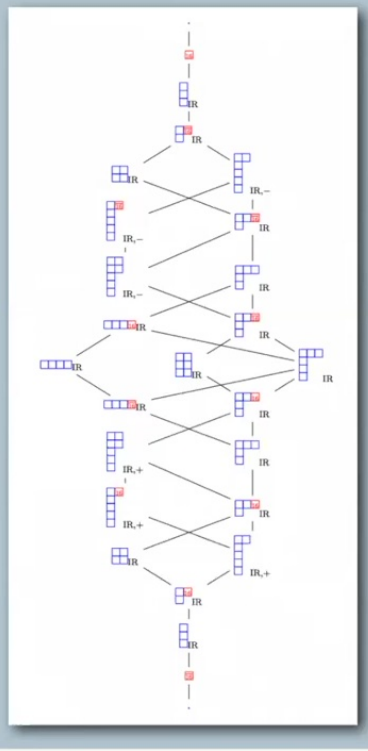
A little bit of my research background

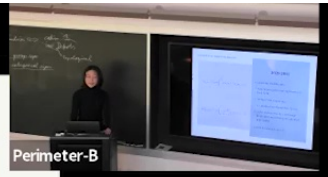
2018-2021

- Higher-dimensional Supergravity
- Polytopic SUSY Representation Theory
- 1D, N=4 SYK models
- SUSY Holography Conjecture

with S.J. Gates

$$\mathfrak{su}(32) \supset \mathfrak{so}(1,10) \quad \Rightarrow \quad \mathcal{R}_{\mathfrak{su}(32)} \xrightarrow{\text{branching rules}} \bigoplus \mathcal{R}_{\mathfrak{so}(1,10)}$$





A little bit of my research background

$$\tilde{A}_n(\Delta_i, z_i, \bar{z}_i) = \int_o^\infty d\omega_i\, \omega_i^{\Delta_i - 1} A_n(\omega_i, z_i, \bar{z}_i)$$

$$\mathbf{L}[\mathcal{O}_{h,\bar{h}}](z, \bar{z}) = \int_{\mathbb{R}} \frac{dz'}{|z' - z|^{2-2h}} \mathcal{O}_{h,\bar{h}}(z', \bar{z})$$

2021~2022

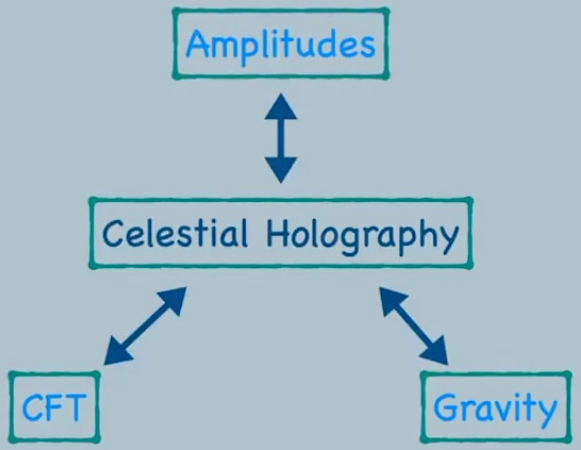
- Celestial Amplitudes
- Dual superconformal symmetry in N=4 SYM
- Differential Equations
  - Celestial vs Momentum Space
- Light transforms & conformal block decompositions of celestial amplitudes

with M. Spradlin & A. Volovich

Celestial Holography Program

Celestial Holography initiative

Quantum Gravity in Asymptotically Flat Spacetime ⟷ Codim-2 Celestial CFT



Stress Tensor Light-ray Operators

Algebra?

Conformal Collider Physics

Higher Spin Dynamics in Gravity

Celestial Holography

- Hofman-Maldacena: Average Null Energy Condition (ANEC) operator

$$\mathscr{E}(\vec{n}) = \lim_{r\to\infty} r^2 \int_0^\infty dt\, n^i T^0{}_i(t, r\vec{n})$$

- Cordova-Shao: smeared stressed tensor light-ray ops form an algebra which has BMS subalgebra
- ANEC smeared along the $\mathscr{I}^+$ forms Virasoro

work in progress w/ S. Pasterski

- BCFW: 3pt + large-z + unitarity + locality
- CCFT: symmetry + spectrum + OPE
- How they encoded in one another?

Celestial Holography

Celestial Holography Dictionary

Celestial Recursion

Revisiting the OPEs

work in progress w/ S. Pasterski

TTbar-like Flow Interpretations for Supersymmetric BI

- 3D, N=1 supersymmetric Born-Infeld Theories [Hu, Koutrolikos, 22]
- Maxwell $\xrightarrow{T\bar{T}}$ Born-Infeld

$$\frac{\partial \mathscr{L}}{\partial \lambda} = \frac{1}{2} T^{ab} T_{ab} - \frac{1}{3} (T^a{}_a)^2 - \frac{1}{3} (T^a{}_a) \cdot \sqrt{T\bar{T}} \qquad d = 3$$

- Supersymmetric Maxwell $\xrightarrow{T^2}$ supersymmetric Born-Infeld
  - 2D and 4D cases have been extensively studied

$$\frac{\partial \mathscr{L}}{\partial \lambda} = \int d^{\#}\theta \, \mathcal{O}_{T^2} + \text{total derivatives} + \text{EOM}$$

  - 3D, N=1 ?

work in progress w/ C. Ferko, K. Koutrolikos, G. Tartaglino-Mazzucchelli

Thank You!
Perimeter-B