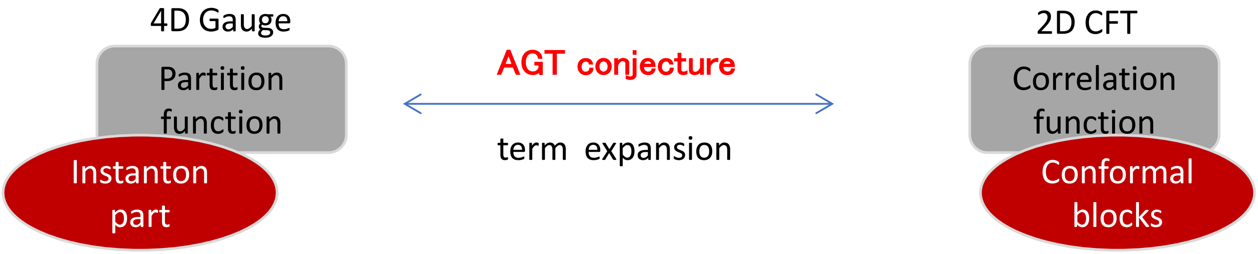
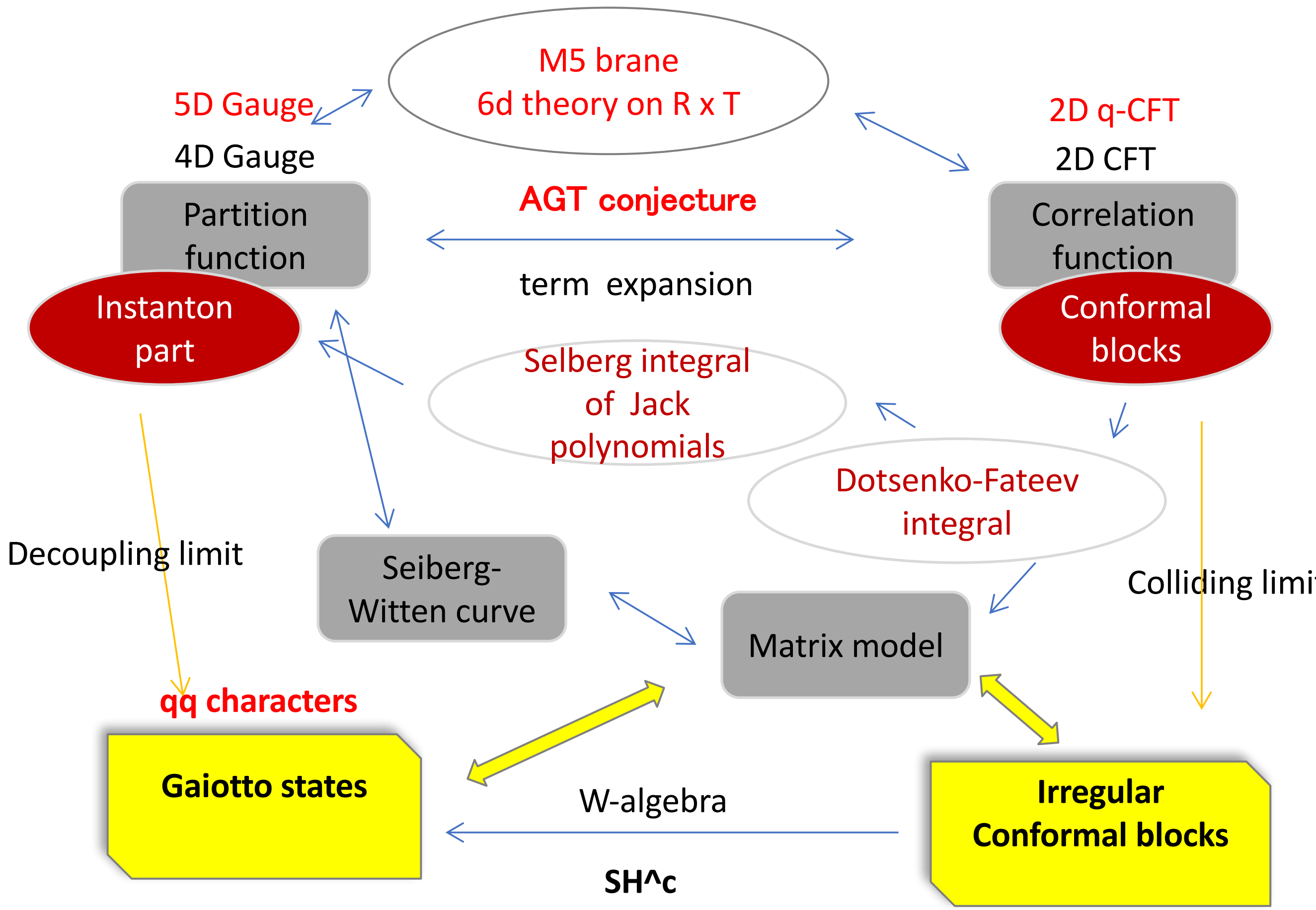
SUPERSYMMETRIC YANGIAN, DIM ALGEBRA, AND AGT RELATION

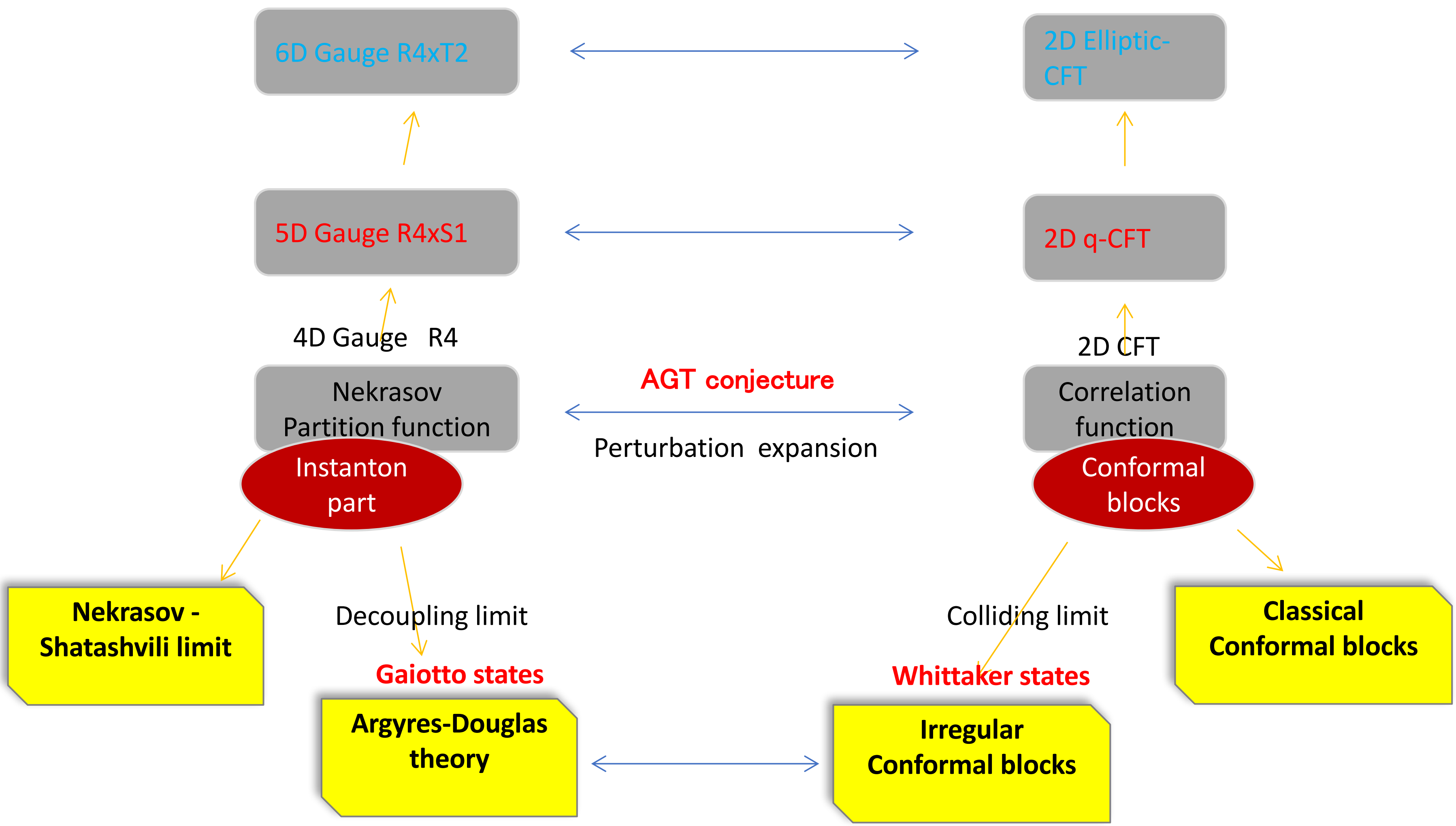
Hong ZHANG

Institute of Theoretical Physics, CAS

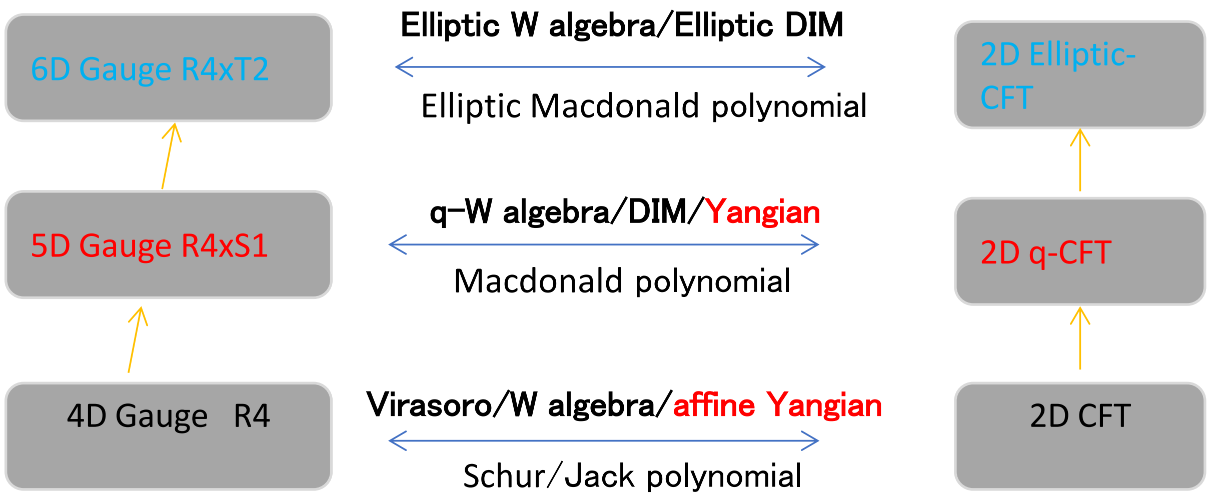
(in Collaboration with **M. Gaberdiel**, **W. Li** and **C. Peng**, arXiv:1711.07449)

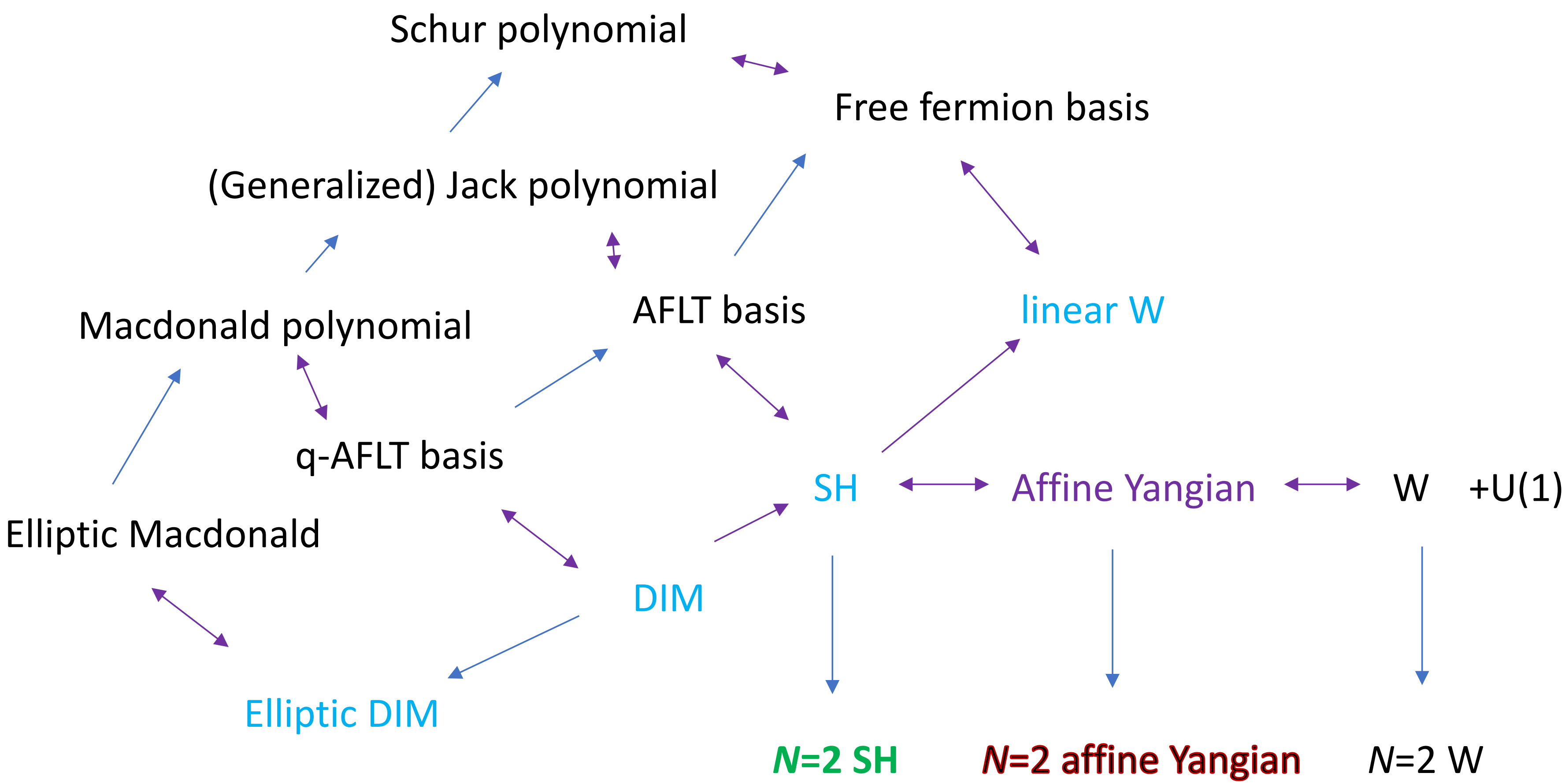

4D Gauge
Partition function
Instanton part
AGT conjecture
term expansion
2D CFT
Correlation function
Conformal blocks


M5 brane
6d theory on R x T
5D Gauge
4D Gauge
2D q-CFT
2D CFT
Partition function
AGT conjecture
term expansion
Correlation function
Instanton part
Conformal blocks
Selberg integral of Jack polynomials
Dotsenko-Fateev integral
Decoupling limit
Seiberg-Witten curve
Colliding limit
Matrix model
qq characters
Gaiotto states
W-algebra
SH^c
Irregular Conformal blocks



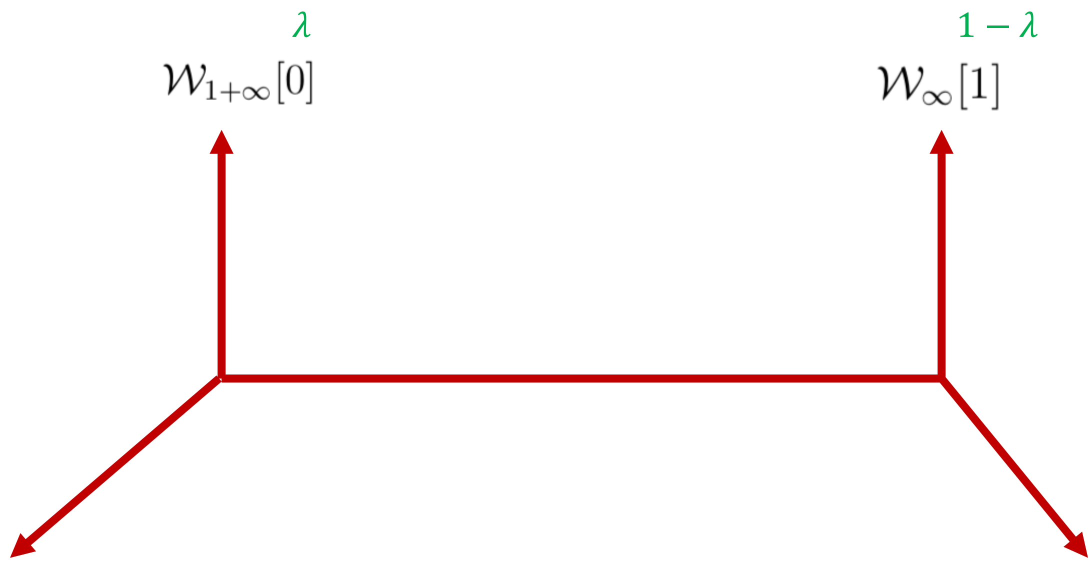
6D Gauge R4xT2
2D Elliptic-CFT
5D Gauge R4xS1
2D q-CFT
4D Gauge R4
2D CFT
AGT conjecture
Nekrasov Partition function
Correlation function
Perturbation expansion
Instanton part
Conformal blocks
Nekrasov - Shatashvili limit
Decoupling limit
Colliding limit
Classical Conformal blocks
Gaiotto states
Whittaker states
Argyres-Douglas theory
Irregular Conformal blocks


6D Gauge R4xT2
Elliptic W algebra/Elliptic DIM
Elliptic Macdonald polynomial
2D Elliptic-CFT
5D Gauge R4xS1
q–W algebra/DIM/Yangian
Macdonald polynomial
2D q-CFT
4D Gauge R4
Virasoro/W algebra/affine Yangian
Schur/Jack polynomial
2D CFT


Schur polynomial
Free fermion basis
(Generalized) Jack polynomial
AFLT basis
linear W
Macdonald polynomial
q-AFLT basis
SH
Affine Yangian
W +U(1)
Elliptic Macdonald
DIM
Elliptic DIM
N=2 SH
N=2 affine Yangian
N=2 W

$$\mathrm{shs}[\lambda]^{(\mathrm{bos})} \cong \mathrm{hs}[\lambda] \oplus \mathrm{hs}[1-\lambda]$$

$$\mathcal{W}_{\infty}^{(\mathcal{N}=2)}[\lambda]$$

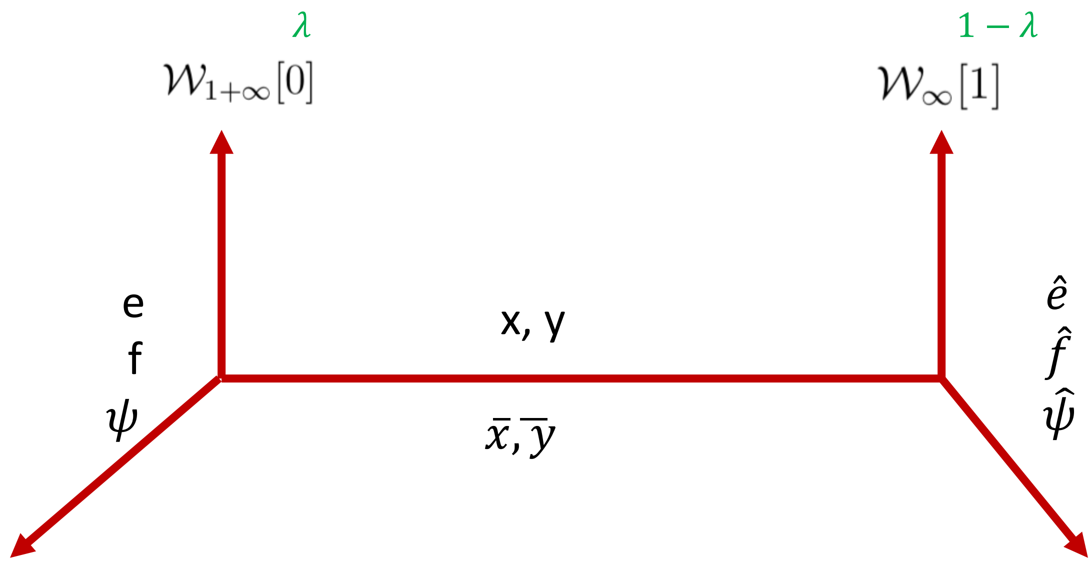


- Central charge
- Character
- explicit form in free field limit
- OPE check
- relation with N=2 W

$$\mathrm{shs}[\lambda]^{(\mathrm{bos})} \cong \mathrm{hs}[\lambda] \oplus \mathrm{hs}[1-\lambda]$$

$$\mathcal{W}_{\infty}^{(\mathcal{N}=2)}[\lambda]$$

$$\mathcal{W}_{N,k}^{(\mathcal{N}=2)} \supset \mathcal{W}_{N,k} \oplus \mathcal{W}_{k,N}$$

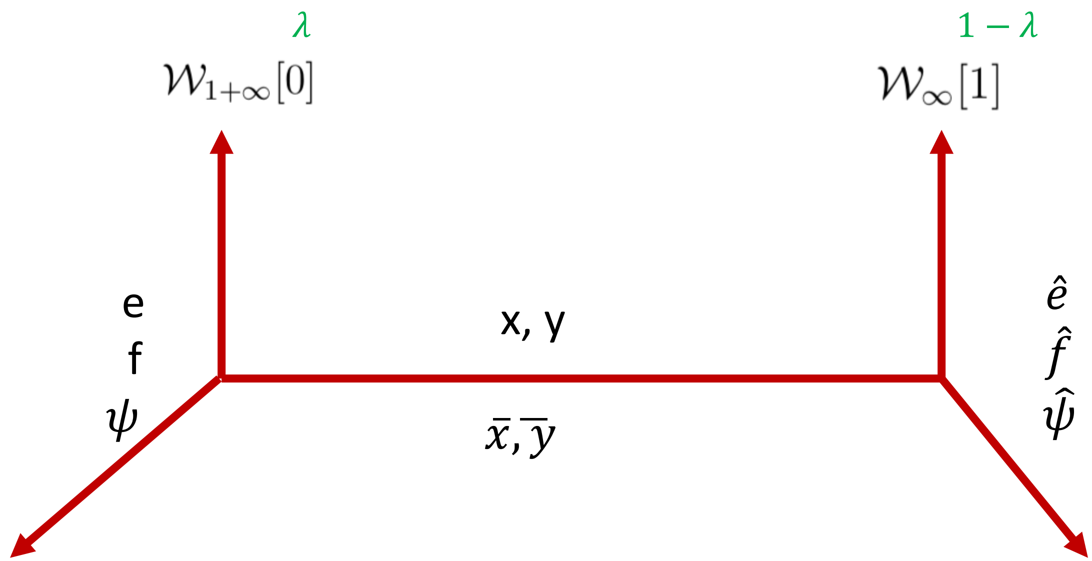


- Central charge
- Character
- explicit form in free field limit
- OPE check
- relation with N=2 W

$$\mathrm{shs}[\lambda]^{(\mathrm{bos})} \cong \mathrm{hs}[\lambda] \oplus \mathrm{hs}[1-\lambda]$$

$$\mathcal{W}_{\infty}^{(\mathcal{N}=2)}[\lambda]$$

$$\mathcal{W}_{N,k}^{(\mathcal{N}=2)} \supset \mathcal{W}_{N,k} \oplus \mathcal{W}_{k,N}$$



- Central charge
- Character
- explicit form in free field limit
- OPE check
- relation with N=2 W
- explicit form away from Free field limit
- plane partition representation check

Ding-Iohara-Miki algebra

$$e(z) = \sum_{k\in\mathbb{Z}} e_k z^{-k}, \quad f(z) = \sum_{k\in\mathbb{Z}} f_k z^{-k}, \quad \psi^{\pm}(z) = \sum_{k\geq 0} \psi^{\pm}_{\pm k} z^{\mp k},$$

$$e(z)e(w) = h(w/z)e(w)e(z), \quad f(z)f(w) = h(z/w)f(w)f(z),$$
$$\psi^{\pm}(z)e(w) = h(w/z)e(w)\psi^{\pm}(z), \quad \psi^{\pm}(z)f(w) = h(z/w)f(w)\psi^{\pm}(z),$$

$$[e(z), f(w)] = \frac{1}{\gamma_1}\delta\left(\frac{z}{w}\right)(\psi^+(z) - \psi^-(z)),$$
$$[\psi^{\pm}(z), \psi^{\pm}(w)] = [\psi^+(z), \psi^-(w)] = 0,$$
$$[e_0, [e_1, e_{-1}]] = 0, \quad [f_0, [f_1, f_{-1}]] = 0,$$

$$h(z) = \prod_{\alpha=1,2,3} \frac{1 - q_\alpha^{-1} z}{1 - q_\alpha z}, \quad \gamma_1 = \prod_{\alpha=1,2,3} (1 - q_\alpha)$$