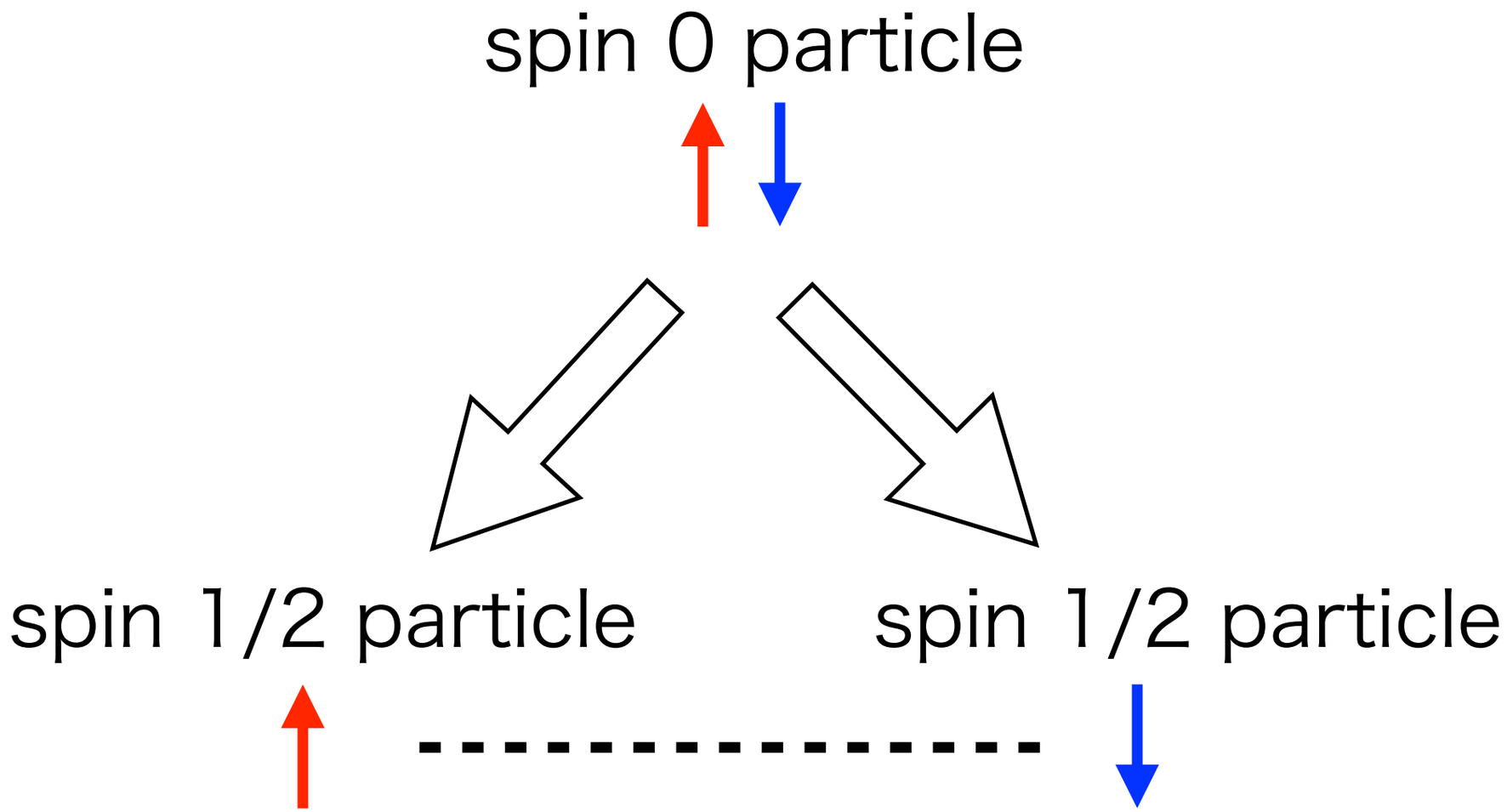
Entanglement in quantum physics

Mitsuhiro Nishida (Osaka University)

Entanglement is a non-local correlation.

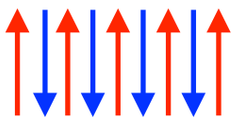


Why entanglement is important?

Entanglement can classify phases.

Symmetry breaking

Ferromagnet



Antiferromagnet

Entanglement
(Non-local order)

Quantum liquid
(No symmetry breaking
at zero temperature)

Entanglement can be measured experimentally.

ultracold bosonic atoms
in optical lattices

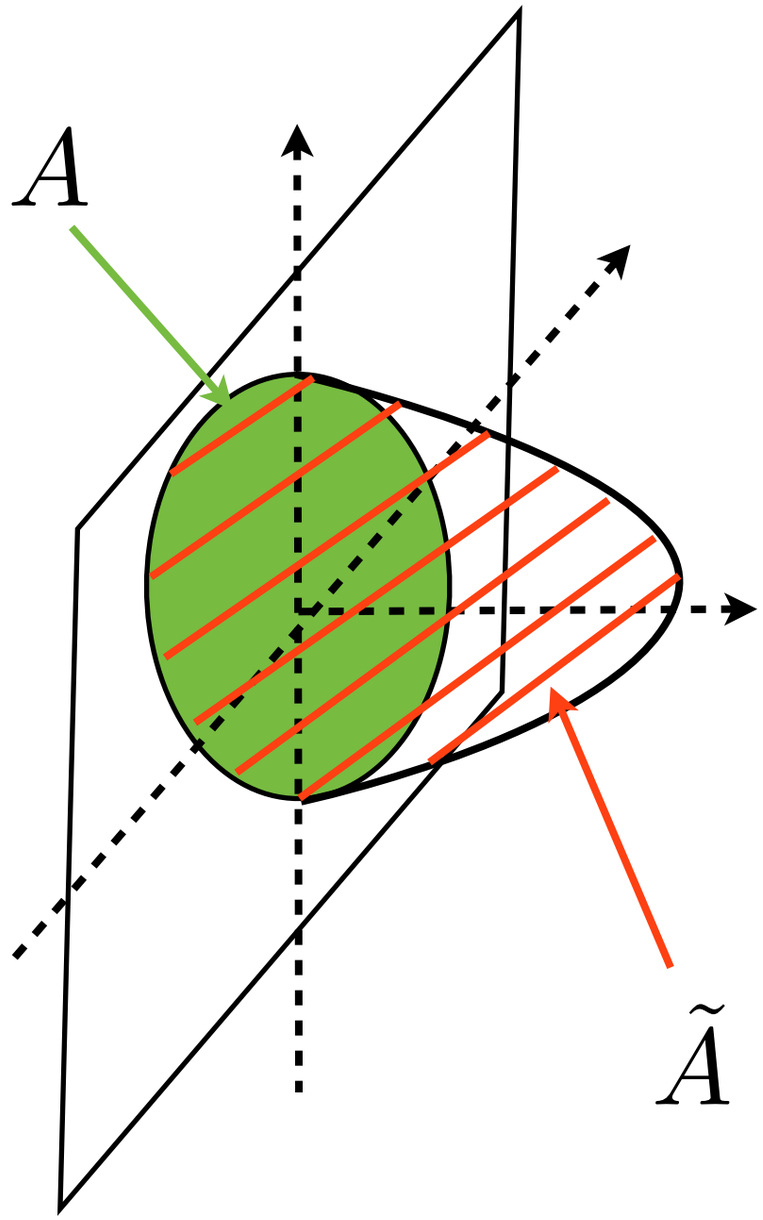
[Islam, Rajibul, et al. *Nature* **528**.7580 (2015): 77-83. Figure 4a]

Entanglement can be described by holography.

Ryu-Takayanagi formula

$$S_A = \frac{\mathrm{Area}(A)}{4G_N}$$

[S. Ryu, T. Takayanagi, 2006]



Summary

- Entanglement is an important non-local order.

- Entanglement is a useful concept in various fields.