Field theory dualities via string dualities

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I’m a HEP-TH person. I work with:

string theory

quantum field theory

geometry

My past research:

AdS/CFT

supersymmetric CFTs

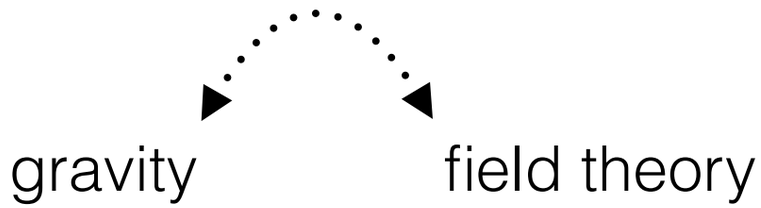
F-theory

the common theme is:

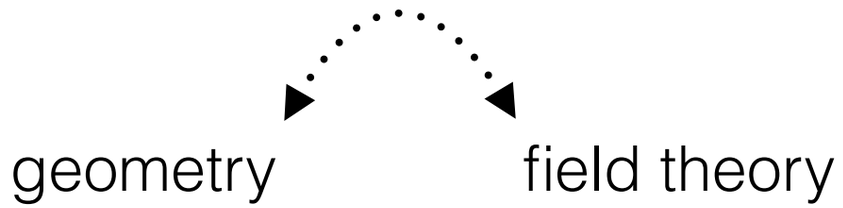
duality

two descriptions of same physics.
each is useful, and more adapted to certain regime.
exploit both to calculate different observables

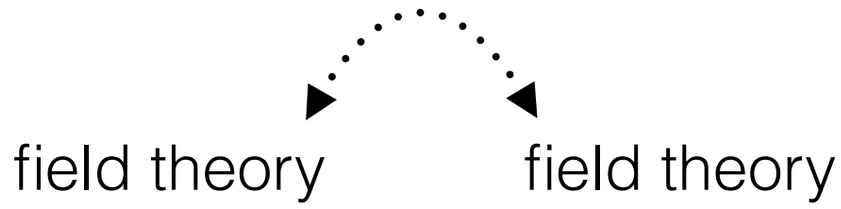
AdS/CFT



F-theory



supersymmetric CFTs



FELLINI project

produce new such dualities
between field theories
(susy & non-susy)

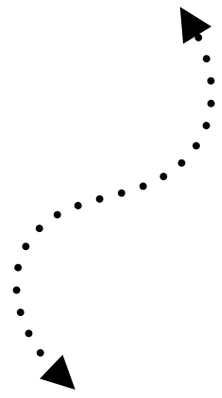
derive them from known ones

embed field theory in string theory:
geometrize the duality

one example

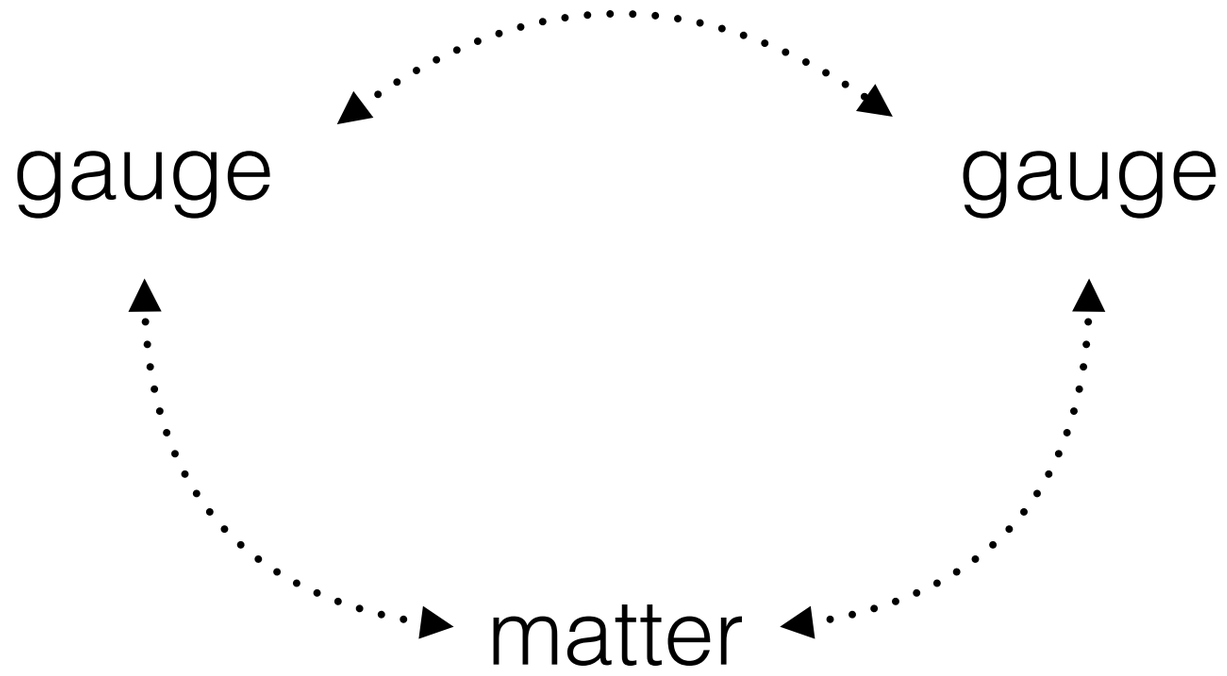
in 3d, matter fields can be dual
to a gauge theory (with matter and interactions)

Dirac fermion



scalar field + gauge
(special kinetic term: Chern-Simons, not Yang-Mills)

generalize this picture & create new dualities



conjectured duality tested exactly

each ‘duality frame’ has favorable characteristics,
invisible in the other frames

why all this?

useful e.g. to theoretically model
condensed matter systems

understand space of QFTs
(especially non-susy,
connecting dimensions)

progress:

we found a ‘triality’ in 3d with as little susy as possible

now construct generalization.
does it fit in a(n infinite) family?
does it extend to zero susy?
does it come from higher dimensions (e.g. 6d)?

secondment?

?

collaborations?

already many in Milano-Bicocca and Milano

organization?

workshop in Milan with other INFN members.
invite collaborators for extended periods

long-term expectations?

tenure position

Thanks