



## Prof. Yi Yang / Department of Electrophysics

### String Theory, Gravity Theory, Field Theory

We are high energy theoretical physics research group. Our research focus on some string theory related topics. Currently, we are interested in two topics:

- Gauge/gravity correspondence** is a holographic duality between two theories at different space-time dimensions. One of the most important properties about this correspondence is strong-weak duality. We can use this property to understand a strongly-coupled theory by studying its weakly-coupled dual theory. Gauge/gravity correspondence has been applied to various physical systems:
  - Construct holographic QCD models and study the phase structure of QCD at finite temperature and finite density, as well as external electromagnetic field.
  - Study fluid/gravity correspondence to investigate the effects of external matter fields and higher order terms on the fluid dynamical equation.
  - Using the method of Kerr/CFT duality to understand the black hole entropy in terms of microscopic entropy of its dual conformal field theory.
  - Construct holographic models to study different strongly-coupled systems in condensed matter Theory, such as quantum Hall effect and topological insulators.
- String scattering amplitudes** is an important quantity to understand the symmetry of string theory. At certain limits, the symmetry of string amplitudes will be realized.
  - In high energy, fixed angle limit, we find that there is a linear relations among different string amplitudes with the ratios explicitly calculated.
  - In high energy, small angle limit (Regge), we find the string amplitudes can be expressed in terms of Appell functions, whose recurrence relations produce the relations among string amplitudes.
  - For each string state, there is a string BCJ relation between s-t and t-u channels string amplitudes. In low energy limit, the string BCJ relation induces to the BCJ relations in gauge theory.