# A Holistic View on Hyper-Dense Heterogeneous and Small Cell Networks

## Massive MIMO:

### Advantage:

* Provides significant capacity gain
* improve energy efficiency

### Disadvantage:

* 被天线的空间分布所决定的系统自由度会由于散射信道的固有属性而饱和（达到瓶颈）
* 大量天线的信道估计和feedback非常难。（is an inherent challenge)
* High deployment cost for guaranteeing the minimum antenna spacing of the large arrays with many radio frequency chains is a very practical problem.

## Hyper-Dense HetSNets

Hyper-Dense HetSNets are motivated by rethinking the network deployment principle: to bring the network close to the users to offer unprecedented capacity.

### Advantage:

* The cost of deployment in HetSNets is much lower than that of macrocells.
* HetSNets are energy efficient as they can be in dormant state.（异构网络可以根据traffic实际情况选择休眠，从而minimize 能耗和干扰）
* 异构网络可以通过handover和offloading实现always nest connected principle.

### Technical Challenges in HetSNets

* Intercell Interference
* In-Device Interference(Self-Interference)
* Unplanned Deployment
* Mobility Management
* Privately Owened Small Cells