SAMOVAR PhD day 2021

Bayesian statistical methods for joint user activity detection, channel estimation, and data decoding in dynamic wireless networks

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- **IOT**

FIGURE 1: Internet of things

5G Communications(2)

Applications

- Cloud services
- Emergency communications
- Service in crowded areas

Technical requirements

- High data rates
- Super real-time and reliable connections

Problems

- Sporadic activity of the users
- Low data rates and flexible latency requirements
- Allocation of whole resource blocks to such devices would be the wastage of resources

Grand-based and Grant-free access

Grant-based access

- Users(UE) send preamble, Base station sends resources, UE sends access request with identifier, BS sends contention resolution
- High energy consumption, High delay, Less chances of access

Grant-free access

- Users send data on grant-free resources
- Advanced signal processing at receiver
  1. Data decoding/demodulation
  2. Channel estimation
  3. User-activity detection (Specific to Grant-free access)

SUB-PROBLEMS

SUB-PROBLEMS

1. Static synchronous multi-access channel, known channel state information(CSIR)
2. Static synchronous multi-access channel, unknown or partially known CSIR
3. Dynamic asynchronous multi-access channel, known CSIR
4. Dynamic asynchronous multi-access channel, unknown or partially known CSIR or may vary according to a dynamic model

STATISTICAL SIGNAL PROCESSING ALGORITHMS

- Sum-product algorithm
- Expectation propagation algorithm
- Approximate message passing algorithm