Fault Tolerance

Types of Faults

- **Persistent: happens during every retry**
- **Intermittent: persistent but happens occasionally**
- **Transient: temporary, retrying mostly works**

Measuring Fault Tolerance

- **MTTF: mean time to failure**
- **MTTR: mean time to recovery**
- **MTTB: mean time between failures**
  = MTTF + MTTR
- **Availability**

Techniques to Increase Fault Tolerance

- **Coding**
  - Forward Error Correction:
    Send extra information to correct errors (when it is hard to retransmit)
  - Backward Error Correction:
    Send extra information only to detect errors (ask sender to retransmit corrupted data)
- **Replication**
- **Voting: Compare results from replicas and pick majority**

Replication of Data

- **Mirroring: Simultaneously write to every replica**
- **Backup: Write to primary replica. Primary propagates to backup replicas later.**
- **Partition: Divide data among several replicas**