Information Collection for Complex Biological Systems

- What information, sensors and networks required for understanding complex and adaptive biological systems?
- What are the constraints and challenges limiting the implementation of information and physical networks in complex system studies?
- What are the interfaces and their implementation between biological objects and electronics?

- Preetam, Radha, Chengde, Reshma, Zohar, Douglas, Mana, Nitia, Chris, Tom, Herbert, Kalyan, JC
Information Collection for Complex Biological Systems

• What information, sensors and networks required for understanding complex and adaptive biological systems?

• Internal network: neural network, brain, GI system, muscles, organs
• Body network: prosthesis, therapeutic treatment, assisted living, safety
• Individual network: human or animal centric network (star network), environment/behavior studies
• Group network: small, medium and large population (mesh network), interaction and individual behaviors, group behaviors
• Adaptive system behaviors
• Complex system parameters
Information Collection for Complex Biological Systems

Using wireless sensors and wireless networks
• Different way to conduct scientific studies
• Massive data collection
• High throughput
• System complexity
  • Environment/Eco systems
  • Data -> Information-> Decision
  • Biodiversity and biopatterns
  • Medical vs biological problems
• Adaptive system – continuous data collection
• Information driven discovery (vs model driven)
• Information collection and influencing
Information Collection for Complex Biological Systems

What are the constraints and challenges limiting the implementation of information and physical networks in complex system studies?

• Distinguishing data
• Cost issues: (Both pros and cons)
  • Density of sensors/coverage
  • Data collecting mechanisms
  • Existing infrastructures: cellular phones, Apps
  • Biological sensors: animal tagged with sensors or engineered biological sensors
• Control systems (models)
• Sampling, accuracy, system variation
• Micro/Macro/Meso environment sand interfaces
What are the **interfaces** and their **implementation** between biological objects and electronics?

- Feedback – bidirectional?
- Sensor lifetime/retreat
- Define problems and hypothesis
  - Energy efficiency for collecting data
  - Complex systems
- Testbeds for experiments