Embodied Robot: Sensing → Fusion → LLM Planning → Adaptive Control → Safety RA → Actuation

**Sensors**
- RGB-D Camera
- LiDAR
- Tactile
- Proprioception (IMU/Joint States)

**Fusion Layer**
- Sync + Calibration
- State Estimation (UKF / Factor Graph)

**LLM Planner**
- Context Encoding (scene summary)
- Constrained Prompting + Confidence Gating

**Adaptive Control**
- PID/Impedance or MPC (online gain tuning)

**Runtime Assurance (Safety)**
- Monitors (invariants, innovation, collision)
- Safety Filter (project to safe set)

**Actuators**
- Base Velocity
- Arm Joints

nominal cmd

proposed cmd

state/confidence

constraints