# Survey Paper Topics -

1. AI for energy-efficient computing
2. AI in edge cloud collaborative architectures
3. Multi-Agent collaboration in embodied AI

# 1. AI for Energy-Efficient Computing

**Scope:**
Covers AI algorithms and system optimizations aimed at reducing power consumption — model compression, quantization, neuromorphic hardware, green data centers, energy-aware scheduling.

**Why it's promising:**

- Sustainability + AI is a **hot IEEE vertical**.
- Strong cross-disciplinary pull (AI + hardware + green tech).
- Governments and industry pushing net-zero targets → relevance to funding & citations.

**Research gap:**

- Many papers focus on specific optimizations; fewer surveys integrate **algorithmic, hardware, and deployment perspectives** together.

**Potential IEEE fit:** *IEEE Transactions on Sustainable Computing*, *IEEE Access*, *IEEE Transactions on Green Communications and Networking*.

**Papers**

## AI for Energy-Efficient Computing

- A 2022 survey focused on **optimization models for energy-efficient computing systems**, particularly in CMOS-based architectures, scheduling, and power-aware ICT systems MDPI.
- A broader **2024 open-access survey** addresses green computing for massive IoT networks—covering edge, fog, and cloud paradigms, with energy-aware architecture, hardware, scheduling, and virtualization ScienceDirect.

# 2. AI in Edge–Cloud Collaborative Architecture

**Scope:**
Focuses on hybrid AI deployments that split workloads between **edge devices** (low-latency inference) and **cloud servers** (heavy model training/storage).

**Why it's promising:**

- Growing due to IoT, autonomous vehicles, and 5G/6G networks.
- Edge–cloud orchestration + AI model partitioning is relatively **under-surveyed compared to cloud-only AI**.
- Fits industrial IoT, telco, and smart city research agendas.

**Research gap:**

- Need for integrated review of **model offloading, energy trade-offs, privacy, and latency** under real-world constraints.

**Potential IEEE fit:** *IEEE Internet of Things Journal*, *IEEE Transactions on Cloud Computing*, *IEEE Network*.

**Papers**

## AI in Edge–Cloud Collaborative Architecture

- **"Edge-Cloud Polarization and Collaboration: A Comprehensive Survey for AI"** – arXiv (Nov 2021)
  Reviews architectures and collaborative mechanisms between edge and cloud for AI workloads. arXiv
- **"A Survey on Collaborative DNN Inference for Edge Intelligence"** – arXiv (July 2022)
  Focuses on collaborative inference models involving cloud, edge, and end devices. arXiv
- **"A Survey on Integrated Computing, Caching, and Communication in the Cloud-to-Edge Continuum"** – *Computer Communications* (Elsevier, April 2024)
  Open-access review of AI-driven resource coordination in edge-cloud architectures. ScienceDirect

# 3. Multi-Agent Collaboration in Embodied AI

**Scope:**
Reviews systems where **multiple AI agents**, often with physical embodiments (robots, drones, vehicles), collaborate in real-world or simulated environments.

**Why it's promising:**

- Combines **reinforcement learning, robotics, and communication protocols**.
- Strong novelty — multi-agent + embodied setting is still **underrepresented in surveys** compared to single-agent or disembodied agents.
- Huge relevance for autonomous fleets, swarm robotics, and collaborative manufacturing.

**Research gap:**

- Very few comprehensive surveys that unify **perception, decision-making, coordination, and embodiment**.
- Emerging area — could set a benchmark in IEEE literature.

**Potential IEEE fit:** *IEEE Transactions on Robotics*, *IEEE Transactions on Cognitive and Developmental Systems*, *IEEE Access*.

**Papers**

## Multi-Agent Collaboration in Embodied AI

- **"Multi-agent Embodied AI: Advances and Future Directions"** – arXiv (May 2025)
  A brand-new survey on embodied AI systems where multiple agents interact in real-world settings. arXiv
- **"Multi-Agent Reinforcement Learning: A Comprehensive Survey"** – arXiv (Dec 2023)
  Although focused on MARL broadly (not necessarily embodied contexts), it's a major resource for multi-agent learning frameworks. Reddit