UNIVERSITY DEPARTMENT, RAJASTHAN TECHNICAL UNIVERSITY, KOTA

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

PRESENTATION ON SEMINAR

AUTONOMOUS UAV NETWORKS : A SURVEY

PRESENTED BY

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SUBMITTED TO

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Drones

Autonomous UAV Networks: A Survey

Presented by: Anish Soni

21/189 CSE A1

Agenda

Overview

Introduction

AI Bases UAV Networks

Security & Privacy

Network & Design

Localisation & Trajectory

Energy Efficiency

Drones

Conclusion

Goals

Add Company Name

Vision

- What is the impact of the company you want to leave behind?
- What is the culture that you want to play out in your employees' lives?

Mission

- What is the impact of the company you want to leave behind?
- What is the culture that you want to play out in your employees' lives?

Goals

- What is the impact of the company you want to leave behind?
- What is the culture that you want to play out in your employees' lives?

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Introduction

RESEARCH ON UNMANNED AERIAL VEHICLE (UAV) NETWORKS HAS GENERATED GREAT INTEREST AMONG NETWORK RESEARCHERS RECENTLY.

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- One of the reasons for using UAV networks is to address the challenging terrains, which are very difficult or impossible to be covered by traditional communications networks. UAV networks are excellent at providing optimal performance based on their topology, spectrum efficiency, and context awareness. As human interventions are limited to UAV network operation, network researchers are keen to explore artificial intelligence (AI) techniques to manage these networks effectively. Various applications are being developed using machine learning methods.
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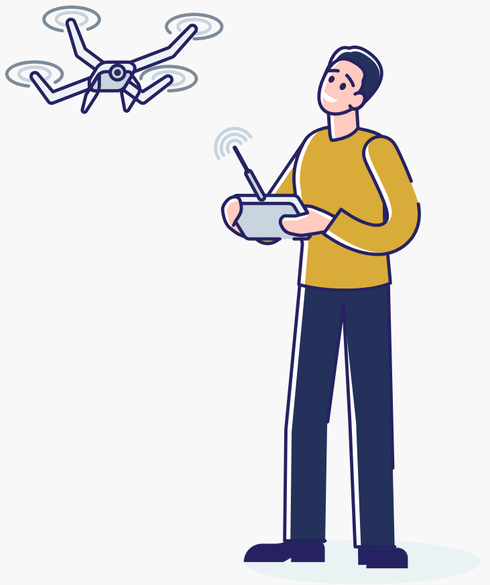
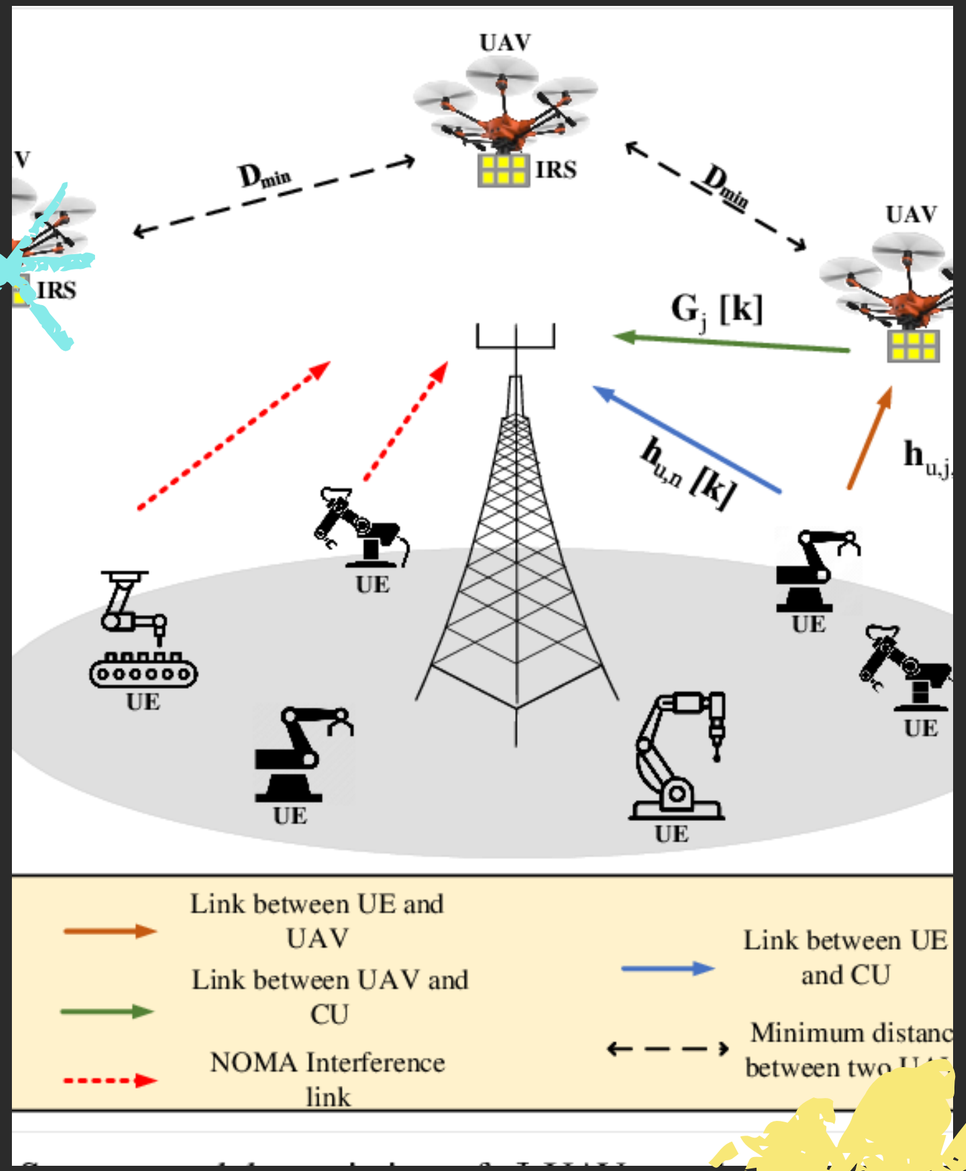
- To solve the review question, we have conducted a comprehensive literature survey by selecting more than 100 papers on UAVs focusing on some aspects of autonomous features, network planning, resource management, network access and routing protocols, and energy efficiency.



AI based UAV Networks

- Artificial intelligence (AI) is the science used to develop techniques that can think like humans or even beyond humans' intelligence.
- While AI-based UAV network design is an ongoing research area, in this section, we focus on four key areas, including security and privacy, network design, localization and trajectory, and general applications of UAVs that are necessary for the efficient design and deployment of next-generation UAV networks.



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Security & Privacy

Security and privacy are always a concern when dealing with a wireless network. This concern even gets more robust when the wireless network we are dealing with has an ever- changing topology.

AI-based security solutions are being suggested for various cyber-attacks, including cyber-physical attacks. The authors have proposed using convolutional neural networks (CNNs) and recurrent neural networks (RNNs) to identify and classify high-risk areas and various motion characteristics of UAVs.

An interesting study is presented based on communicating only local information among the neighboring UAVs in a UAV swamp [5]. The simulation results show that a UAV swamp can effectively blanket terrestrial coverage by using local information and voiding various cyber security threats. The simulation is conducted in OPNET Modeler, considering MANET connectivity for all UAVs.

Federated learning (FL) is a new ML technique proposed for distributed Internet of Things (IoT) devices. FL's critical feature is providing a secure communication channel among IoT devices.

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Security Issues	Privacy Issues
Write a long-term company goal here.	Write a short-term company goal here.
Write a long-term company goal here.	Write a short-term company goal here.
Write a long-term company goal here.	Write a short-term company goal here.

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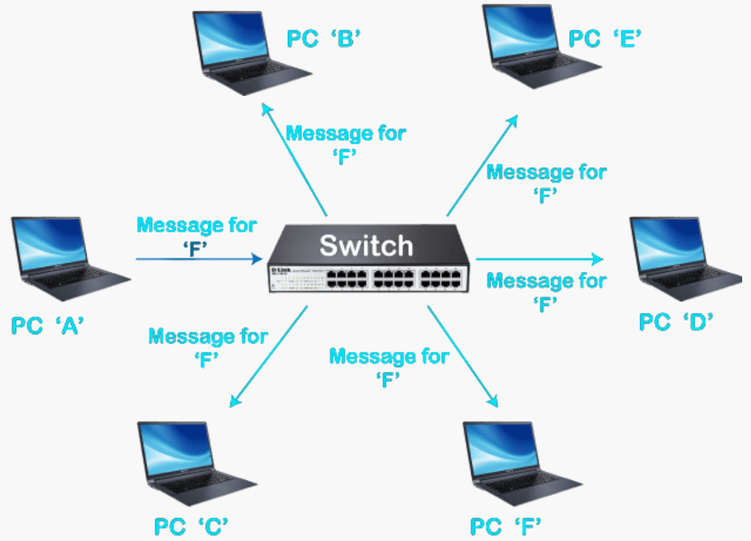
Network & Design



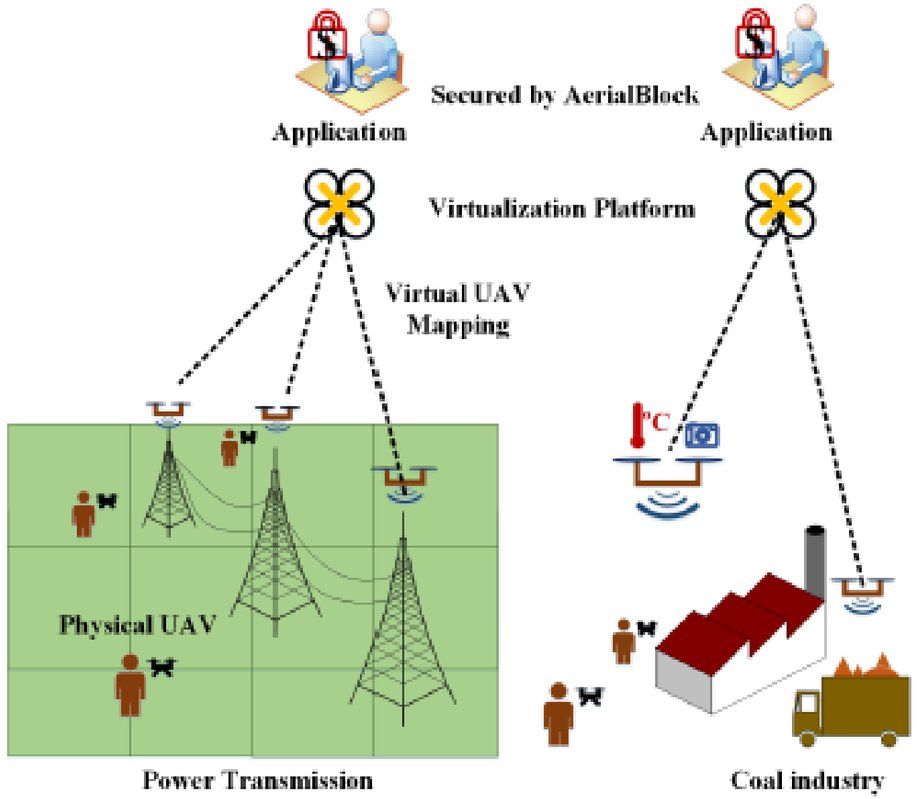
As UAV networks possess unique characteristics, therefore, the solutions developed to address various needs of other wireless networks such as MANETs and VANETs cannot be used for these networks. Therefore, researchers address the network issues faced by UAV networks a bit differently.

Reynolds’ Boid model

~ alignment, separation, and cohesion

- The effectiveness of the proposed solution is evaluated by conducting a simulation using the OMNET++ Modeler.
- The highlighted issues include high reliability, low latency, efficient handover, and efficient path planning.

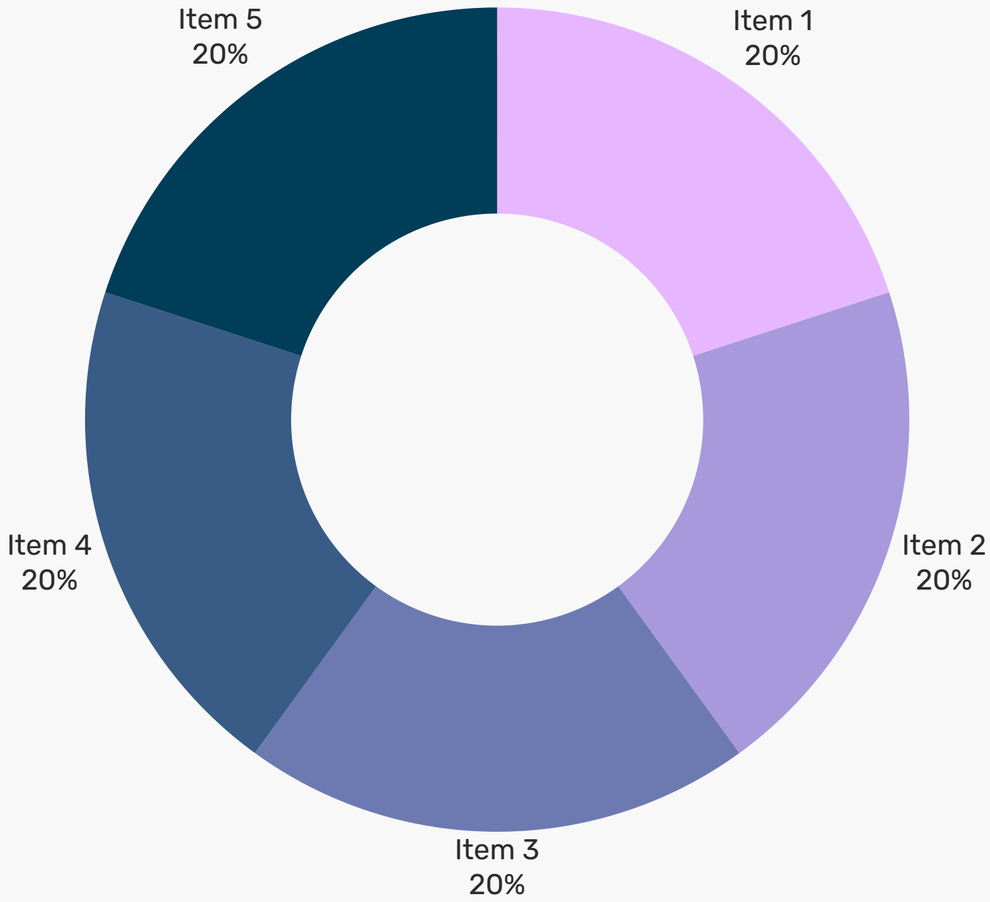
NETWORK ISSUES



Localization & Trajectory

- For Trajectory, the main idea is to use a quantum mechanism to support UAVs from the starting point to their destination place.

- The localization problem is being solved in a 3D model, in which UAV node localization is being realized by limiting the search space in the initial step. This helps reduce the localization error and increases the network convergence speed.
- Important point is to use the most energy-efficient point.



Add Company Name

Roadmap

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ADD THE TARGET MONTH OR YEAR

- Elaborate on the goal here.
- Share the outcome to be achieved by this time.

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Drones

MULTI-ROTOR DRONES

Chief Executive Officer

FIXED-WING DRONES

Chief Executive Officer

SINGLE ROTOR HELICOPTER

Director

FIXED-WING HYBRID VTOL DRONES

Accountant

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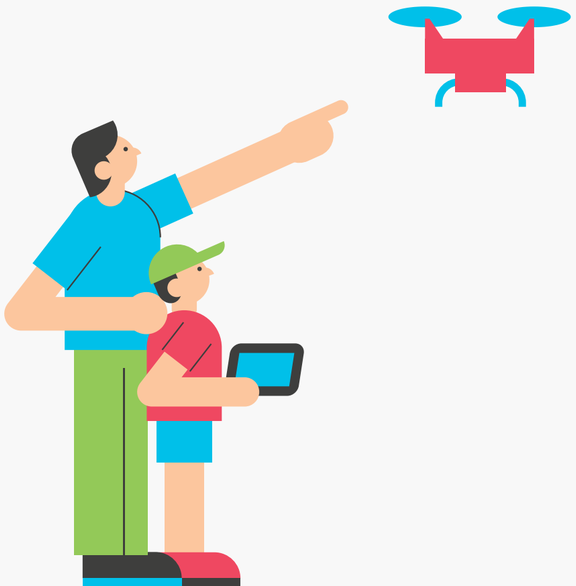
Types of Drones according to their

Sizes

Size	Length	Propeller diameter	Weight	Use
Very small drones	150mm (15cm, 6 inches) or less	51mm (2 inches) or less	200 grams (0.2kg, 0.44lbs) or less	Military surveillance
Small drones	Up to 300mm (12 inches)	76-152mm (3-6 inches)	200-1000 grams (0.44-2.2lbs)	• Indoor equipment inspections • Recreation and photography
Medium drones	300-1200mm (12 inches – 4 feet)	150-640 mm (6-25 inches)	1-20kg (2.2-44 pounds)	• Professional applications • Amateur photography
Large drones	120cm (4 feet) and up	64 cm (25 inches) and up	20kg (44 pounds) and up	• Enemy detection and combat capabilities • Civil applications such as drone deliveries or filmmaking



Types of Drones according to their

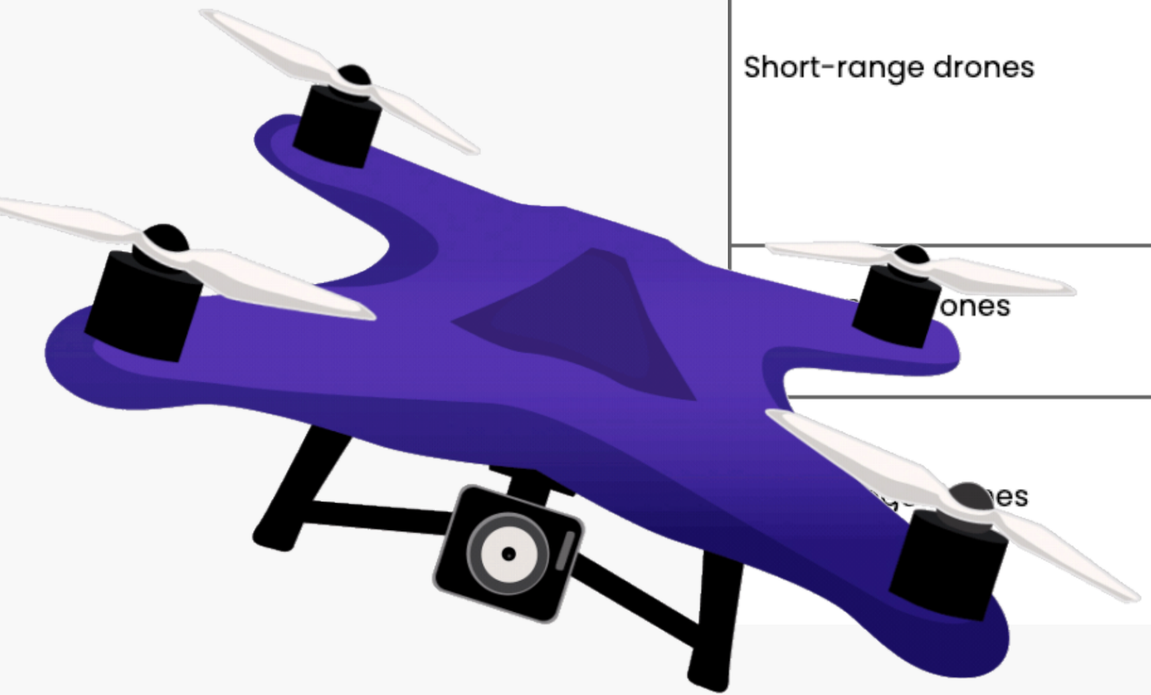
Payload

Drone type	Weight	Payload capacity	Use
Featherweight drones	Less than 11 grams (0.011 kg)	4 grams to 100 grams (0.004 to 0.1 kg)	Military surveillance
Lightweight drones	200–1000 g (0.2–1 kg)	150–270 g (0.15–0.27 kg)	Recreation and photography
Middleweight drones	1–600 kg (2.20–1323 lb)	400–1460 grams (0.4–1.46 kg)	• Professional applications • Aerial photography
Heavy-lift drones	More than 160 kg	More than 1,000 kg	• Enemy detection and combat capabilities • Civil applications such as drone deliveries or filmmaking

Types of Drones according to their

Range

Drone range	Flight distance	Flight time	Use
Very close-range drones	5 km	1 hour	Recreation
Close-range drones	up to 50 km	1-6 hours	• Military surveillance • Aerial photography
Short-range drones	up to 150 km	8-12 hours	• Large-scale surveillance • Mapping and surveying • Utility inspection
[illegible]ones	644 km	24 hours	Military combat and surveillance
[illegible]es	More than 644 km	More than 24 hours	• Military surveillance and espionage • Weather tracking • Geographic mapping



VISION	MISSION	VALUES
Write the vision statement here	Write the mission statement here	List company values here

GOALS	PRODUCTS	SERVICES
List company goals here	List products here	List services here

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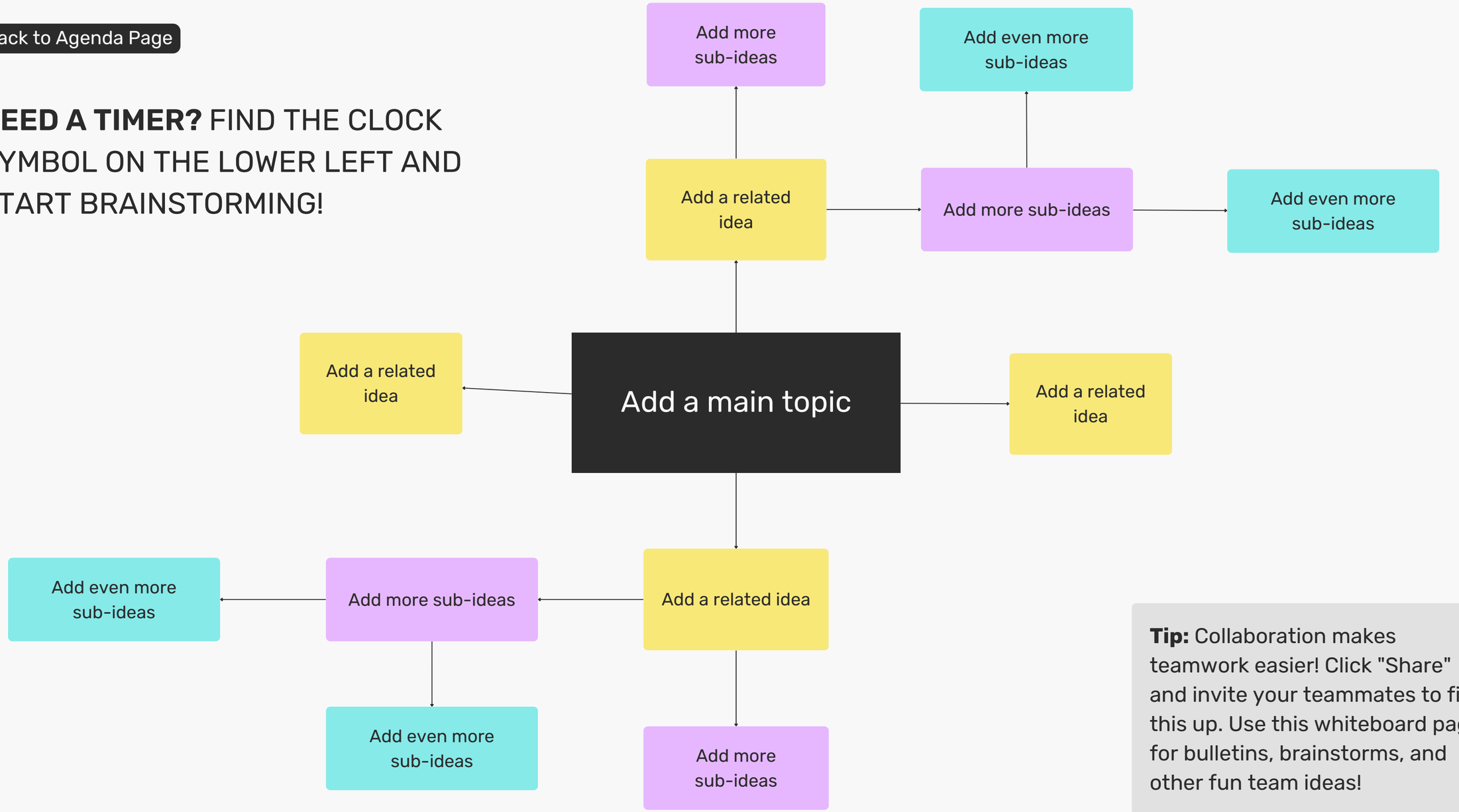
NEED A TIMER? FIND THE CLOCK SYMBOL ON THE LOWER LEFT AND START BRAINSTORMING!



Tip: Collaboration makes teamwork easier! Click "Share" and invite your teammates to fill this up. Use this whiteboard page for bulletins, brainstorms, and other fun team ideas!

Resource Page

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Delete this page before presenting.

B FOR BLUR

C FOR CONFETTI

D FOR A DRUMROLL

M FOR MIC DROP

O FOR BUBBLES

Q FOR QUIET

U FOR UNVEIL

ANY NUMBER FROM **0-9** FOR A TIMER

Conclusion

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Thank You