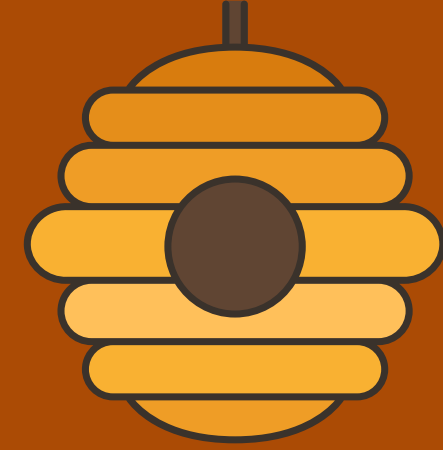


BEE ALGORITHM

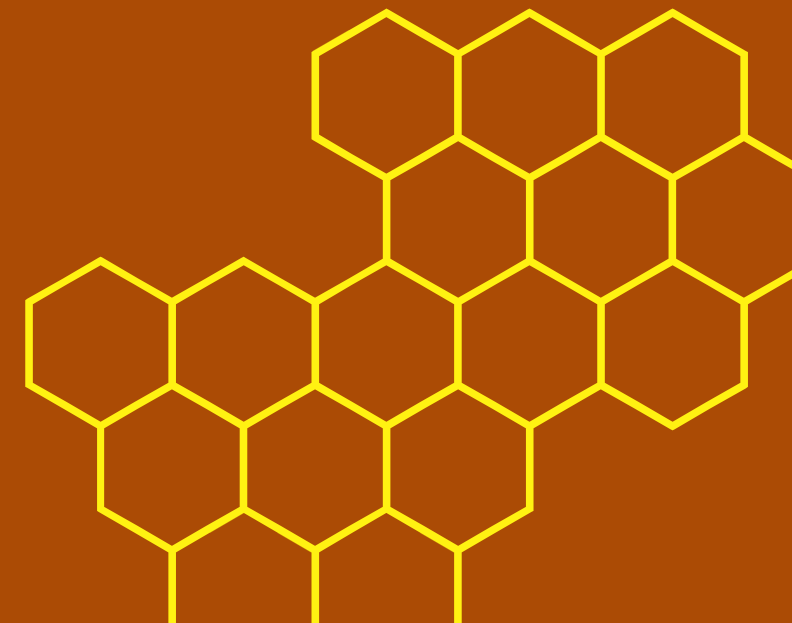
A NATURE-INSPIRED
OPTIMIZATION TECHNIQUE



Presented By: Erfan Khadiv
Course: Artificial Intelligence
Instructor: Dr. Soheil Afraz
2025

INTRODUCTION

- Optimization
- Nature-Inspired
- Swarm Intelligence



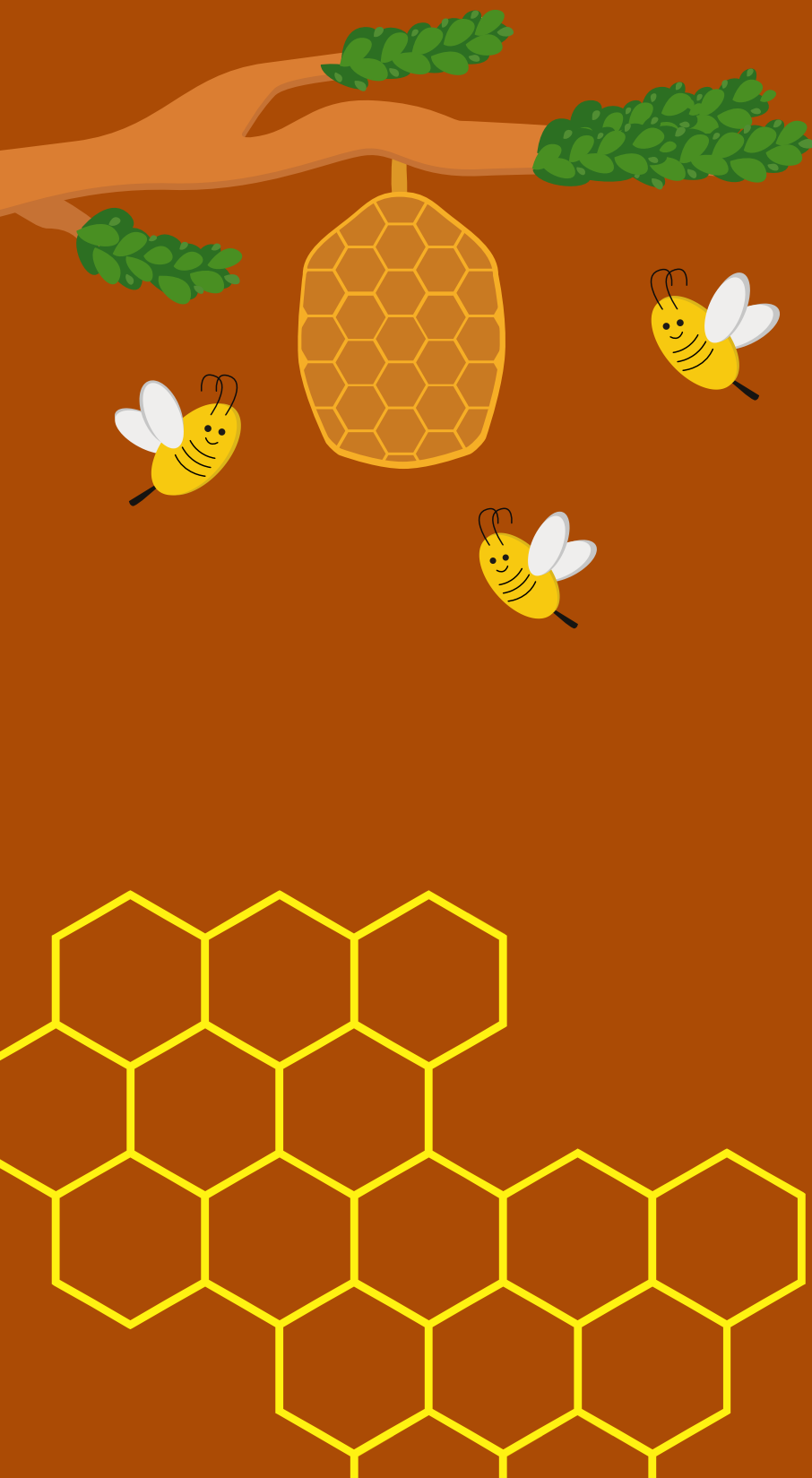
History and Development

The Bee Algorithm was developed in 2005 at Cardiff University by Professor D.T. Pham and his research team, which included the Iranian researcher Afshin Ghanbarzadeh.

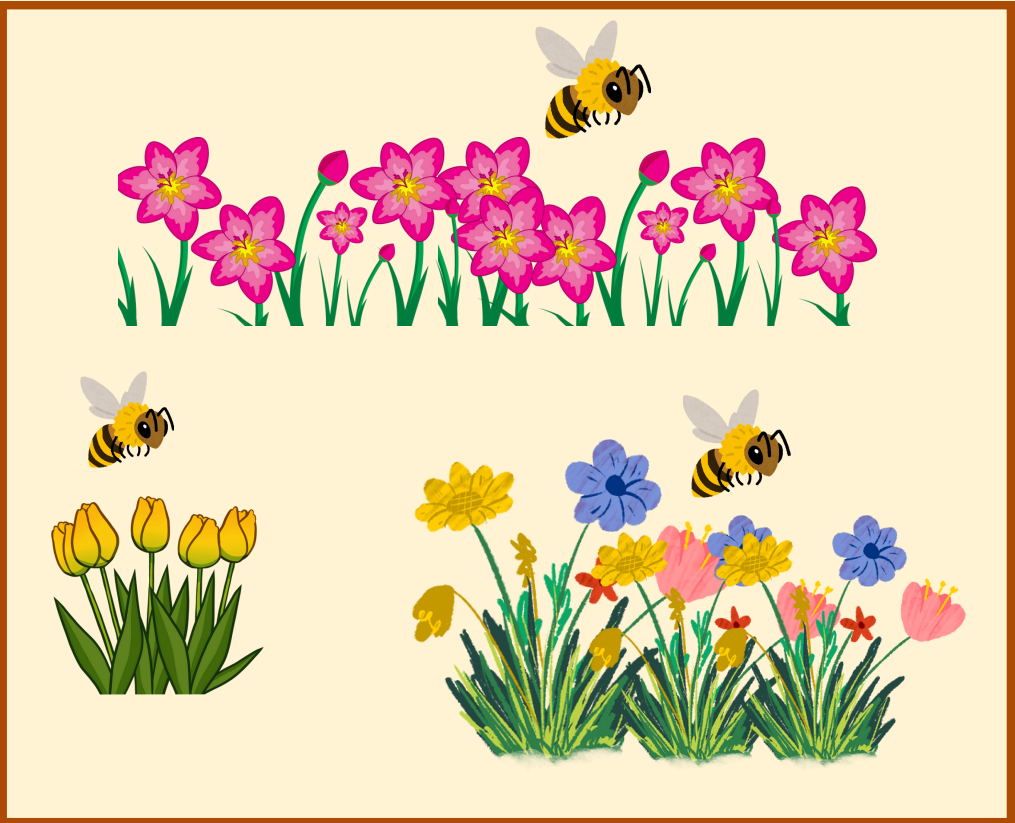
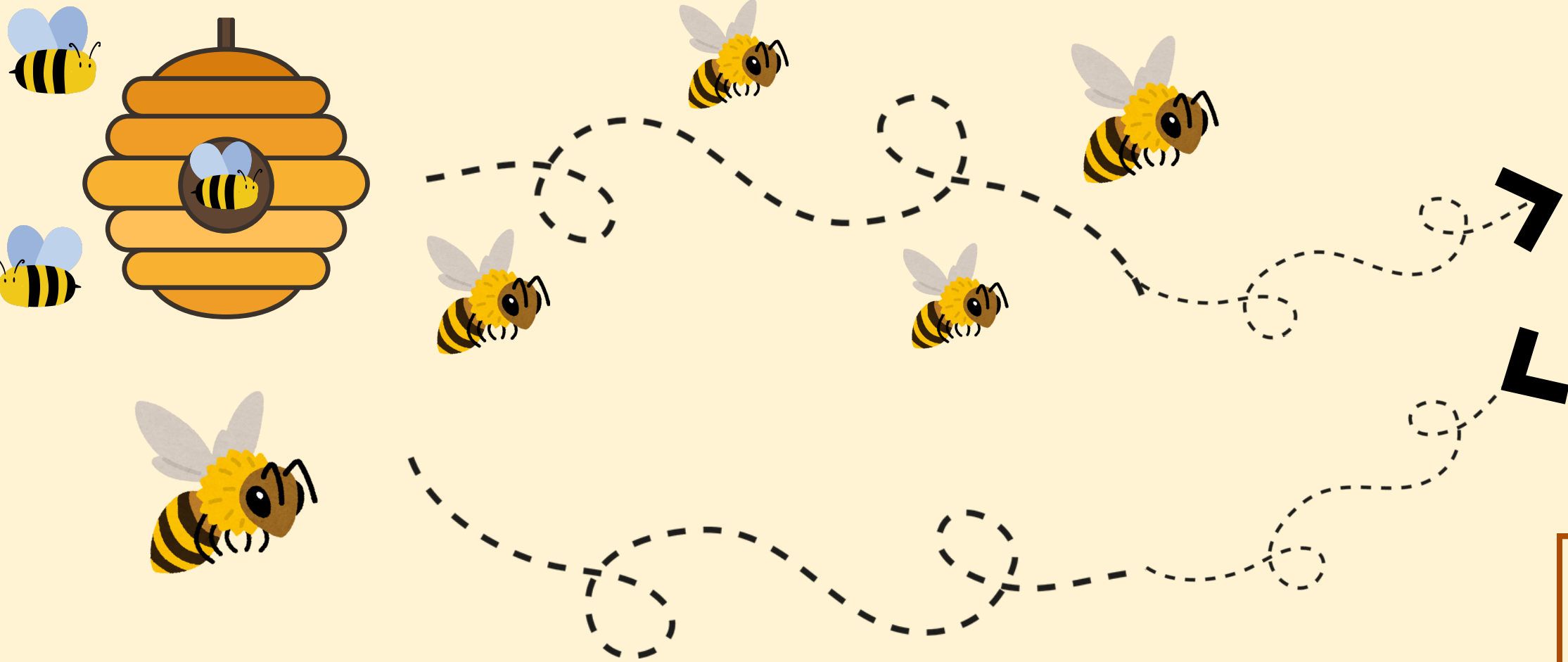


Real Behavior of Honey Bees

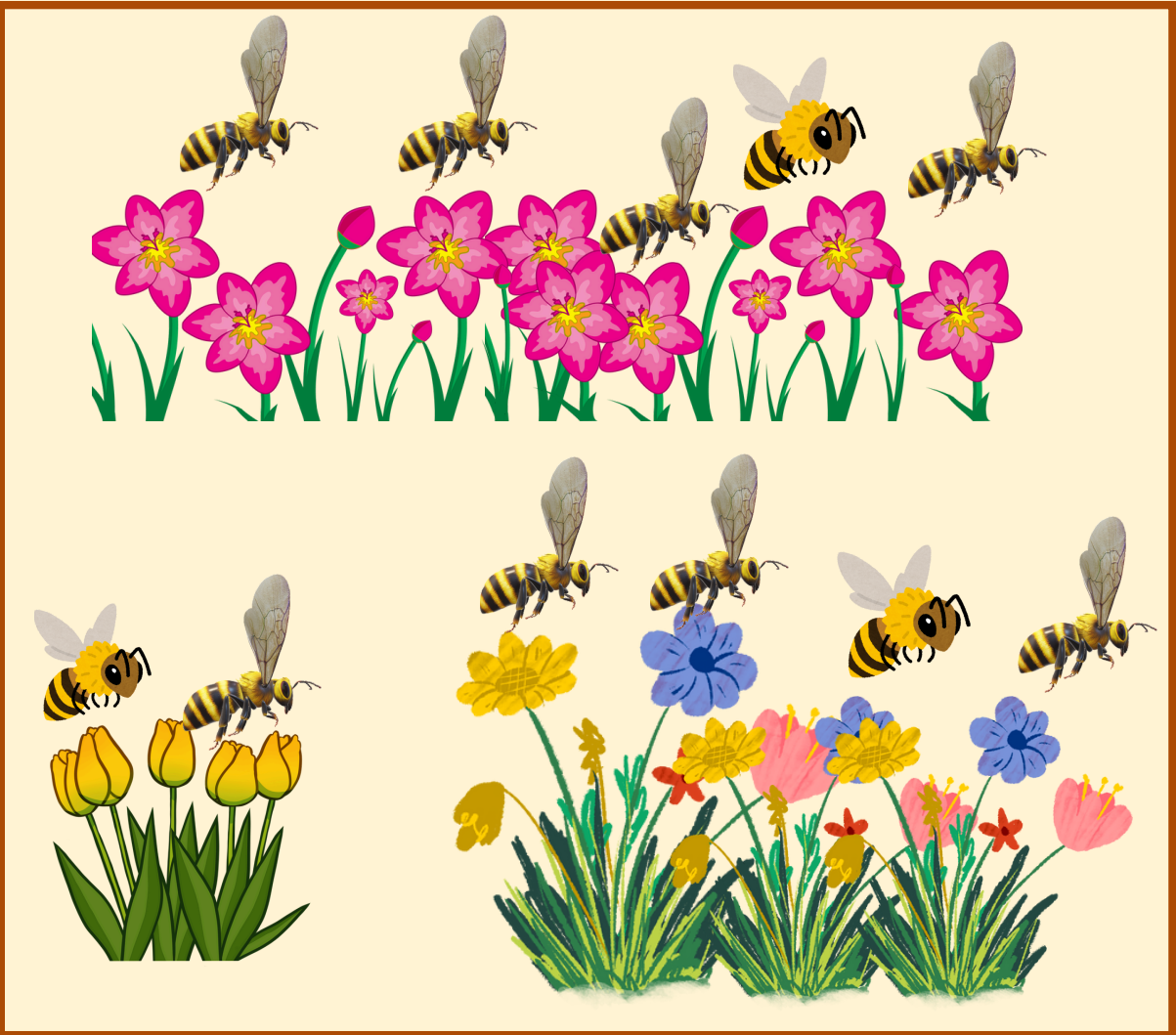
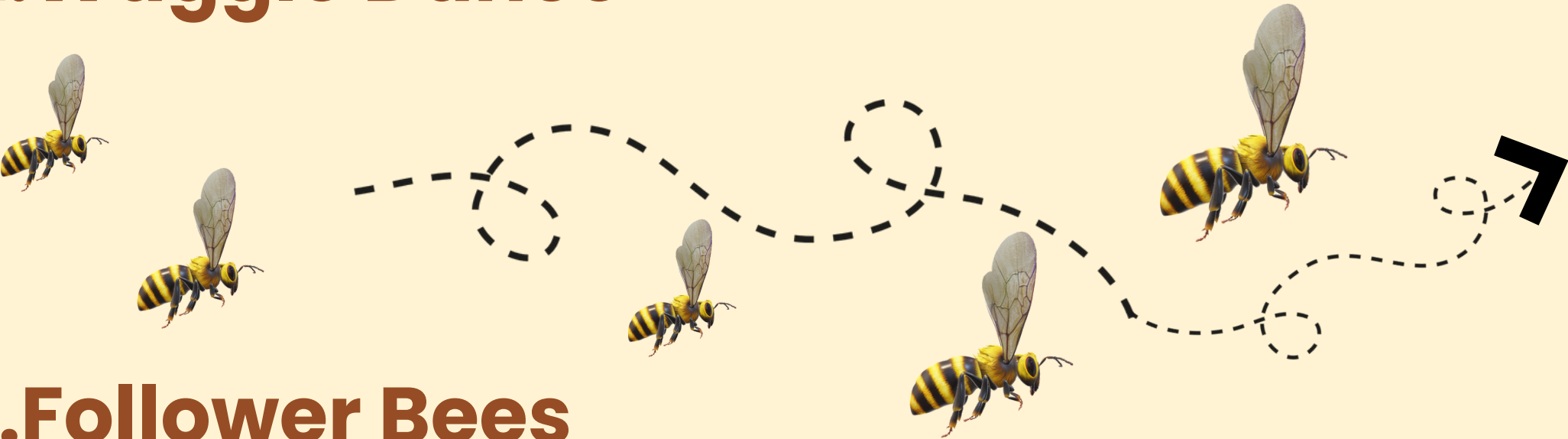
- **Scout and Forager Bees:**
Exploring and Communicating Food Sources
- **The Waggle Dance and Bee Recruitment:**
How Scouts Share Location, Distance and Quality of Food
- **Bee Foraging and Communication:**
From Random Exploration to Collective Decision-Making
- **From Scouts to Followers:**
The Collective Foraging Strategy of Honey Bees
- **Honey Bee Foraging Dynamics:**
How Scouts and Followers Optimize Food Gathering



1.Scout Bees



2.Waggle Dance

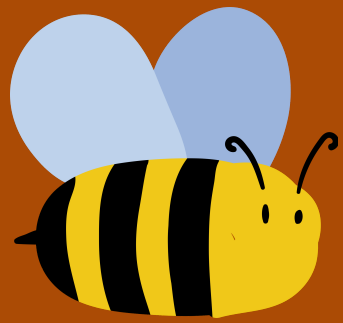


3.Follower Bees

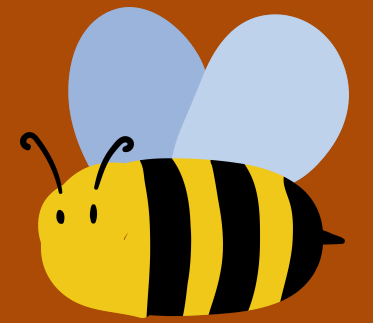
Bee Algorithm Variants and Their Applications

- **The Bees Algorithm (BA)**
Function optimization, Engineering design problems
- **Artificial Bee Colony (ABC)**
Neural network training
- **Hybrid Bees Algorithm**
Feature selection in machine learning
- **Binary Bees Algorithm**
Feature selection





Parameters



- **n** – Number of scout bees
- **m** – Number of selected sites from visited locations
- **e** – Number of elite sites (best among m)
- **nep** – Number of recruited bees around each elite site
- **nsp** – Number of recruited bees around other selected (non-elite) sites
- **ngh** – Neighborhood (patch) size around each site
- **Stopping Criterion** – Error threshold or maximum number of iterations

Pseudo code of the Bee Algorithm

Begin

Initialise population with random solutions

Evaluate fitness of all solutions

While (stopping criterion not met) do

Select m sites for neighbourhood search

Determine patch size (ngh)

Recruit bees for selected sites

→ **Assign more bees to elite sites (e)**

→ **Assign fewer bees to other selected sites**

Evaluate fitness of all recruited bees

Select the fittest bee from each patch

Abandon sites without improvement

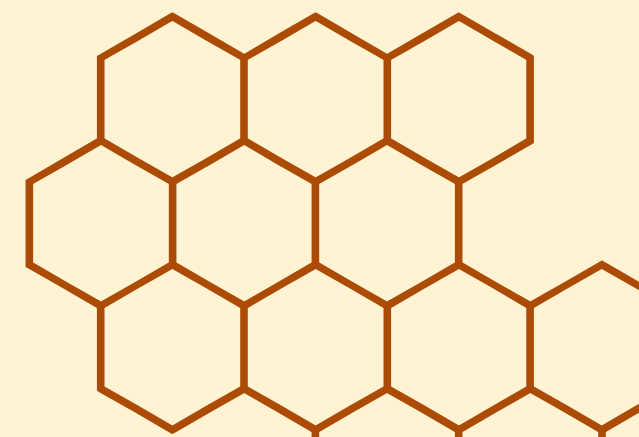
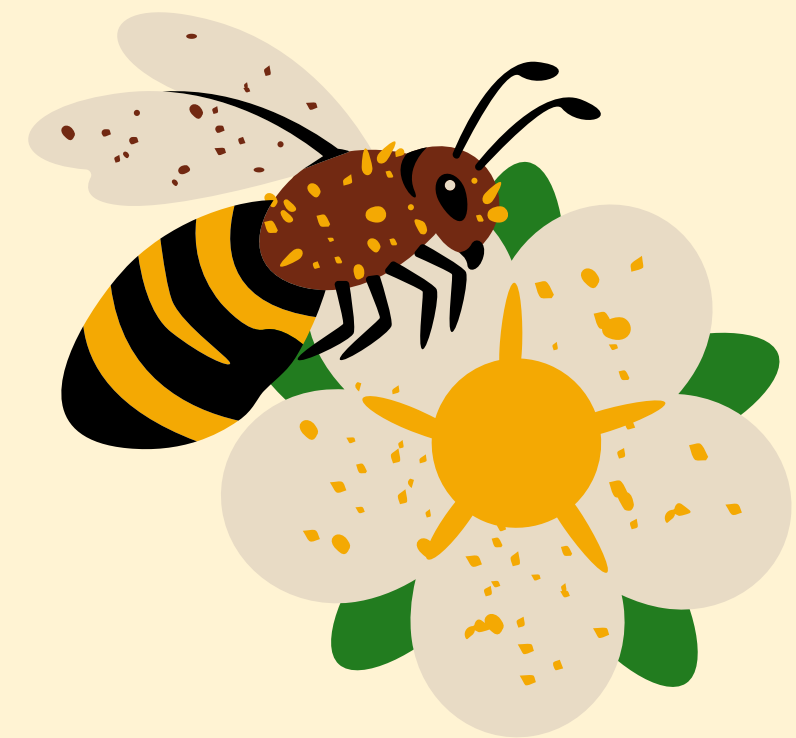
Assign remaining bees to random search (exploration)

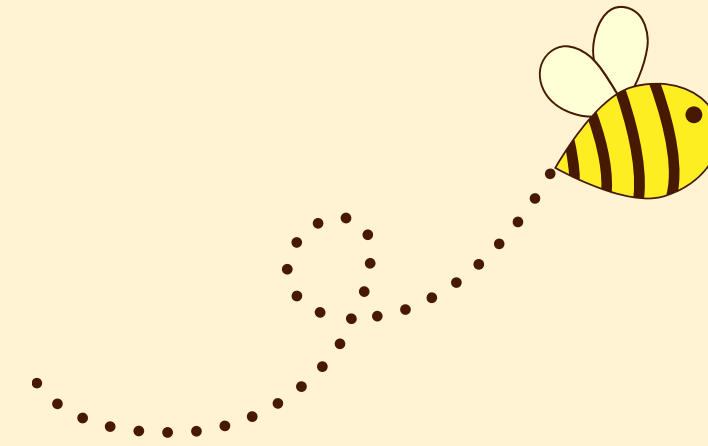
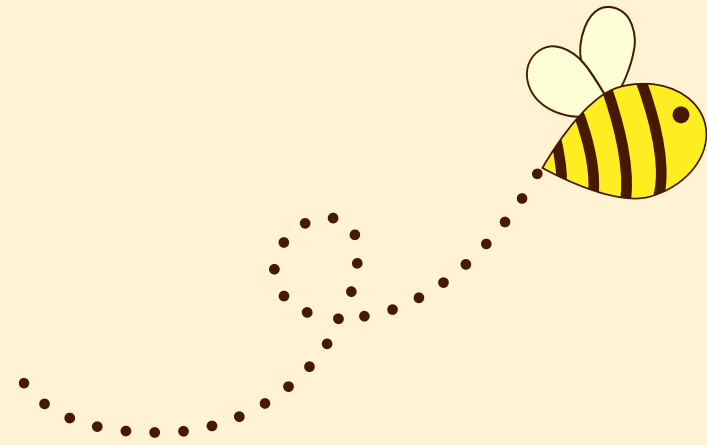
Evaluate fitness of new random solutions

End While

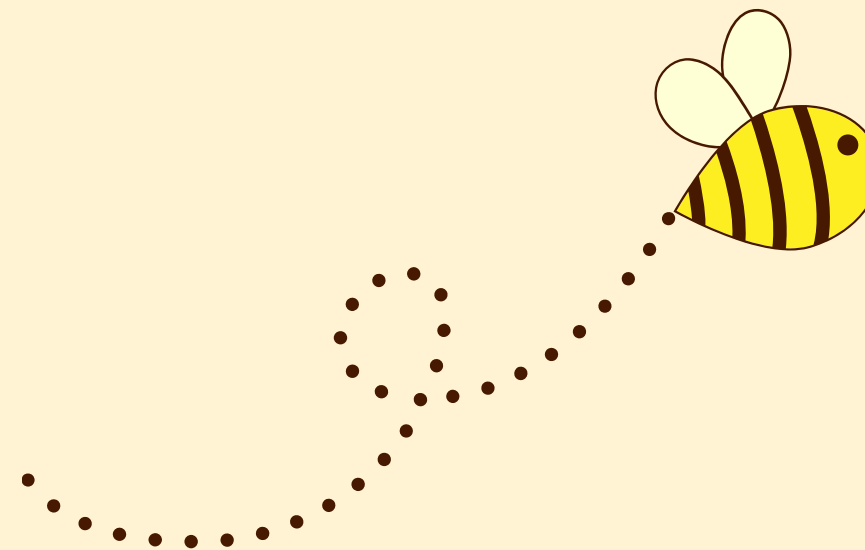
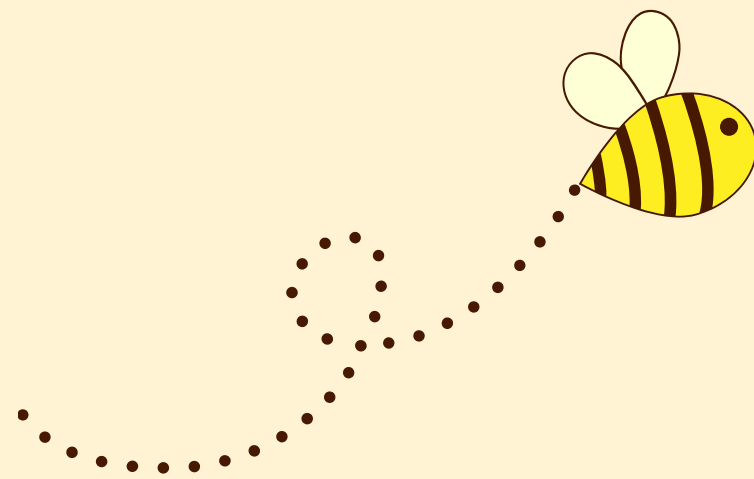
Output the best solution found

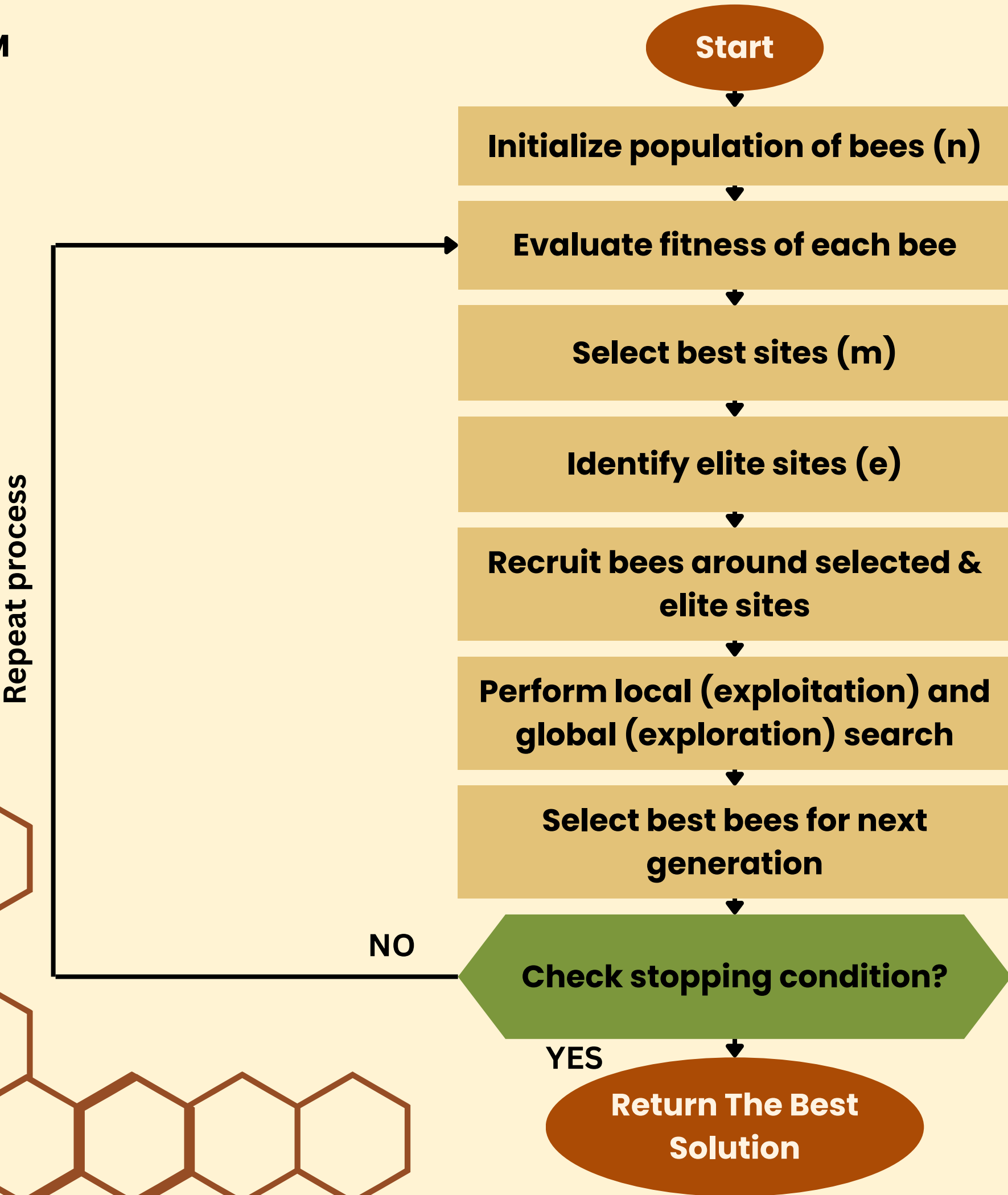
End





Flowchart of the Bee Algorithm





Bee Algorithm Applications



Networking & Telecommunications

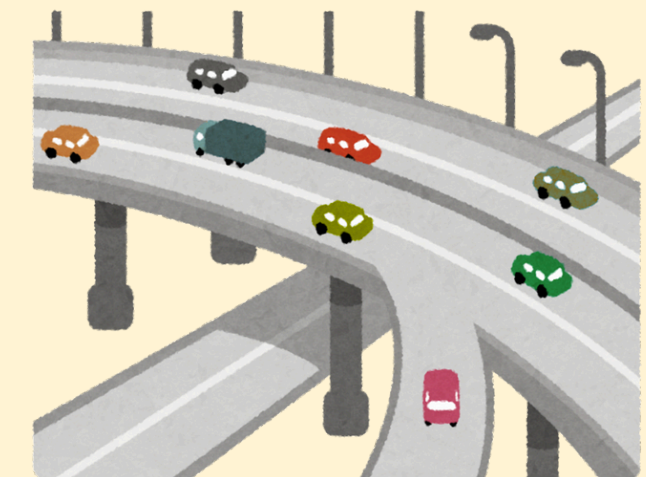
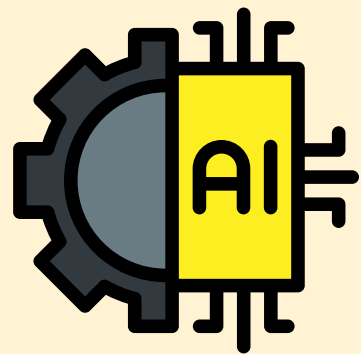
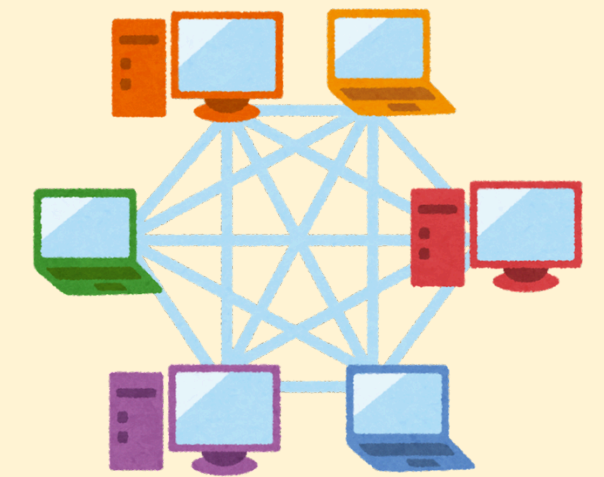
AI & Machine Learning

Economics & Management

Data & Image Processing

Transportation & Logistics

Energy Systems



THANK YOU FOR LISTENING

PRESENTED BY **ERFAN KHADIV**
2025