Swarm Intelligence for Solving a Traveling Salesman Problem

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Knowledge for Tomorrow

Isabel Kühner

I did a cooperative study program at

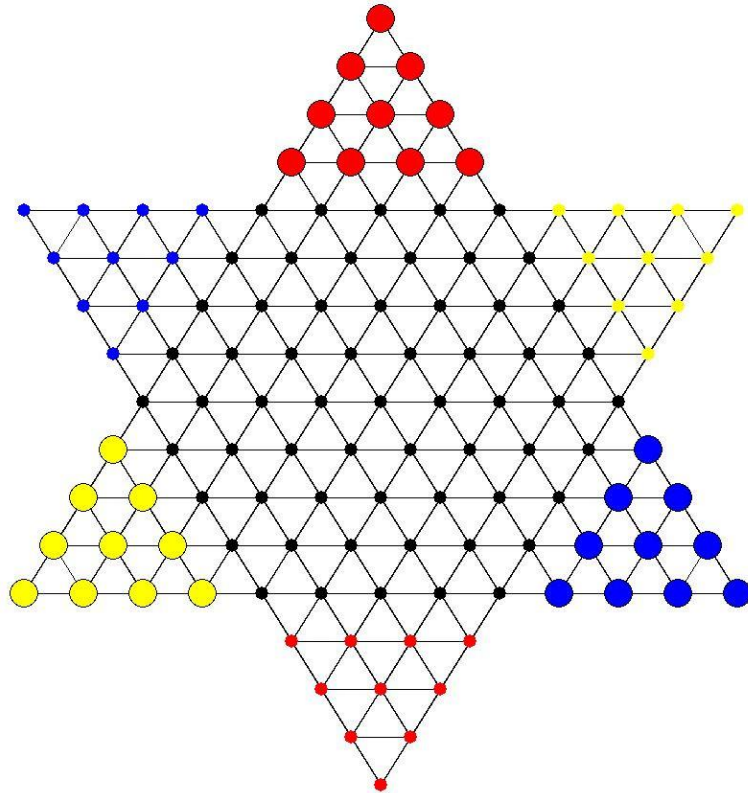Baden-Wuerttemberg Cooperative State University (DHBW) Mannheim

German Aerospace Center (DLR) Oberpfaffenhofen Institute of Communications and Navigation
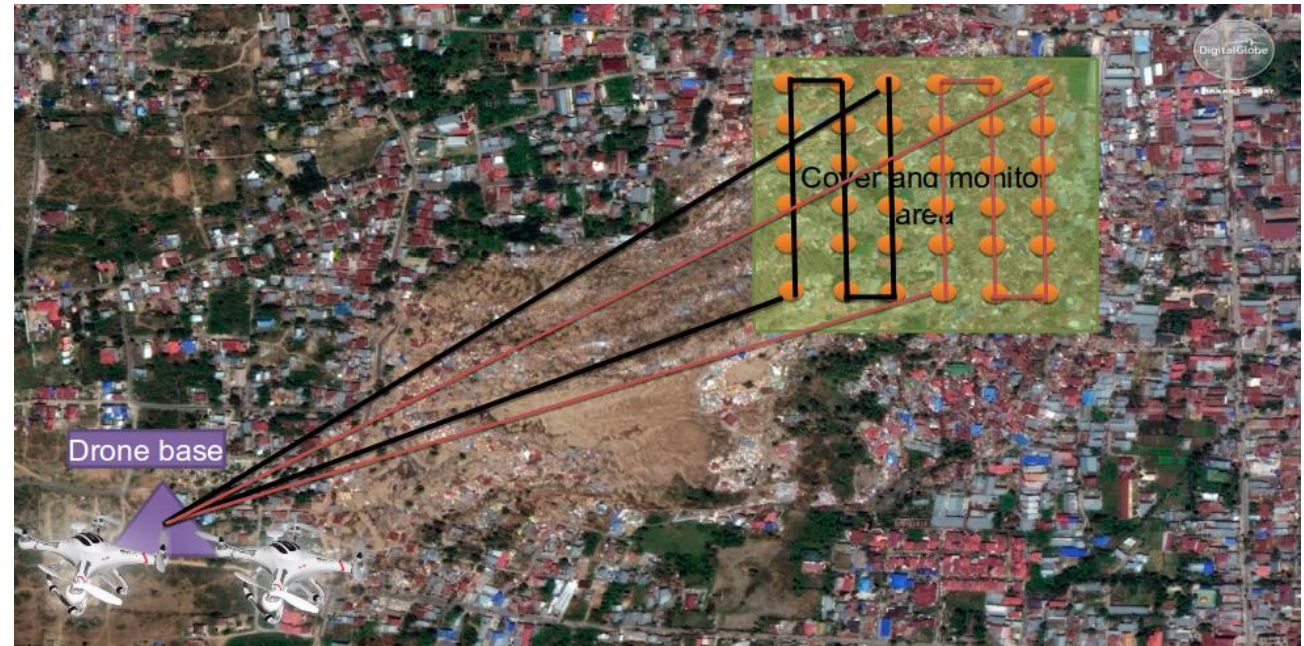
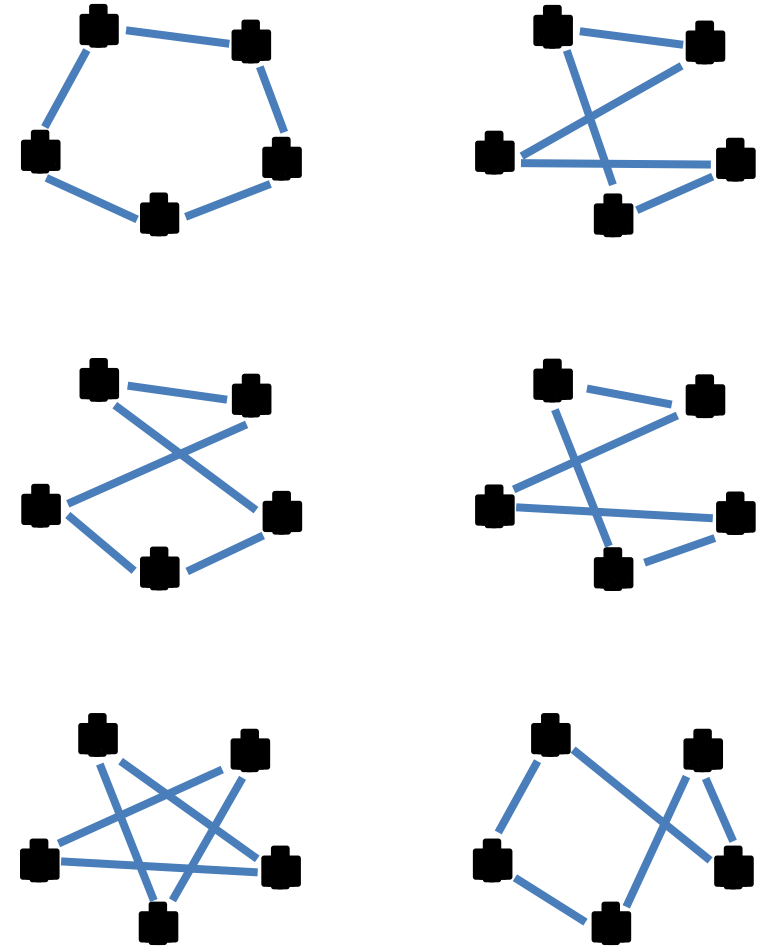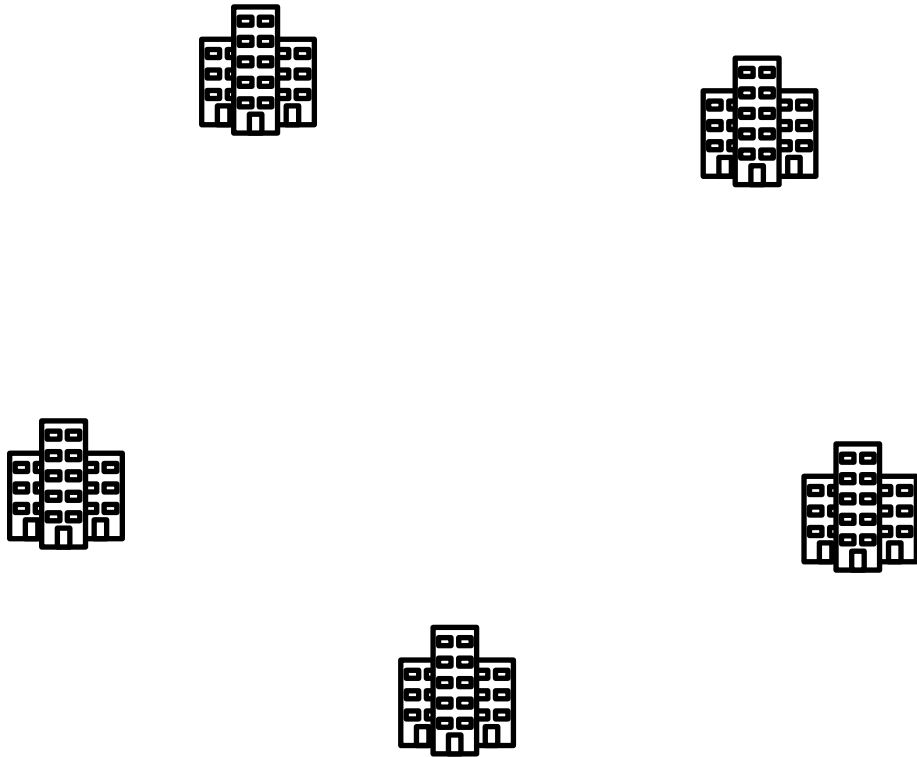and obtained my Bachelor degree in 2019.

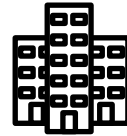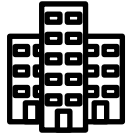# Motivation

Board Game Halma (Chinese Checkers)

Drones for Disaster Management

Traveling Salesman Problem

Traveling Salesman Problem

Ant Colony Optimization (ACO)

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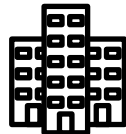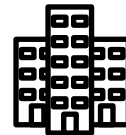# Ant Colony Optimization (ACO)
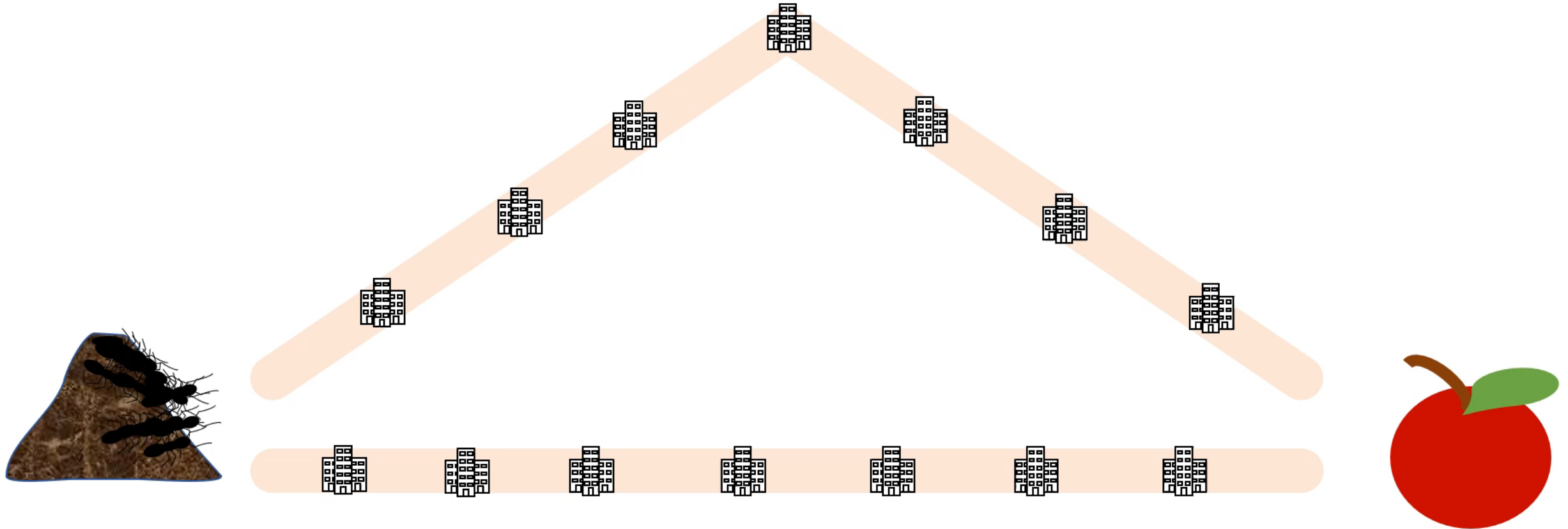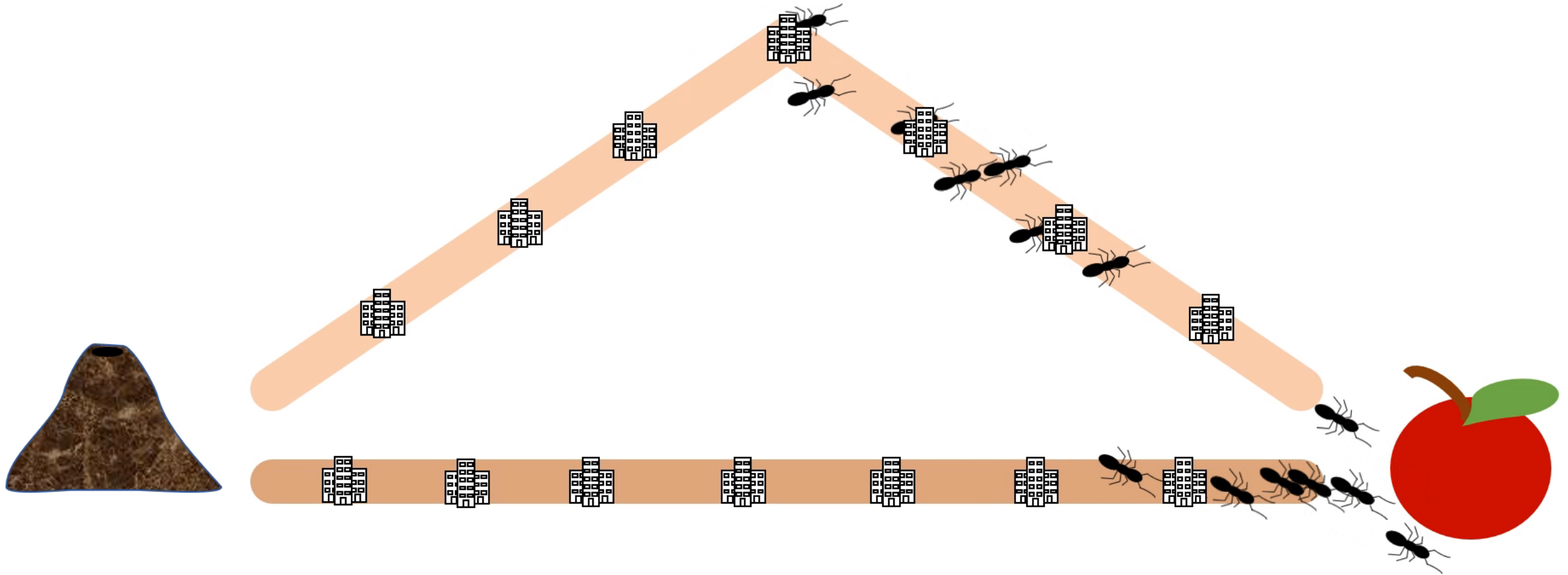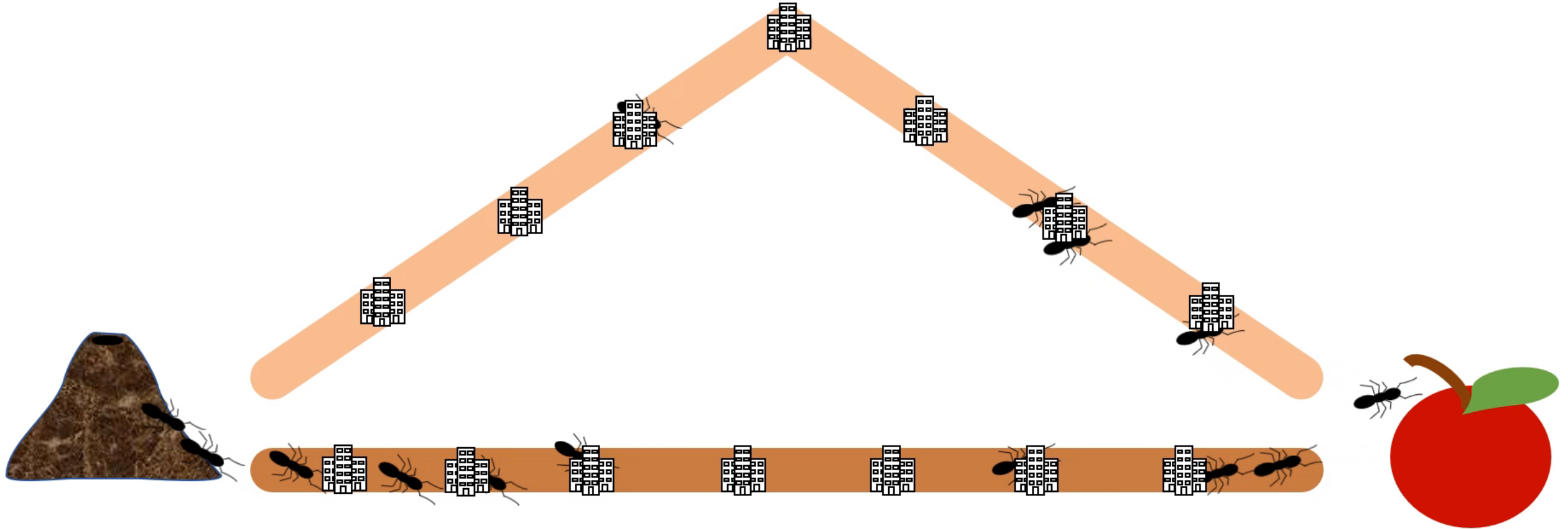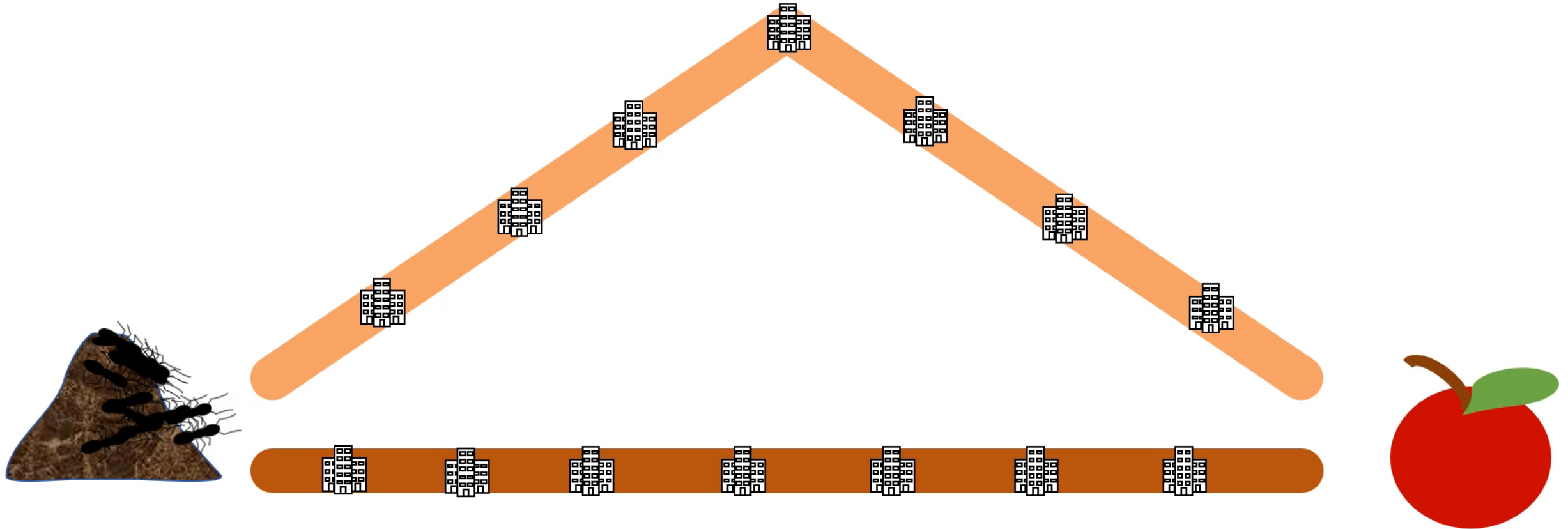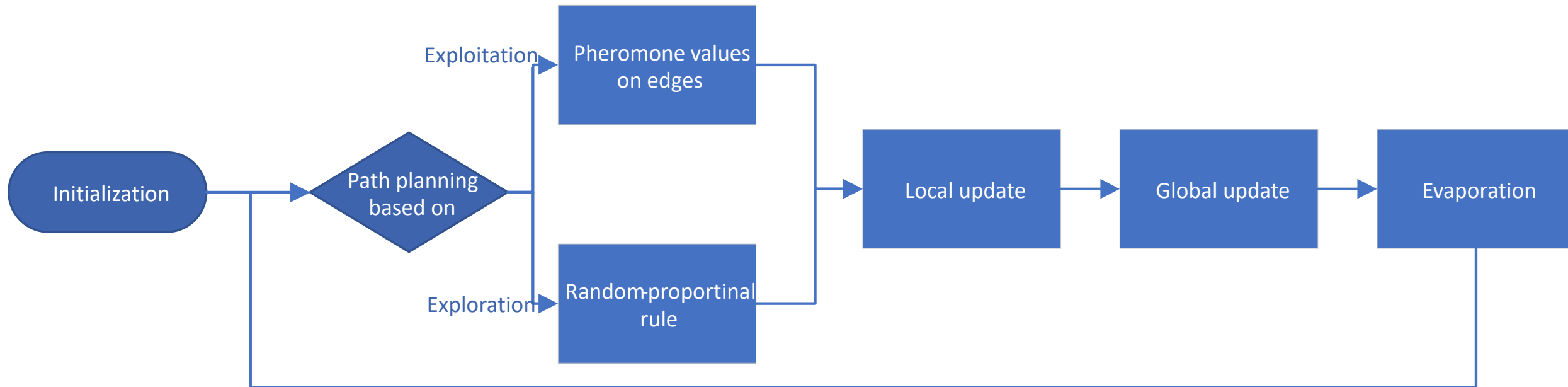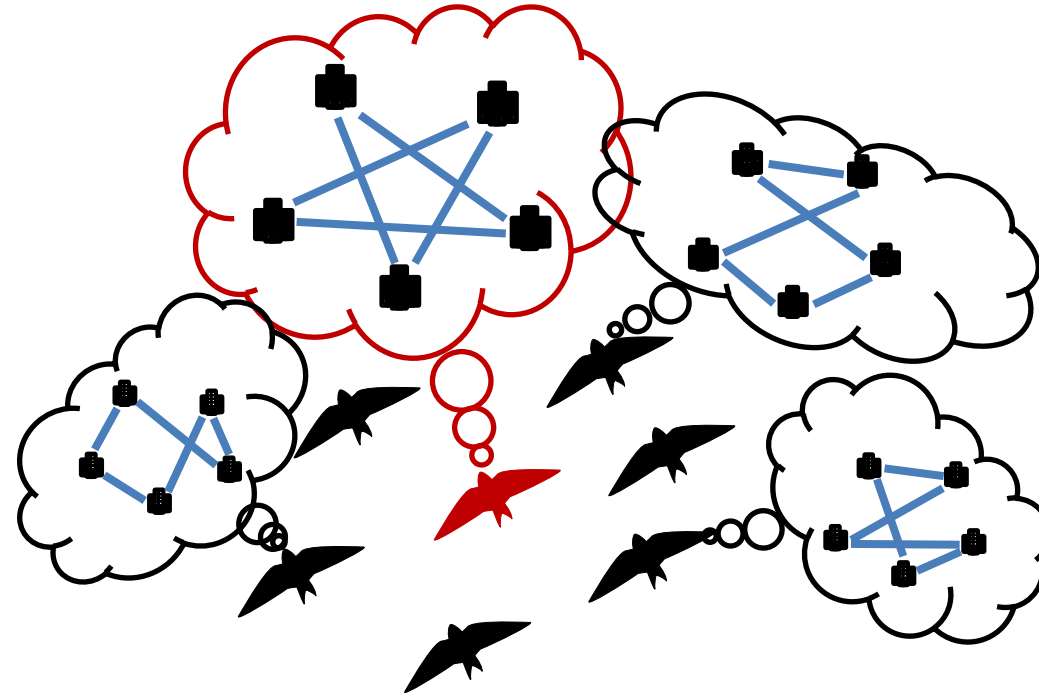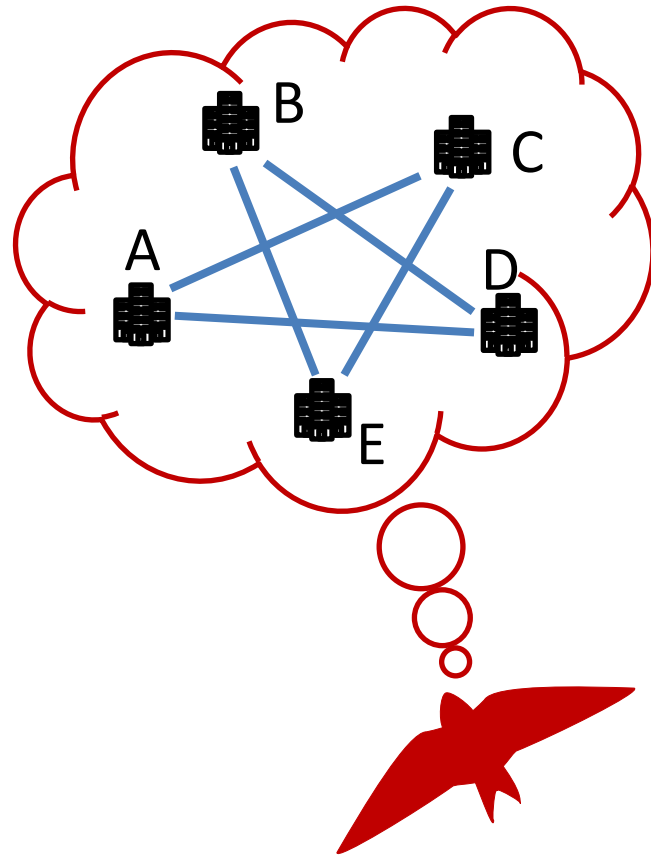
Ant Colony Optimization (ACO)

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Particle Swarm Optimization (PSO)
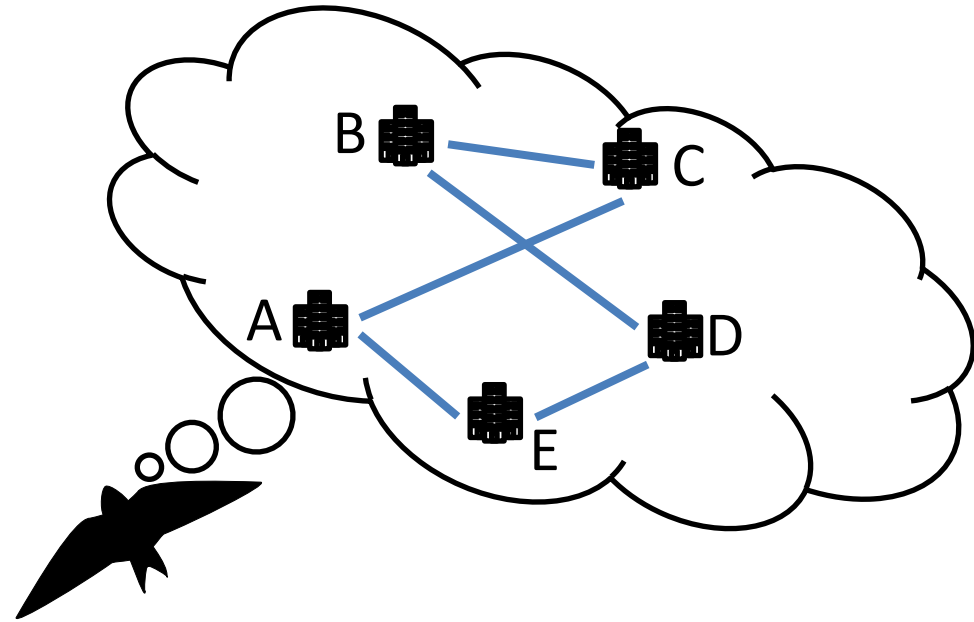
Particle Swarm Optimization (PSO)

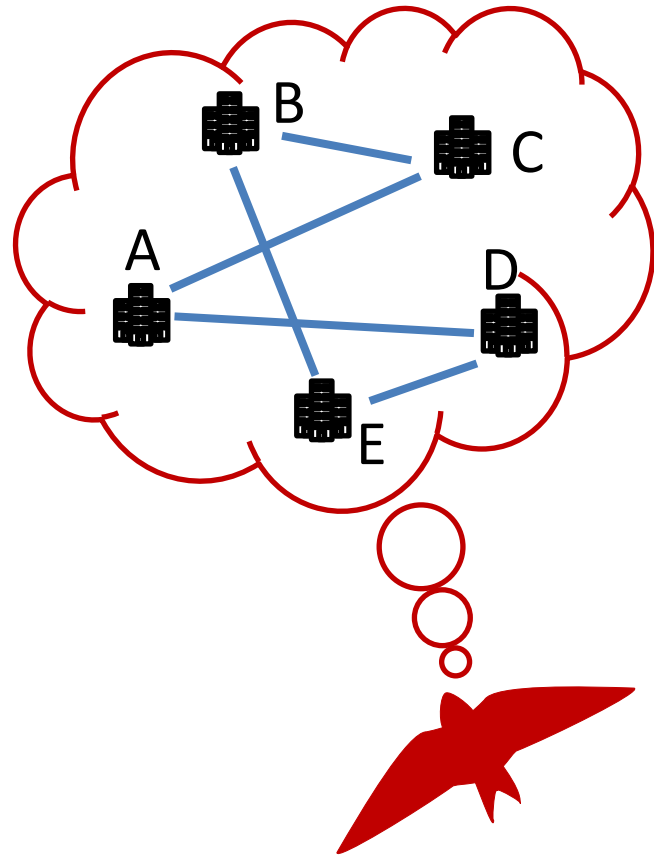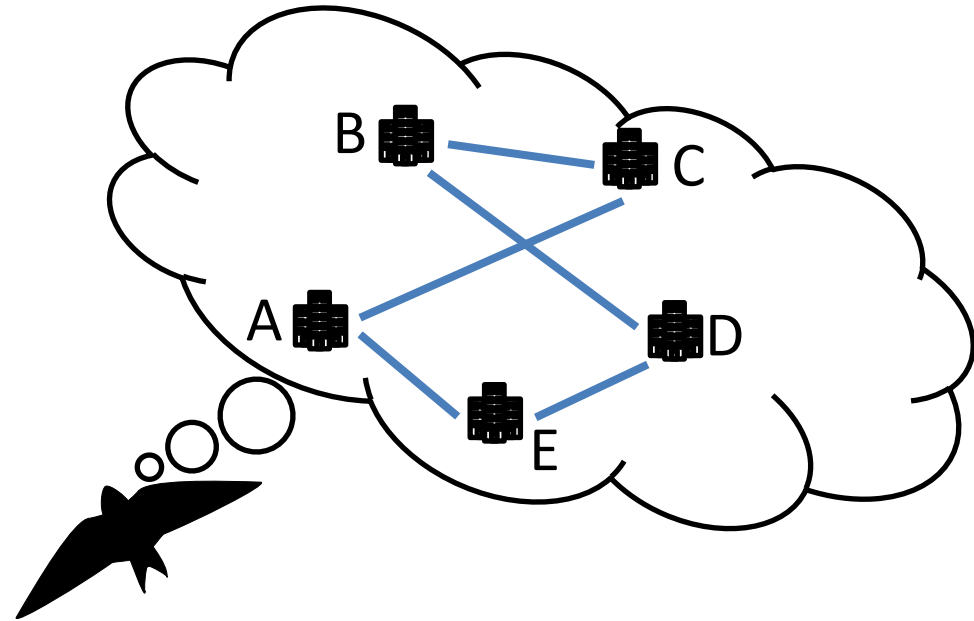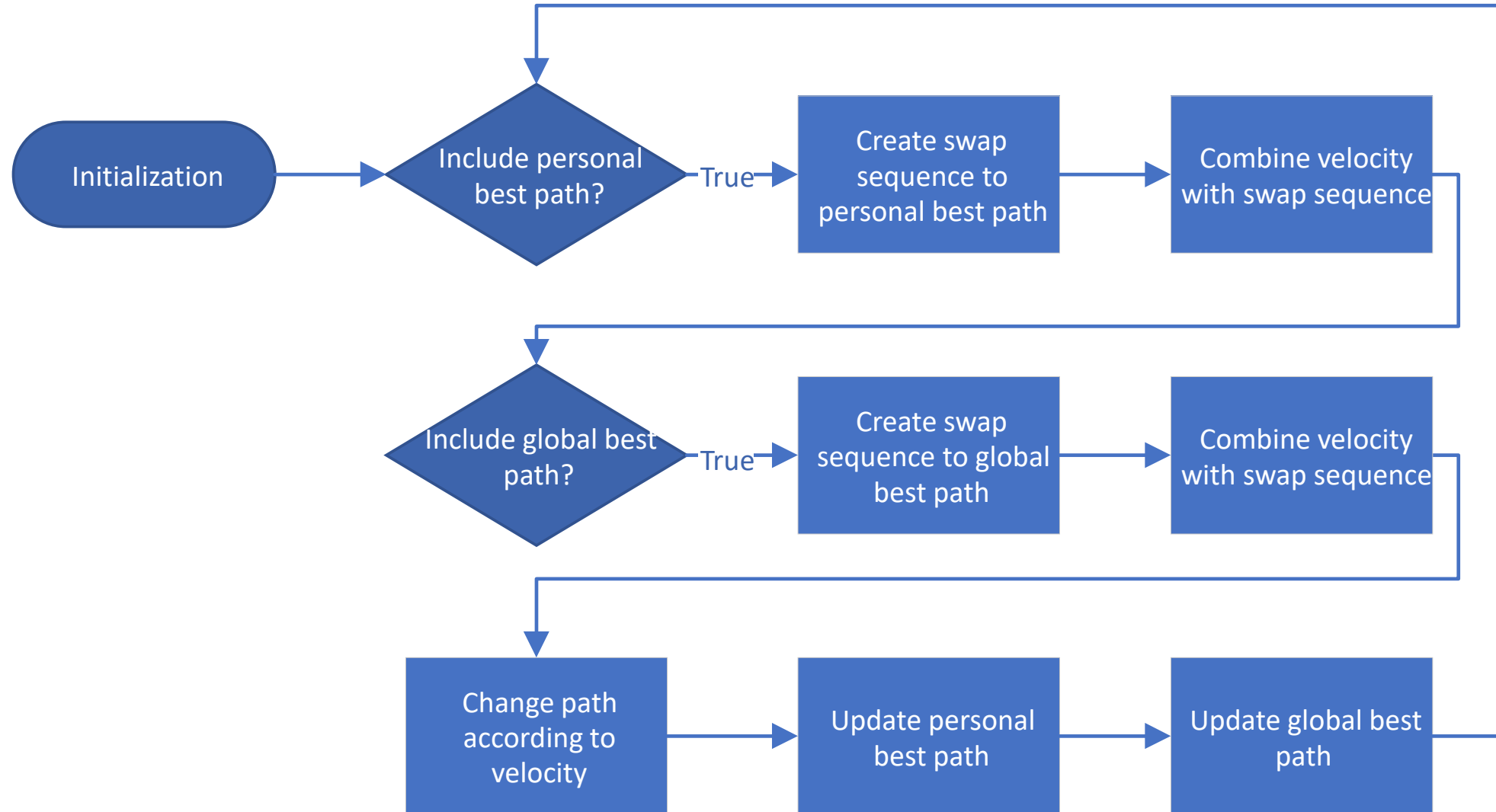# Particle Swarm Optimization (PSO)
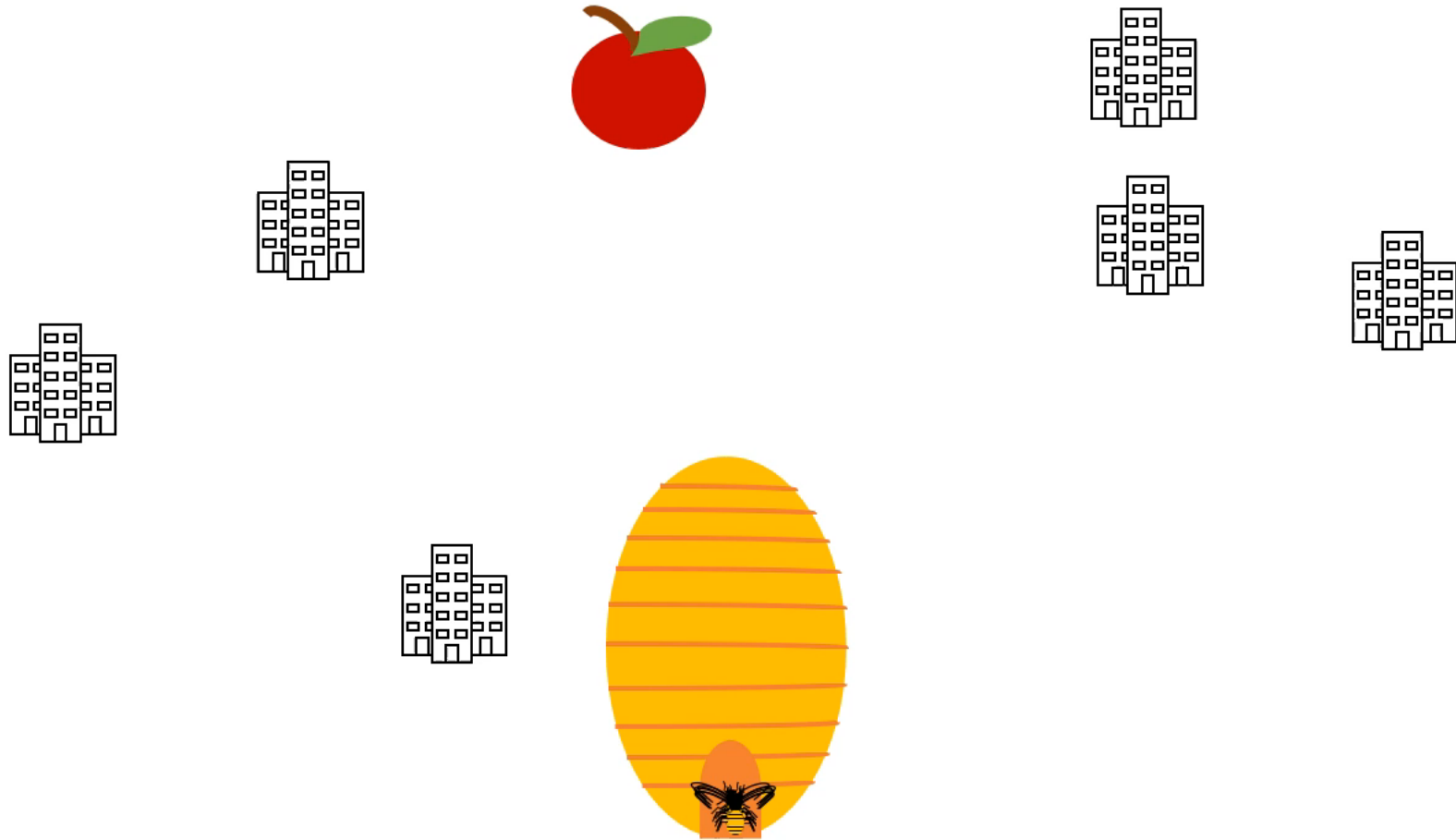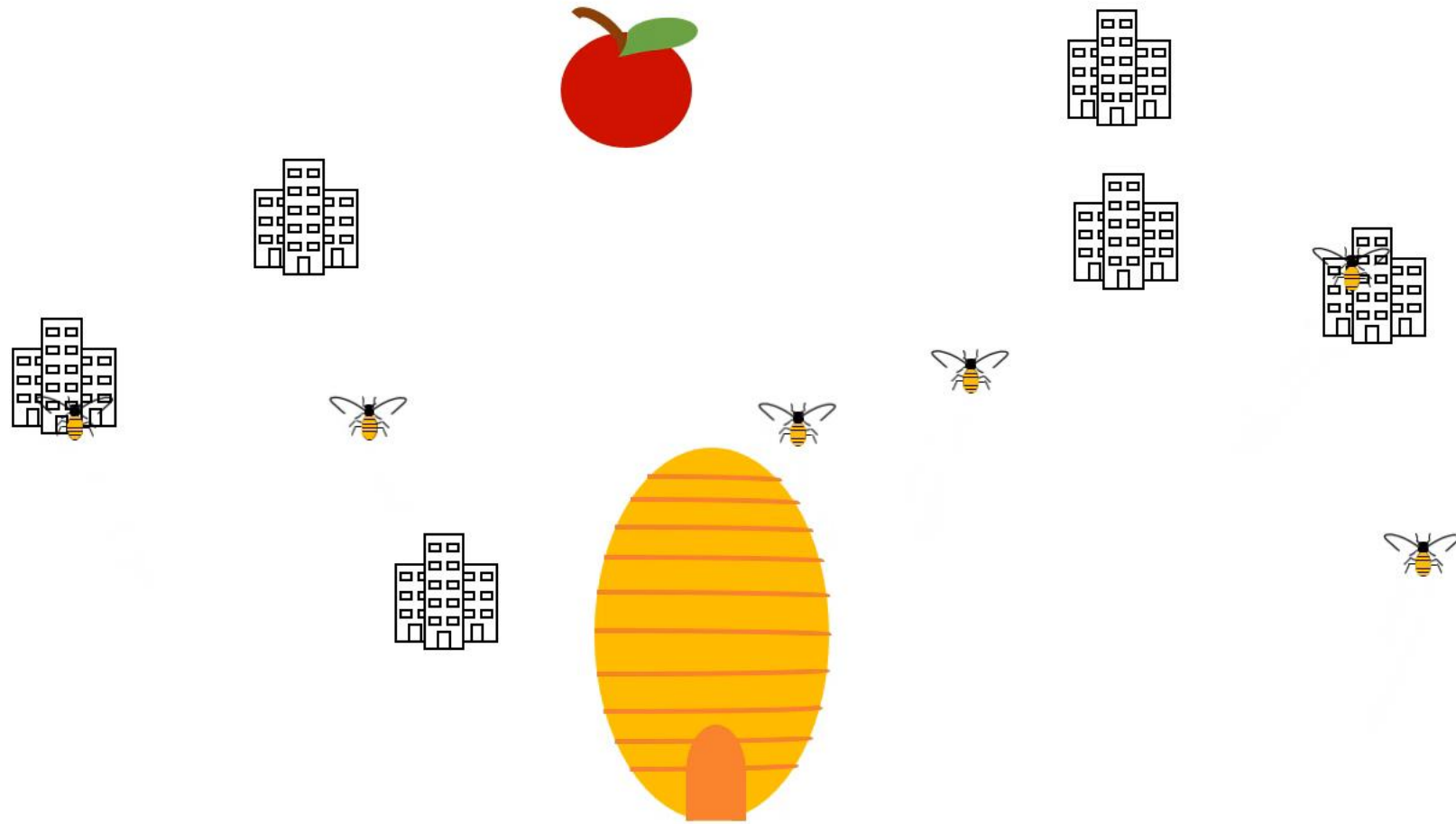

A C B E D A   A C B D E A

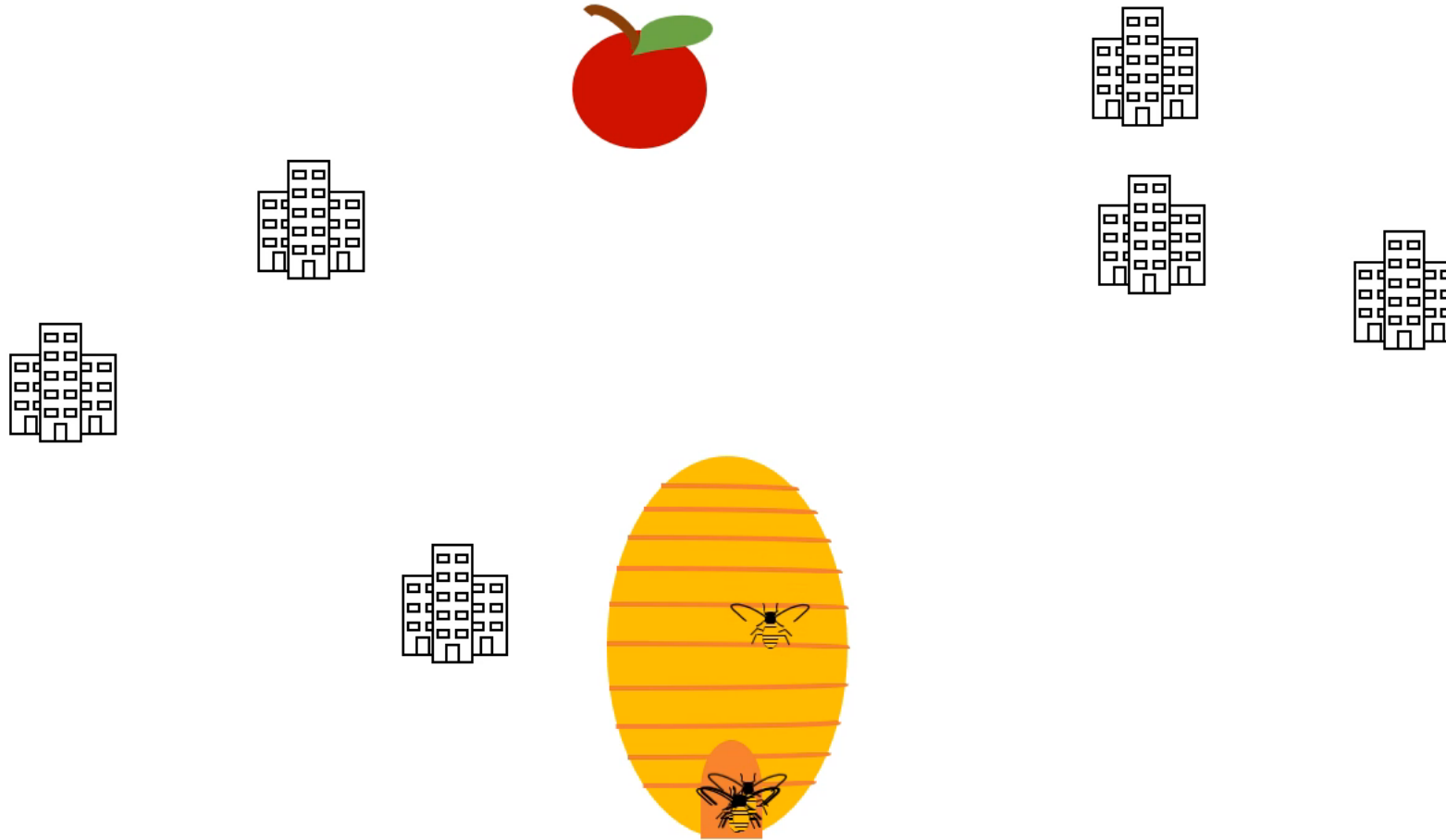# Particle Swarm Optimization (PSO)

Bee Colony Optimization (BCO)
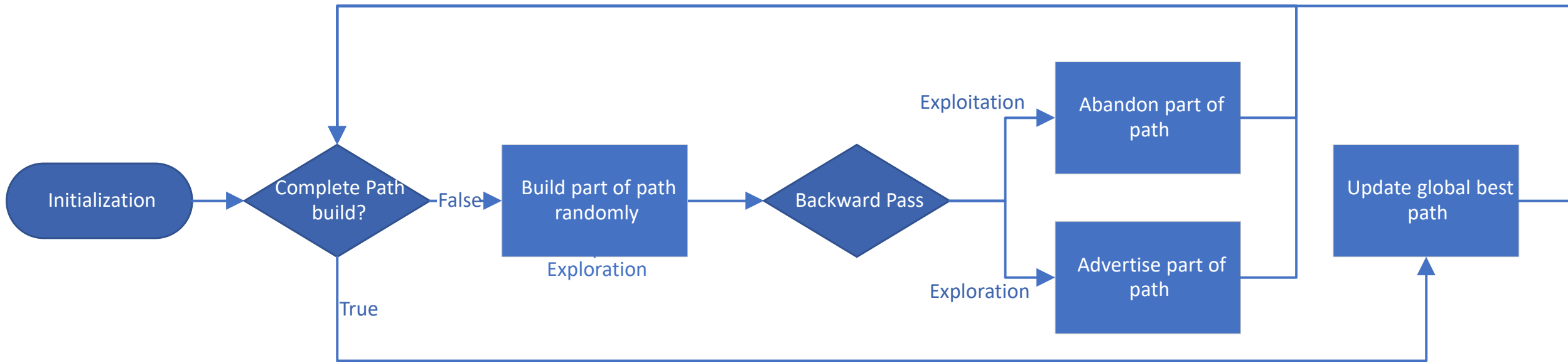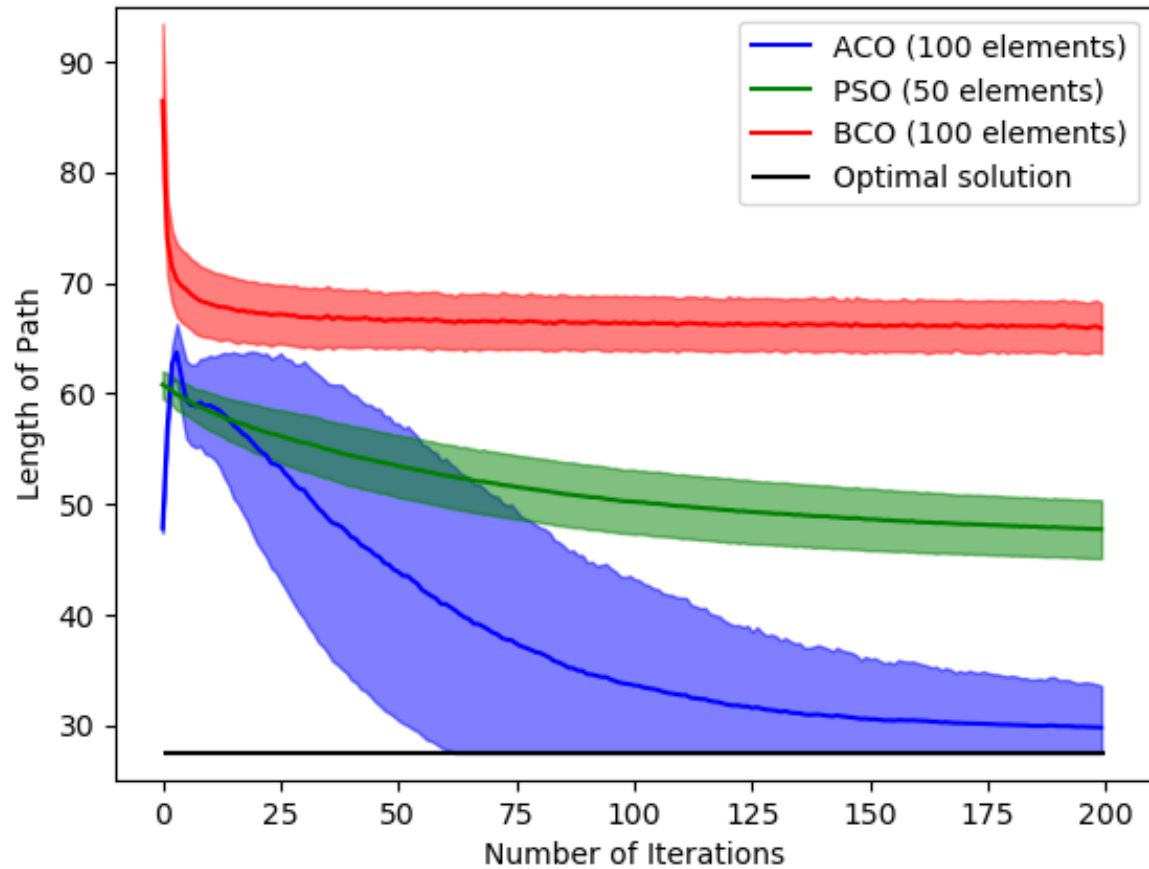
Bee Colony Optimization (BCO)

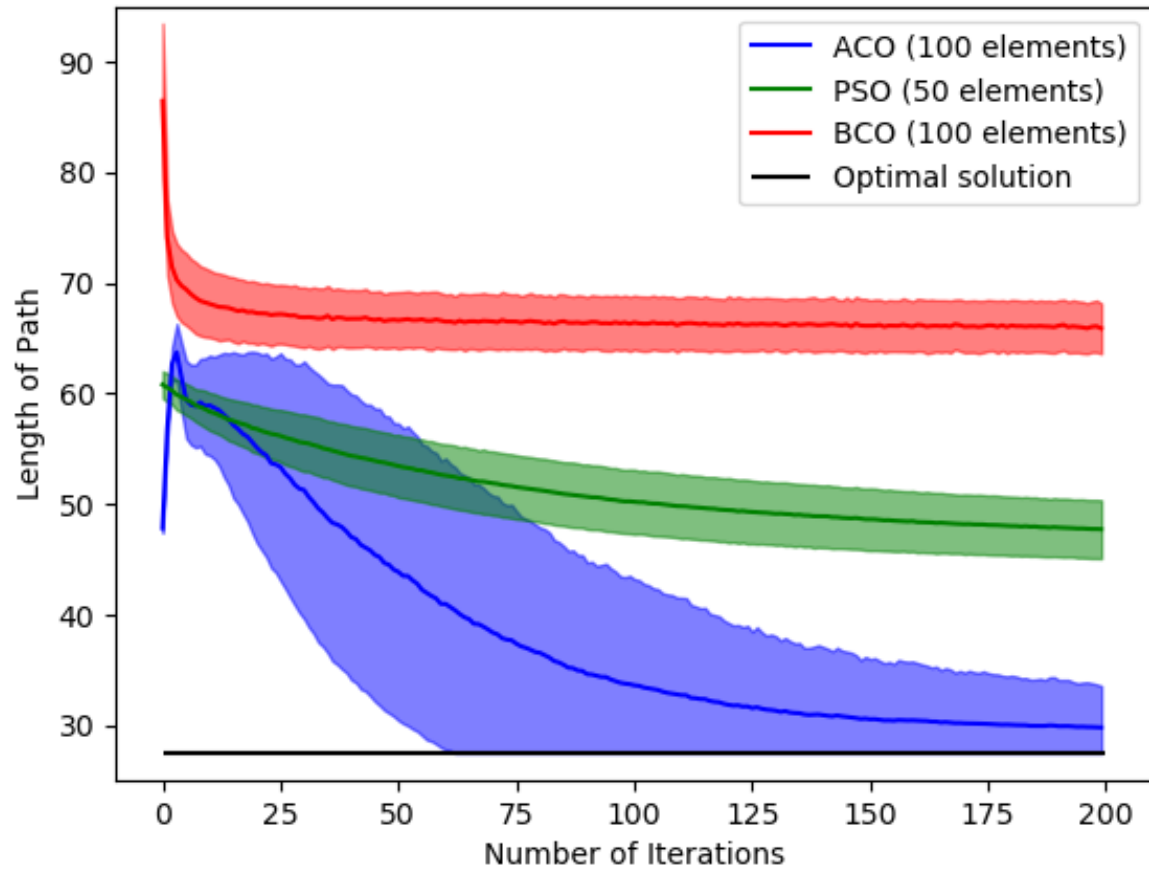# Bee Colony Optimization (BCO)

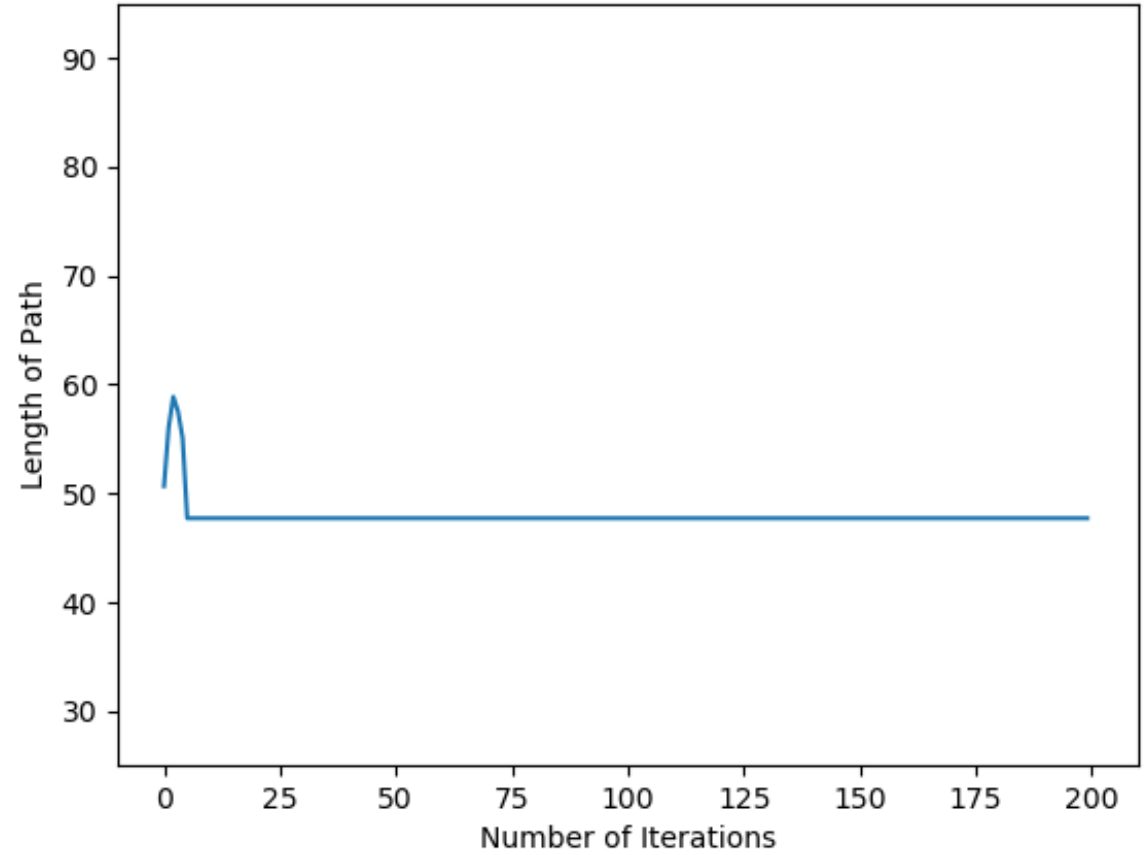# Bee Colony Optimization (BCO)

Experimental Results

- Cities for TSP: 10
- Iterations: 200
- Tests per algorithm: 1000

Experimental Results

ACO with 100% exploitation

Experimental Results

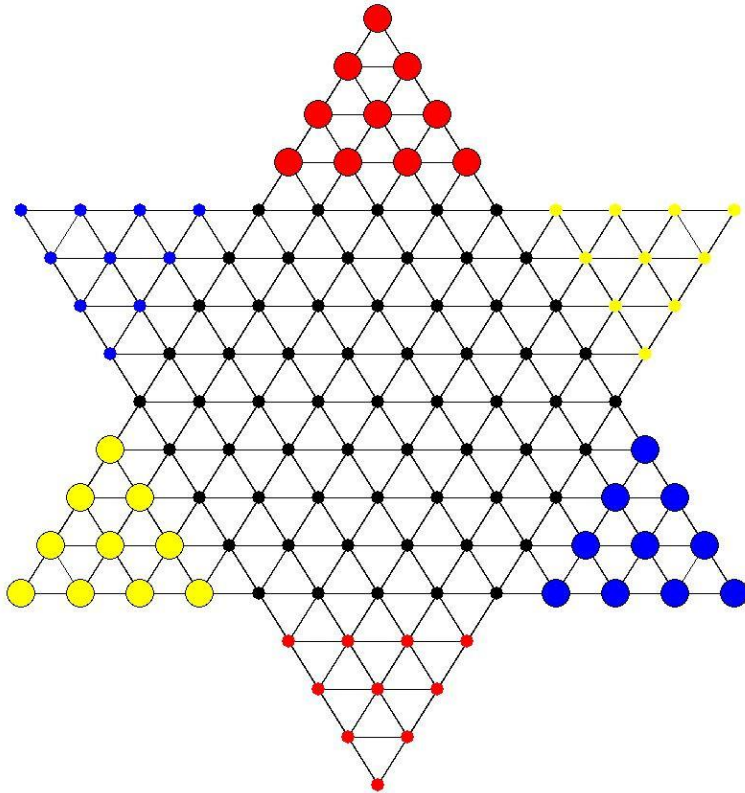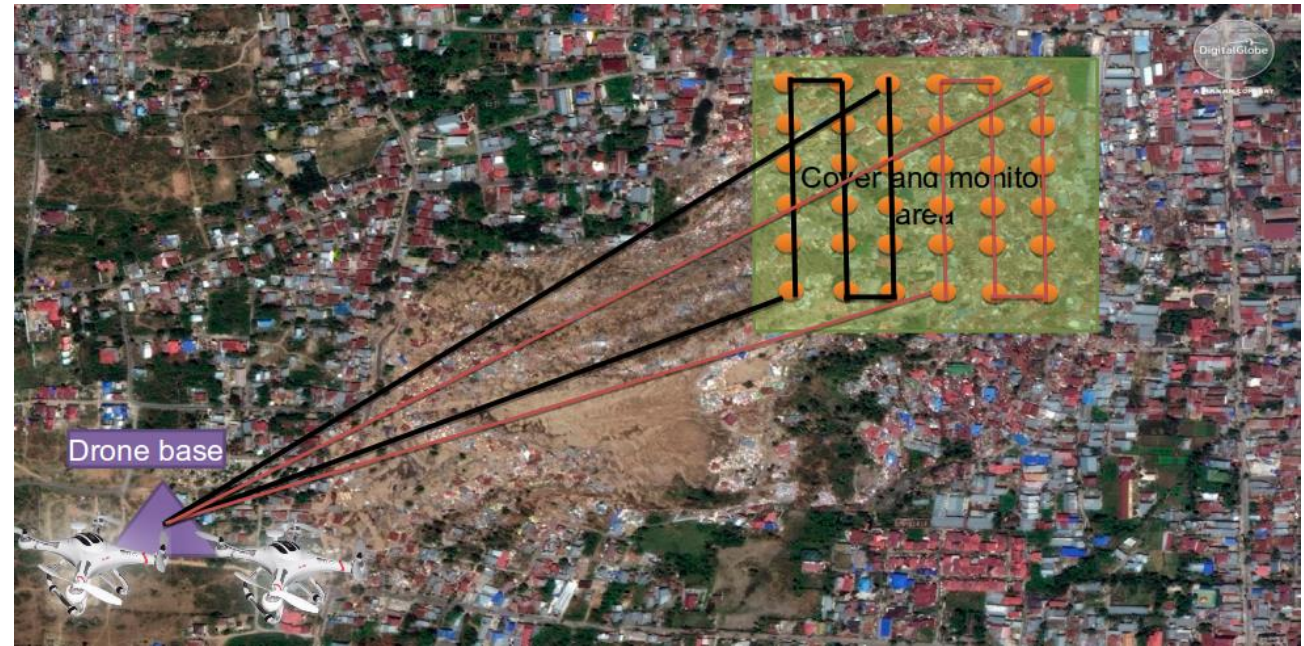| Algorithm	Advantages	Disadvantages
ACO	+ Converges for small number of iterations + Parameter to control balance between exploration and exploitation	- Parameter tuning
PSO	+ Good balance between exploration and exploitation	- Needs more iterations
BCO	+ Few parameters	- Exploitation predominates over exploration

Conclusion

➔ ACO performs best for TSP
➔ Balance between exploration and exploitation is important

Future Work

Board Game Halma (Chinese Checkers)

Drones for Disaster Management