

# Venice is a triwizard maze!

Various uses of Ant Colony Optimization



# Intro



# Triwizard Maze

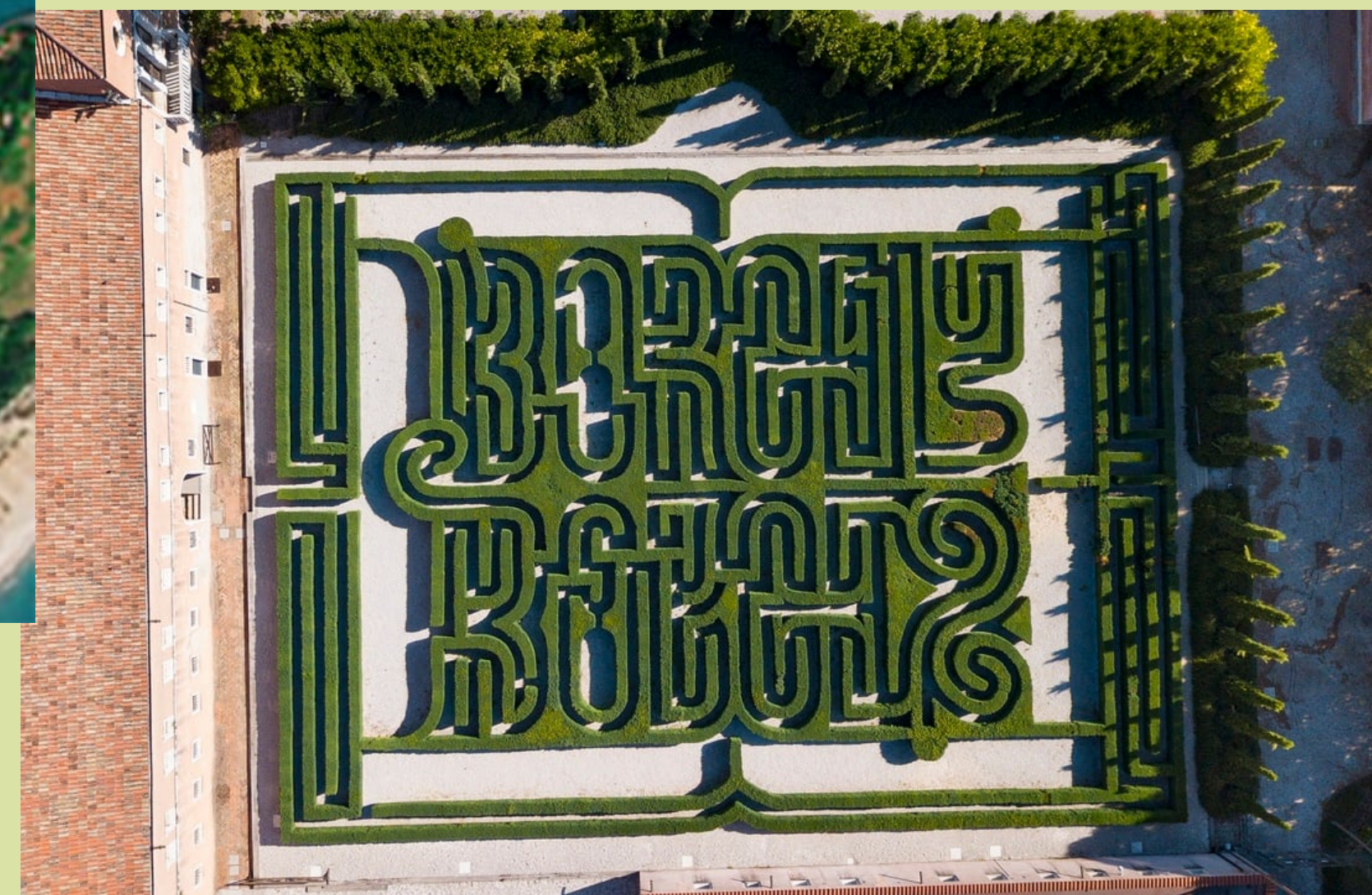


# Triwizard Maze



- Harry Potter and the Goblet of Fire,
- Triwizard Cup hidden in the center of the maze,
- Cedric Diggory and Harry Potter won together by touching the cup at the same time.

# Venice is and has a maze



**Ants:**

**Mirmecology**

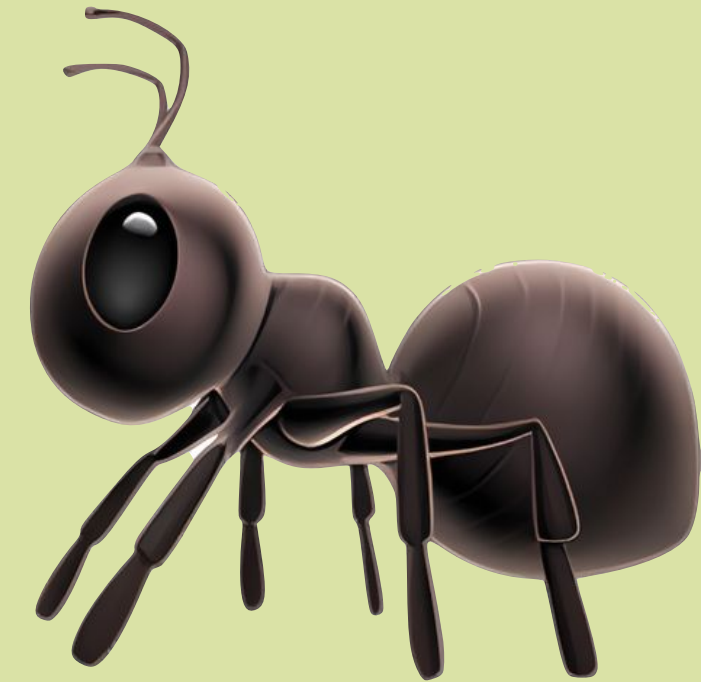
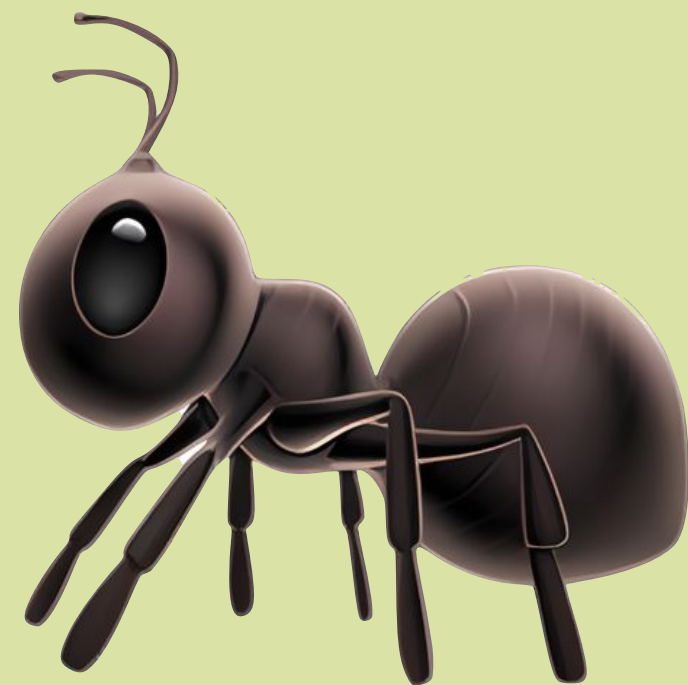
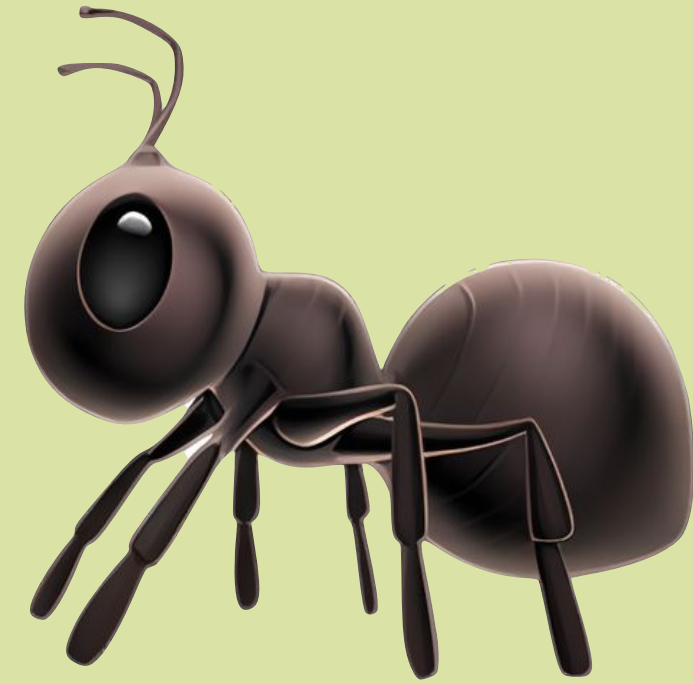


# Ants:

There are more than 15,700 named species and subspecies of ants, and many others not yet named by science. Ants' high degree of social organisation has enabled them to colonise nearly all ecosystems and regions around the globe.



# Ants:





**Stigmergy**

GLI ADELPHI

*Douglas R. Hofstadter*

## Gödel, Escher, Bach:

*un'Eterna Ghirlanda Brillante*



Vi è un certo livello di comunicazione fra le formiche, sufficiente a evitare che il loro movimento sia completamente casuale. Con questa minima comunicazione esse si ricordano reciprocamente che non sono sole, ma che sono impegnate in un lavoro di gruppo. Per qualsiasi attività, come ad esempio per formare una colonna, sono sempre necessarie innumerevoli formiche tenute insieme da questa minima comunicazione reciproca. [6]

# Ants:



# Pheromone

# Procedure:

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**Algorithm 3** Ant Colony Optimization

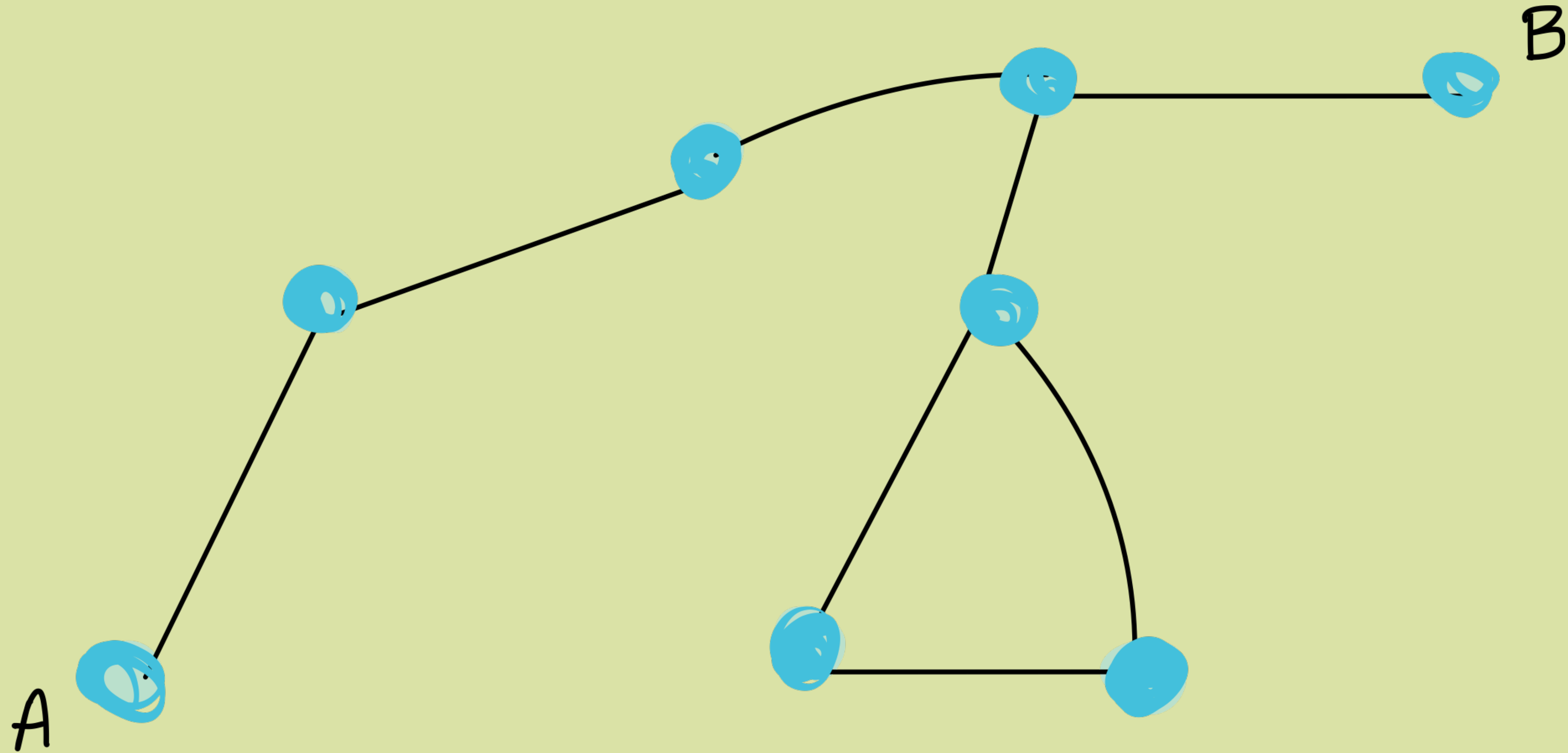
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```
1: procedure ANT COLONY OPTIMIZATION(ants)
2:   while Casual exploration of the environment do
3:     if An ant finds food then
4:       Ant comes back to the colony leaving a pheromone trace
5:     end if
6:   end while
7:   Other ants follow the pheromone trace by probability  $p$ 
8:   The pheromone trace becomes shorter and stronger
9:   The pheromone trace becomes the shortest path
10:  Return The shortest path dicovered by the ant colony
11: end procedure
```

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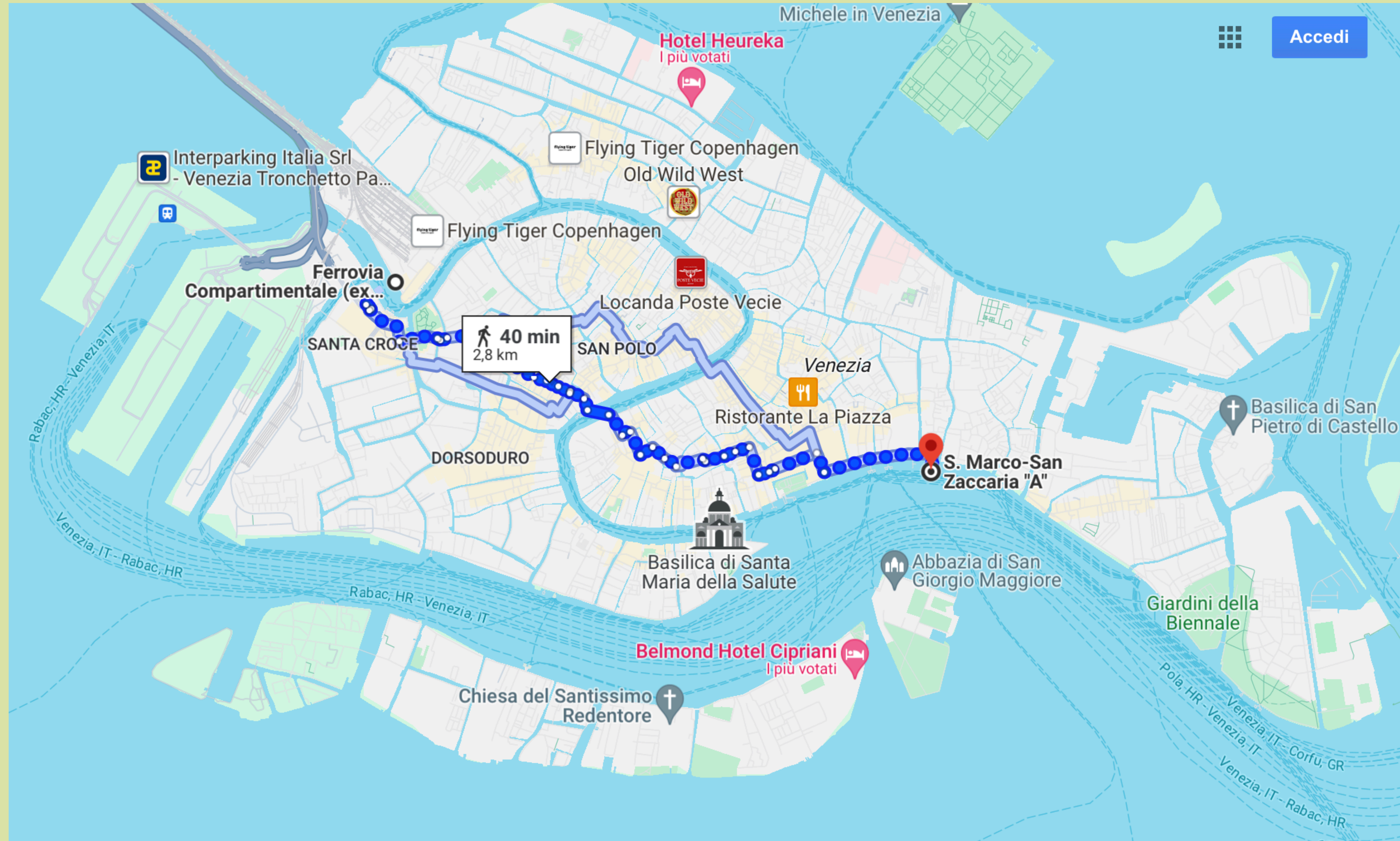
updated by the ACO algorithm during the search.

The ants move from vertex to vertex along the edges of the construction graph exploiting information provided by the pheromone values and in this way incrementally building a solution. Additionally, the ants deposit a certain amount of pheromone on the components, that is, either on the vertices or on the edges that they traverse. The amount  $\Delta\tau$  of pheromone deposited may depend on the quality of the solution found. Subsequent ants utilize the pheromone



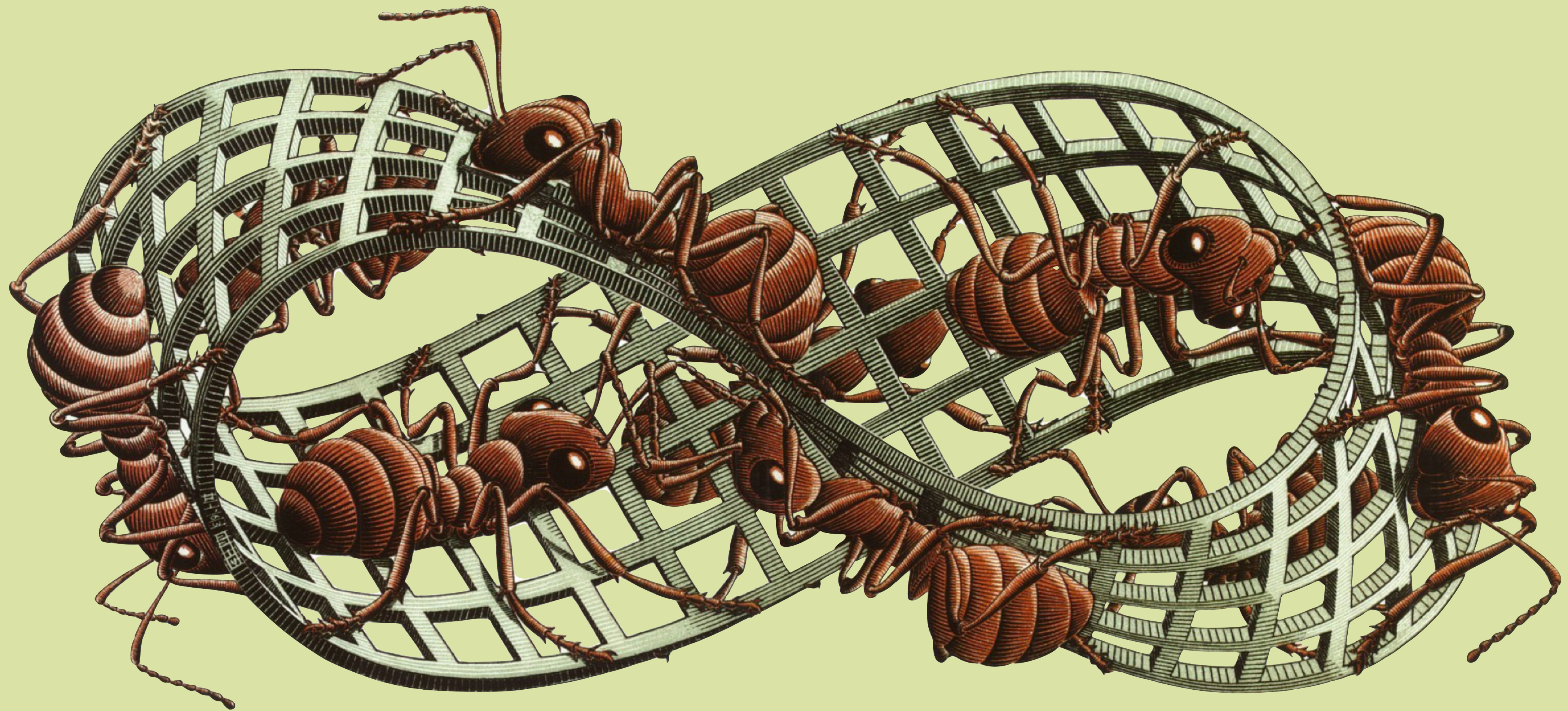
# Nature Inspired Computing

# Venice is still a maze





# Outro



**Möbius Strip II - M.C. Escher**

**Grazie**

A dark blue event poster for 'AI heroes'. On the left is a large white graphic of a ticket stub with three perforations. To the right, the text 'AI heroes' is written in white, with 'AI' inside a red speech bubble. Below this, the word 'TICKETS' is written in large, bold, red capital letters. Underneath 'TICKETS', the phrase 'now on sale!' is written in white. At the bottom left, there is a smaller version of the 'AI heroes' logo. At the bottom right, the text '1 December 2023 | Turin & Online | brought to you by /synesthesia events' is written in white. The background of the poster has a subtle pattern of white dots in the upper corners.

AI heroes 1 December 2023 | Turin & Online | brought to you by /synesthesia events

[github.com/federikovi/talks](https://github.com/federikovi/talks)

