



SAPIENZA  
UNIVERSITÀ DI ROMA

# Artificial Intelligence

2023/2024 Prof: Sara Bernardini

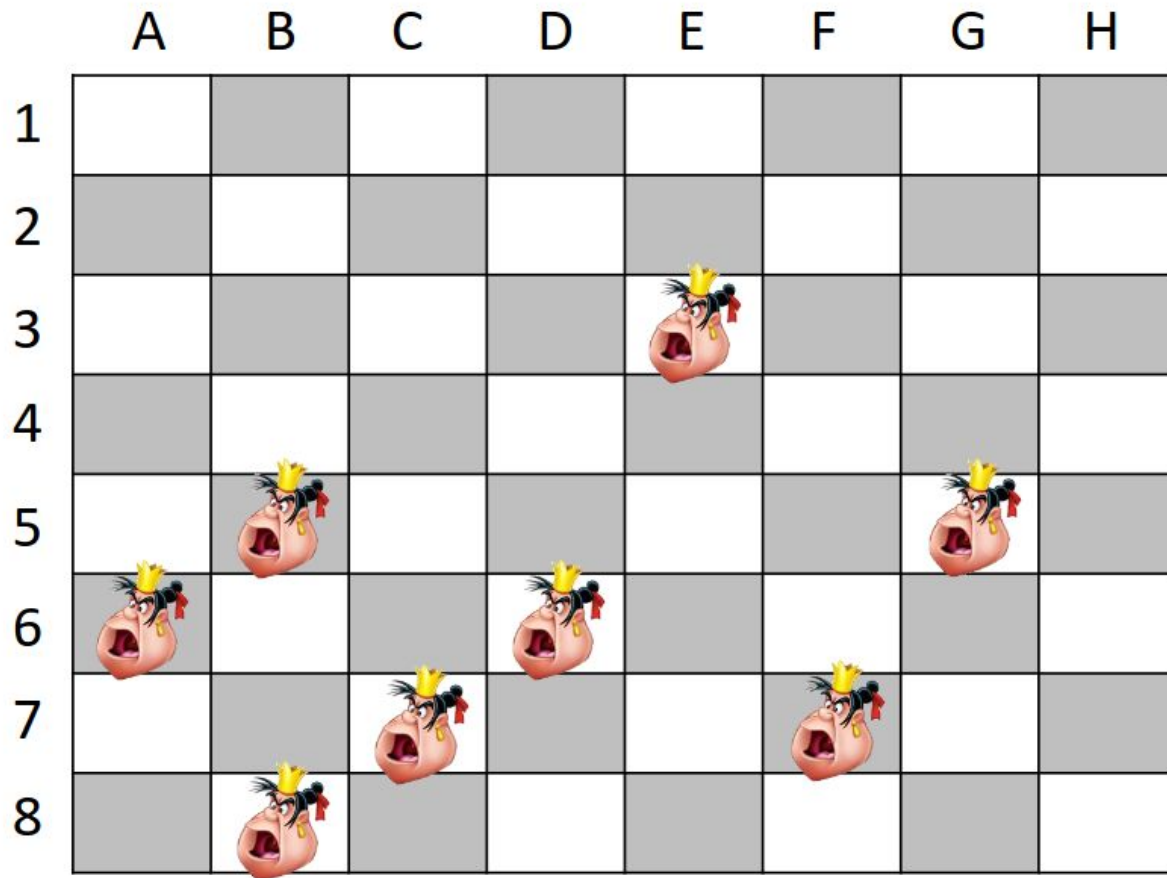
## Lab 3: Local Search and Games

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\*The slides have been prepared using the textbook material available on the web, and the slides of the previous editions of the course by Prof. Luigia Carlucci Aiello, Prof. Daniele Nardi and Dott. Fabio Previtali.

# Example: 8-Queens

Use a **hill-climbing** with the evaluation function “number of queens which are threatened by another queen” in the 8-Queens problem.



# Example: 8-Queens

1. What is the current score for the evaluation function?
2. Write down 3 of the possible moves from this state to the goal one (queens can move anywhere)
3. Give an example of an illegal move (in the hill climbing search)
4. What do you do if there are no legal moves?

# Example: Tic-Tac-Toe

Tic-Tac-Toe is played on square grid of size  $3 \times 3$ . At each turn, players select an empty cell and place there its own symbol (i.e., O or X). A player wins when he places three of its own symbols in a line (vertical, horizontal or diagonal).

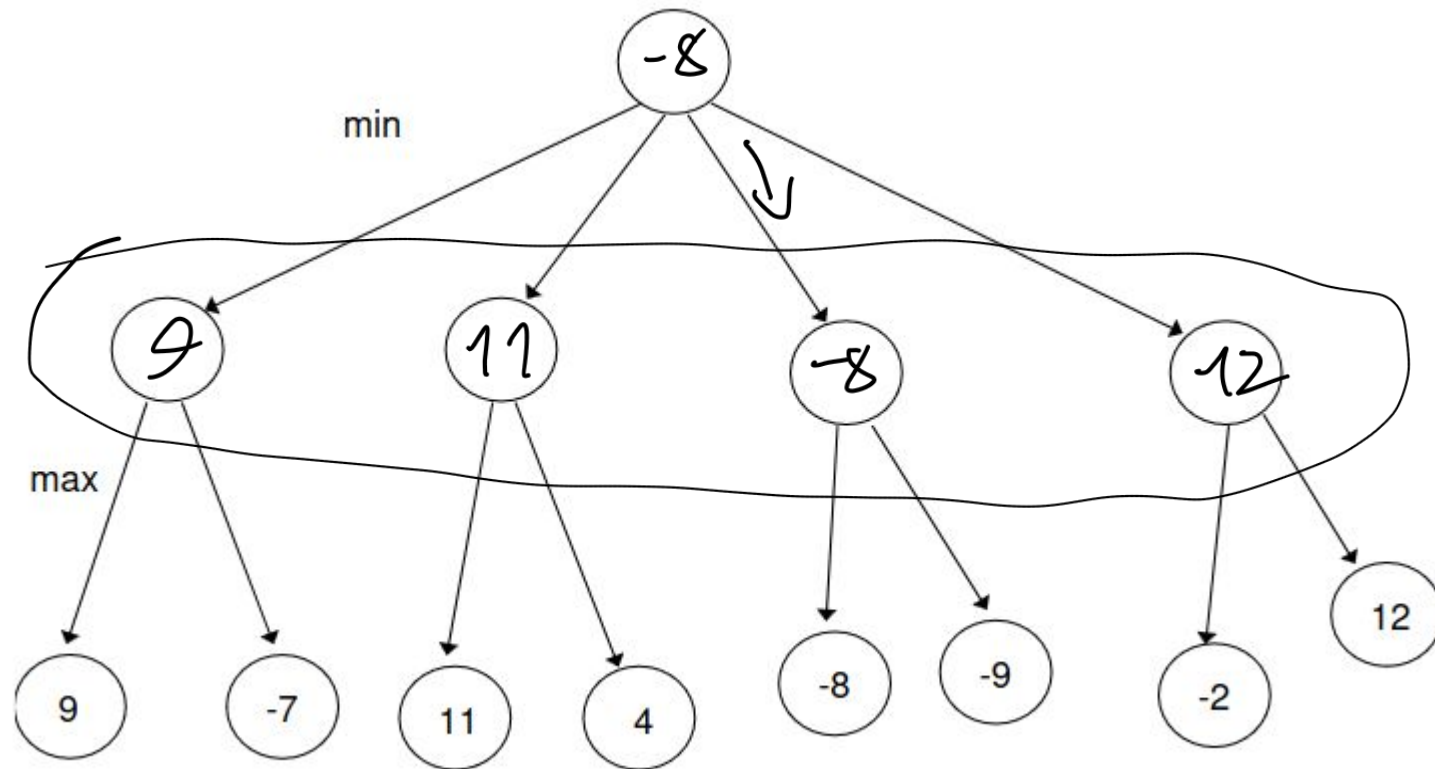
If the grid is filled without any player being able to place three symbols in a line, the game ends in a draw.

1. Suppose that the game is in the state described by the previous picture and that X must move next. Draw the game tree of the rest of the match.

2. Show the solution of the game using mini-max, knowing that payoffs, are for each player, -1, 0, +1 depending on if he loses, draws or wins, respectively.

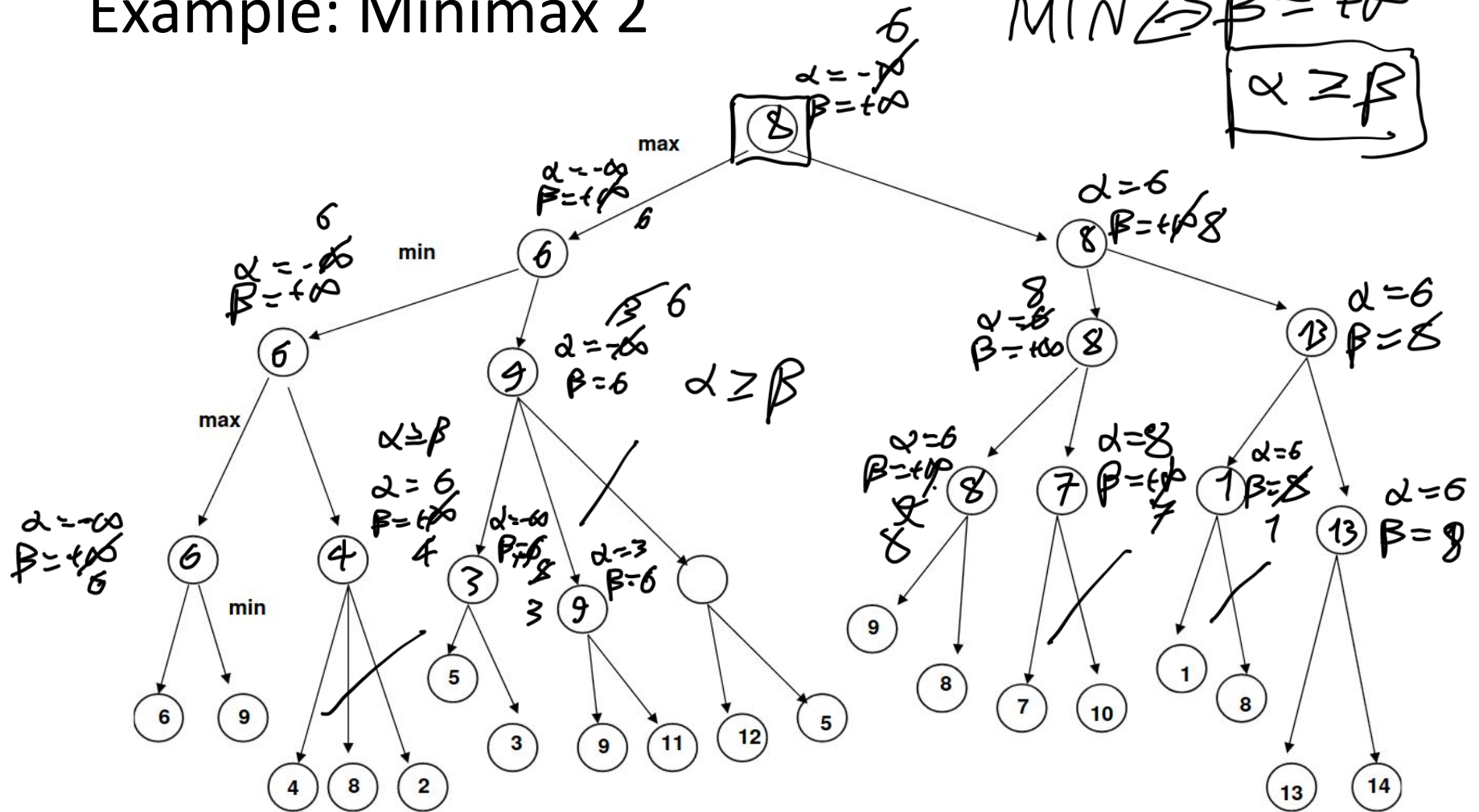
X		O
O	X	
X		O

# Example: Minimax 1



# Example: Minimax 2

$MAX \Leftrightarrow \alpha = -\infty$   
 $MIN \Leftrightarrow \beta = +\infty$   
 $\boxed{\alpha \geq \beta}$



# Tools

[https://raphsilva.github.io/utilities/minimax\\_simulator/#](https://raphsilva.github.io/utilities/minimax_simulator/#)

<https://pascscha.ch/info2/abTreePractice/>





