Introduction to AI

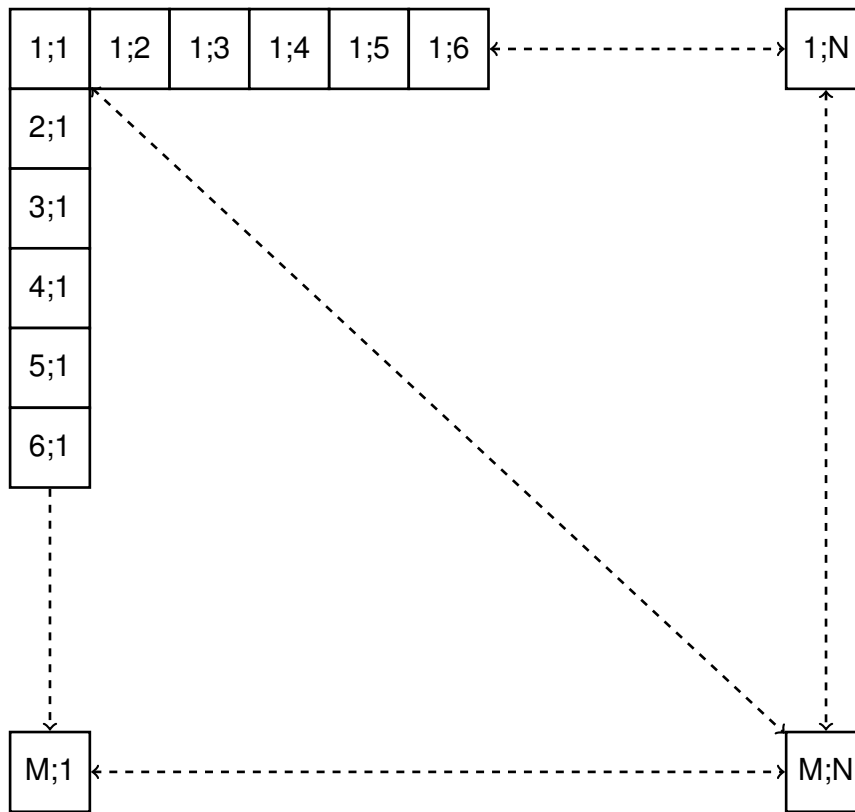# Project : $N \times M \times K$ Tic Tac Toe

Not 3D

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1 PRATICAL INFORMATIONS

- Individual project ;

- Deadline : TBA, should be end of November ? ;

- Deliverable : A python file with a class named "Solver" which can be initialised with *Solver(X)* which has to implement the following function : *solve(M)*, where *M* is a NumPy matrix of integers and *X* your symbol (either 1 or 2), which return a tuple (A,B) with A and B strictly positive natural numbers ;

    - ⚠ If your tuple violates the game constraints, you simply miss the turn ;

- Send your deliverable to saittahar@ulg.ac.be with the subject *name*_tictactoe, and with enclosed a file with the same name and *.py* extension

2 $N \times M$ TIC TAC TOE GRID

This is a classical tic tac toe grid. You'll notice that the grid can be really large. Plus, it is not necessarily a square.
Usually, we denote 'X' and 'O' for each player token, but in this project we'll go for 1 and 2 (0 is empty).

The rules[1] remain the same, except the following. Instead to have most complete diagonals/lines/columns with the same symbol, players are expected to cumulate subdiagonals/sublines/subcolumns of size K (denoted as K-alignment) with the same symbol.
For each of them, the player earns 1 point. Plus, if a symbol is at an intersection of i $K - 1$ alignments, those are counted as i distincts K alignments. When a symbol is used at an intersection, this rule does not apply to symbols along the same direction for which the distance from this former is less than $K - 1$. Finally, when a player build at least 1 K-alignment, he also takes the next turn.

Thus, the goal is to have more points than the opponent at the point where it is not possible for any of the players to build more K-alignments. The game is made more challenging with a budget time limit of 1 minute.

You'll find below some common scoring examples with a 10×10 grid and $K = 5$.

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[1] For a quick reminder : https://en.wikipedia.org/wiki/Tic-tac-toe

				X					
				X					
				X					
				X					
				X					
			X						
		X							
	X								
X					X	X	X	X	X

Figure 2.1: Here, the score for the player *X* is 3

				X					
				X					
				X					
				X					
				X					
				X					
				X					
				X					
X	X	X	X	X	X	X	X	X	

Figure 2.2: Here, the score for the player *X* is 4