

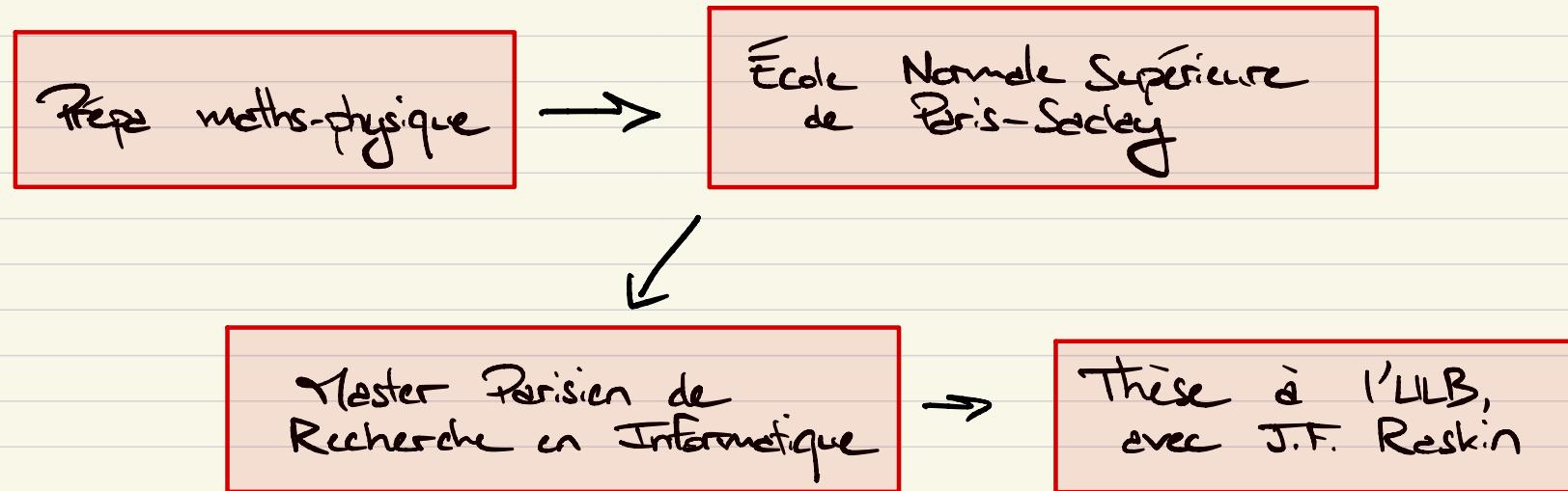
# La théorie des jeux en informatique

où comment faire un doctorat en informatique  
sans écrire une ligne de code



Léonard Brice

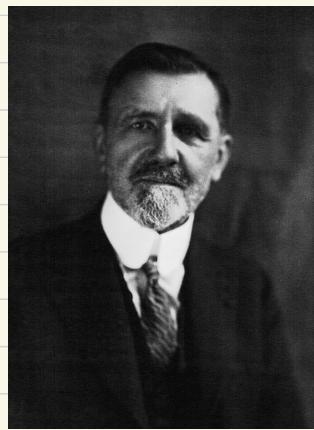
Mon parcours :



# La théorie des jeux : Genèse



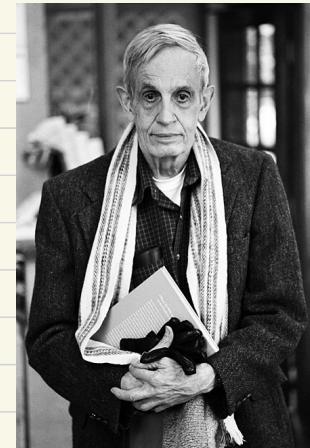
Antoine-Augustin Cournot  
1801 - 1877



Émile Borel  
1871 - 1956



John von Neumann  
1903 - 1957



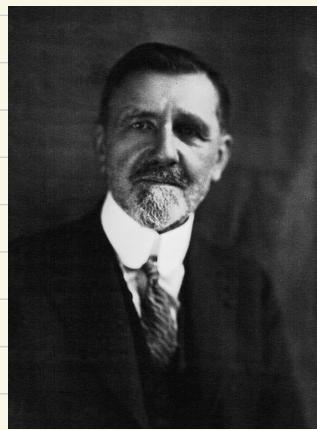
John Nash  
1928 - 2015

# La théorie des jeux : Genèse

1938: Recherche sur le principes mathématiques de la théorie des richesses



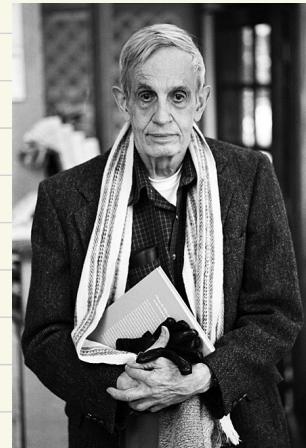
Antoine-Augustin Cournot  
1801 - 1877



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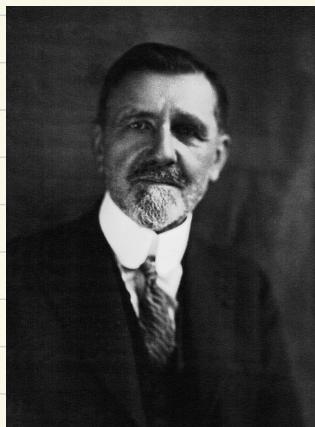
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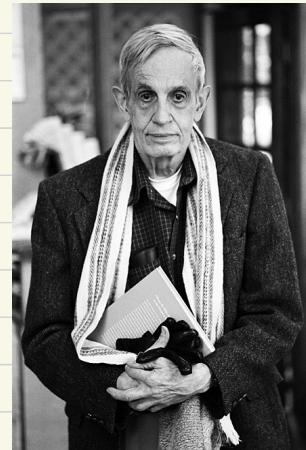
Antoine-Augustin Cournot  
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John von Neumann  
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1928 - 2015



1938: Applications aux jeux de hasard

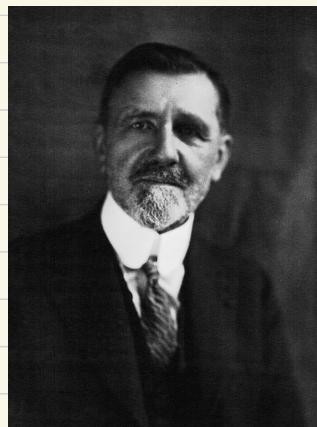
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1938 : Recherche sur le principes mathématiques de la théorie des richesses



Antoine-Augustin Cournot  
1801 - 1877

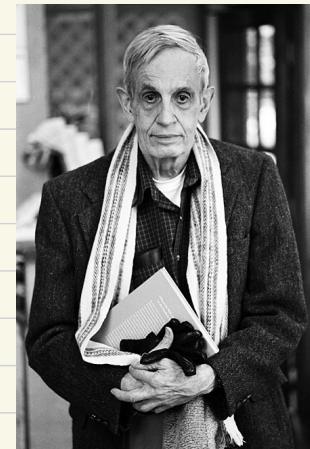
1944 : Theory of Games and Economic Behavior



Émile Borel  
1871 - 1956



John von Neumann  
1903 - 1957



John Nash  
1928 - 2015



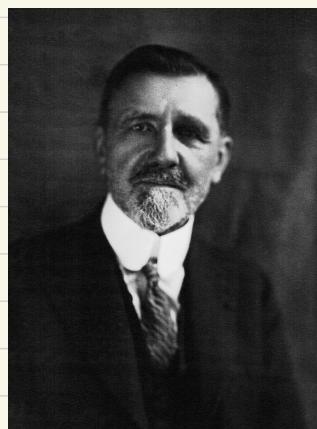
1938 : Applications aux jeux de hasard

# La théorie des jeux : Genèse

1938 : Recherche sur le principes mathématiques de la théorie des richesses



Antoine-Augustin Cournot  
1801 - 1877

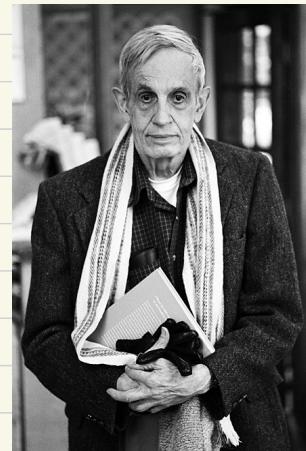


Émile Borel  
1871 - 1956

1944 : Theory of Games and Economic Behavior



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1938 : Applications aux jeux de hasard

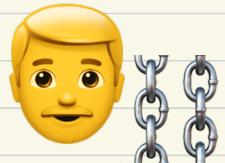
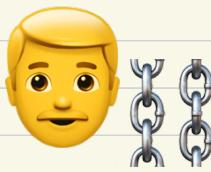


plusieurs travaux autour de 1950

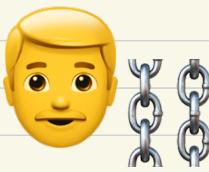
Un jeu à somme nulle



Un jeu à somme non-nulle

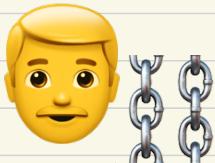


Un jeu à somme non-nulle



J'avoue

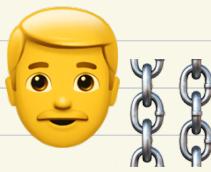
Je garde le silence



J'avoue

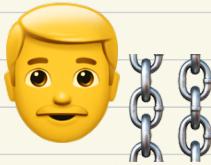
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Un jeu à somme non-nulle



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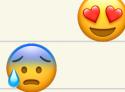
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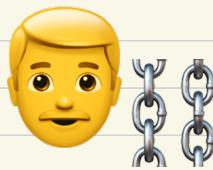
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Je garde  
le silence

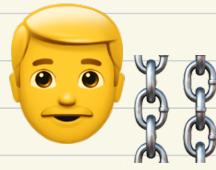


Un jeu à somme non-nulle



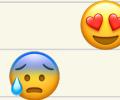
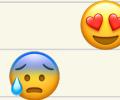
J'avoue

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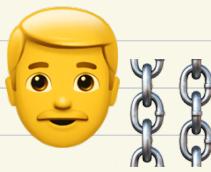


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Je garde  
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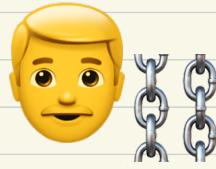


Un jeu à somme non-nulle



J'avoue

Je garde le silence

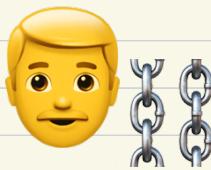


J'avoue

Je garde  
le silence

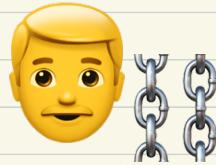


Un jeu à somme non-nulle



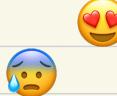
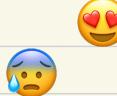
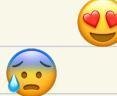
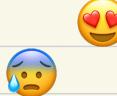
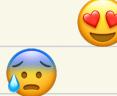
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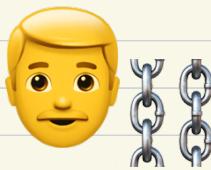


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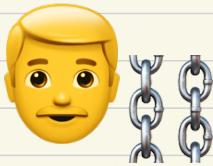


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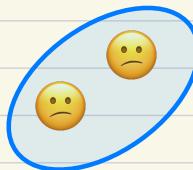
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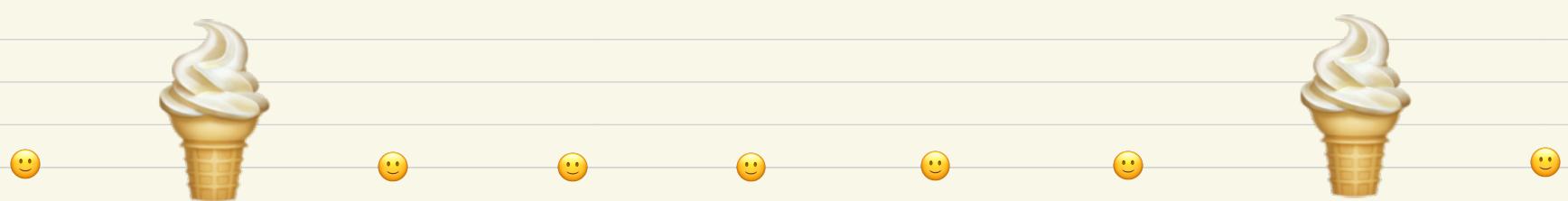
Je garde le silence



J'avoue

Je garde  
le silence





En sciences politiques :



GAUCHE  
ANTICAPITALISTE

ecolo



En sciences politiques :



GAUCHE  
ANTICAPITALISTE



Théorème de Gibbard-Satterthwaite (1973) : tout système de vote est soit dictatorial, soit manipulable.

En biologie évolutioniste :



Les colombes partagent la ressource ( $\frac{V}{2}$  chacune)



Le faucon prend tout (V pour lui, 0 pour le colombe)



Les faucons se battent : le gagnant prend la ressource V, le perdant subit un coût C.

En biologie évolutioniste :



Les colombes partagent la ressource ( $\frac{V}{2}$  chacune)



Le faucon prend tout ( $V$  pour lui,  $0$  pour le colombe)



Les faucons se battent : le gagnant prend la ressource  
 $V$ , le perdant subit un coût  $C$ .

☞ Si  $V < C$ , on tend vers un pourcentage de faucons de  $\frac{V}{C}$ .

En relations internationales :

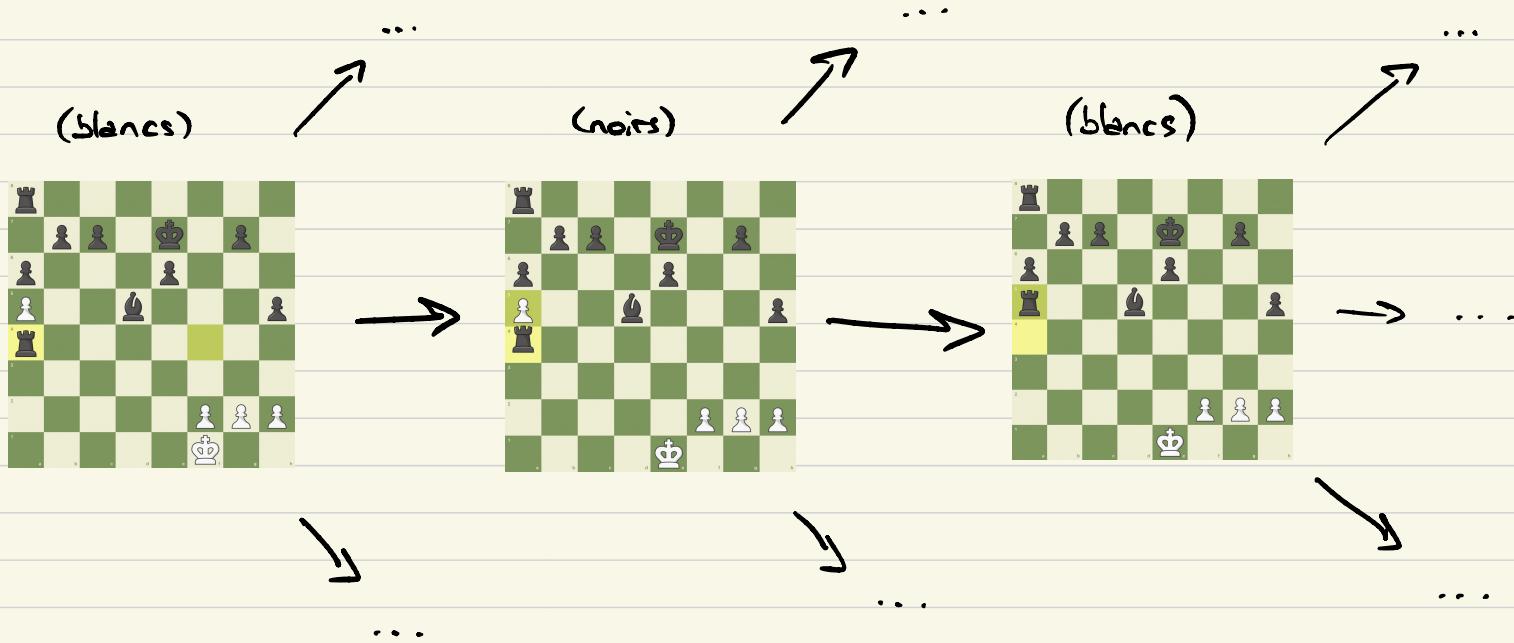


En relations internationales :



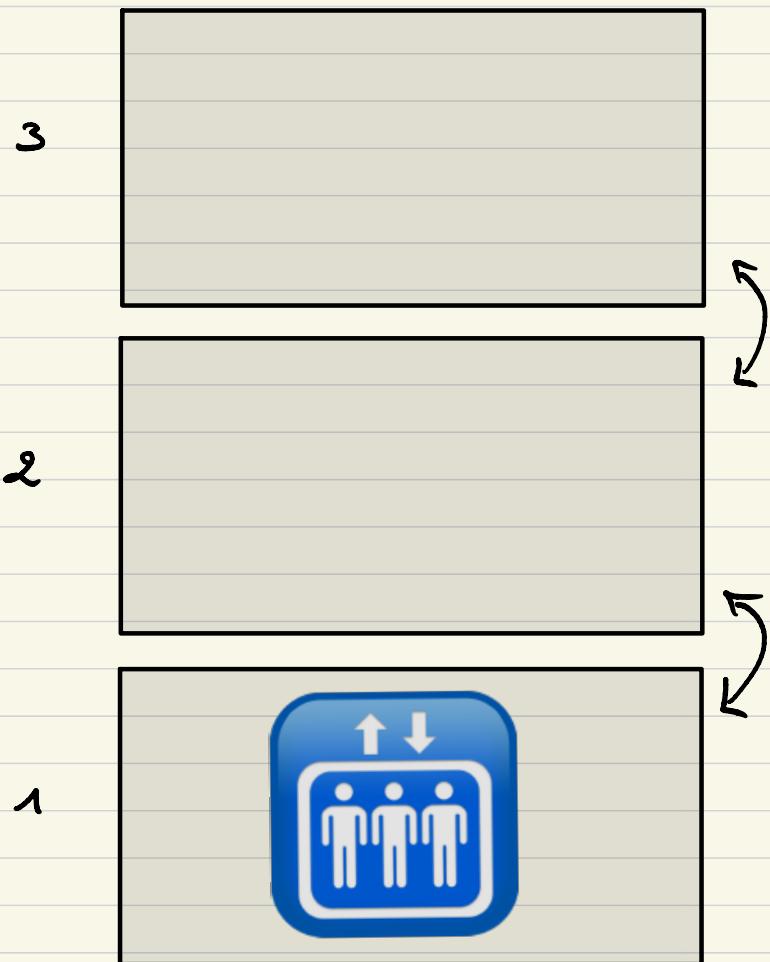
Et en informatique ?

Résolution algorithmique de jeux :

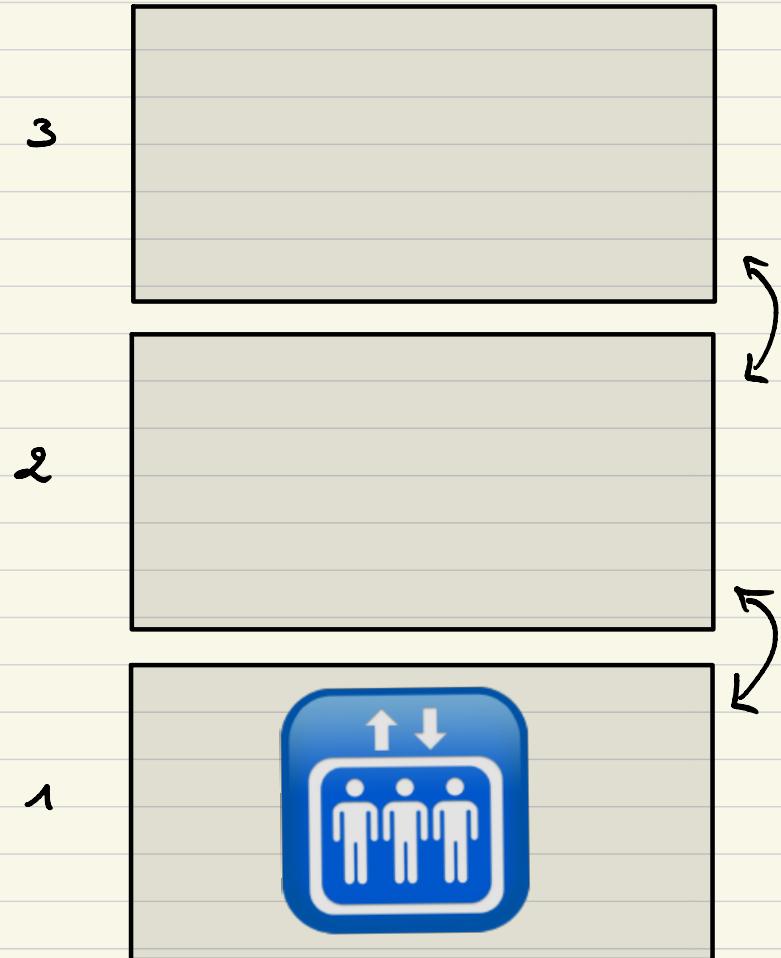




La métaphore-jeu :

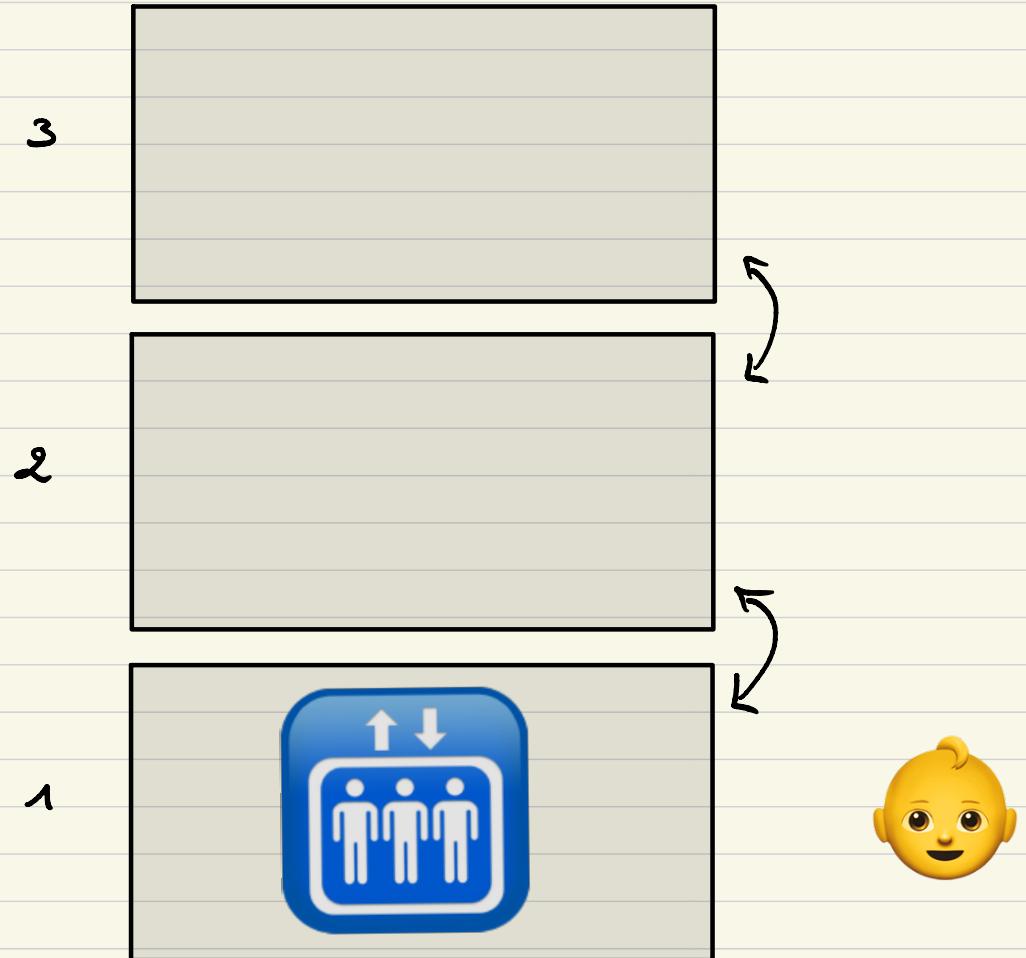


La métaphore-jeu :

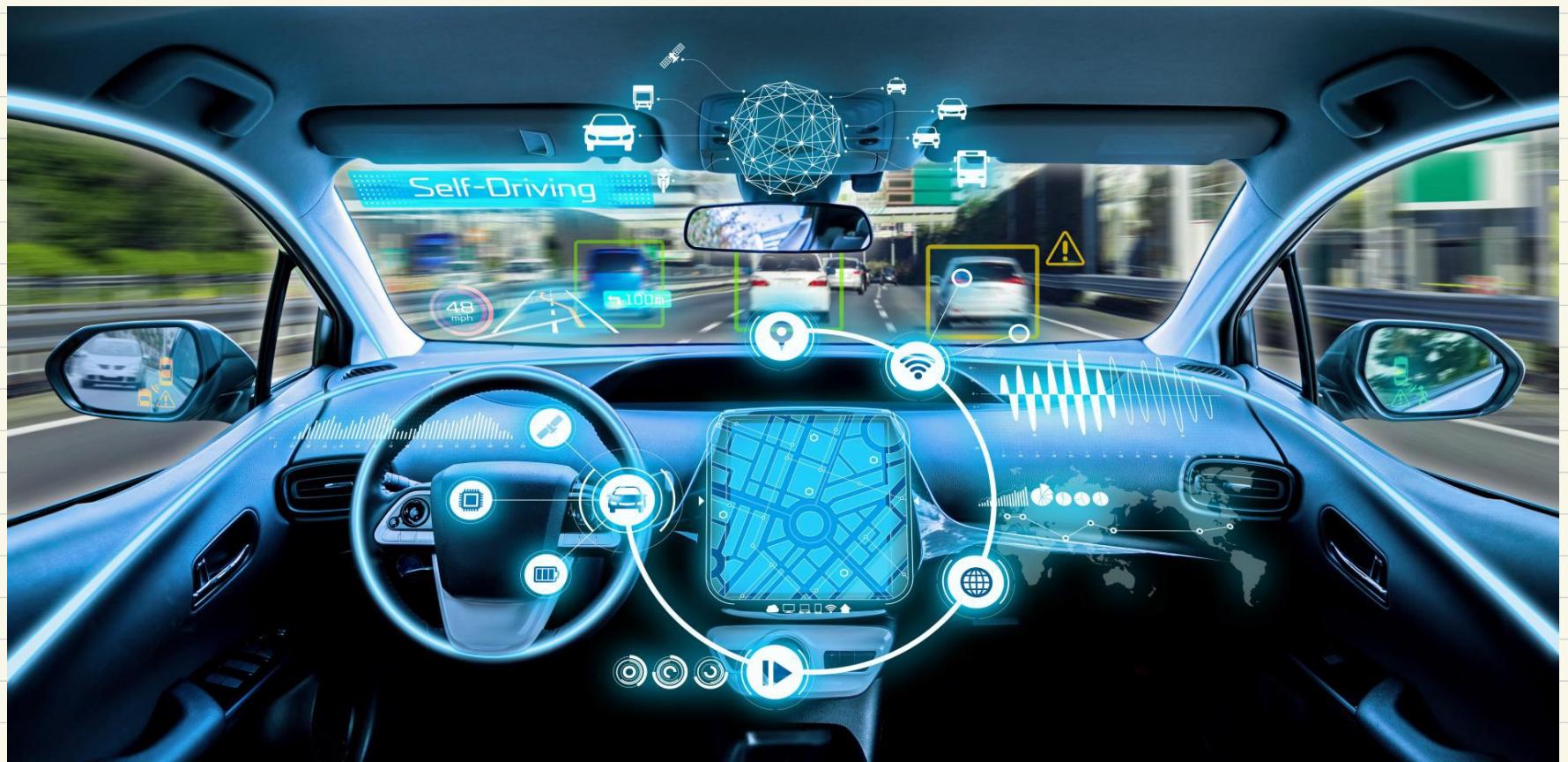


Sépécification :  $\forall k \in \{1, 2, 3\}, G (cell(k) \Rightarrow F \text{ reach}(k))$

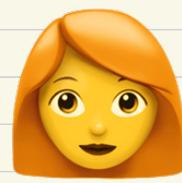
La métaphore-jeu :



Spécification :  $\forall k \in \{1, 2, 3\}, G (cell(k) \Rightarrow F \text{ reach}(k))$



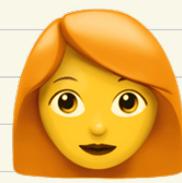




Alice



Bob



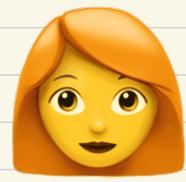
Alice



Bob



Charlie



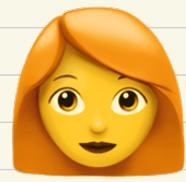
Alice



Bob



Charlie



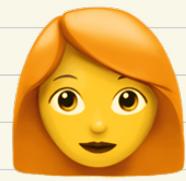
Alice



Bob



Charlie



Alice



Bob



Charlie



Alice



Bob



Charlie



Alice



Bob



Charlie



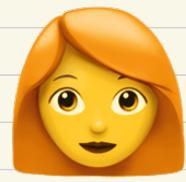
Alice



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Charlie



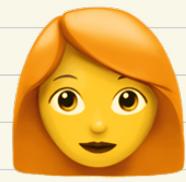
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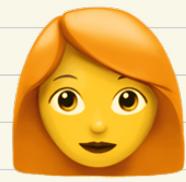
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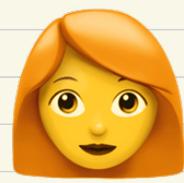
Alice



Charlie



Bob



Alice



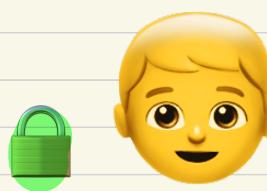
Bob



Charlie



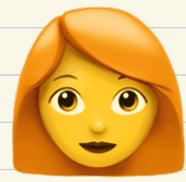
Alice



Bob



Charlie



Alice



Charlie



Bob



Alice



Charlie



Bob

Les protocoles de Needham-Schroeder (1978)

attaque identifiée en 1995 par Gavin Lowe

La théorie des jeux,  
normative ou descriptive ?

Merci !

↳ pour consulter mes articles : DBLP > Léonard Brice