

FRIARE

Pour une intelligence artificielle responsable et efficiente en Afrique

WEBINAIRE

INTELLIGENCE ARTIFICIELLE : AU DELÀ DE L'APPRENTISSAGE AUTOMATIQUE

Episode 3 Recherche en situation d'adversité



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Chercheur et Enseignant
en Intelligence Artificielle

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John AOGA

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BIOGRAPHY

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16th March 2024

<https://johnaoga.github.io/>







John Aoga, PhD

Who am I?
 Doctor & Engineer in Science and Technology
 Specialist in Data science & AI
 Researcher and Teacher
 Co Founder of MIFY S.A.R.L company

Goals and Aspirations
 Promote and develop AI 4 Africa In Africa
 Promote and develop Education tools

Domains & Interests
 Algorithms and Optimization
 Data/Pattern Mining Approches and applications
 Deep Learning & NLP for local languages
 Social Data Analysis

Scientific References

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AI Beyond Machine Learning

Adversarial Search

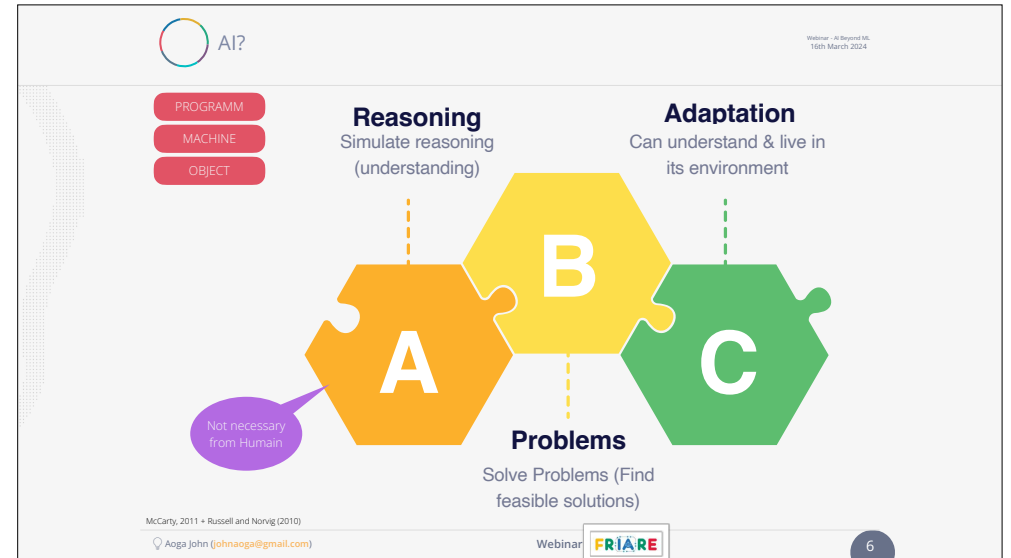
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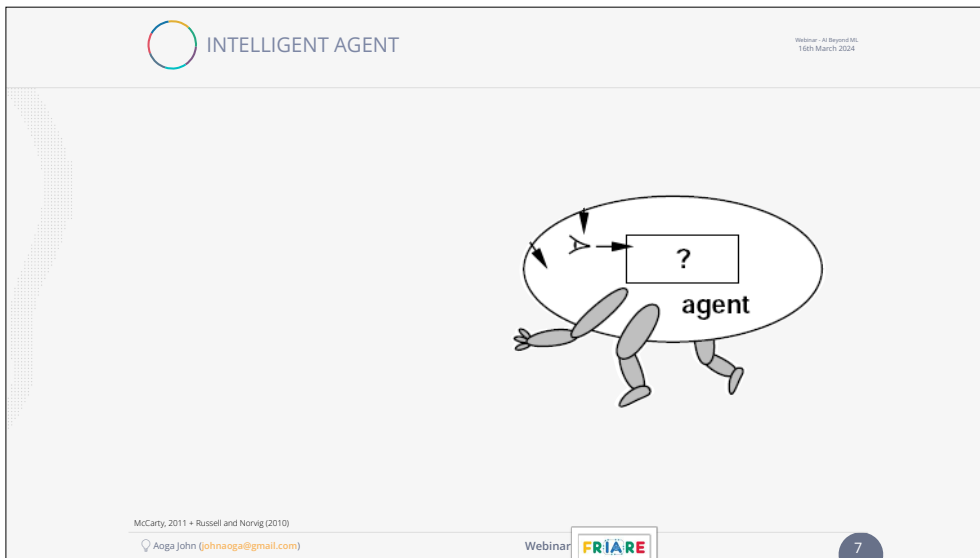
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Introduction

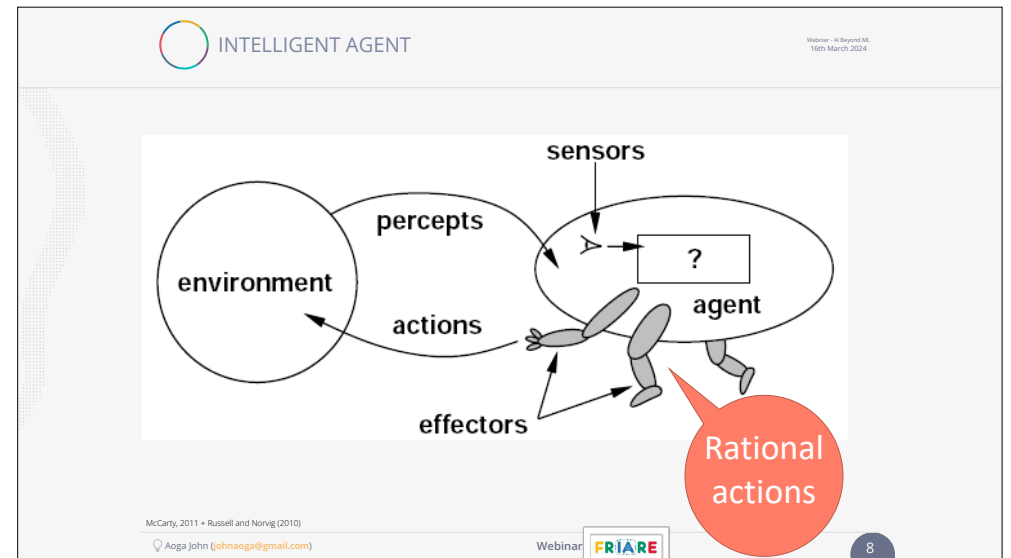
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TIC-TAC-TOE SIMULATION
How to find the right action to take?

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X : +1
O : -1
Tie : 0

What's the best move?

X-turn (max)

O-turn (min)

Minimax!

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Minimax

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MINIMAX ALGORITHM SIMULATION
Simple example

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White-turn (max)

Black-turn (min)

White-turn (max)

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MINIMAX ALGORITHM IMPLEMENTATION
Simple example

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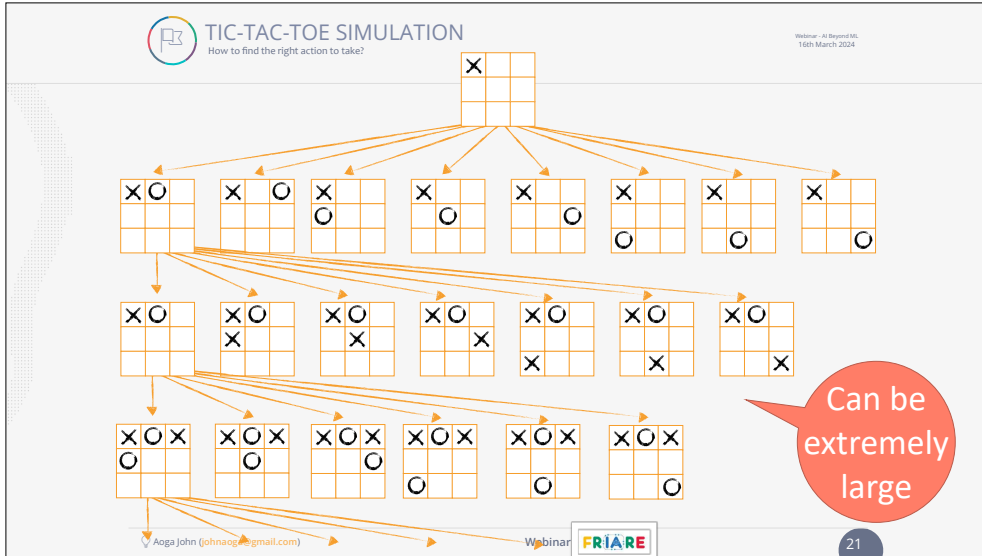
```
function minimax(position, depth, maximizingPlayer)
  if depth == 0 or game over in position
    return static evaluation of position

  if maximizingPlayer
    maxEval = -infinity
    for each child of position
      eval = minimax(child, depth - 1, false)
      maxEval = max(maxEval, eval)
    return maxEval

  else
    minEval = +infinity
    for each child of position
      eval = minimax(child, depth - 1, true)
      minEval = min(minEval, eval)
    return minEval
```

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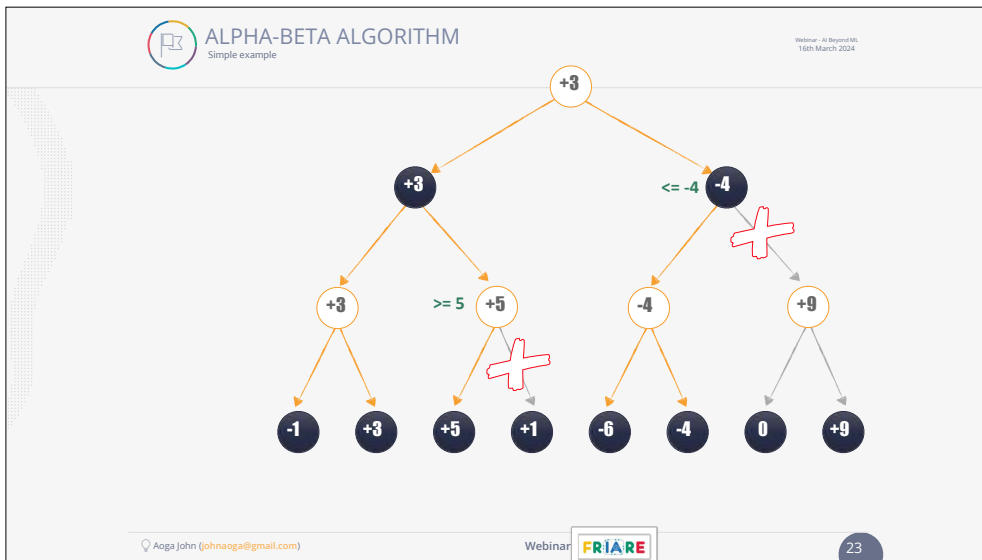
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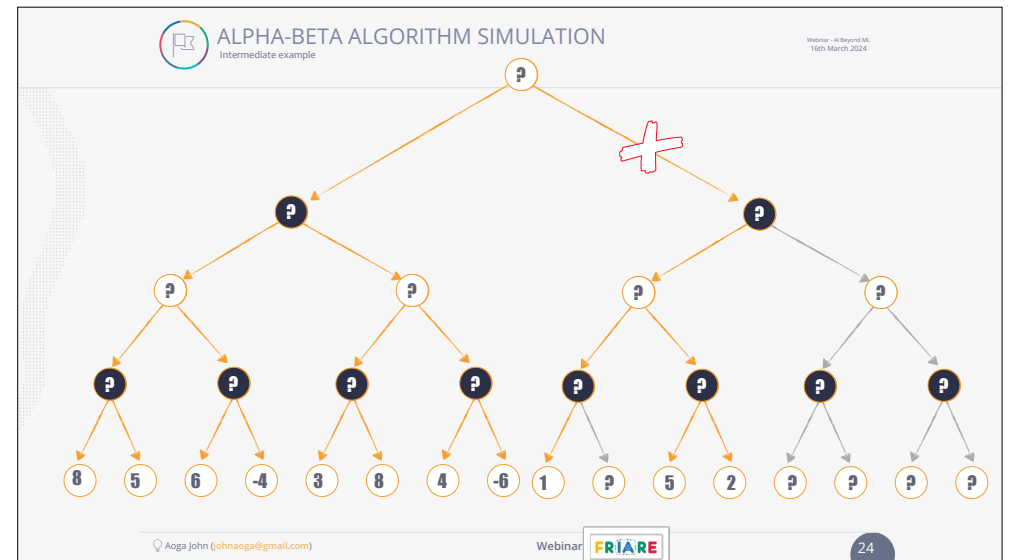
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ALPHA-BETA ALGORITHM IMPLEMENTATION

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```

function minimax(position, depth, alpha, beta, maximizingPlayer)
  if depth == 0 or game over in position
    return static evaluation of position

  if maximizingPlayer
    maxEval = -infinity
    for each child of position
      eval = minimax(child, depth - 1, alpha, beta, false)
      maxEval = max(maxEval, eval)
      alpha = max(alpha, eval)
      if beta <= alpha
        break
    return maxEval

  else
    minEval = +infinity
    for each child of position
      eval = minimax(child, depth - 1, alpha, beta, true)
      minEval = min(minEval, eval)
      beta = min(beta, eval)
      if beta <= alpha
        break
    return minEval

```

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MCTS Steps

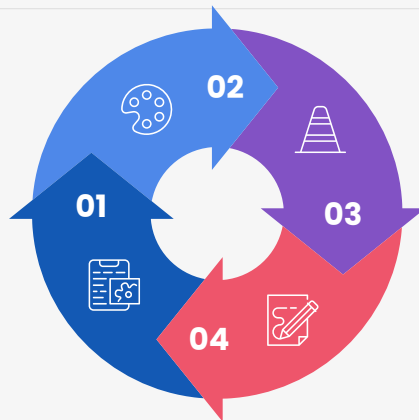
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Expansion

Expand the tree by adding new possibilities that stem from the current game state represented by the node

SELECTION

Starting from the root node, select successive child nodes down to a leaf node
- UCB1



Simulation

From the new node, simulate a random playout to the end of the game.

Backpropagation

Propagated back up the tree, updating the statistics of the nodes visited during the selection phase.

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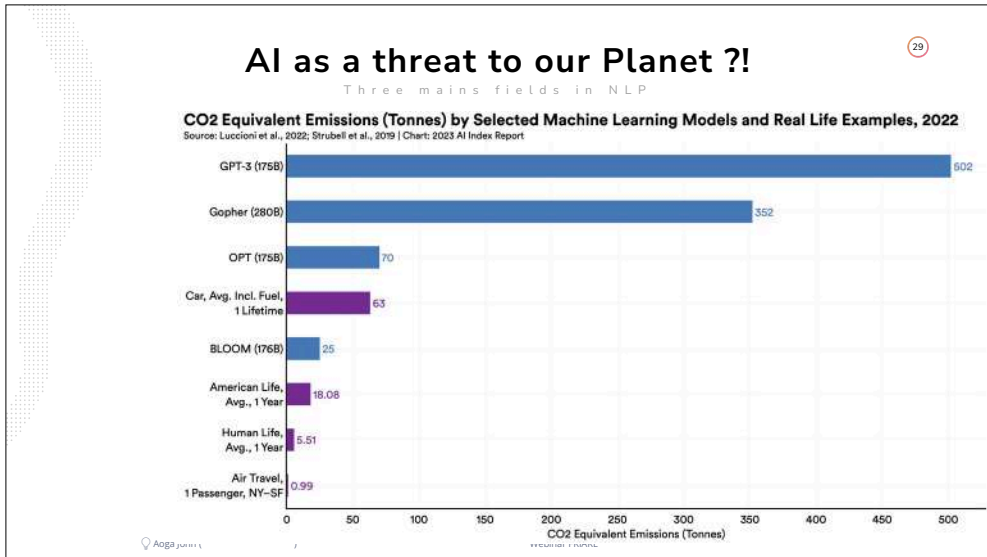
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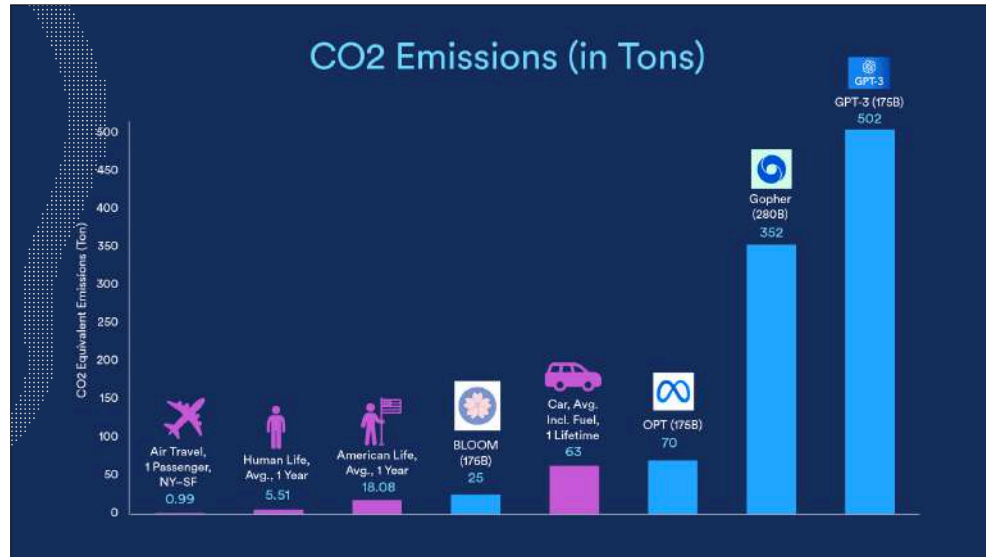
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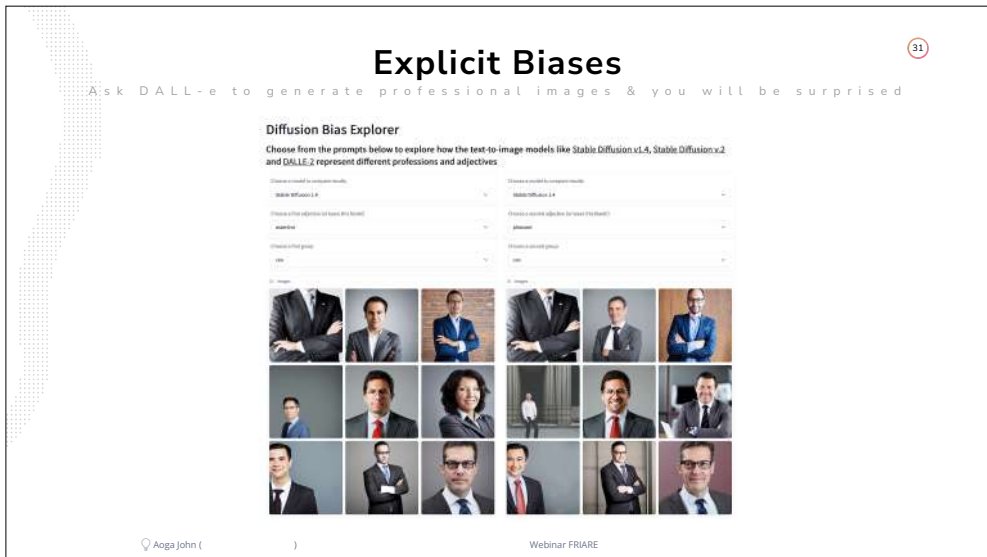
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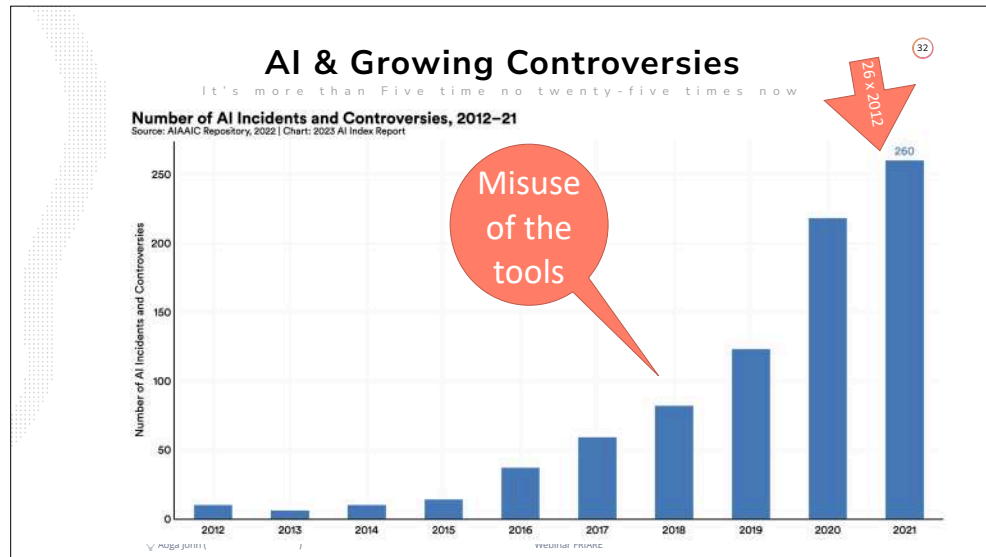
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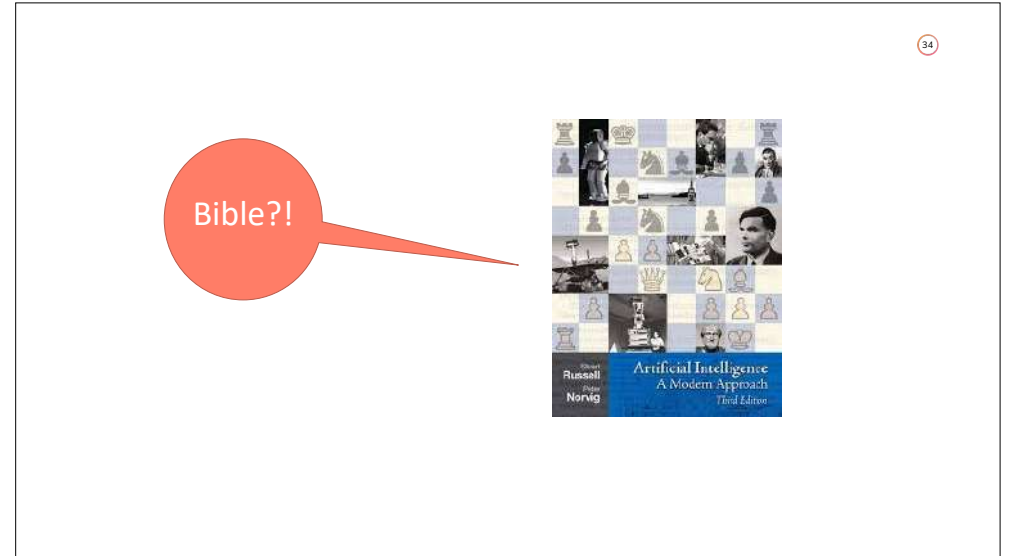
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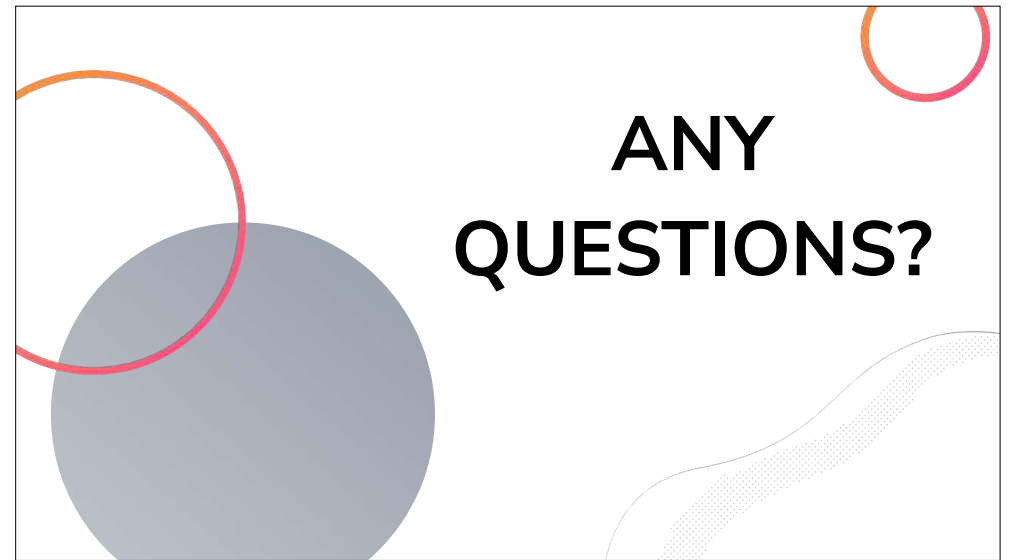
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