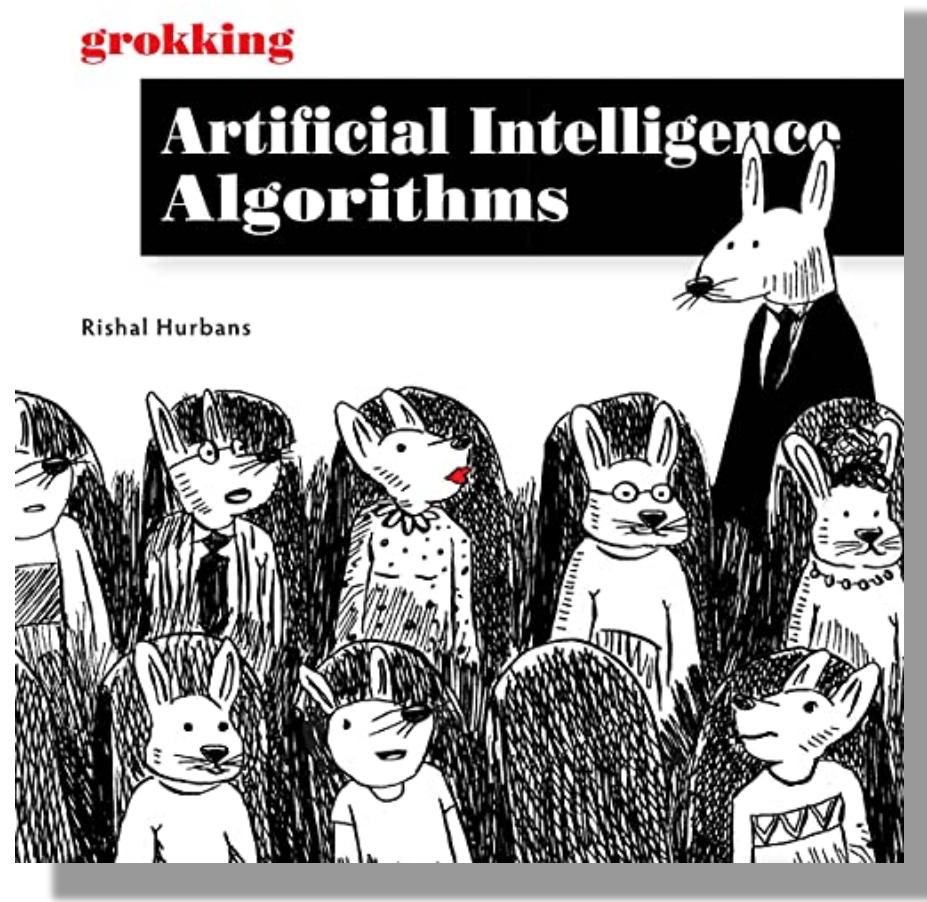


AI Programming

Referentievragen leerstof



**VIVES University of Applied Sciences
Bachelor in electronics-ICT**



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Chapter 1 – Intuition of artificial intelligence

- Why is there no unanimous **definition** for artificial intelligence?
- What is the difference between **quantitative data** and **qualitative data**? Give some concrete examples of both types of data.
- What is the difference between **data, information and knowledge**?
- What is an **algorithm**? What is an **AI algorithm**? What are the **components** of an algorithm?
- Give a few **categories of problems** that people are trying to solve via (AI) algorithms.
- What is the difference between a **local best solution** and a **global best solution**?
- What is the difference between **super intelligence, general intelligence** and **narrow intelligence**?
- What is the relationship between **biology-inspired algorithms, machine learning, deep learning and search algorithms**?
- Which three types of 'learning' fall under **machine learning** and concisely explain each type of 'learning'?

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Chapter 2 – Search fundamentals

- What is a **data structure** and give some concrete examples of data structures?
- Explain the following terms: **graph**, **vertex**, **node** and **edge**.
- **Given:** a **graph**
 - **Assignment:** determine the 'array of edges', the 'incidence matrix' and the 'adjacency matrix'
- **Explain:** a tree is a **connected acyclic graph**
- Explain the following 'tree' terms: **root node**, **parent node**, **sibling node**, **descendent**, **ancestor**, **leaf node**, **goal node**, **path**, **cost**, **degree** and **depth**.
- Explain the **Breadth-First Search (BFS)** algorithm and which data structure is used?
- **Given:** a search tree
 - **Assignment:** apply the Breadth-First Search (BFS) algorithm to find any solution
- Explain the **Depth-First Search (DFS)** algorithm and which data structure is used?
- **Given:** a search tree
 - **Assignment:** apply the Depth-First Search (DFS) algorithm to find any solution

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Chapter 3 – Intelligent search

- **Heuristics**
 - What is a heuristic?
 - Why can heuristics improve the efficiency of search problems?
 - Give a few concrete examples of heuristics.
- **A* Search**
 - Explain how the A* search algorithm works.
 - How is the cost function determined?
- **A* Search**
 - given: a search tree with the cost per node.
 - question: determine the sequence of searching the search tree, using the A* algorithm.

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Chapter 3 – Intelligent search

- **Min-Max Adversarial Search**
 - Explain how the min-max adversarial search algorithm works.
- **Min-Max Adversarial Search**
 - given: a search tree with the cost for each leaf node.
 - question: determine the value of each node in the min-max search tree.
- **Alpha-Beta Pruning**
 - Explain how the alpha-beta pruning adversarial search algorithm works.
 - What is alpha? What is beta?
 - What makes alpha-beta pruning a much more efficient search algorithm?
- **Alpha-Beta Pruning**
 - given: a search tree with the cost for each leaf node.
 - question: determine the value of each node in the search tree and explain why certain branches in the search tree may be pruned.

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Chapter 4 – Evolutionary algorithms

- **Genetic Algorithm: Life cycle**
 - Briefly explain the **life cycle** of a genetic algorithm.
- **Enter diversity**
 - Genetic algorithms use **crossover** and **mutation** as principles to ensure the **diversity** of the next generations.
 - Explain this principle.
 - Give some examples of crossover and mutation.
- **Genetic Algorithm parameters**
 - Name 5 parameters to configure a genetic algorithm.
 - How does each parameter affect the generation of solutions?
- **Fitness function**
 - What is a **fitness function** within genetic algorithms?
 - Why is the correct choice of the right fitness function crucial for the performance of the algorithm?

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Chapter 5 – Advanced evolutionary approaches

- **Selection mechanisms**
 - Briefly discuss the principle of following selection mechanisms in the evolutionary algorithm and discuss the advantages and disadvantages of each selection mechanism:
 - roulette-wheel selection
 - rank selection
 - tournament selection
 - elitism selection
- **Mutation mechanisms**
 - Briefly discuss the principle of following mutation mechanisms in the evolutionary algorithm:
 - boundary mutation
 - arithmetic mutation
- **Tree encoding and tree crossover**
 - Briefly discuss the principle of:
 - tree encoding
 - tree crossover

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Chapter 6 – Swarm intelligence

- **Swarm intelligence**
 - Explain what swarm intelligence is and on what principles is this form of intelligence based.
 - Why is the analogy to ants selected in the ant optimization algorithm?
- **Ant colony optimization algorithm**
 - Discuss the different steps in the ant colony optimization algorithm
 - Discuss the mathematical formula for destination selection based on pheromones and distance heuristics.
 - How is the best solution ultimately determined?
 - What criteria can be used to stop the algorithm?
- **Ant colony optimization algorithm – selection of the destination**
 - given: a figure showing the distances between different objects and the intensity of the pheromones on each of the paths.
 - question: discuss how the destination with the highest probability is determined. Use the mathematical formula for selecting the destination and choose your own value for **alpha** and **beta**.

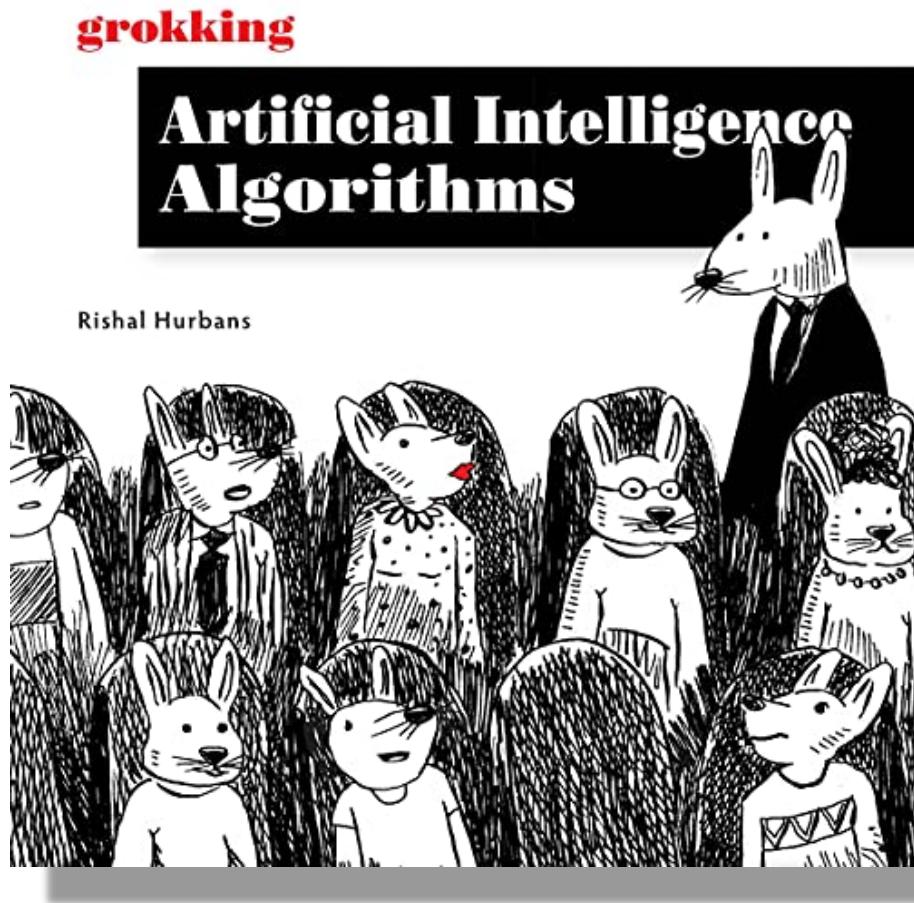
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Chapter 7 – Swarm intelligence: Particles

- **Particle swarm intelligence: bird flocks**
 - What do the following terms mean for simulating the movement of individual birds in relation to bird flocks?
 - Alignment
 - Cohesion
 - Separation
- **Particle swarm optimization algorithm**
 - Discuss the different steps in the particle swarm optimization life cycle algorithm
 - Discuss how the position of the particles is updated
 - How is the best solution ultimately determined?
 - What criteria can be used to stop the algorithm?
- **Particle swarm optimization algorithm**
 - Explain the following relation:
 - new velocity = inertia component + cognitive component + social component
 - What is the function of?
 - The inertia component
 - The cognitive component
 - The social component

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