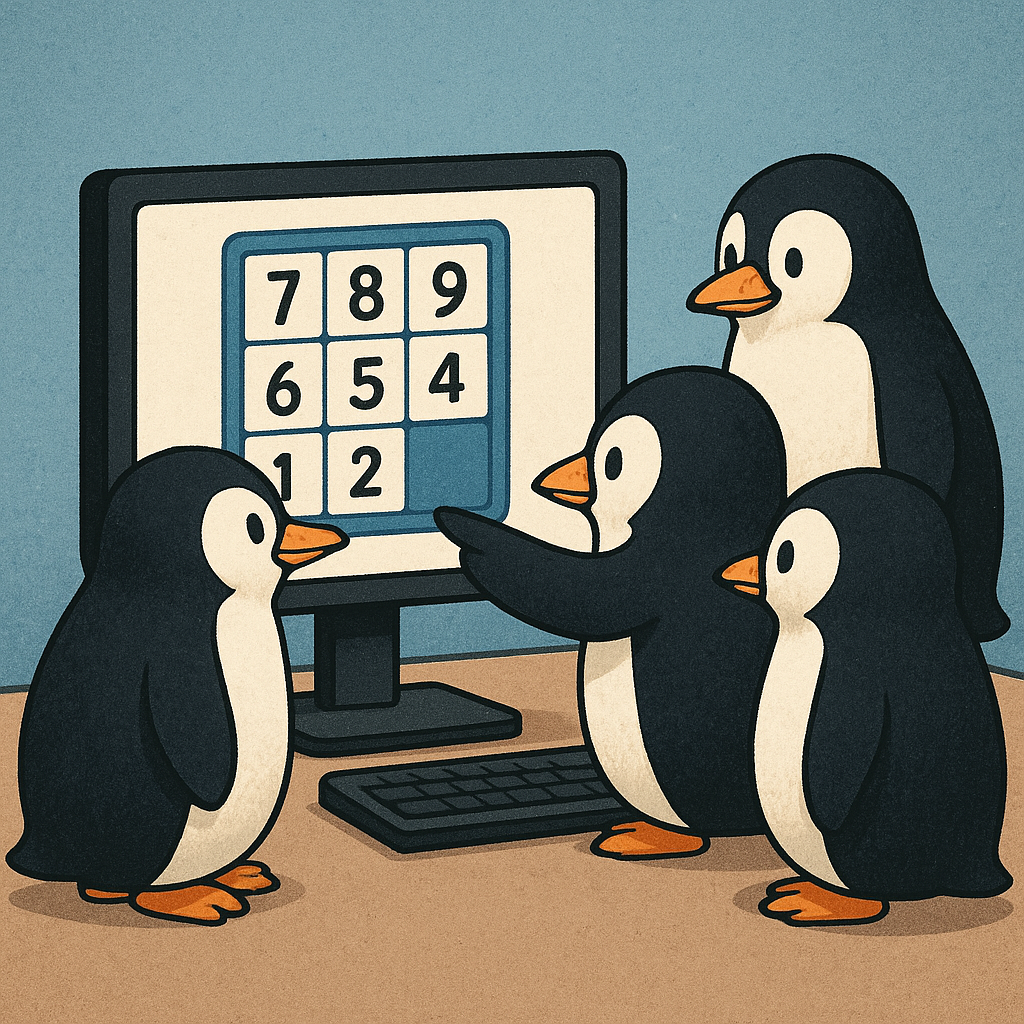
# **Introduction to AI and Data Science ILV** Exercise 1: 8-Puzzle

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**Presented by:**

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## Task Description: 8-Puzzle

Start: From a random start state

* Check for solvability
* Generate goal state
* Using at least 2 different heuristic functions
* Provide estimate of algorithms complexity
* Implementation in Python
* Measure memory effort (number of nodes expanded) and run time for each of 100 random states and each heuristics
* Provide mean and standard deviation of memory usage and execution time for each heuristics

Ein Bild, das Rechteck, Quadrat, Design enthält.

KI-generierte Inhalte können fehlerhaft sein.

## Component Checklist

1. Setup:

Setup Python-Version and .venv

Requirements.txt

Project-structure clear

1. Check for Solvability

It’s solvable

Goal state is reliably achievable

1. Implement two Heuristics:

Hamming (misplaced tiles)

Manhattan

Provide an estimate of both algorithm complexity

1. Compare two Heuristics (using 100 random searches each):

Hamming: 100 searches done

Manhattan: 100 searches done

Memory Usage (number of expanded nodes in the search tree)

Computation (Run) Time

1. Statistics for each Heuristic:

Mean deviation of memory usage

Mean deviation of execution time

Standard deviation of memory usage

standard deviation of execution time

1. Comment Code, provide for each submodule at least:

What are Inputs and Outputs

What is the Function of the submodule

1. Don’t just copy/paste code from Internet

Provide you own structure

Comment the code (see above)

Measure space (memory) and time complexity of each heuristics

## Task Documentation

1. Short task description
2. Software architecture diagram
3. Short descriptions of modules and interfaces
4. Explain design decisions
5. Discussion and conclusions

* Describe your experience
* Provide a table with complexity comparisons of different heuristics
* Possible improvements in future