monte.py – Documentation

Core Idea: Connect-4 engine using 64-bit bitboards and UCT Monte-Carlo Tree-Search.

Board & Helpers

Constant	Value	Purpose
ROWS, COLS	6,7	Standard Connect-4 grid
BITS_PER_COL	7	6 rows + sentinel row

drop(bb, bit) – set a bit.

is_win(bb) – fast win test (vertical, horizontal, diagonals) using bit manipulation

BitboardGame class

Attribute	Purpose
bb[2]	bitboards
heights[7]	Next free bit index per column
moves	Stack for undo

Methods: legal_moves(), play(col), undo(), terminal(), copy().
Property: side_to_move (0 = X, 1 = O). __str__ prints ASCII board.

MCTSAgent

Params: time_limit (s), tactical (bool), optional rng.

Internal Node keeps wins, visits, children, untried and UCB uses √2.

Command-line helpers

Function	Purpose
human_vs_ai( )	Play vs AI (default - 5s per move)
self_play(n=5, t=5)	Run n self-games, each move t time