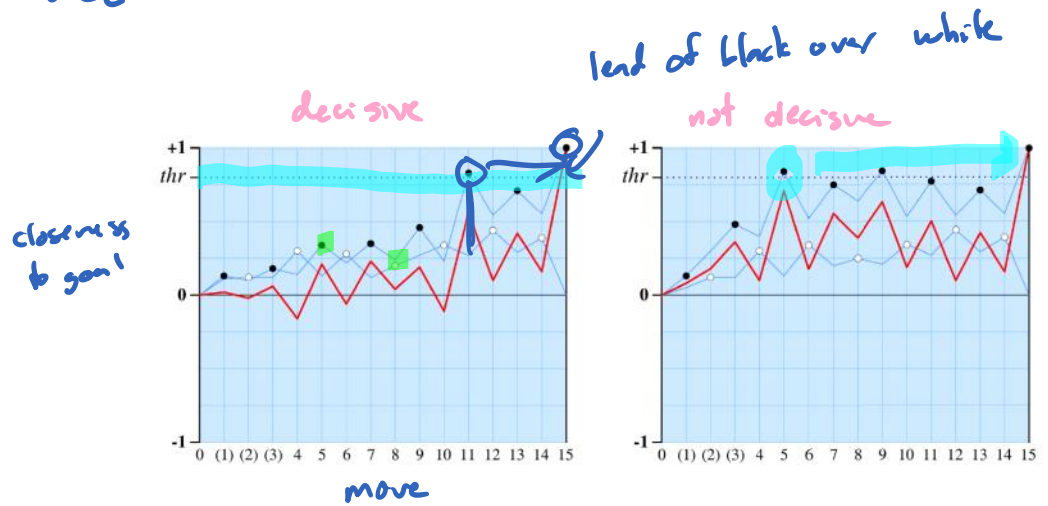


Ludii : general game playing system
general AI

Metrics : deci

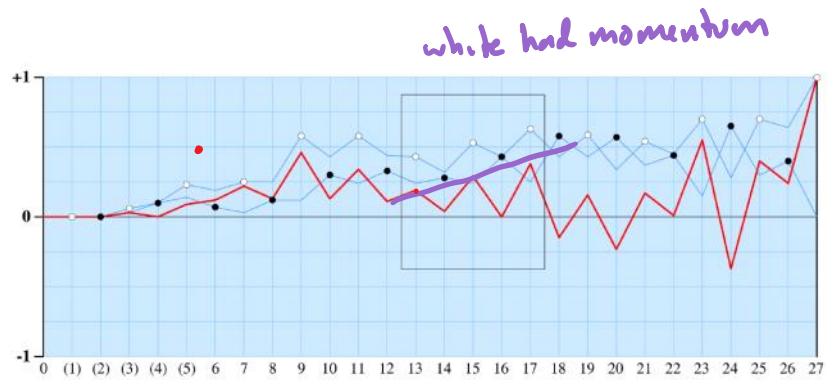


Diagrams from

[Browne, Cameron Bolitho](#) (2008) *Automatic generation and evaluation of recombination games*. PhD thesis, Queensland University of Technology.

From <<https://eprints.qut.edu.au/17025/>>

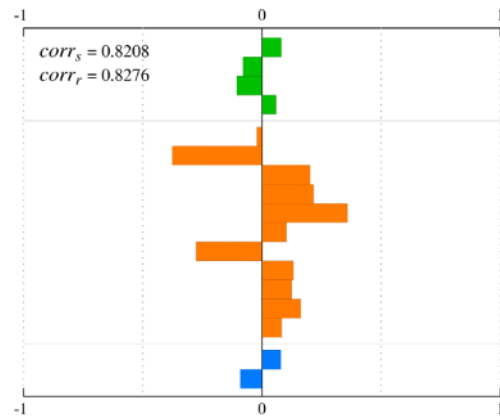
Momentum



Qualitative measures from heuristics for novice-level AIs
evolution strategy

Correlate with subjective evaluation of games
 ↳ human

	Criteria	Weight
intrinsic	5. Goal (group)	0.0818
	6. Goal (stack)	-0.0804
	8. Goal (block)	-0.1055
	13. Piece capture	0.0585
quality	17. Convergence	-0.0221
	21. Clarity (variance)	-0.3763
	25. Uncertainty (late)	0.2023
	26. Drama (average)	0.2167
	28. Killer moves	0.3585
	29. Permanence	0.1027
	30. Lead change	-0.2769
	32. Decisiveness threshold	0.1311
	36. Momentum (1)	0.1244
	39. Correction (1)	0.1622
viability	45. Puzzle quality	0.0826
	46. Completion	0.0788
	51. Duration	-0.0907
	Bias	-0.2576



Generate new games by genetic algorithm

fitness: predicted by

Younath: high fitness

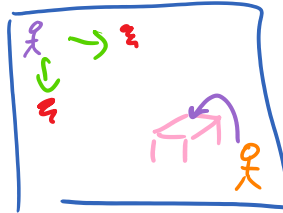
Game/Content Evaluation

Desirable qualities of a game

- drama
- decisiveness
- drawishness

balance
strategic depth

- how many levels of skill are there?



What makes Chess, Go, ... interesting?

complexity - state space / game tree size

branching factor
 complexity class

set of operations: +1, +3, -2, *5, ~~4~~, ..., %8

SD operations

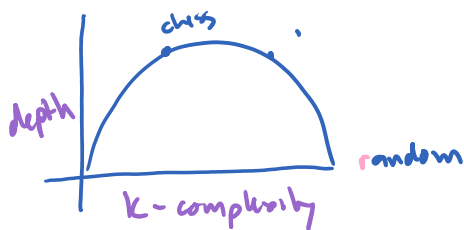
start @ 1 choose operation (then sit at play for rest of game)

at end P2 wins if result is even

↓
 apply pseudorandom num. generator

Kolmogorov complexity (compressability)

↳ complexity of seq = size of shortest alg to produce it

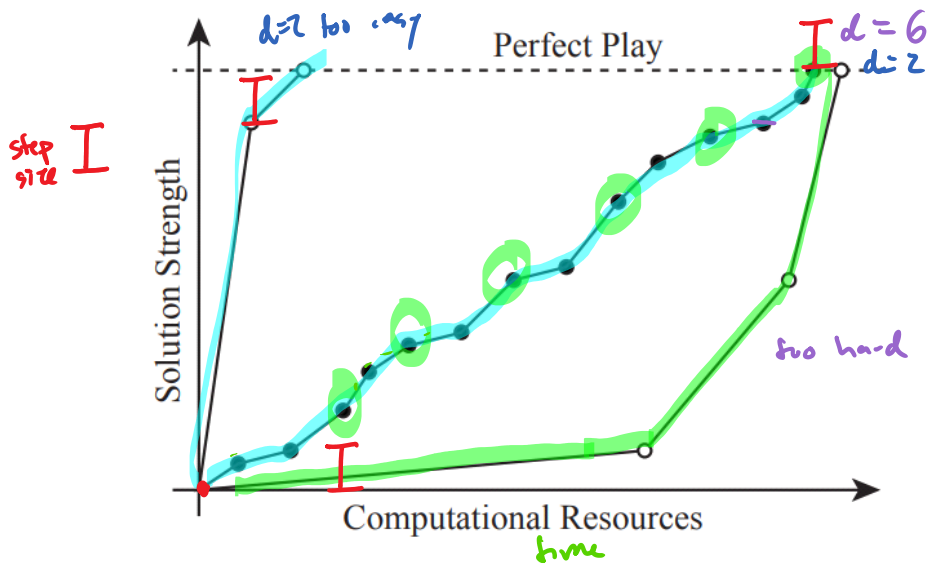


abcdabcdabcd...abcd low
 a x g r i 7 4 3 % b Z J k ... high
 10⁹ times 10⁹ random chars

heuristics compress search

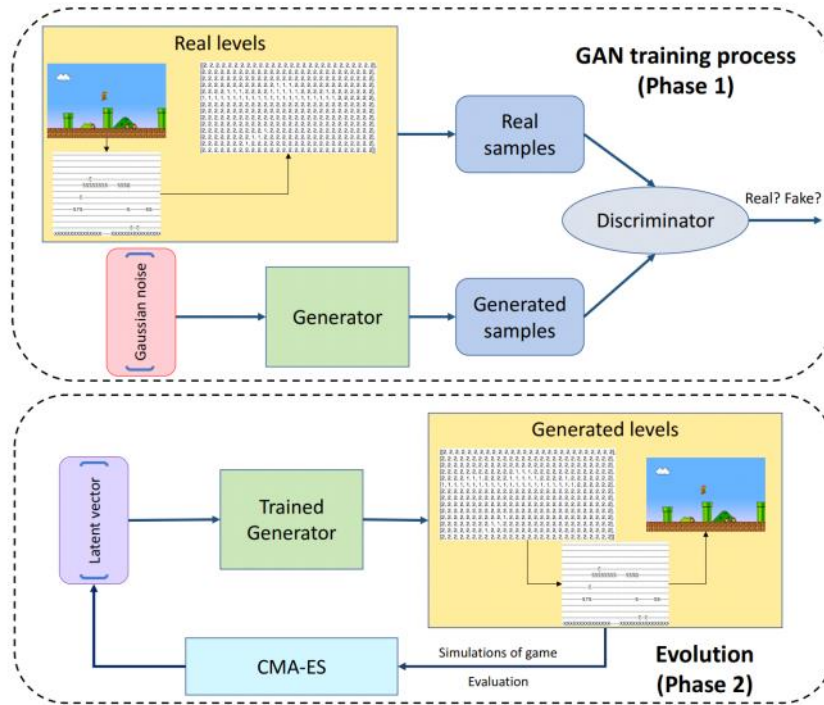
depth ≈ # heuristics to learn

Strategy Ladder



From: Lantz, F., Isaksen, A., Jaffe, A., Nealen, A., & Togelius, J. (2017). Depth in strategic games. Proc. 31st AAAI Conference on Artificial Intelligence, AAAI 2017. 967-974

Vanessa Volz et al



From V. Volz, J. Schrum, J. Liu, S. M. Lucas, A. Smith, and S. Risi, "Evolving Mario Levels in the Latent Space of a Deep Convolutional Generative Adversarial Network", GECCO '18, July 15–19, 2018, Kyoto, Japan ISBN 978-1-4503-5618-3/18/07, <https://doi.org/10.1145/3205455.3205517>

