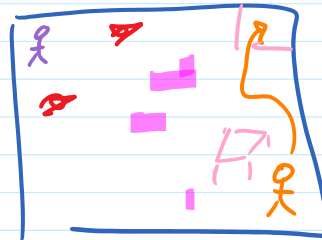


# Game/Content Evaluation

## Desirable qualities of a game

- balanced
- not too long / too short
- simple rules
- not drawish
- interesting "deep" — many levels of play to advance through as you study more



## What makes Chess, Go, ... interesting?

complexity - state space / game tree size  
 branching factor  
 complexity class

set of operations:  $+1, +3, *3, *2, +5, -1, \dots$

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

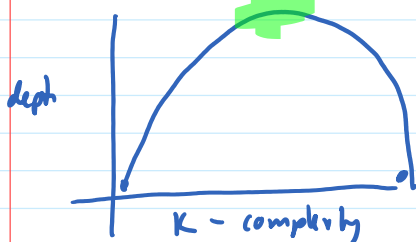
at end PZ wins if result is even

set of ops:  $+1, +5, \dots$   
 start @ 1, choose op and then apply it + pseudorandom #  
 ends after 100 moves

deterministic fcn  
 that has random-looking  
 output  
 ↓  
 generator

## compressability - Kolmogorov complexity

measures complexity of sequence  
 by length of shortest alg to produce it



abcd abcd abcd abcd ....

argpurrvi46j-lk clwbeek .....

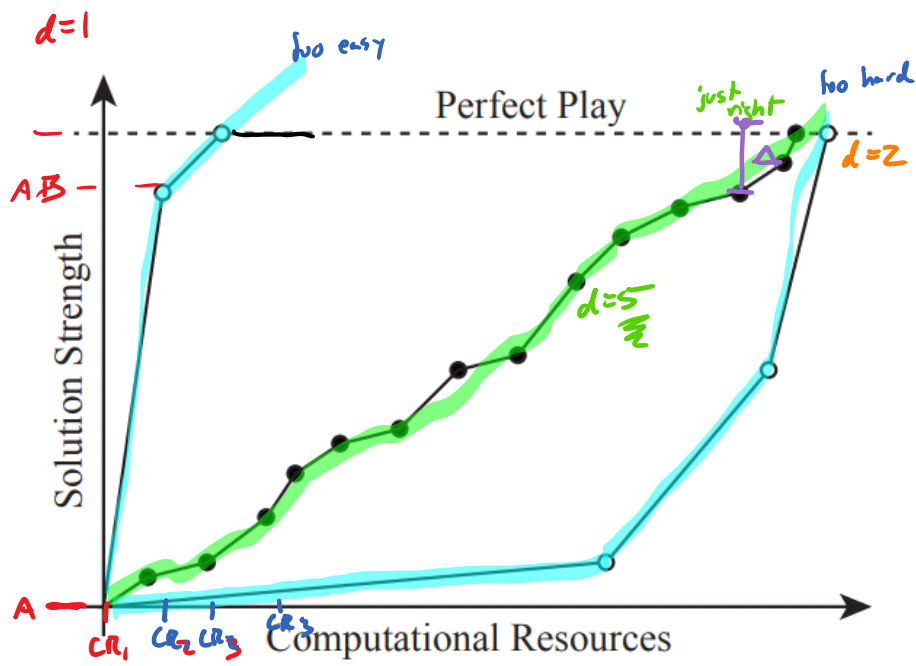
heuristics compress search

depth  $\approx$  # of heuristics to learn

## Strategy Ladder

$d=1$

too easy



strength =

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

```

d ← 0
let step unit = Δ
compute A = A(CR1)
while not at max resources
  let B = A(CRk)
  if B > A + Δ
    A ← B
    d ← d + 1
  
```

# Rainbow Dice

Ones

Twos

Threes

Fours

Fives

Sixes

4 of kind

32

5 of kind

30 Full House

6 straight

Chance

6 of kind

Reds

Oranges

Yellows

Greens

Blues

Violets

10

4 of kind

5 of kind

Full House

Rainbow

Chance

6 of kind