
河北宣工

Bulldozers 3

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Entropy

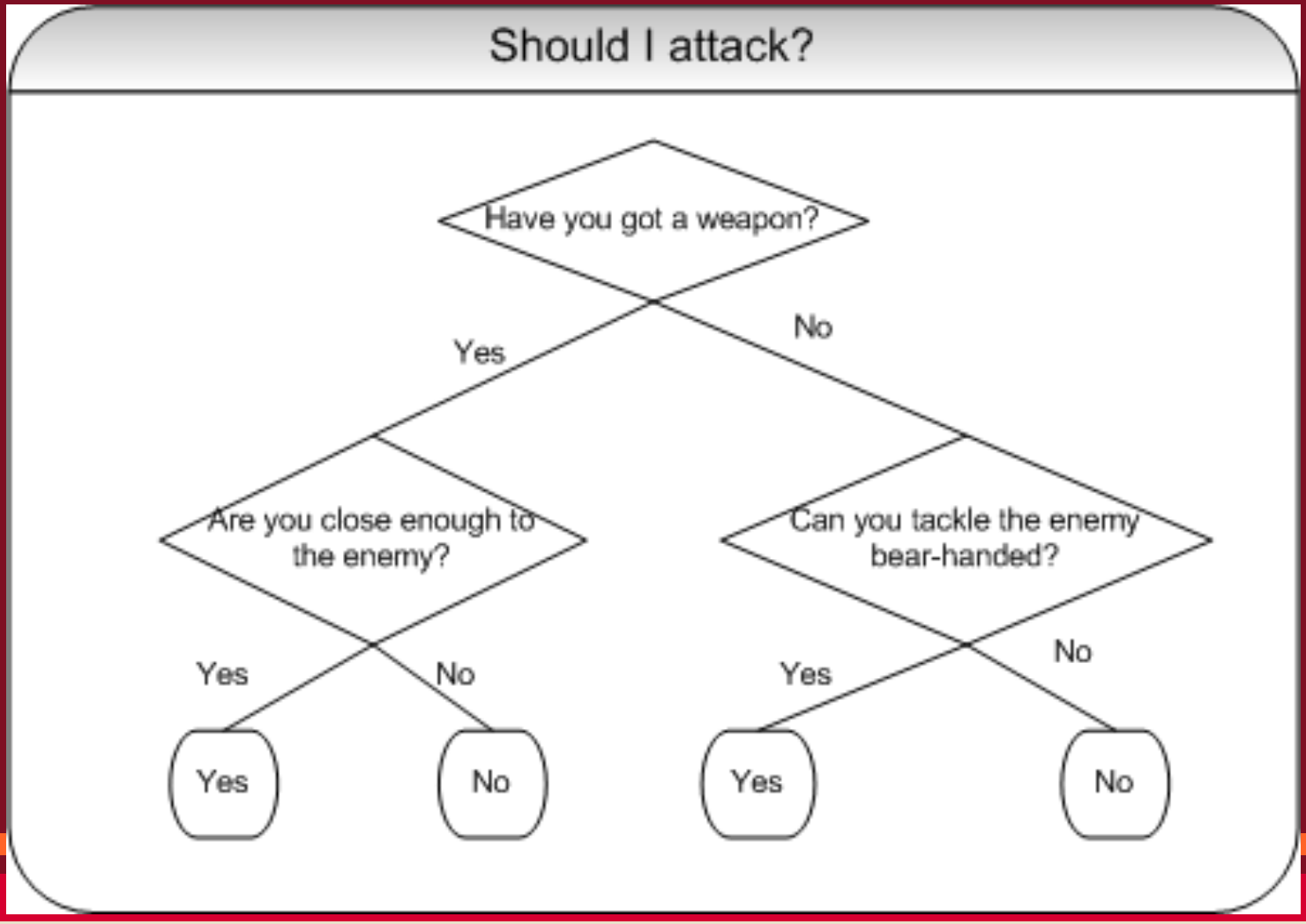
- gives us the average amount of information in bits in some attribute of an instance
- $-\Sigma_i p_i \log_2 p_i$

Entropy

- approximately 140 boxes => log2(140) ~ 7.129 bits
- global entropy ~ 6.006
- https://docs.google.com/spreadsheet/ccc?key=0Av1dVjNSTV1idDIzTjQ2QU9hVkgxdWk1QUN1c0pHbEE#gid=0

Tomasek - decision by parameters

Decision tree



Decision tree - last time TODO

- don't use irrelevant enums
- sql optimizations
- multi core processing
- find some very strong Machine

upgrade - irrelevant enums

- deleted 20 less significant enums
  - filled in less than 30 % records
  - small entropy (fiModelSeries)

sql optimizations

- building additional indexes
- original query time for first iteration ~ 10 min
- with indexes 6 min
- using entropy instead of var

decision tree split

- count
  - very fast
  - very wrong
- var
  - very slow
  - good
- entropy
  - fast
  - good

boxes

- result fix size for $1024
  - small enough
  - $1000 error gives for 24000 rmsle 0.01
  - index can be counted in one division (price /1000)
  - but $1024 is even better
    - division 1024 can be done in one bit shift (>> 10)
  - box id can be cached in sql (counted columns)

Decision tree - result last time

- depth 4
- runtime 2:34:02
- result 0.54
- using var

Decision tree - result optimalized

- depth 4
- runtime 0:45:31
- result 0.46

Decision tree - final result

- depth 6
- runtime 6:34:02
- result
  - 0.26 train
  - 0.29 valid

Result overview

- bigger depth leads to over fit
- doing something better in leafs will not help
- this result is good in competition but even the winner results can't be used in real word

Genetic solution overview

- Population member
  - Expression tree
    - Evaluates price
  - Nodes
    - [Price] -> Price
    - Constant, Arithmetic, Sql Aggregation, Switch
- Fit function
  - Challenge official: RMSLE
- Reproduction
  - switching subtrees between father and mother

Genetic solution overview

- Previous results
  - **0.49** in 294 generations

Genetic solution - upgrade

- Objectives
  - More totality, less liberalism
  - More mutation

Genetic solution - upgrade

- Reproduction
  - Before:
    - Randomized subtree switching
  - Now:
    - Node type specific "DNA exchange"
      - subtree taken from node of type T (ex. atrith. plus) is alternated only by partner subtree taken from "T-node"
      - Forced reproduction brokes max-depth constraint

Genetic solution - upgrade

- Changed fit function
  - Considerates "dynamism" aspect of tree (population member)
    - Static members have worse fit

Genetic solution - upgrade

- Not mutating pruning
  - Subtrees independent on evaluated data row replaced by constant
    - Scope for softer mutation convergence
      - example…

Genetic solution - upgrade

- More mutation
  - Pruning
    - Random subtree replace by 0 constant
      - simulates "totalitarian" supervision
  - Mutation for SqlAgg nodes
    - Changing agg function
    - Added: extension/reduction filter parameters
      - data columns
  - For EnumSwitch nodes
    - Switching / cloning, replacing subtrees
      - example...

Genetic solution - upgrade

- Startup population
  - Reusing older results
    - Loading serialized trees
- Performance
  - Sql result caching
    - By exactly same parameters (data column values)
  - Lower startup population count
    - Mutation process provides new every generation
      - Not exactly pure mutation

Genetic solution - results

- Weekend run on i7
  - 8 threads (4 cores HT)
  - Run parameters:
    - Threadpool size: 16
    - Pop count: 30
      - + Loaded older members
    - Min depth: 3
      - But partly eliminated changed fit function
    - Max depth: 12
      - But the new reproduction
    - Probabilities: R = 0.6, C = 0.1, M = 0.7
    - Train data count: 100k
      - changing every generation

Genetic solution - results

- Weekend run on i7
  - 180 generations
    - Previous test train data set size was 40k
  - Best result fit
    - train **0.284**
    - valid **0.341**

Genetic solution - results

- Alpha male example…

Neural networks

Added state, fiProductClassDesc indicators

Better guesswork for YearMade

Classifier accuracy went up to 29.15 on training set

RMSLE on training set 0.425

Actual usability

Actual RMSLE for challenge winner:
0.22910

On a bulldozer priced at 22000 GBP (cca. median value of training set), that indicates an average error of 5664.5 GBP, or >25%

Actual usability

Our best system RMSLE:

0.341

On a bulldozer priced at 22000 GBP, that indicates an average error of 8940 GBP, or > 40%

Actual usability

We believe both these results to be hardly usable for an actual Blue Book

(We think expert judgment would provide a far smaller error for a similar cost)

Q & A

Bonus - Angry Birds AI Competition

why is this interesting ?

- everybody knows this game
- best results from last year can not beat human players in score
- you can play angry birds by doing this competition
- planning and physics

Angry Birds AI Competition

- well known game
- there is some Basic Game Playing Software
  - basic java code which can
    - analyse a video game frame
      - get bounding box of components
    - calculates trajectories of birds
    - game playing

What to do

- planning
  - what to attack with witch bird
  - special action birds planing
- physics
  - "what will happens when I attack here ?"
  - "where to attack to destroy this building ?"

Discussion