

Def of AI

rational agent acting rationally
does one thing
AI1, AI1, AI2
function: history \rightarrow act
program: generates function
PEAS: Perf, Env, Act, Sens

Searches

uninformed blind, brute force
- suitable for fully obs, deter, disc
heuristic, informed search, states with
different values
suitable for fully obs, deter, disc
local search, goal as only, no cost
- suitable for fully obs, deter, cont/disc
adversarial, search interface of other AI

CSP

Domains, Variables, Constraints
assign next var with fewest poss
heuristics which adds most const.
detect failure by checking remaining legal
values of var = forward checking
do it recursive
value assignment: least constraining

tree training

inductive: with examples
supervised: data + result
start with which verteil training data
am besten entropy
cross validation: unterteilt training data
TP+TN
accuracy $\frac{TP+TN}{TP+TN+FP+FN}$

recall: should be found $\frac{TP}{TP+FN}$

precision: found true $\frac{TP}{TP+FP}$

overfitting: Δ test-training grows
zu komplex
too few examples

underfitting: Δ test-training small
too simple
too constrained

Env Properties

observability: fully, partial, un
amount of agents: single vs multi
Deterministic, Stochastic, non-det
Action effects: episodic (have effect)
sequential
World state: static vs dynamic
state, time percept: discrete, continuous
Rules of env: known, unknown

improve local search

hill climbing, search for optimum, restarts
genetic, local beam with more rand
rank by fitness
swap parts of states with other + rand
local beam: keep k states instead of one
choose top n states and their succ
good searches result others
goods, result often in some hill
simulated annealing: escape local optimum
by allowing bad moves but reduce
their size and frequency

Datalog

clause: atomic symbol or info
 $\alpha \leftarrow R_1 \dots R_n$
head body
rule

term: var or constant
knowledgebase: set of clauses
data driven: true facts \rightarrow goal
goal driven: goal true \rightarrow search facts
assumptions
- definitive and pos clauses
- env is static
- finite individuals with ID

Adaboost vs bagging

add new learners -
adjust weights -
good learners weights -
bias reduce -
may overfit fix overfit
majority vote
random train sampling
ensemble
improve stability
reduce V

Agent Types

V2 1/2

simple reflex: percept \rightarrow action, no state
stateful reflex: planning with percept and state
no goal, z.B. local search
Goal based: agent simulate way
z.B. Pfadsuche
Utility based: reach goal cheapest way
z.B. greedy search
learning agent: perf measure or active learning
balance exploring / exploiting
z.B. Bilderkennung

formal knowledge \rightarrow reasoning

agree to domain - agree to talk objects
set relationships - choose symbols
tell sys knowledge - ask - entailment

Entailment

$A \models \alpha$ all of A true $\rightarrow \alpha$ true
inference $A \models \alpha$ can be derived from
A by procedure;
false if $\alpha = \text{false}$ $\wedge A = \text{true}$

PDDL

Action * precondition + effect
nicht deklarativ \rightarrow fals
implizit $\forall x$

Action (fly(plane, from, to))
precondition: $\wedge At(\text{plane, from})$
effect: $\neg At(\text{plane, from}) \wedge At(\text{plane, to})$

Ensembles

different experts let them vote
- representational: agent not fit
- comput. heuristic = search
- statistical: test data only finite
bagging: experts as different as possible
boosting: boost perf of weak learners
misclassified more imp
Adaboost: good learners get higher weight
gradient boost: more outline robust
shortcomings = gradient
different shortcomings
minimize loss
not changing existing functions, adding
gradient descent andere representation von
Boosting.

Semantic Web

Triples Harrison has Dog
addition to www
SPARQL Protocol
Res Desc Long
ontology: Nergelwörter
aus Klassen +
Eigenschaften

Sentences

valid = all 1, neither 1 and 0
unsatisfiable = all 0

Expert Systems

knowledge + inference to solve expert problems
weaker than deep neural network
Component:

Explanation Factory: Explains decision
working mem: database of facts
inference engine

forward chaining: facts \rightarrow resolution
backward: hypothesis \rightarrow facts to prove/disprove
activation, rule firing, retraction

Agenda: prio list of rules created by
inference engine whose facts are satisfied by
facts in working mem
knowledge acquisition memory: optional, from examples

Expert Systems II

indirect check for correctness, consistency,
completeness
advantage: explanation, reduced cost, unfunctional

Robotics

Uncertain \rightarrow decision \rightarrow Utility (maximize)
Cost: Value of vars, minimize
Policy: Gen. Input to System
Improvement: Gen new Policy based on
previous param-cost, minimize