

Combining learning and reasoning for Bio-AI

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SingularityNET



Why combining machine learning and reasoning?



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Ultimate answer to overfitting

Why?

What about simulation?

Impractical without abstractions

Reasoning
⇓
Abstractions

Why?

Help learning (and reasoning)

- Reasoning for meta-learning
 - Filtering relevant features
 - Guide optimization
- Learning for meta-reasoning
 - Discover inference control patterns
 - Create contextual Hebbian links

Learning & reasoning over the Bio-AtomSpace

- Learning:
 - MOSES (program evolution)
⇒ Predictive models
 - Pattern Miner (frequent pattern mining)
⇒ Discover abstractions
- Reasoning:
 - Pattern Miner
 - PLN (Probabilistic Logic Networks)
⇒ Use existing and discovered background knowledge

Example

Example of reasoning involving MOSES model + discovered pattern + background knowledge.

Status

- Discovered simple patterns
 - Pattern size: 2 conjuncts
 - GO + SMP dataset: 1M atoms
 - Time: couple hours
- Inferred short trails
 - Trail size: about 8 steps
 - GO dataset: 650K atoms
 - Time: couple hours
- Focused on longevity

Difficulties

- Porting data into the atomspace
- Finding good queries
- Very resource angry (millions of atoms)
⇒ [Stress-test on the Rule Engine](#)
- Advanced forms of reasoning
⇒ [Stress-test on PLN](#)

To do

- Experiment with other domains, COVID-19, Cancer
- Complete Multi-threaded Rule Engine
- Integrate ECAN
- Integrate spatio-temporal reasoning
- Experiment with inference control meta-learning