

Log : 10/18 - Current

January 10, 2021

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1.1 Differential Geometry

https://en.wikipedia.org/wiki/Riemannian_connection_on_a_surface

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2.1 Automated Theorem Proving

2.1.1 Open Logic

<http://builds.openlogicproject.org/>

Covers set theory, modal logic, model theory, computation, intuitionist models

2.1.2 Lean

https://github.com/leanprover-community/mathematics_in_lean

Tutorial:

https://github.com/leanprover-community/mathematics_in_lean

Background 1. Formal language setting: Dependent type theory

Question 1. What does \leftarrow do

Answer 1. Applies reverse rule(elimination rule). Like \leftarrow mul_assoc looks for $a + (c + d)$ to turn into $a + c + d$ instead of other way

Remark 1. Arguments to tactics are curried

Theme 1. Making mathematics more empirical/feedback oriented! Especially brilliant because it mirrors coding process so effectively.

Remark 2. Can rewrite any statement, assumption or goal

Prop 1. *apply tactic matches conclusion of theorem to goal and makes hypotheses new goal*

Prop 2. *exact tactic finishes proof with full apply(if given proof matches goal exactly)*

Remark 3. For working backwards

Question 2. Not really sure of difference between apply and exact

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3.1 Deep RL

<https://cmudeeprl.github.io/Spring202010403website/lectures/>

Idea 1. Using reinforcement learning in automated proof theory.

Prop 3. *In RL often cannot use gradient optimization, in contrast to supervised learning. So instead we use non-gradient optimization methods and gradient estimators*

Prop 4.

"it is comparatively easy to make computers exhibit adult level performance on intelligence tests or playing checkers, and difficult or impossible to give them the skills of a one-year-old when it comes to perception and mobility"

Hans Moravec

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4.1 Northwestern Reserach

Transport Model for Feature Extraction

<https://arxiv.org/pdf/1910.14543.pdf>

Remark 4. Well known techniques for (nonlinear) feature extraction:

- Kernel PCA

- isomap
- locally linear embeddings
- laplacian eigenmaps

Def 1. Transport operator

$$Ty = Ly - \text{div}(vy)$$

for some anti-symmetric matrix v and laplacian L

On The Energy Landscape of Spherical Spin Glass : p-Spin

<https://arxiv.org/pdf/1702.08906.pdf>

4.2 Tensor Contraction

<https://www.quora.com/What-is>

-Tensor-contraction-

How-to-compute-tensor-contraction

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5.1 Set

Remark 5. test