Computer Science
Rekenaarwetenskap

Steve Kroon

PLEASED: Planning, Learning, and Search for Decision-making.
http://www.cs.sun.ac.za/~kroon/decision.html

Maties Machine Learning: 25 October 2019
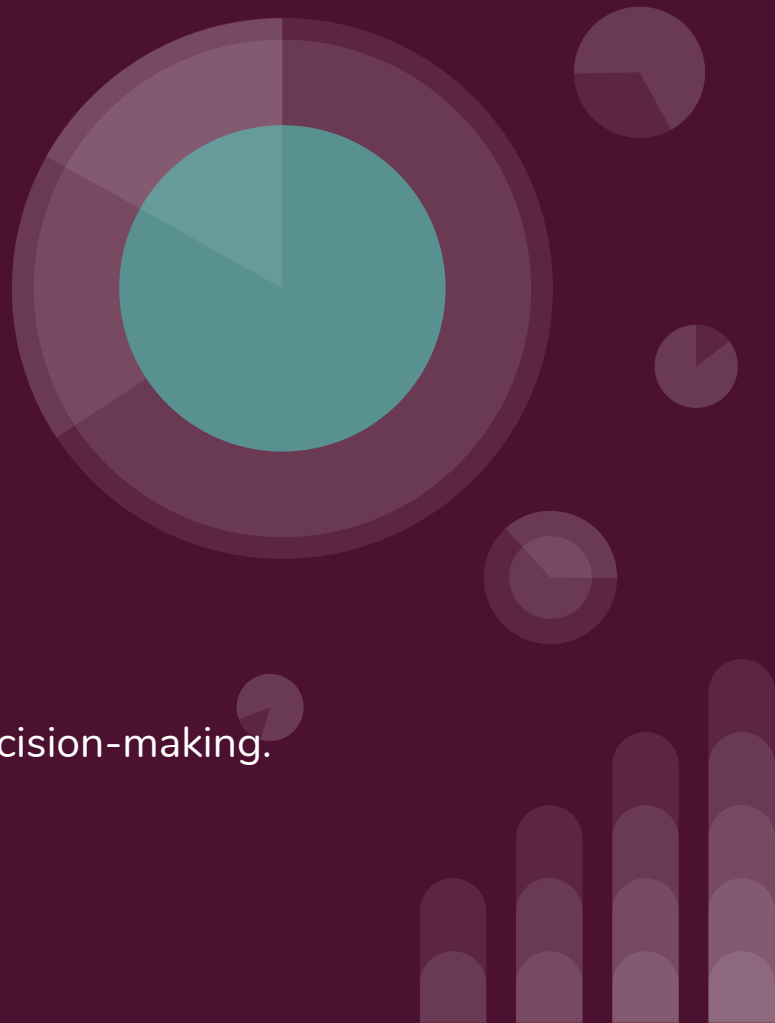
"This group considers almost any aspect of the general decision-making problem, including sequential decision-making under uncertainty. Major sub-problems we consider are planning, machine learning, and search algorithms. Our approach is grounded in probability theory and game theory for managing uncertainty and multi-agent systems."
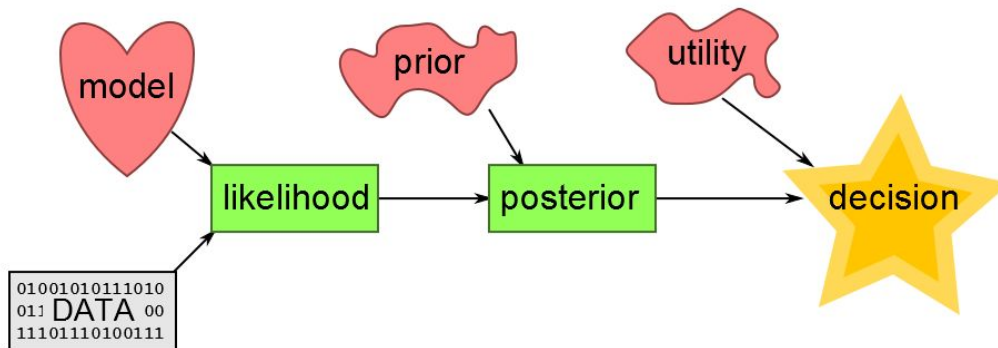
Single agent, single decision

Principled - grounded in:
- Probability theory
- Decision theory
- Game theory

Typically requires:
- A model (perhaps >1)
- Data
- Payoff function

Good foundation: Bayesian decision theory

Extensions

- Sequential decision making
  - Search
  - Planning
  - Bayes filter
  - Reinforcement learning
- Multi-agent settings
  - Adversarial
  - Collaborative
- Tractable inference/decision making
  - Inference approaches
  - Search techniques
  - Choice of approximations
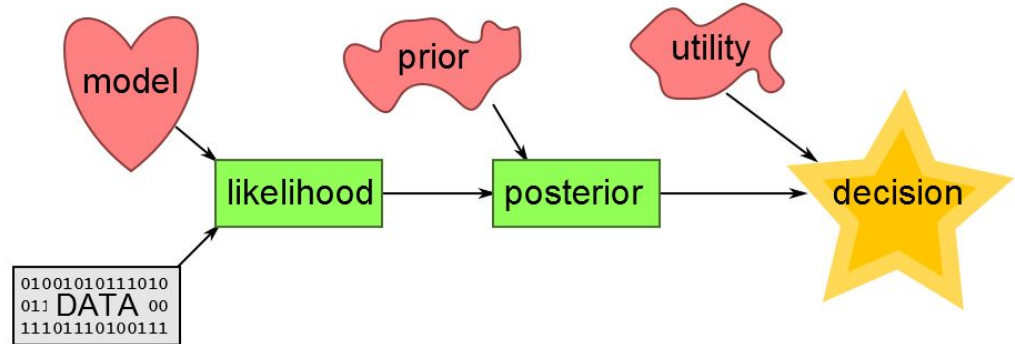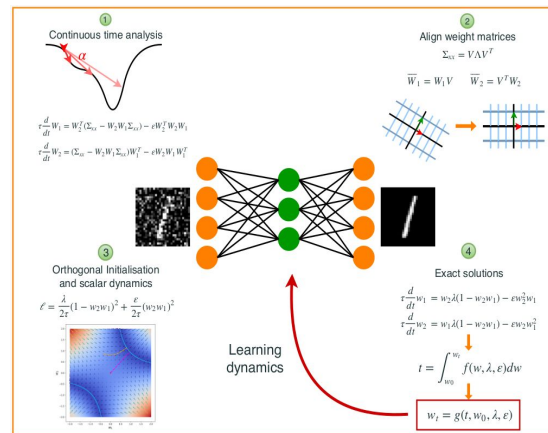
Group members

Current

- 2008-: Steve Kroon (staff)
- 2016-: Jordan Masakuna (PhD student, co-supervising with Simukai Utete) - coordination of solitary robots.
- 2016-: Marc Christoph (Masters student, co-supervising with Cornelia Inggs) - distributed Monte Carlo tree search.
- 2017-: Arnu Pretorius (PhD student, co-supervising with Herman Kamper) - noise-regularized neural networks.
- 2018-: Marno Basson (Masters student, co-supervising with Jamie Cripwell, Lidia Auret and Roelof Coetzer) - Bayesian ODE parameter inference.
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- 2018-: Dirko Coetsee (PhD student, co-supervising with McElory Hoffmann and Luc de Raedt) - automated spreadsheet integration.
- 2019-: Hendri Krijt (Honours student) - news feed topic clustering.
- 2019-: Ignazio Ferreira (Honours student) - Wasserstein shapeshifting.
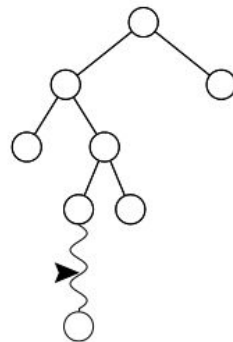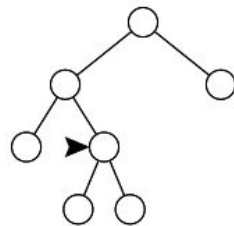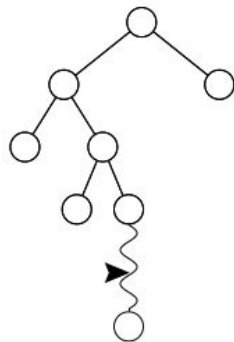
Learning theory[*]

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*understanding relationships between and properties of machine learning/statistical models and approaches to fitting them
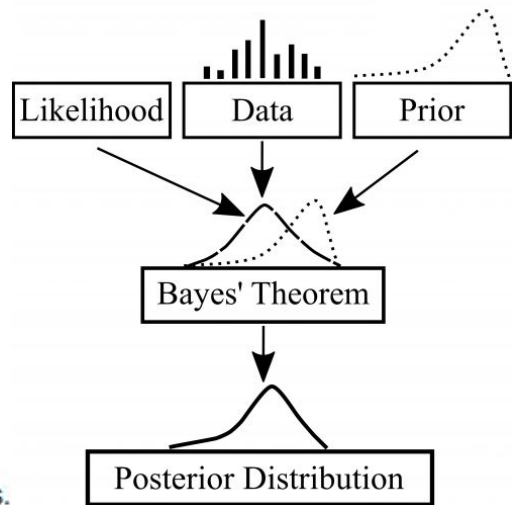
Search/Planning

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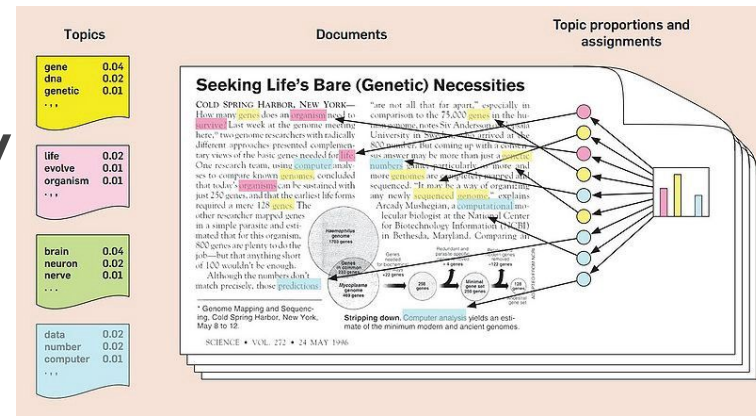
Bayesian analysis

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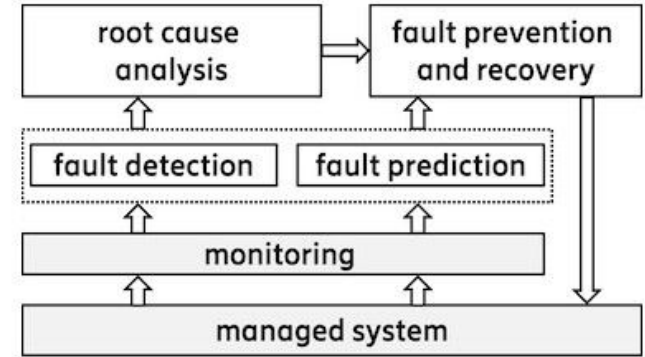# Latent variable models/ variational inference

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Process monitoring and fault detection/diagnosis

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Specific interests

Learning Theory* (mostly NNs)

Search/Planning (mostly MCTS)

Bayesian analysis

Latent variable models and variational inference

Process monitoring, fault detection and diagnosis

Common elements:
- Regularizing effects of model, inference, and optimization
- Tractable inference/search
- Dynamical systems

*understanding relationships between and properties of machine
learning/statistical models and approaches to fitting them

THANK YOU – QUESTIONS?