Karlsruhe Institute of Technology

Autonomous Learning Robots Lab

Adaptive World Models: Learning Behaviors by Imagination Under Non-Stationarity

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Existing Gap

- Dreamer agents showed SOTA-performance mainly on single, stationary tasks:
  - Can Dreamer world models **adapt to changes** and be used to **infer adaptable behaviors**?

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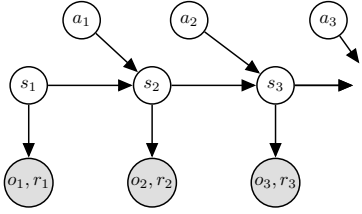
Observation changes: Color

Dynamics changes: Mass

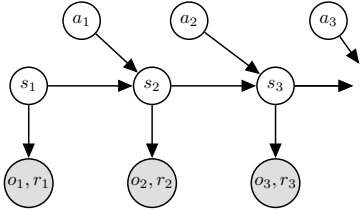
Objective changes: Skills

Non-Stationary RL Formalisms

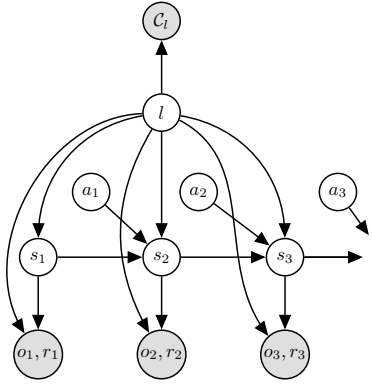


POMDP

Non-Stationary RL Formalisms

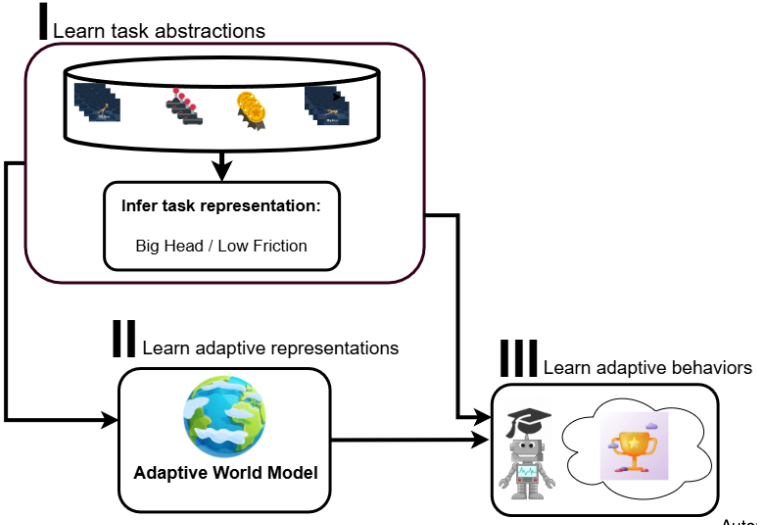


POMDP

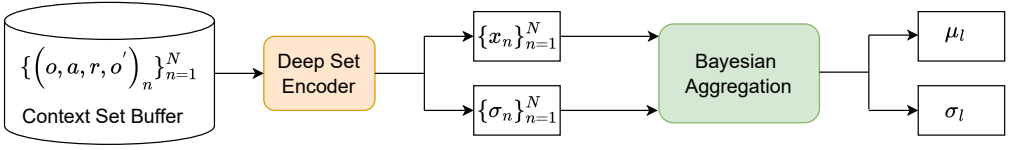


HiP-POMDP

Adaptive MBRL Agents

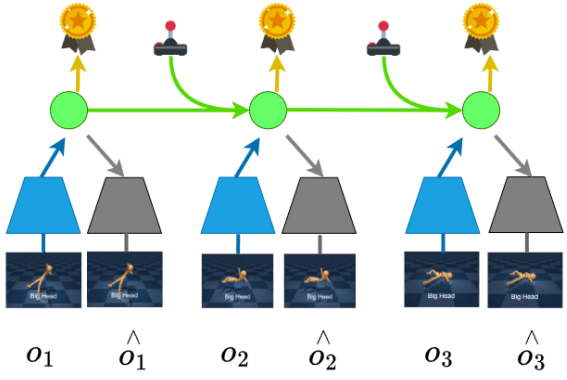


I: Latent Task Inference using Bayesian Context Aggregation



Volpp et al. 2021

II: Learning Adaptive Representations



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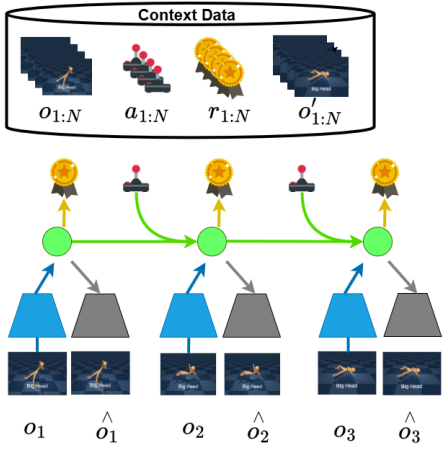

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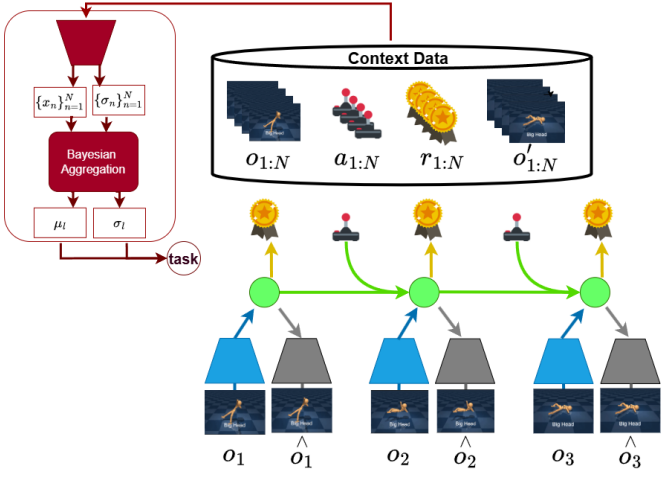

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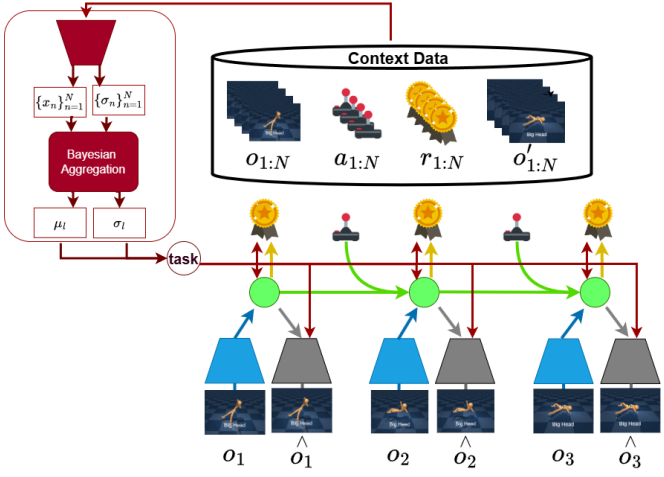
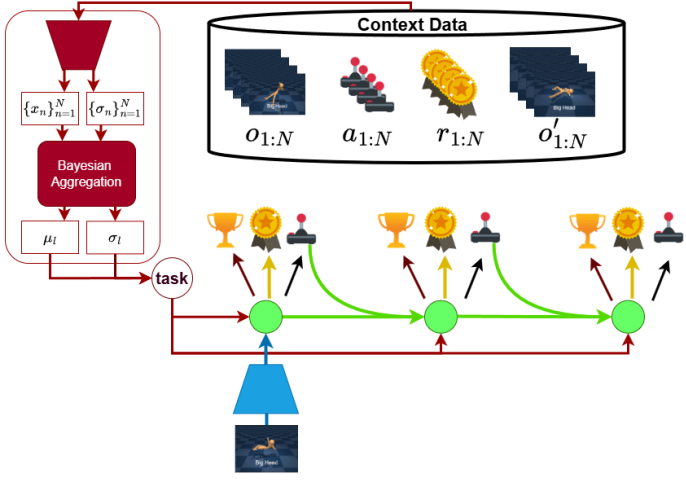
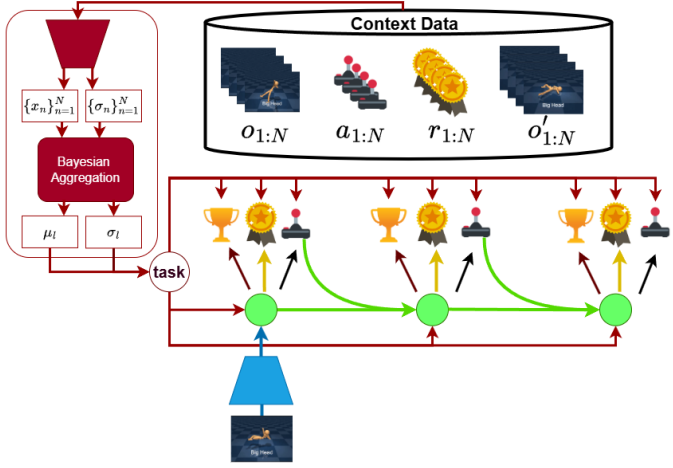


III: Learning Adaptive Behaviors



III: Learning Adaptive Behaviors

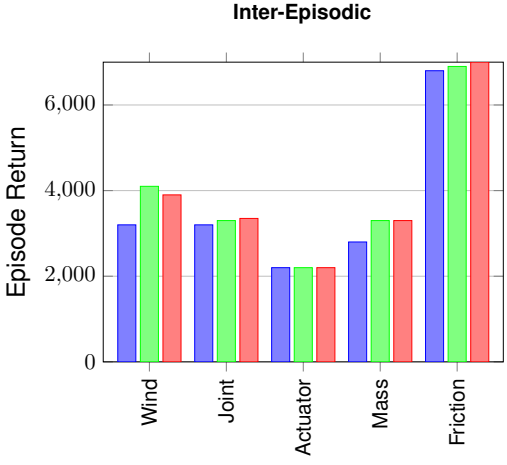


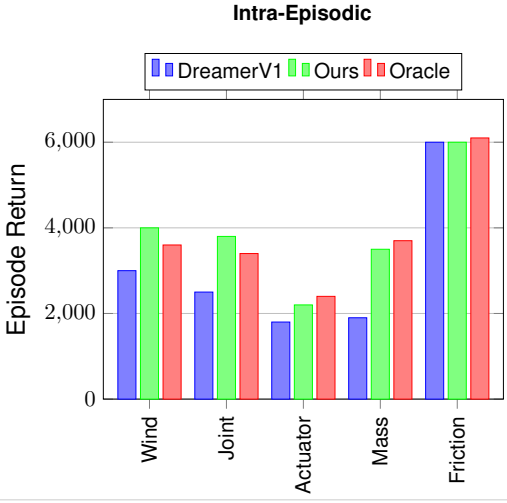
Modified Gymnasium + DMC Benchmarks

Gymnasium

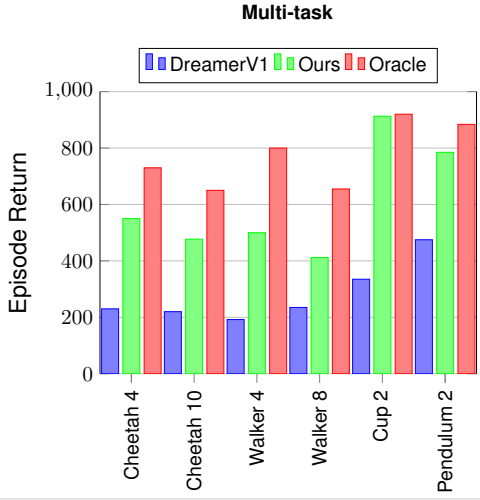
DMC Multi-task

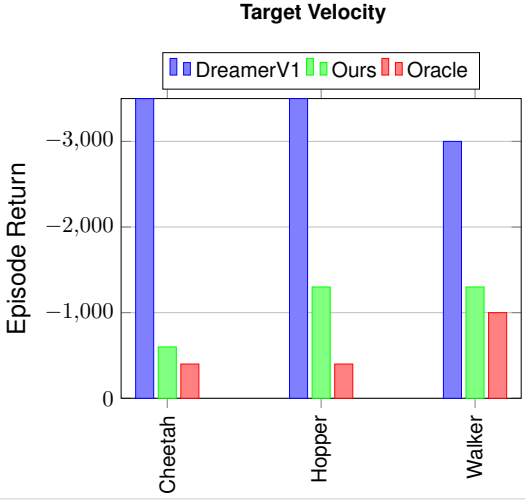
Can agents handle changing dynamics?



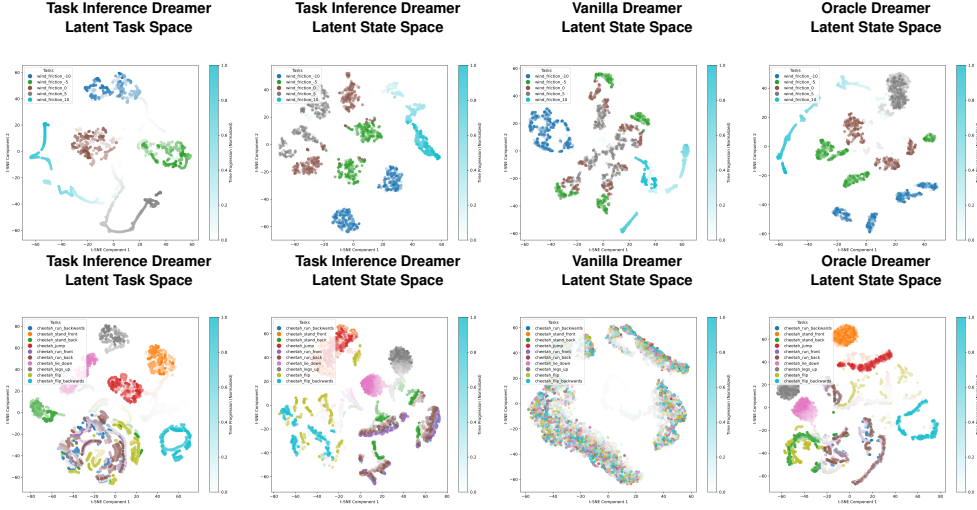


Can agents handle objective changes?





Latent space visualizations



Conclusion

- **Bayesian context aggregation** as a **general** task inference **approach**.
- **POMDP** formalism **can handle** dynamical changes, **not** objective changes.
- **HiP-POMDP** results in **more structured latent spaces, improving** the **performance**.