

LLM-Driven Composite Neural Architecture Search for Multi-Source RL State Encoding

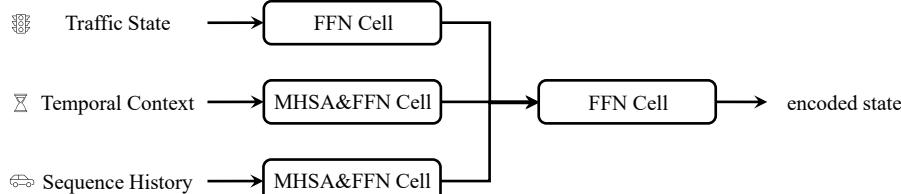


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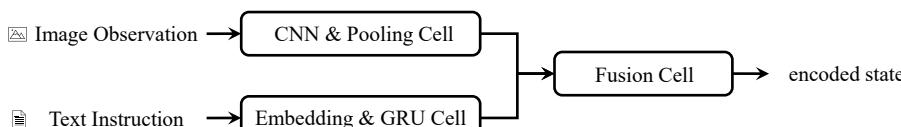


Multi-Source RL State Encoding

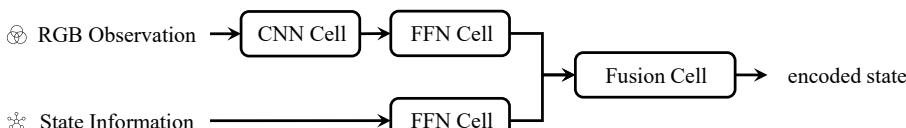
Mixed-autonomy traffic control:



MiniGrid goal-oriented tasks:



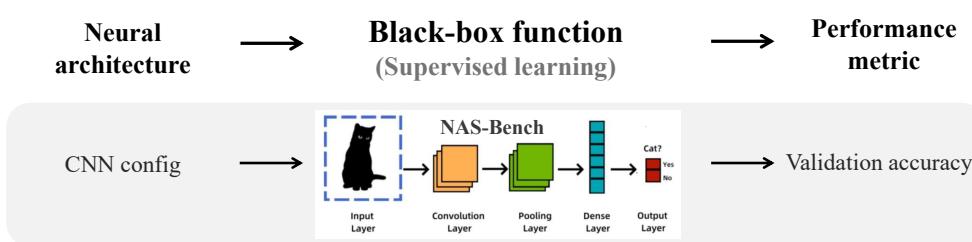
ManiSkill robotic control:



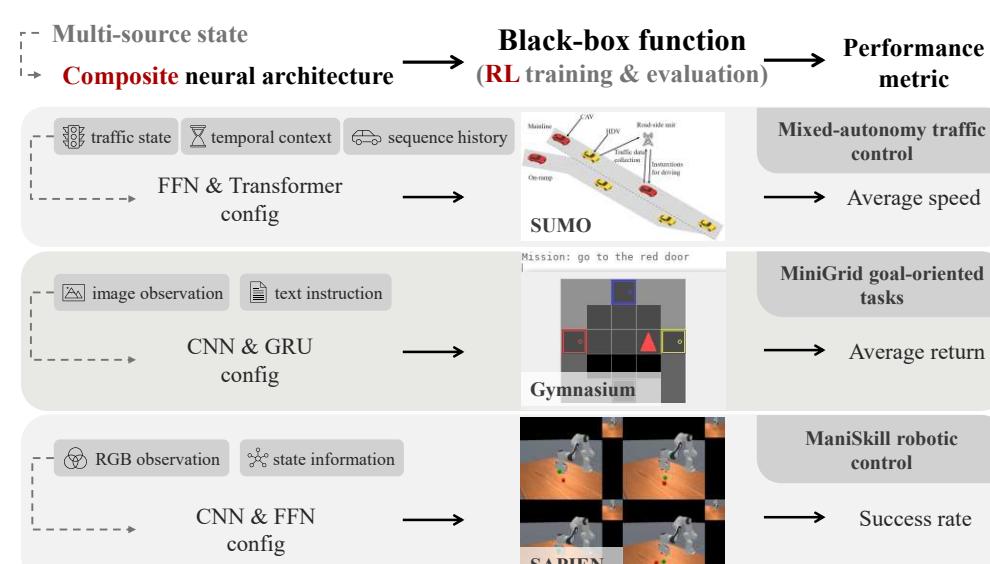
💡 Designing state encoders for multi-source-RL remains underexplored.

Composite Neural Architecture Search

NAS for supervised learning:



NAS for multi-source RL state encoding:



💡 Unlike supervised learning, multi-source RL requires composite NAS.

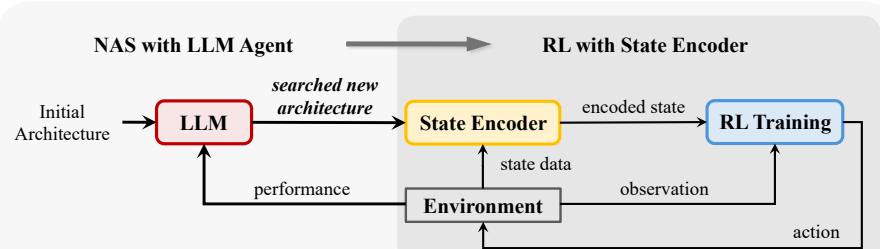
RL training and evaluation:



💡 Balance convergence stability and training cost for efficient, reliable NAS.

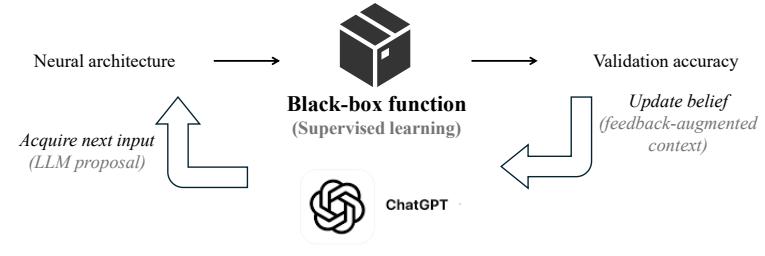
Pipeline

LLM-driven Neural Architecture Search for Composite State Encoders in RL (LACER):

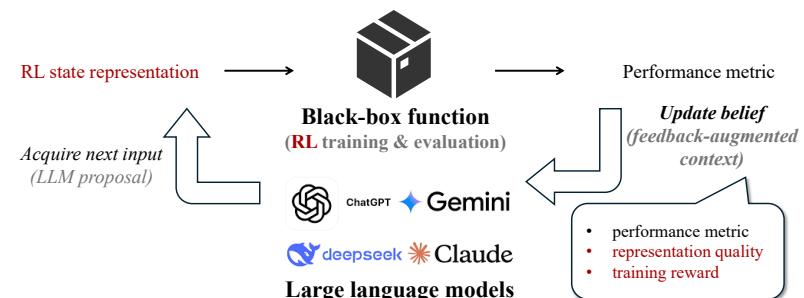


LLM-Based Method Comparisons

GENIUS (existing LLM-based NAS):



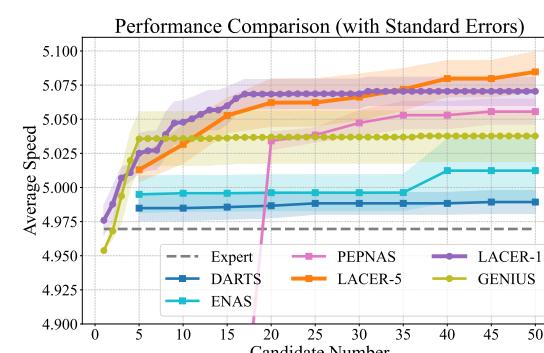
LACER (ours):



💡 Exploit side info on source-specific encoders beyond performance metric.

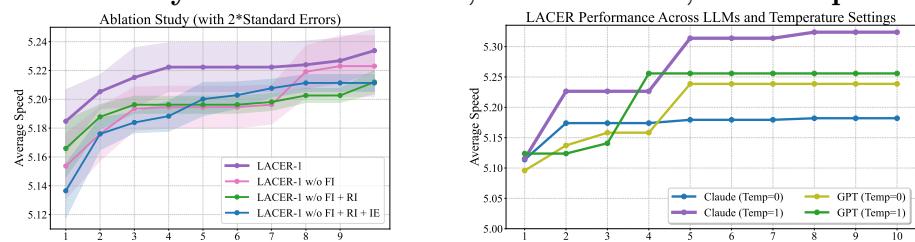
Performance

Comparison between LACER and baselines:



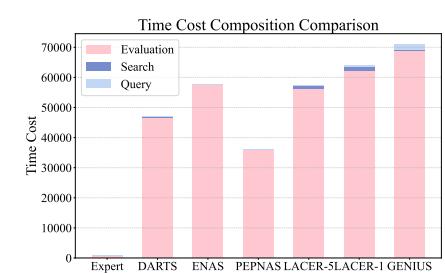
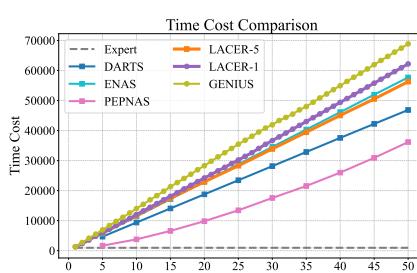
💡 LACER-5 denotes the batch variant (five candidates per iteration).

Ablation study on LLM feedback, model choice, and temperature:



💡 LLM priors and richer feedback enable sample-efficient composite NAS.

Computation Time



💡 LLM query time is negligible relative to encoder candidate eval time.