# Dungeons and DQNs

## Toward Reinforcement Learning Agents that Play Tabletop Roleplaying Games

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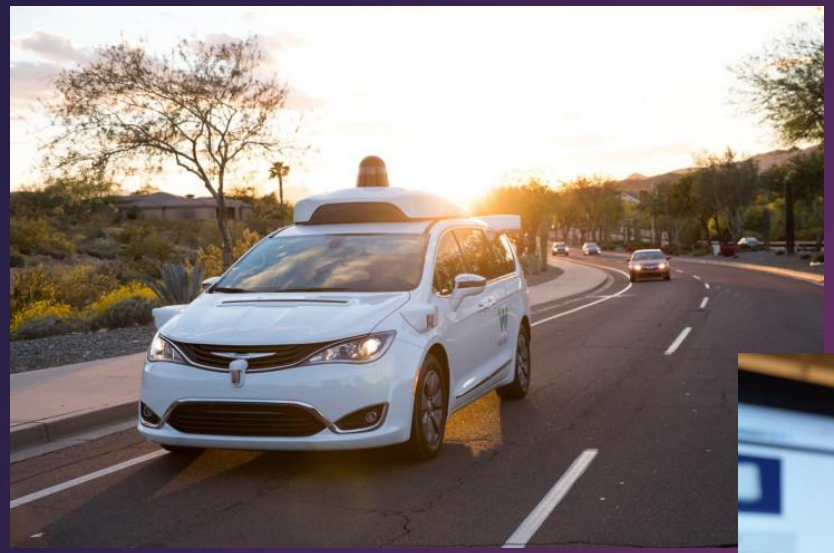
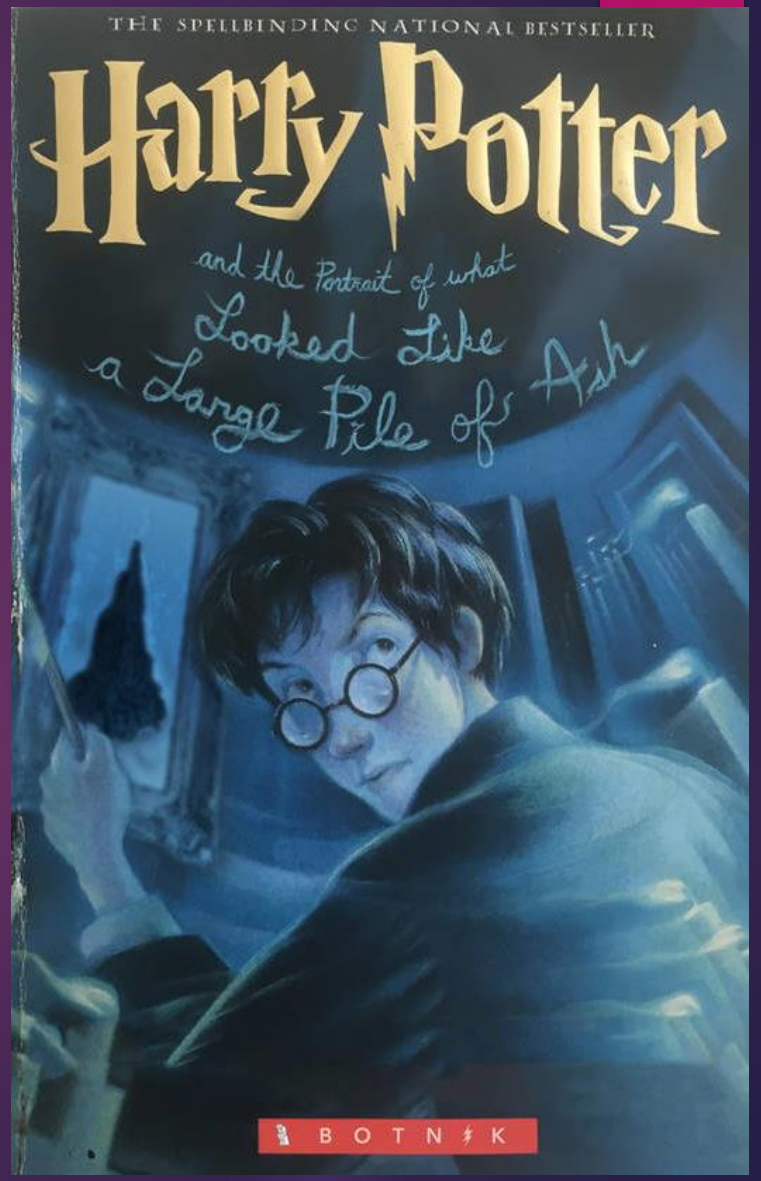
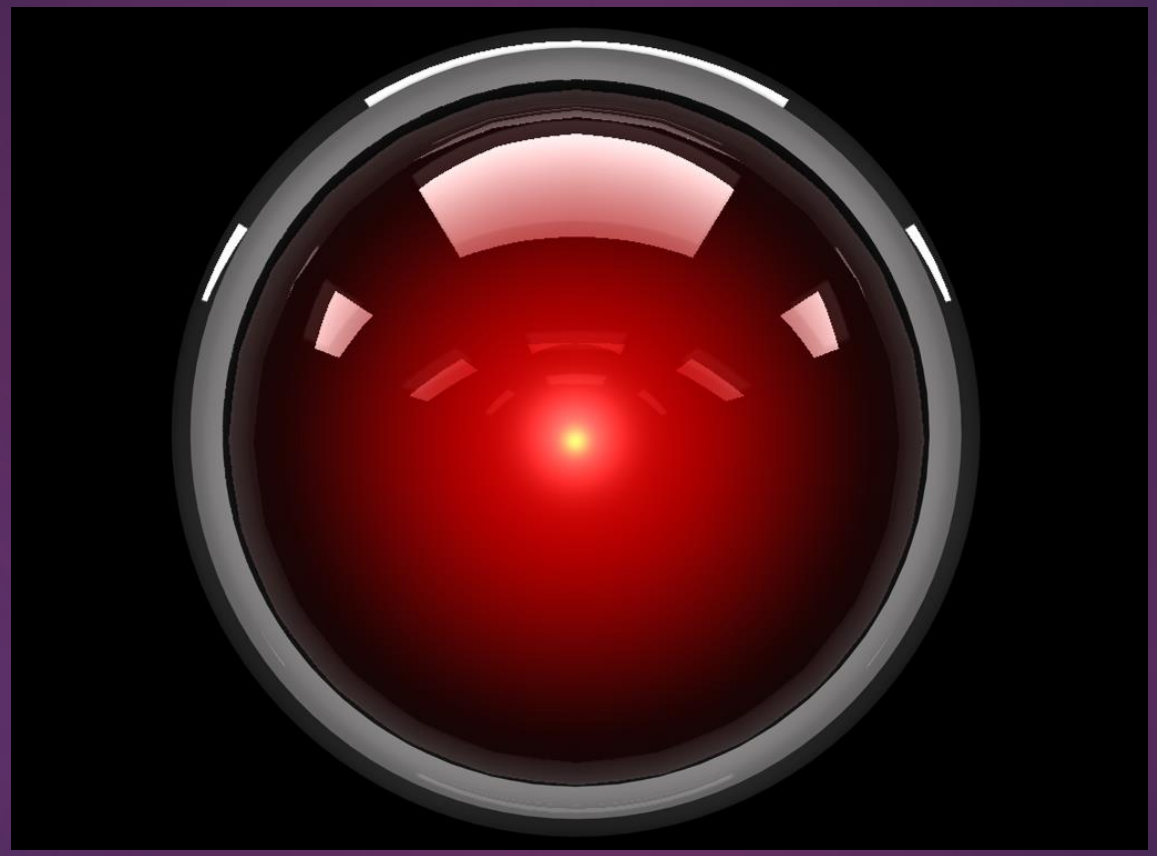





# It's an exciting time for AI

# How do we push the limits of AI?

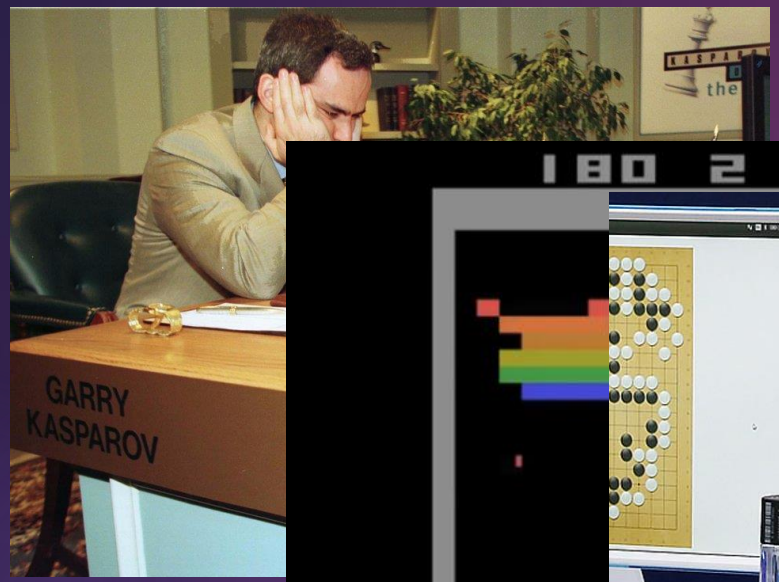




I'm sorry, Dave. I'm afraid I can't do that.

# Games!



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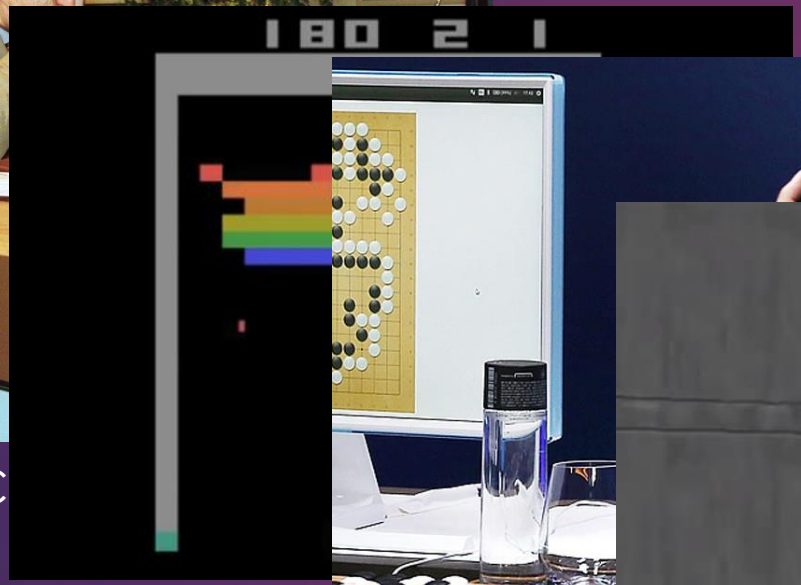
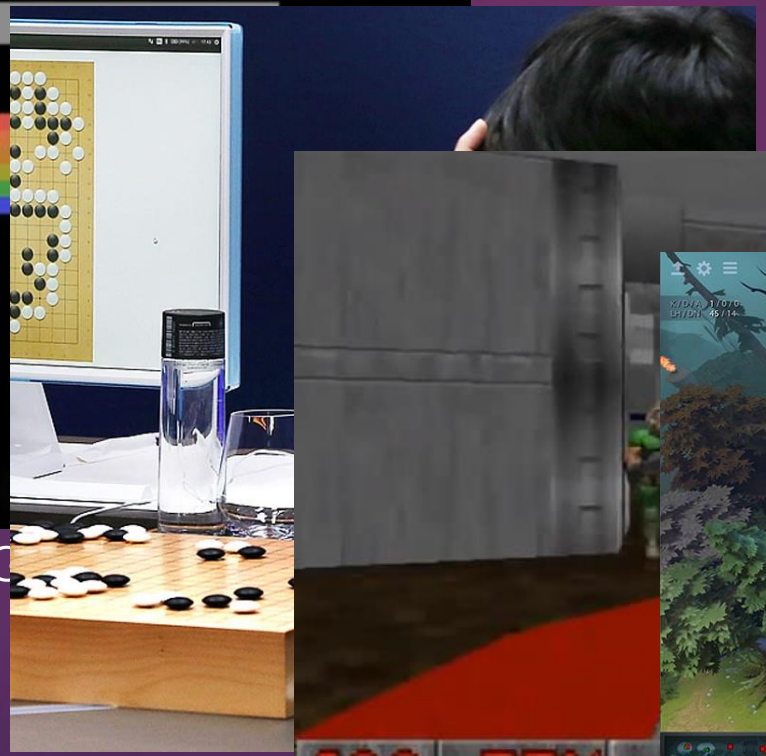



Atari G



Doom - 2016




DOTA 2 - 2018

# What about Dungeons & Dragons?



- Players create characters to play & describe their character's actions
- Characters exist in a shared imaginary world
- Game/Dungeon Master (GM/DM) mediates and sets up scenarios—or campaigns

# Why Dungeons and Dragons?



- Unlimited actions (discourse)
- Actions can have unexpected consequences and/or DM can get unexpected player actions
- Actions cannot cleanly map to states (model of the world changes as game progresses)
- Distributed game world (across players and DM)
- Players receive intrinsic reward for actions (unclear win condition)
- Collaborative

# Outline



- TRPGs compared to:
  - Interactive Fiction
  - Experience Management
  - Automated Story Generation
- Our starting point:
  - Genre Expectation Model + Commonsense Rules Model
  - Deep Q-Learning

# TRPGs vs the World



| Medium | Comparison to TRPGs |
| --- | --- |
| Interactive Fiction (IF) Playing | • Use puzzles to uncovers pre-existing story<br>• Often simplified grammar |
| Experience Management (Used in Interactive Narrative) | • Intervenes in storyline to keep things "on track" for quality<br>• Often fixed set of actions |
| Automatic Story Generation | • Generates new story<br>• Uses planners to create actions for characters for well-defined domains |

# Outline



- TRPGs compared to:
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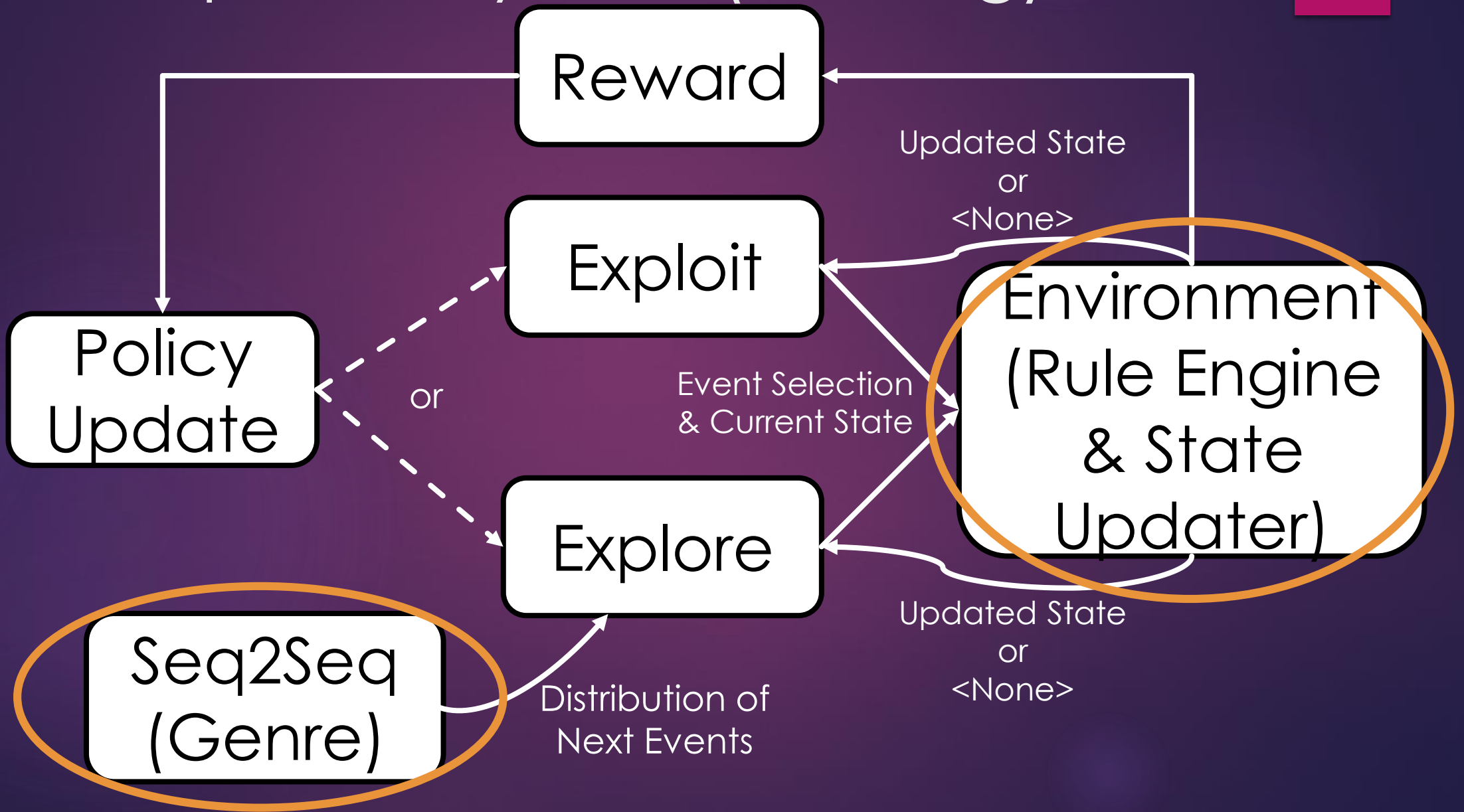
# Assumptions



- No dice rolling (i.e. no combat, etc.)
- Agent is always in character
- GMs aren't refereeing

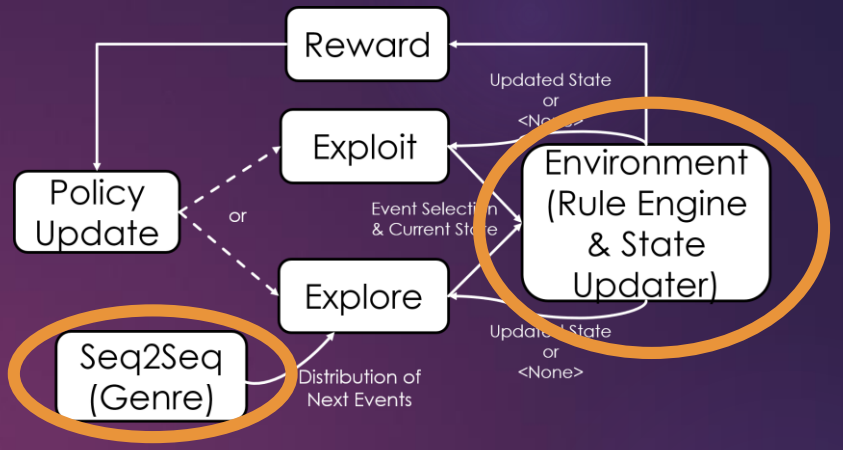
# The Proposed System (Training)





# World Model

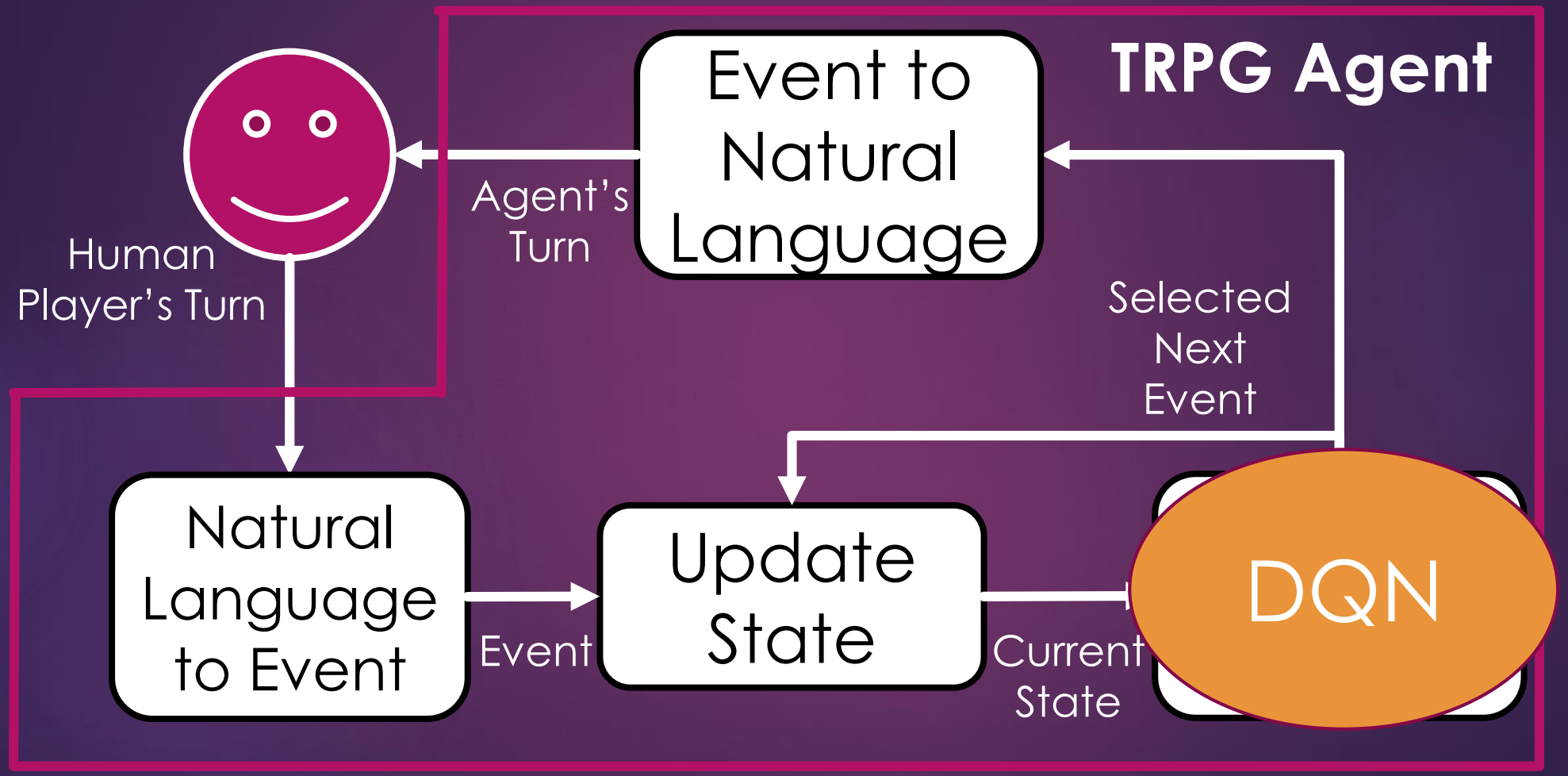





1. Genre Expectation Model
   - Seq2Seq network generates next event in the story
   - Trained on relevant genre
2. Commonsense Rules Model
   - Things that aren't mentioned in stories (see: Principle of Minimal Departure)
   - Temporal & physical rules

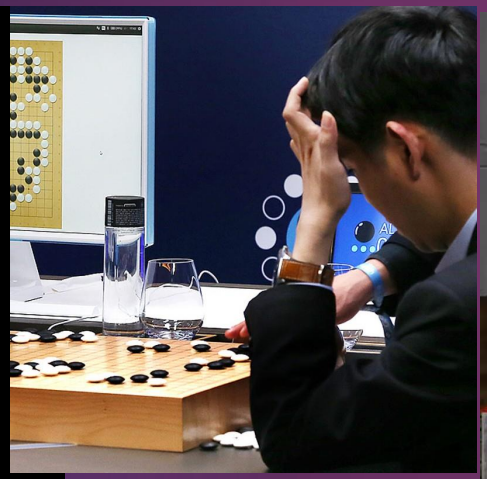
# The Proposed System Pipeline





# Back to Games!

Atari Games - 2015



Go - 2016

Doom - 2016

DOTA 2 - 2018

# Conclusion



- TRPGs are the next AlphaGo

# Thank you!

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