Build a working prototype on a WORLD for gaming

R244 open-source project

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World model (recap from last week)

- Jürgen Schmidhuber & David Ha “World models” (https://worldmodels.github.io/)
- Reinforcement learning using world models trained in an unsupervised manner
- Abstract representation of world
- Minimalistic controller model
- “Learning in a dream”
- Tested on 2 environments
  - Carracing_v0 & VizDoom
  - State-of-the-art results
Motivation for project

- “World models” (https://worldmodels.github.io/)
- Very good results
- Rather limited experimentation
  - Even in other implementations
- Can it be more generally applied?
- Or were the environments picked very carefully?
- Are the results going to be as good?

<table>
<thead>
<tr>
<th>Method</th>
<th>Avg. Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>DQN (Prieur, 2017)</td>
<td>343 ± 18</td>
</tr>
<tr>
<td>A3C (continuous) (Jang et al., 2017)</td>
<td>591 ± 45</td>
</tr>
<tr>
<td>A3C (discrete) (Khan &amp; Elibol, 2016)</td>
<td>652 ± 10</td>
</tr>
<tr>
<td>CEOBillionaire (Gym Leaderboard)</td>
<td>838 ± 11</td>
</tr>
<tr>
<td>V model</td>
<td>632 ± 251</td>
</tr>
<tr>
<td>V model with hidden layer</td>
<td>788 ± 141</td>
</tr>
<tr>
<td><strong>Full World Model</strong></td>
<td><strong>906 ± 21</strong></td>
</tr>
</tbody>
</table>

*Table 1.* CarRacing−v0 scores achieved using various methods.
Project idea and research questions

- Repeat experiment
- Test other (OpenAI Gym) environments
  - Test on real environment as well as “dream learning”
  - Compare results
- Are there other practical uses?
- Is it going to fail in more complex environments?
- Scope somewhat dependent on time and resources…
What's next?

- Implement through an open-source implementation
  - https://github.com/ctallec/world-models
  - https://github.com/hardmaru/WorldModelsExperiments
- Repeat experiment on environments used in original experiment
- Pick other environments for testing
- Test, compare results to state-of-the-art solutions
- Write report
- Submit report :)
Questions and Suggestions