
RAINBOW DQN HYPERPARAMETER OPTIMIZATION USING HYPEROPT FOR CARTPOLE-V1

TECHNICAL REPORT

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ABSTRACT

In this paper, we present a hyperparameter optimization study of the Rainbow DQN algorithm using the Hyperopt library. We use the CartPole-v1 environment from the OpenAI Gym as a benchmark. We show that Hyperopt can be used to find optimal hyperparameters for the Rainbow DQN algorithm. We also show that the Rainbow DQN algorithm can be used to solve the CartPole-v1 environment with a high degree of success. We provide a detailed analysis of the hyperparameters found by Hyperopt and discuss the implications of these results. We also provide a comparison of the performance of the Rainbow DQN algorithm with the performance of other previous DQN algorithms on the CartPole-v1 environment. Finally, we discuss the limitations of our study and suggest directions for future research.

1 Introduction

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2 Headings: first level

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2.1 Headings: second level

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$$\xi_{ij}(t) = P(x_t = i, x_{t+1} = j | y, v, w; \theta) = \frac{\alpha_i(t) a_{ij}^{w_t} \beta_j(t+1) b_j^{v_{t+1}}(y_{t+1})}{\sum_{i=1}^N \sum_{j=1}^N \alpha_i(t) a_{ij}^{w_t} \beta_j(t+1) b_j^{v_{t+1}}(y_{t+1})} \quad (1)$$

2.1.1 Headings: third level

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Paragraph There is also a `\paragraph` command available, which sets the heading in bold, flush left, and inline with the text, with the heading followed by 1 em of space.

3 Citations, figures, tables, references

3.1 Citations within the text

The `natbib` package will be loaded for you by default. Citations may be author/year or numeric, as long as you maintain internal consistency. As to the format of the references themselves, any style is acceptable as long as it is used consistently.

The documentation for `natbib` may be found at

<http://mirrors.ctan.org/macros/latex/contrib/natbib/natnotes.pdf>

Here is an example usage of the two main commands (`citet` and `citep`): Some people thought a thing [??] but other people thought something else [?]. Many people have speculated that if we knew exactly why ? thought this...

If you wish to load the `natbib` package with options, you may add the following before loading the `arxiv` package:

```
\PassOptionsToPackage{options}{natbib}
```

If `natbib` clashes with another package you load, you can add the optional argument `nonatbib` when loading the style file:

```
\usepackage[nonatbib]{arxiv}
```

3.2 Footnotes

Footnotes should be used sparingly. If you do require a footnote, indicate footnotes with a number¹ in the text. Place the footnotes at the bottom of the page on which they appear. Precede the footnote with a horizontal rule of 2 inches (12 picas).

Note that footnotes are properly typeset *after* punctuation marks.²

¹Sample of the first footnote.

²As in this example.

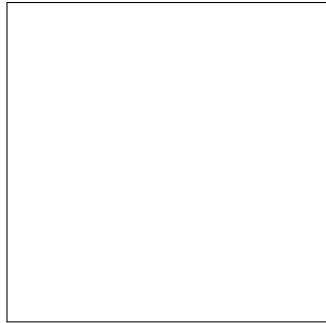


Figure 1: Sample figure caption.

Table 1: Sample table title

Part		
Name	Description	Size (μm)
Dendrite	Input terminal	~ 100
Axon	Output terminal	~ 10
Soma	Cell body	up to 10^6

3.3 Figures

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All artwork must be neat, clean, and legible. Lines should be dark enough for purposes of reproduction. The figure number and caption always appear after the figure. Place one line space before the figure caption and one line space after the figure. The figure caption should be lower case (except for first word and proper nouns); figures are numbered consecutively.

You may use color figures. However, it is best for the figure captions and the paper body to be legible if the paper is printed in either black/white or in color.

3.4 Tables

All tables must be centered, neat, clean and legible. The table number and title always appear before the table. See Table 1.

Place one line space before the table title, one line space after the table title, and one line space after the table. The table title must be lower case (except for first word and proper nouns); tables are numbered consecutively.

Note that publication-quality tables *do not contain vertical rules*. We strongly suggest the use of the booktabs package, which allows for typesetting high-quality, professional tables:

<https://www.ctan.org/pkg/booktabs>

This package was used to typeset Table 1.

3.5 Lists

- Lorem ipsum dolor sit amet
- consectetur adipiscing elit.

- Aliquam dignissim blandit est, in dictum tortor gravida eget. In ac rutrum magna.

3.6 Math

Note that display math in bare TeX commands will not create correct line numbers for submission. Please use LaTeX (or AMSTeX) commands for unnumbered display math. (You really shouldn't be using \$\$ anyway; see <https://tex.stackexchange.com/questions/503/why-is-preferable-to> and <https://tex.stackexchange.com/questions/40492/what-are-the-differences-between-align-equation-and-displaymath> for more information.)

3.7 Margins in L^AT_EX

Most of the margin problems come from figures positioned by hand using `\special` or other commands. We suggest using the command `\includegraphics` from the `graphicx` package. Always specify the figure width as a multiple of the line width as in the example below:

```
\usepackage[pdftex]{graphicx} ...  
\includegraphics[width=0.8\linewidth]{myfile.pdf}
```

See Section 4.4 in the graphics bundle documentation (<http://mirrors.ctan.org/macros/latex/required/graphics/grfguide.pdf>)

A number of width problems arise when L^AT_EX cannot properly hyphenate a line. Please give LaTeX hyphenation hints using the `\-` command when necessary.