

Model-Free Reinforcement Learning for Static Point Source Localization in a 3D Simulation.*

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Abstract—The development of effective source localization techniques has broad reaching implications across multiple domains and environments. Whether it be natural resource detection, environmental monitoring and conservation, search and rescue, navigation or endless additional applications it is an interesting and complex problem that can be solved by the implementation of machine learning algorithms. The contribution of this work aims to implement an RL method that balances the trade-off between exploration and exploitation to efficiently locate and navigate toward the “source” in a relatively large static environment

Index Terms—reinforcement learning, q-learning, source localization,

I. INTRODUCTION

The development of effective source localization techniques has broad reaching implications across multiple domains and environments. Whether it be natural resource detection, environmental monitoring and conservation, search and rescue, navigation or endless additional applications it is an interesting and complex problem that can be solved by the implementation of machine learning algorithms.

Demonstrated methods of source localization such as local search and optimization problems guided by chemotaxis are not efficient for large search environments or remote isolated sources due to their affinity for local minima and maxima. The contribution of this work aims to implement an RL method that balances the trade-off between exploration and exploitation to efficiently locate and navigate toward the “source” in a relatively large static environment

II. RELATED WORKS

What papers can we reference?

III. METHODS

A python interface was implemented to simulate an agent and a three-dimensional environment. A uniform concentration gradient

Explain data, pollution? units?

was applied around a source point which the agents goal was to locate. The agent was trained using Direct Utility Estimation

Identify applicable funding agency here. If none, delete this.

Cite this: 21.2.1 Direct utility estimation, Artificial Intelligence A Modern Approach Third Edition, pg 833

IV. EXPERIMENTS AND RESULTS

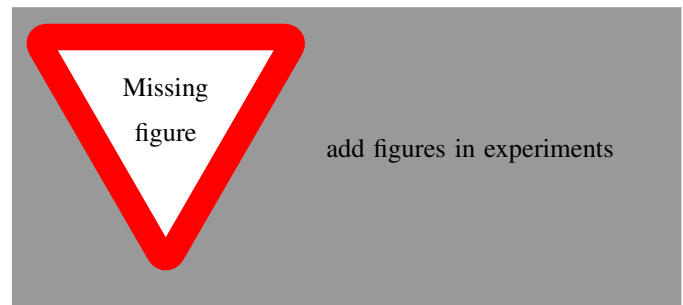


Fig. 1. Example of a figure caption.

V. CONCLUSION

VI. FUTURE WORK

ML Project Paper Due 2021-MAY-06

TODO LIST

What papers can we reference?	1
Explain data, pollution? units?	1
Cite this: 21.2.1 Direct utility estimation, Artificial Intelligence A Modern Approach Third Edition, pg 833	1
Figure: add figures in experiments	1
ML Project Paper Due 2021-MAY-06	1

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Number equations consecutively. To make your equations more compact, you may use the solidus (/), the exp function, or appropriate exponents. Italicize Roman symbols for quantities and variables, but not Greek symbols. Use a long dash rather than a hyphen for a minus sign. Punctuate equations with commas or periods when they are part of a sentence, as in:

$$a + b = \gamma \quad (1)$$

Be sure that the symbols in your equation have been defined before or immediately following the equation. Use “(1)”, not “Eq. (1)” or “equation (1)”, except at the beginning of a sentence: “Equation (1) is . . .”

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Please use “soft” (e.g., `\eqref{Eq}`) cross references instead of “hard” references (e.g., (1)). That will make it possible to combine sections, add equations, or change the order of figures or citations without having to go through the file line by line.

Please don’t use the `\eqnarray` equation environment. Use `\align` or `\IEEEeqnarray` instead. The `\eqnarray` environment leaves unsightly spaces around relation symbols.

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\BibTeX does not work by magic. It doesn’t get the bibliographic data from thin air but from .bib files. If you use \BibTeX to produce a bibliography you must send the .bib files.

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- In your paper title, if the words “that uses” can accurately replace the word “using”, capitalize the “u”; if not, keep using lower-cased.
- Be aware of the different meanings of the homophones “affect” and “effect”, “complement” and “compliment”, “discreet” and “discrete”, “principal” and “principle”.
- Do not confuse “imply” and “infer”.
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- There is no period after the “et” in the Latin abbreviation “et al.”.
- The abbreviation “i.e.” means “that is”, and the abbreviation “e.g.” means “for example”.

An excellent style manual for science writers is [7].

F. Authors and Affiliations

The class file is designed for, but not limited to, six authors. A minimum of one author is required for all conference articles. Author names should be listed starting from left to right and then moving down to the next line. This is the author sequence that will be used in future citations and by indexing services. Names should not be listed in columns nor group by affiliation. Please keep your affiliations as succinct as possible (for example, do not differentiate among departments of the same organization).

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a) *Positioning Figures and Tables:* Place figures and tables at the top and bottom of columns. Avoid placing them in the middle of columns. Large figures and tables may span across both columns. Figure captions should be below the figures; table heads should appear above the tables. Insert figures and tables after they are cited in the text. Use the abbreviation “Fig. 2”, even at the beginning of a sentence.

TABLE I
TABLE TYPE STYLES

Table Head	Table Column Head		
	Table column subhead	Subhead	Subhead
copy	More table copy ^a		

^aSample of a Table footnote.

Figure Labels: Use 8 point Times New Roman for Figure labels. Use words rather than symbols or abbreviations when



Fig. 2. Example of a figure caption.

writing Figure axis labels to avoid confusing the reader. As an example, write the quantity “Magnetization”, or “Magnetization, M”, not just “M”. If including units in the label, present them within parentheses. Do not label axes only with units. In the example, write “Magnetization (A/m)” or “Magnetization {A[m(1)]}”, not just “A/m”. Do not label axes with a ratio of quantities and units. For example, write “Temperature (K)”, not “Temperature/K”.

ACKNOWLEDGMENT

The preferred spelling of the word “acknowledgment” in America is without an “e” after the “g”. Avoid the stilted expression “one of us (R. B. G.) thanks ...”. Instead, try “R. B. G. thanks...”. Put sponsor acknowledgments in the unnumbered footnote on the first page.

REFERENCES

Please number citations consecutively within brackets [1]. The sentence punctuation follows the bracket [2]. Refer simply to the reference number, as in [3]—do not use “Ref. [3]” or “reference [3]” except at the beginning of a sentence: “Reference [3] was the first ...”

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Unless there are six authors or more give all authors’ names; do not use “et al.”. Papers that have not been published, even if they have been submitted for publication, should be cited as “unpublished” [4]. Papers that have been accepted for publication should be cited as “in press” [5]. Capitalize only the first word in a paper title, except for proper nouns and element symbols.

For papers published in translation journals, please give the English citation first, followed by the original foreign-language citation [6].

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