

Summary and Contributions

The authors give an overview and review of the emerging field of learned optimizers. Learned optimizers would alleviate the need for handcrafted optimization algorithms and costly hyperparameter tuning.

The authors give an introduction to the supervised deep learning setting. They explain the task of optimization in such a setting and give formal context. Popular, *traditional* gradient based methods are described in detail.

The authors then continue by giving a similarly detailed introduction to the notion of learned optimizers. They also support their formal explanation with figures to help the reader build an intuition.

With a formal background established, different approaches to tackle the challenge of learning optimizers are introduced. Special emphasis is layed on a strain of work by Metz et al. which is discussed further. The results of this work are described in detail and are critically evaluated.

Strengths

- Fundamentals section gives a detailed formal background while
- Very good written language
- Clear motivation why the topic is relevant
- Good use of visuals
- Emphasis on explanation of the idea of learned optimizers
- Critical discussion of reviewed work, revealing the lack of proper scientific conduct
- Good selection of literature
- Pointing out specific weaknesses and strengths of current learned optimizers

The authors have a deep understanding of the discussed matter. All concepts are explained in detail and are critically discussed.

Weaknesses

- No-free-lunch-theorem could use more context.
- Some wrong commas.

Correctness

While the reviewer is not particularly familiar with the relevant literature, all references appear to be cited properly. The reviewer could not find any false formulations or equations.

Clarity

The work is easy to follow. The structure is well composed. Language is precise and detailed. Equations and text support one each other. Visuals provide further intuition where needed. Overall, the work is clear and precise.

Further Comments

Rating and Confidence

- Overall Score: 9.9
- Confidence: 7.5

1. Summary and contributions: Briefly summarize the Report. 2. Strengths: Describe the strengths of the work. 3. Weaknesses: Explain the limitations of this work along the same axes as above. 4. Correctness: Are the given formulas, citations and the text correct? 5. Clarity: Is the paper well written? Is there a logical thread? 6. Additional feedback, comments, suggestions for improvement and questions for the authors 7. Please provide an overall score” for this submission (between 1 and 10 (10 is best)).