Report Template
FYS-STK3155 - Project X

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The Runge function is important for a number of reasons ¡list of reasons¿ ¡citations¿. Making good estimates for it can save a lot of computing time and expand the its number of applications ¡citations¿. Three approximations of the Runge function using various machine learning techniques are presented; namely ordinary least squares, ridge regression and lasso regression. A model that is 10 % faster and 5 % more accurate in applications than exsisiting models are presented.

I. INTRODUCTION

The Runge function has recently appeared in many applications ¡citations¿. Many of these applications require speed and accuracy something this function does not allow ¡citeation¿. Hence there has been a lot of research on estimates and approximations for this function ¡citations¿, but there are few that uses the methods of machine learning.

In this article we explore how differnet machine learning methods can be used to make approximations for the Runge function. The methods used are ordinary least squares, ridge regression and lasso regression. We will then give a discussion of the methods limitations and performance. Finally we will give some insighets into applications and further research.

II. METHODS

A. Method 1/X

- Describe the methods and algorithms, including the motivation for using them and their applicability to the problem

- Derive central equations when appropriate, the text is the most important part, not the equations.

B. Implementation

- Explain how you implemented the methods and also say something about the structure of your algorithm and present very central parts of your code, not more than 10 lines

- You should plug in some calculations to demonstrate your code, such as selected runs used to validate and verify your results. A reader needs to understand that your code reproduces selected benchmarks and reproduces previous results, either numerical and/or well-known closed form expressions.

C. Use of AI tools

- Describe how AI tools like ChatGPT were used in the production of the code and report.

III. RESULTS AND DISCUSSION

In this section I will write about the results. In the experiment I tried to approximate some data y. 1 shows the bias-variance tradeoff for ridge regression on this data.
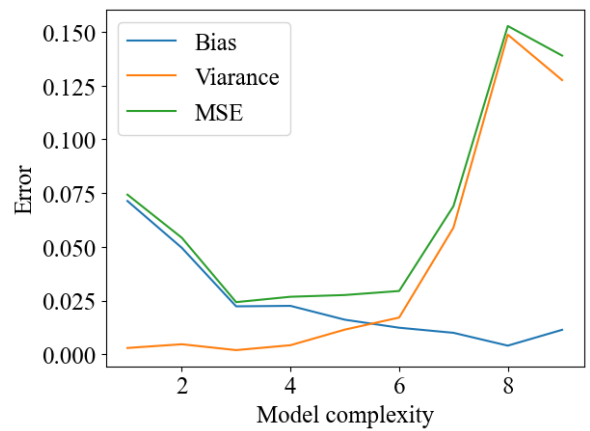

Figure 1: The bias-variance tradeoff for ridge regression of data y

Here are some more text about how we looked at different parameteres for ridge regression and tried finding the optimal ones with a grid-search2.

IV. CONCLUSION

- State your main findings and interpretations

- Try to discuss the pros and cons of the methods and possible improvements

- State limitations of the study

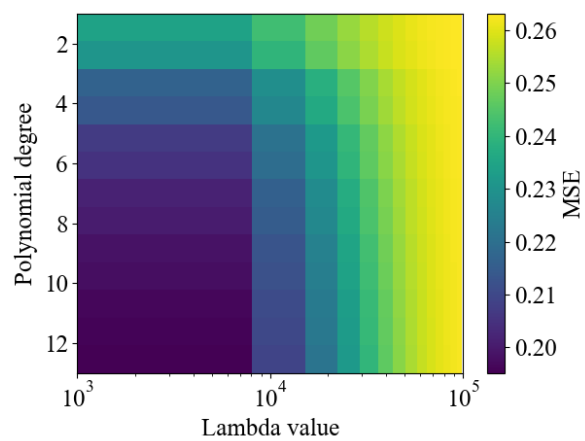- Try as far as possible to present perspectives for future work

Figure 2: Grid-search for optimal parameters of ridge regression of data y