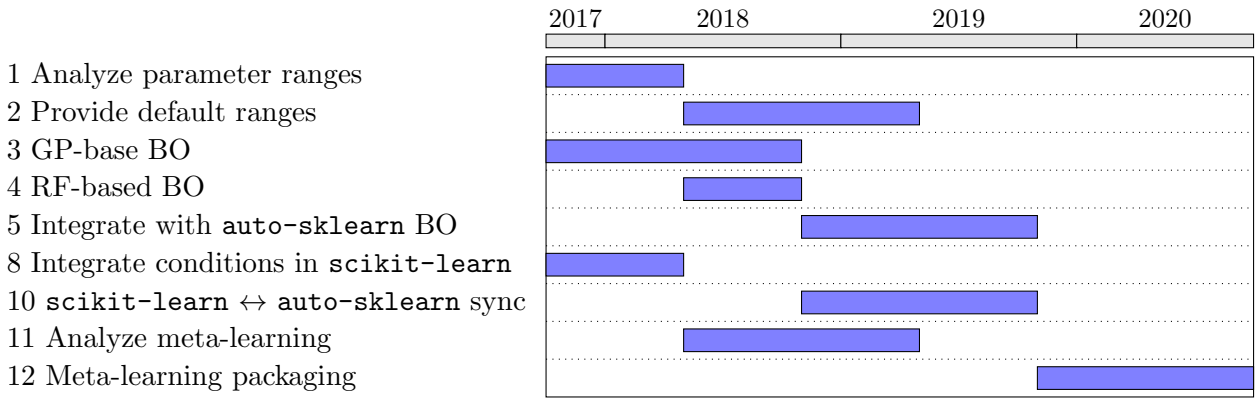

Figure 1: Project timeline

1 Change of proposed work

Due to the reduced budget, and given the current state of scikit-learn development, we will drop the tasks 6 (Searching pipeline steps), 7 (Transformation conditions) and 9 (Feature encodings in `scikit-learn`) from the proposal. A revised project timeline can be found in Figure 1. Task 6 is already implemented in the current version of scikit-learn, while tasks 7 and 9 are in the process of being implemented, partially as part of a different grant.

2 Overlap with other funded work

Another project of mine relating to `scikit-learn` has recently been funded under the title "Extensions and Maintenance of Scikit-learn", which focusses on integration of `scikit-learn` with the pandas library, better support for missing and categorical data, and better tools for understanding and visualizing models. That work does not include any aspects of automation, benchmarking or meta-learning, and removing task 9 from this proposal eliminates any overlap.

3 Related Education

There are two seperate aspects of this proposal that relate to education. The first is outreach to contribute to open source projects, through coding sprints and collaboration with the Women in Machine Learning and Data Science group. The other aspect is the training of students in the use of machine learning software, in particular the software developed as part of this project. I am teaching an annual course on Applied Machine Learning [1] at the Columbia Data Science Institute. This elective is part of the graduate curriculum of the Data Science program, but is open to students from other programs. Notably, this years course had participants from programs in Astronomy, Statistics, Economics, Urban Development, Applied Mathematics and Finance. This class is focused on teaching data analysis skills and software tools that can be applied to real-world problems. Tools developed as part of this project will be included in the course as they are completed. This will also provide feedback for further refinement of the software.

[1] https://amueller.github.io/applied_ml_spring_2017/lectures.html

4 Licensing of Software Products

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```
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[2] https://opensource.org/licenses

5 Quantitative Usage Metrics

We will use two main metrics to quantify the adoption of our software: Usage in open source code published on GitHub, and contributors. Thanks to the Google BigQuery interface for open source repositories on GitHub[3] and the Github code search feature it is possible to quanitatively analyze a large amount of scientific software and experimentation code. This even allows for fine-grained analysis of which features of the software are used. For code that is contributed to the `scikit-learn` package, we will use this code analysis exclusively, as contributors to parts of the package are hard to track[4] For code that lives in a separate package, we will use contributors and code analysis statistics.

Year 1 At least 10 open source projects or research projects using the provided features

Year 2 At least 20 open source projects or research projects using the provided features, at least 2 external contributors to the project.

Year 3 At least 50 open source projects or research projects using the provided features, at least 5 external contributors to the project.

We do not include citations into our metrics, as citations for software are unfortunately rare, and a paper to describe the meta-learning project could only be published at the end of the third year. Counting citations to scikit-learn related publications are unlikely to reflect the particular outcomes of this project.

6 User and Community Engagement

[3] https://cloud.google.com/bigquery/public-data/github

[4] The number of editors of a file is not a good proxy for the number of contributors.