

Final Course Assignment

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Mathematical Aspects in Machine Learning

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1 Introduction

In the past course we dealt with the broad mathematical foundations of machine learning. To get an idea of what the consequences of those mathematical theorems and approaches are and to get in touch with the standard Python tools, we have evaluated an comparatively easy data science example found on [kaggle.com](https://www.kaggle.com). The example dataset [1] consists of the historic passenger records of the disastrous Titanic maiden voyage in 1912.

Listing 1: Hello World

```
# Copyright (C) 2017 Mark Niehues, Stefaan Hessmann
#
# This program is free software: you can redistribute it and/or modify
# it under the terms of the GNU General Public License as published by
# the Free Software Foundation, either version 3 of the License, or
# (at your option) any later version.
#
# This program is distributed in the hope that it will be useful,
# but WITHOUT ANY WARRANTY; without even the implied warranty of
# MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
```

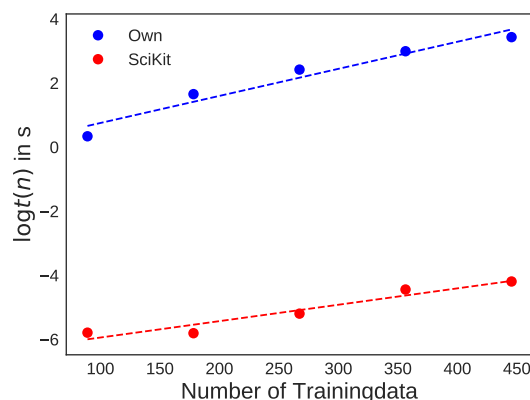


Figure 1: Benchmark

```
# GNU General Public License for more details.
#
# You should have received a copy of the GNU General Public License
#
```

```
import numpy as np
```

```
class Kernels:
    """
    Class that holds different Kernels
    """
    def __init__(self, gamma):
        self.gamma = gamma
        self.kernels = {
            "rbf" : self.kernel_rbf,
            "linear": self.kernel_lin}

    def get_kernel(self, kernel_name):
        return self.kernels[kernel_name]

    def kernel_lin(self, x, y):
        """
        Linear kernel
        """
        return x.dot(y)

    def kernel_rbf(self, x, y):
        """
        RBF Kernel
        """
        d = x - y
        return np.exp(-np.dot(d, d) * self.gamma)
```

2 Applying Machine Learning Methods on the Titanic Disaster

blalba

3 Implementation of an easy SMO Algorithm

References

- [1] Kaggle. *Titanic: Machine Learning from Disaster*. July 13, 2017. URL: <https://www.kaggle.com/c/titanic>.