

-期末報告-

ElasticNet

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Regression(3)

Outline

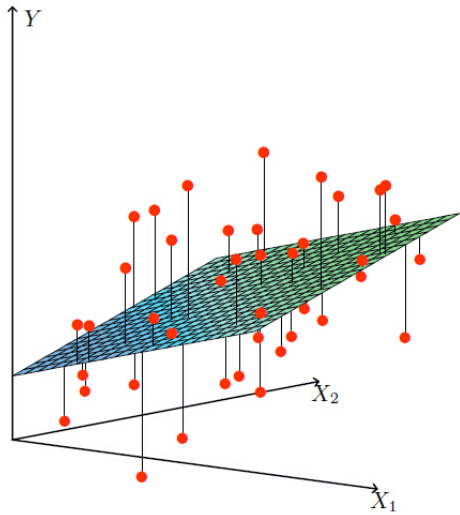
- Algorithm Introduction
- Code Review
- Model Preview
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- Conclusion
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Algorithm Introduction

Linear Regression

Algorithm Introduction

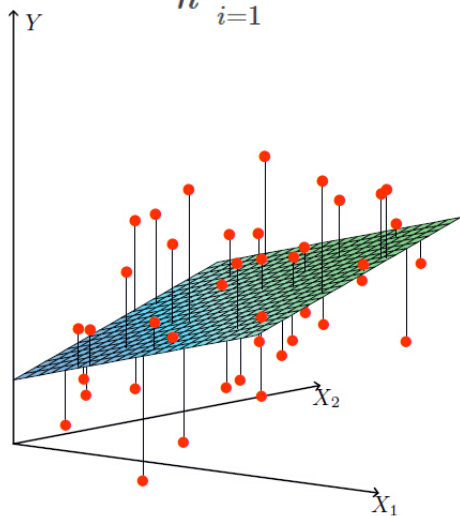
Linear Regression



Algorithm Introduction

Linear Regression

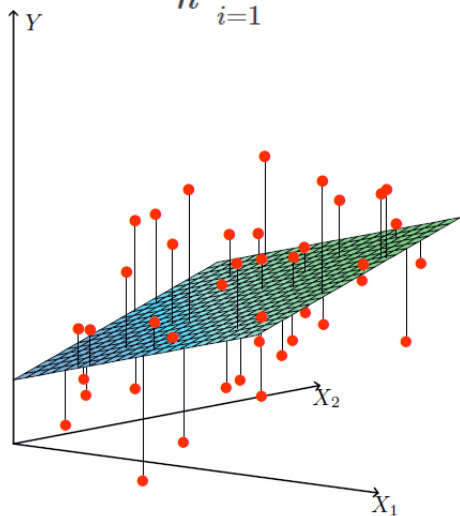
Loss function: $\frac{1}{n} \sum_{i=1}^n (y_i - f(x_i))^2$



Algorithm Introduction

Linear Regression

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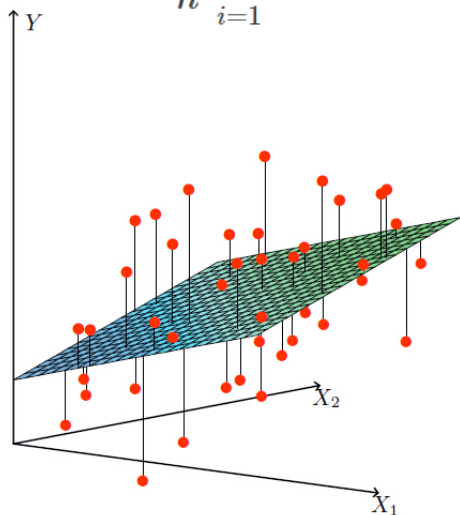
Ridge Regression

Linear Regression + **L2 normalization**

Algorithm Introduction

Linear Regression

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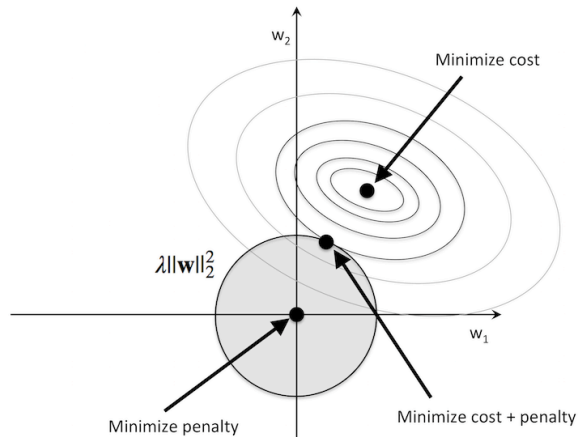


Ridge Regression

Linear Regression + **L2 normalization**

L2 norm: $\sum \theta^2$

數據變動時移動較小



Algorithm Introduction

Lasso Regression

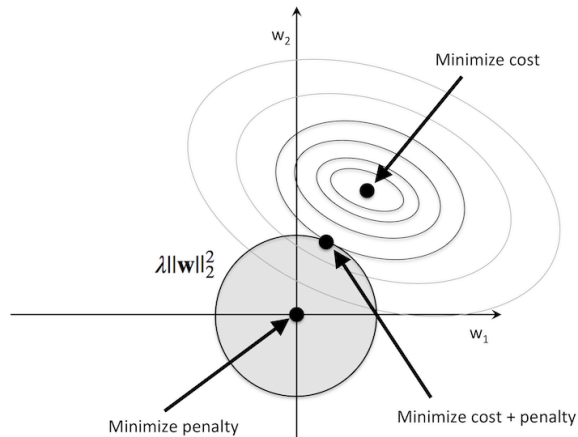
Linear Regression + **L1 normalization**

L1 norm: $\sum |\theta|$ 具有篩選feature的特性

Ridge Regression

Linear Regression + **L2 normalization**

L2 norm: $\sum \theta^2$ 數據變動時移動較小

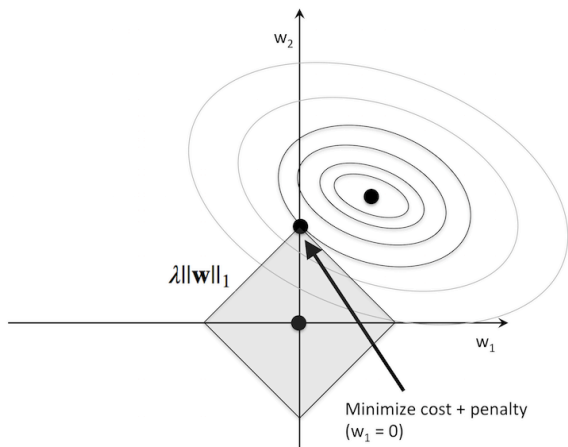


Algorithm Introduction

Lasso Regression

Linear Regression + **L1 normalization**

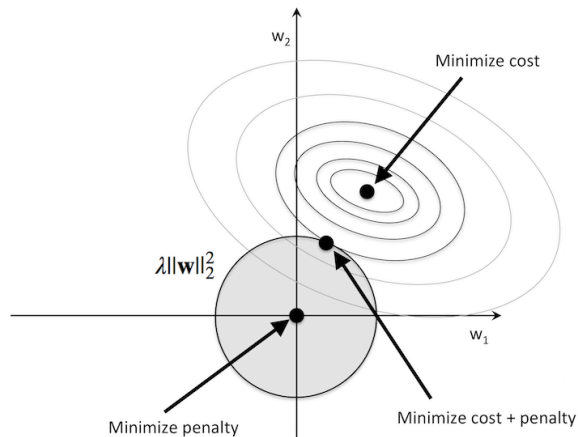
L1 norm: $\sum |\theta|$ 具有篩選feature的特性



Ridge Regression

Linear Regression + **L2 normalization**

L2 norm: $\sum \theta^2$ 數據變動時移動較小



Algorithm Introduction

Elastic Net

Algorithm Introduction

Elastic Net

Linear Regression + L1 norm + L2 norm

L1 norm + L2 norm: $\rho \sum |\theta| + (1 - \rho) \sum \theta^2$

Algorithm Introduction

Elastic Net

Linear Regression + L1 norm + L2 norm

L1 norm + L2 norm: $\rho \sum |\theta| + (1 - \rho) \sum \theta^2$

結合L1與L2的特性，Model更彈性

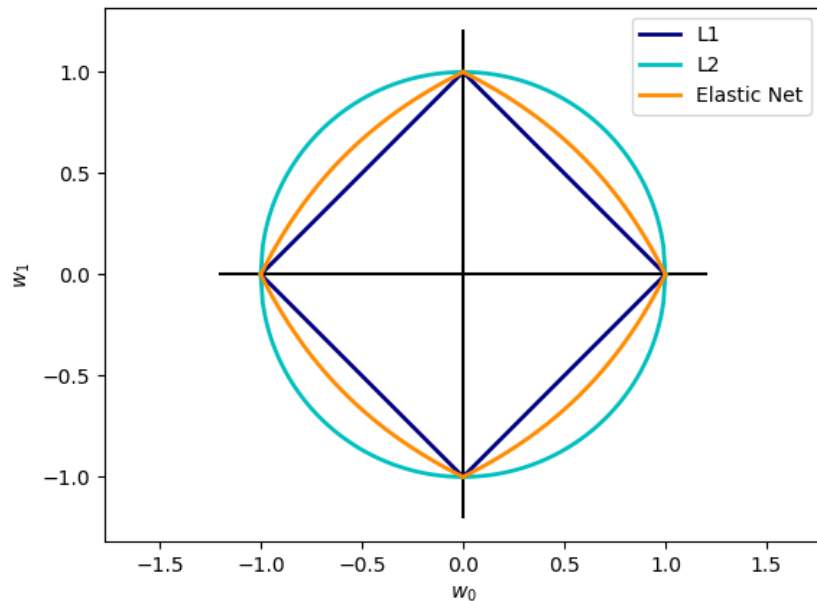
Algorithm Introduction

Elastic Net

Linear Regression + **L1 norm**+**L2 norm**

L1 norm + L2 norm: $\rho \sum |\theta| + (1 - \rho) \sum \theta^2$

結合L1與L2的特性，Model更彈性



Code Review

Param Definition(繼承algo_component中的ParamsDefinitionSet)

```
class ParamsDefinitionSet(alc.ParamsDefinitionSet):
    def __init__(self):
        self.params_definition_set = \
        {
            alc.ParamsDefinition(name='alpha', type='float', range='', default_value='1.0', description=''),
            alc.ParamsDefinition(name='l1_ratio', type='float', range='0,1', default_value='0.5', description=''),
            alc.ParamsDefinition(name='fit_intercept', type='boolean', range='True,False', default_value='True', description=''),
            alc.ParamsDefinition(name='normalize', type='boolean', range='True,False', default_value='False', description=''),
            alc.ParamsDefinition(name='precompute', type='boolean', range='True,False', default_value='False', description=''),
            alc.ParamsDefinition(name='max_iter', type='int', range='', default_value='1000', description=''),
            alc.ParamsDefinition(name='copy_X', type='boolean', range='True,False', default_value='True', description=''),
            alc.ParamsDefinition(name='tol', type='float', range='', default_value='0.0001', description=''),
            alc.ParamsDefinition(name='warm_start', type='boolean', range='True,False', default_value='False', description=''),
            alc.ParamsDefinition(name='positive', type='boolean', range='True,False', default_value='False', description=''),
            alc.ParamsDefinition(name='random_state', type='int', range='', default_value='None', description=''),
            alc.ParamsDefinition(name='selection', type='enum', range='cyclic,random', default_value='cyclic', description='')
        }
```

Code Review

利用傳入的參數建立Model並回傳(繼承algo_component中的InanalysisAlgo)

```
class ElasticNet(alc.InanalysisAlgo):
    def __init__(self):
        self.input_params_definition = ParamsDefinitionSet()

    def get_input_params_definition(self):
        return self.input_params_definition.get_params_definition_json_list()

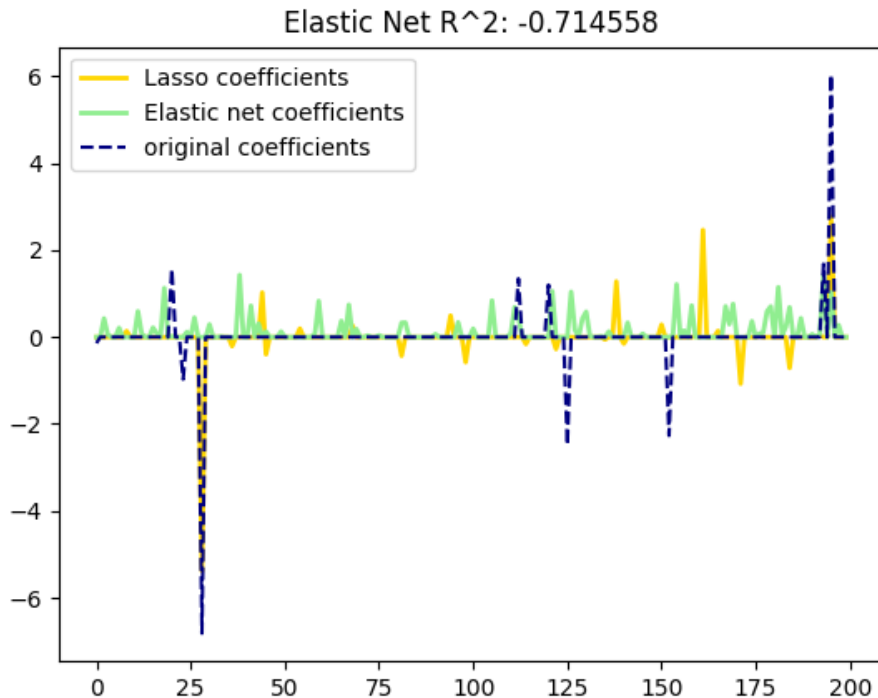
    def do_algo(self, input):
        control_params = input.algo_control.control_params
        if not self.check_input_params(self.get_input_params_definition(), control_params):
            log.error("Check input params type error.")
            return None
        mode = input.algo_control.mode
        data = input.algo_data.data
        label = input.algo_data.label
        if mode == 'training':
            try:
                model = linear_model.ElasticNet(
                    alpha=control_params["alpha"],
                    l1_ratio=control_params["l1_ratio"],
                    fit_intercept=control_params["fit_intercept"],
                    normalize=control_params["normalize"],
                    precompute=control_params["precompute"],
                    max_iter=control_params["max_iter"],
                    copy_X=control_params["copy_X"],
                    tol=control_params["tol"],
                    warm_start=control_params["warm_start"],
                    positive=control_params["positive"],
                    random_state=control_params["random_state"],
                    selection=control_params["selection"]
                )
                model.fit(X=data, y=label)
                algo_output = alc.AlgoParam(algo_control={'mode': 'training', 'control_params': ''},
                                           algo_data={'data': data, 'label': label},
                                           algo_model={'model_params': model.get_params(), 'model_instance': model})
            except Exception as e:
                log.error(str(e))
                algo_output = None
        else:
            algo_output = None
        return algo_output
```

Model Preview

產生50筆200個feature的data

分別作圖原始方程式、Lasso與Elastic net的參數值

可以看見Elastic Net比起Lasso更加圓滑一些



Live Demo

Conclusion

- 熟悉scikit learn機器學習套件的使用
- 更深入理解演算法並比較之間差異
- 學習視覺化呈現

Reference

- [Scikit-learn](#)
- [STATISTICAL LEARNING AND DATA MINING III](#)
- [Ridge & LASSO & Elastic Net](#)