# Income estimation

Based on skills

Can we calculate salaries for jobs in any industry based only on skills and location?

# Datasets

Salary data from Bureau of Labor Statistics:

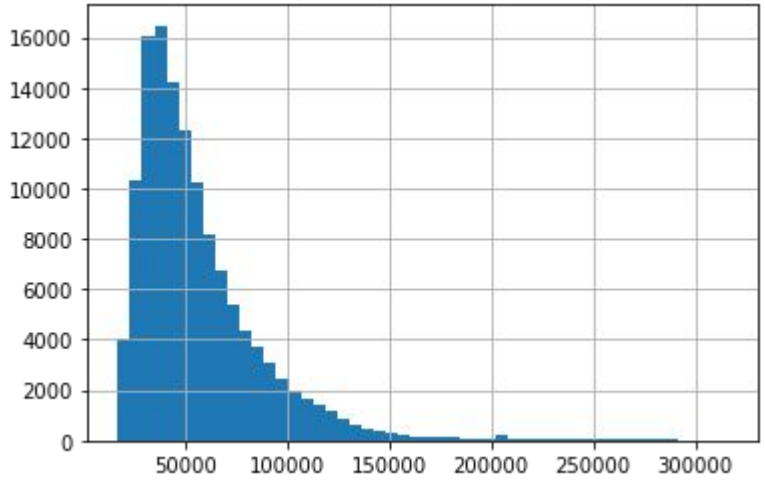
- Occupation
- State
- Annual Salary

Skills data from Onet

There are two scales, impotence and level

For this exercise we choose importance with a scale of 1-5

# Target feature




| | Annual | Hourly |
|---|---|---|
| Mean | 57,448 | 27.34 |
| Min | 17,300 | 8.32 |
| Max | 315830 | 151.84 |

# Features

Features

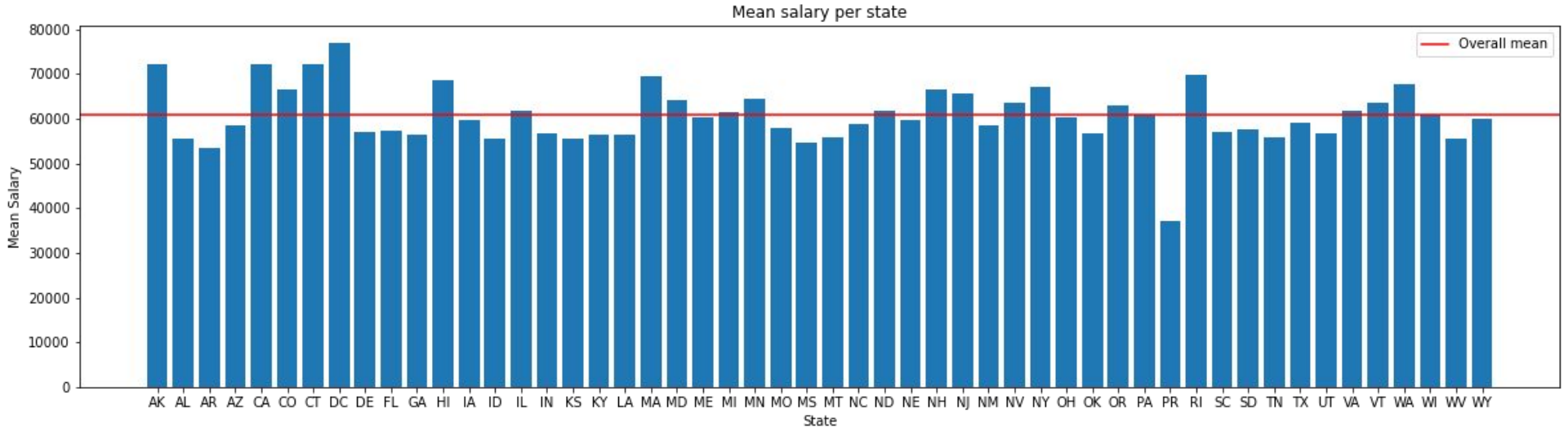
states

788 occupations

35 skills

379 locations

# States


Mean salary per state
Overall mean
Mean Salary
80000
70000
60000
50000
40000
30000
20000
10000
0
AK AL AR AZ CA CO CT DC DE FL GA HI IA ID IL IN KS KY LA MA MD ME MI MN MO MS MT NC ND NE NH NJ NM NV NY OH OK OR PA PR RI SC SD TN TX UT VA VT WA WI WV WY
State

# Skills scale

## 1 to 5

Just looking at these histograms, we can see that Installation, Equipment Maintenance, Equipment Selection, and Repairing are highly skewed to the right. Most of their values are concentrated around 1.

Most of the distributions above are bimodal. Time Managment and Service Orientation have the most normal distributions. Technology design and Programming have most of their values concentrated below 2. Science has a high value at 1 which means that science is not ranked as important for many occupations! We also see this features in Troubleshooting, Programming and Operations and Control.

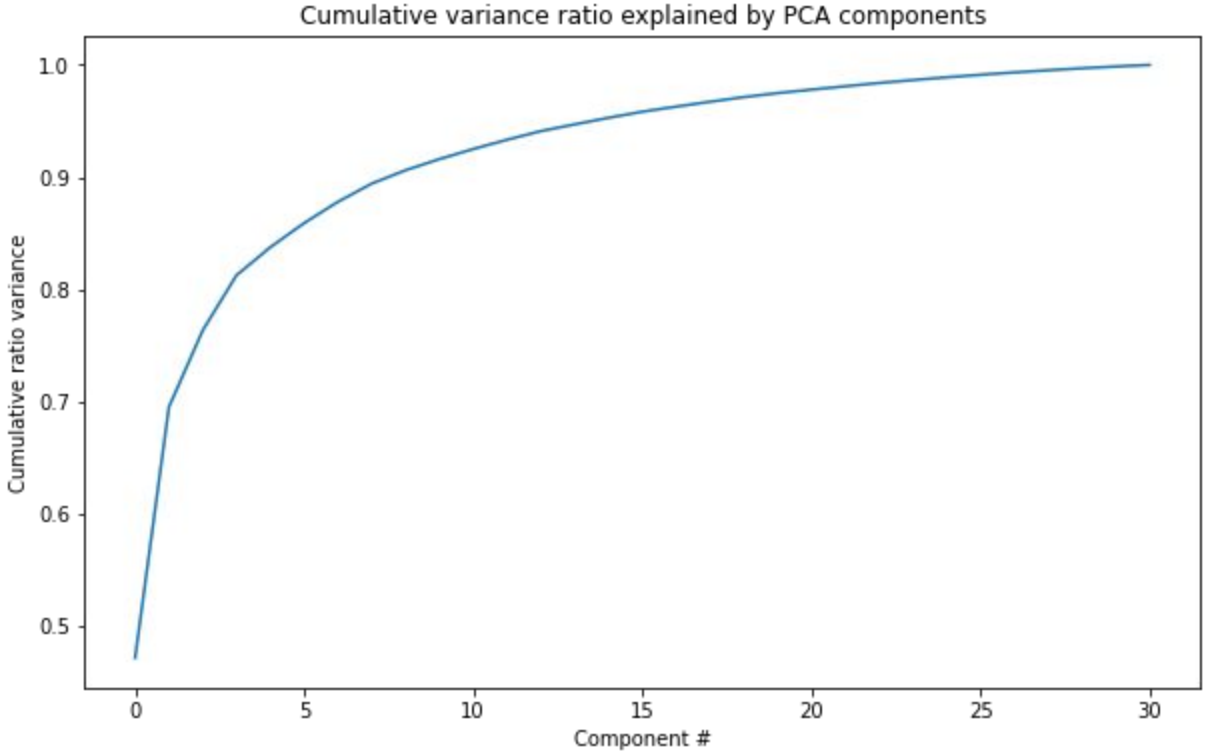
# Relationship between target feature (salary) and variables (skills)

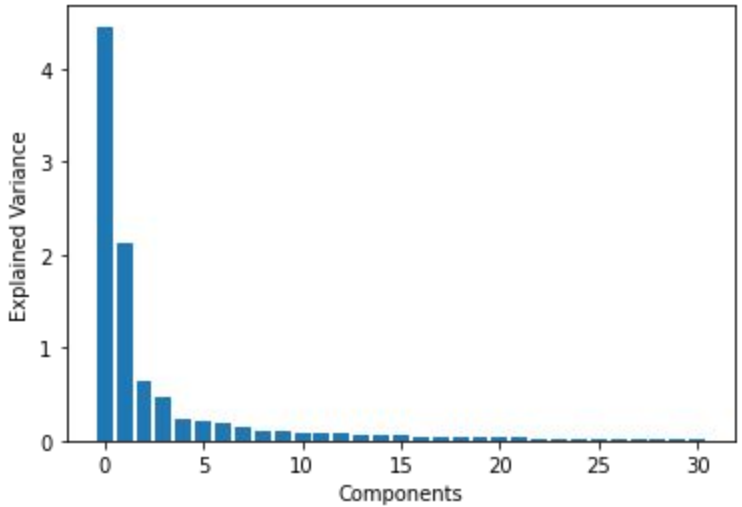
# Relationship between target feature (salary) and variables (skills)

## Correlation between each feature

Heatmaps, pairplots

# PCA


Cumulative variance ratio explained by PCA components
Cumulative ratio variance
1.0
0.9
0.8
0.7
0.6
0.5
0
5
10
15
20
25
30
Component #


Explained Variance
0
1
2
3
4
0
5
10
15
20
25
30
Components

# Baseline model

Uses mean as the best estimate

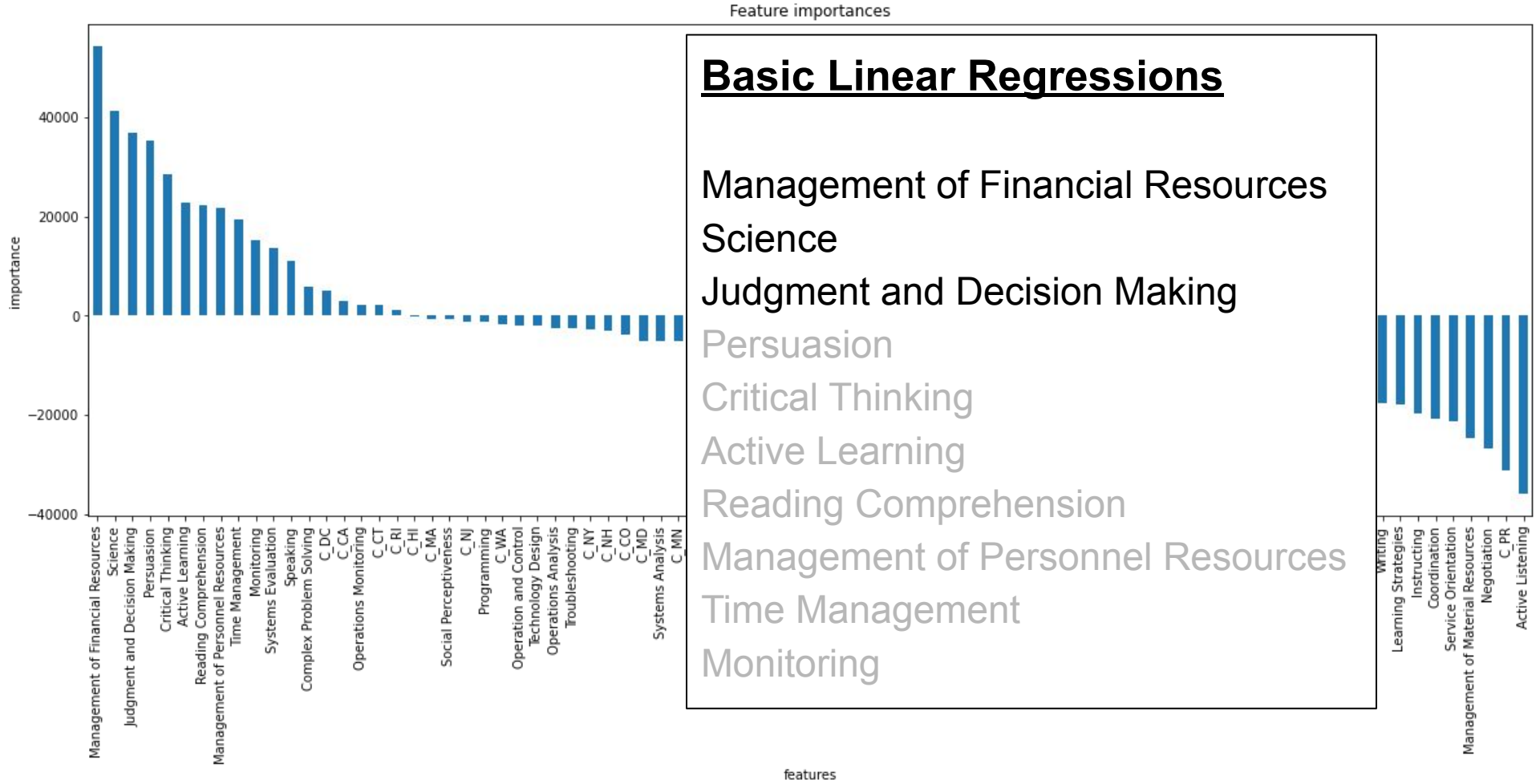
Get basically zero for R^2 error: the model does a terrible job

Fit time = 0.5

Score time = 0.08

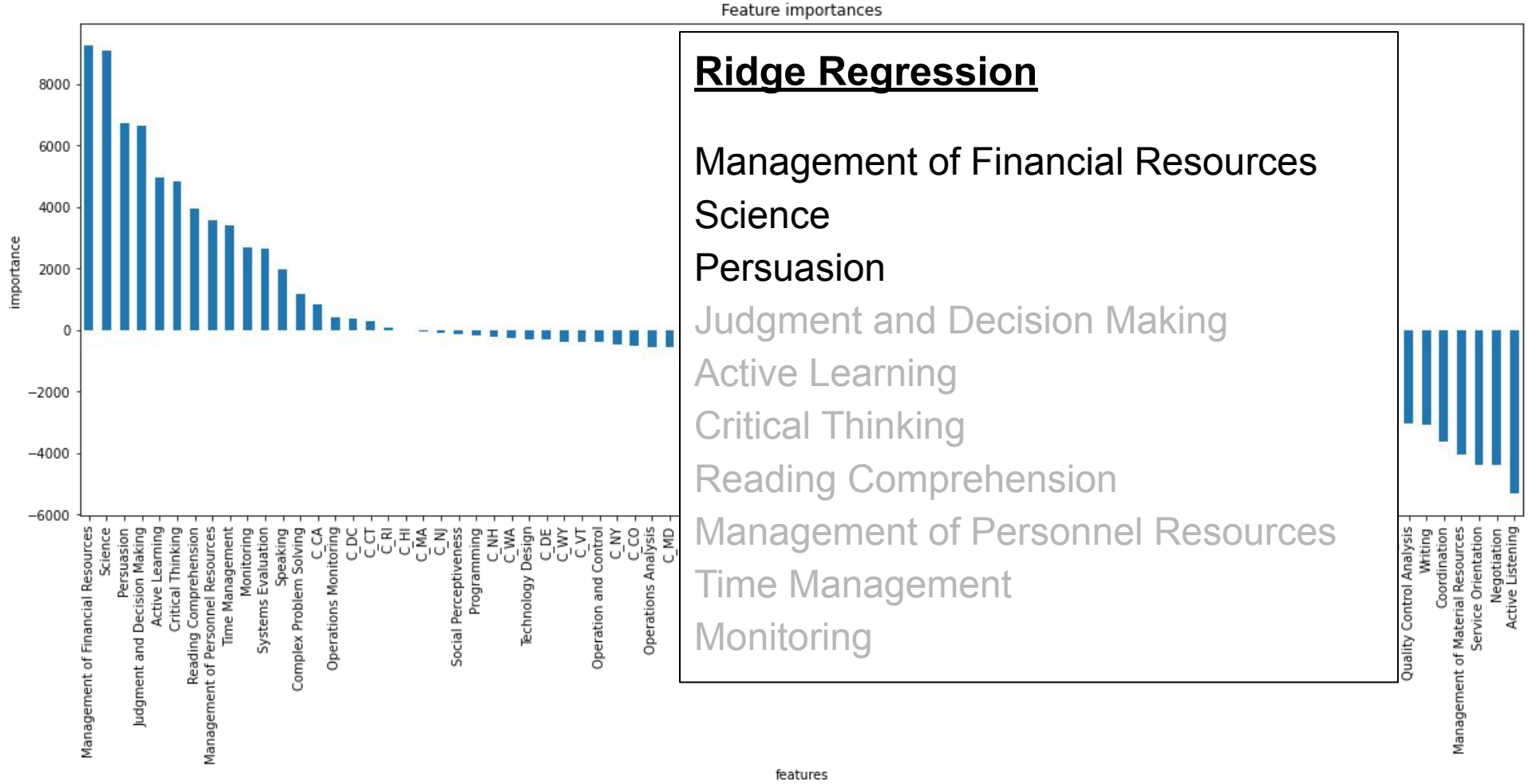
# Regression Models

| | OLS | Ridge | SVR |
|---|---|---|---|
| **R-squared** | 0.606 | 0.606 | 0.586 |
| **Fit time** | 12.88 | 0.93 | 91.27 |
| **Score time** | 0.58 | 0.066 | 0.0198 |
| **MAE test** | $14,251 | | |



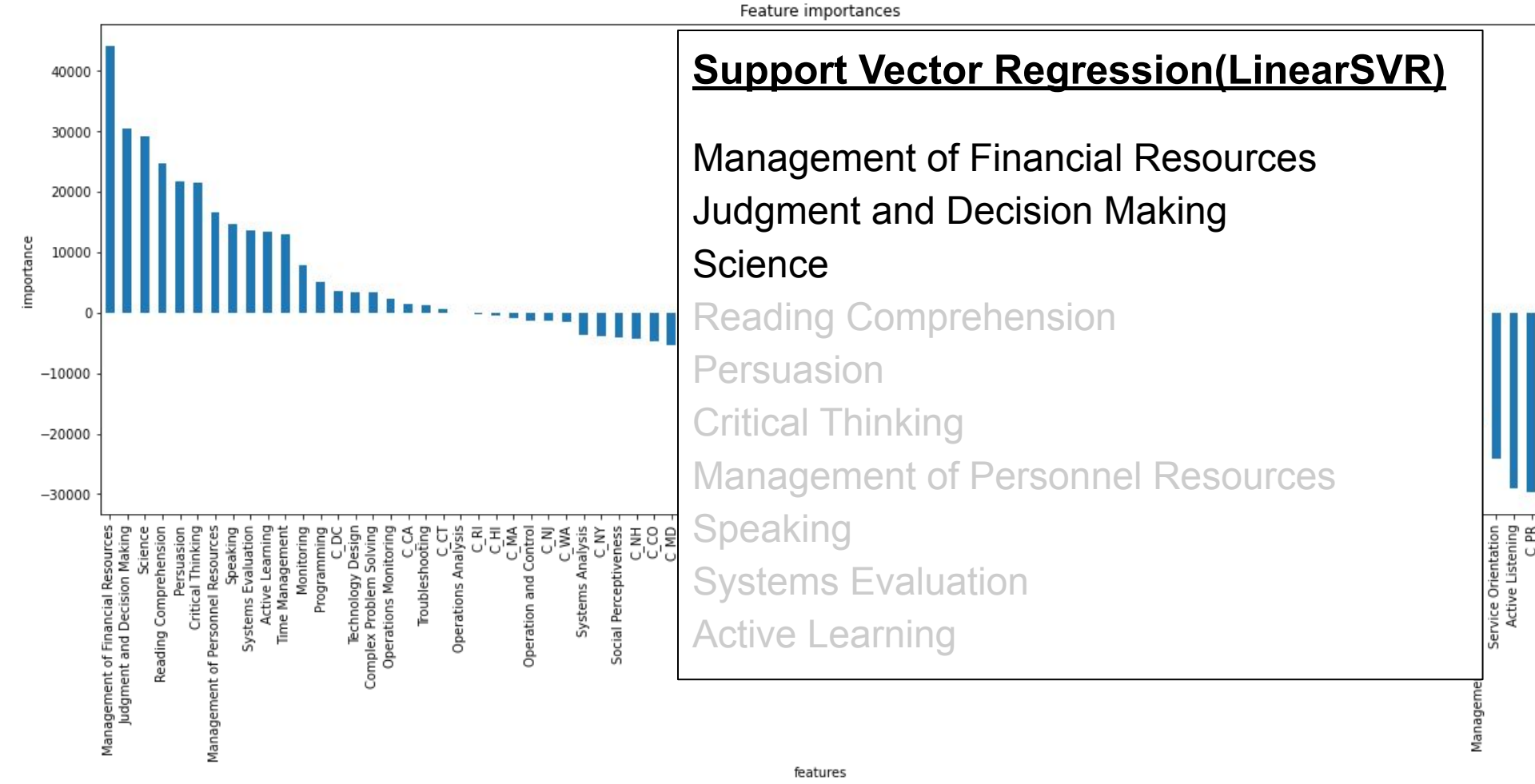

## Basic Linear Regressions

Management of Financial Resources
Science
Judgment and Decision Making
Persuasion
Critical Thinking
Active Learning
Reading Comprehension
Management of Personnel Resources
Time Management
Monitoring




## Ridge Regression

Management of Financial Resources
Science
Persuasion
Judgment and Decision Making
Active Learning
Critical Thinking
Reading Comprehension
Management of Personnel Resources
Time Management
Monitoring




## Support Vector Regression(LinearSVR)

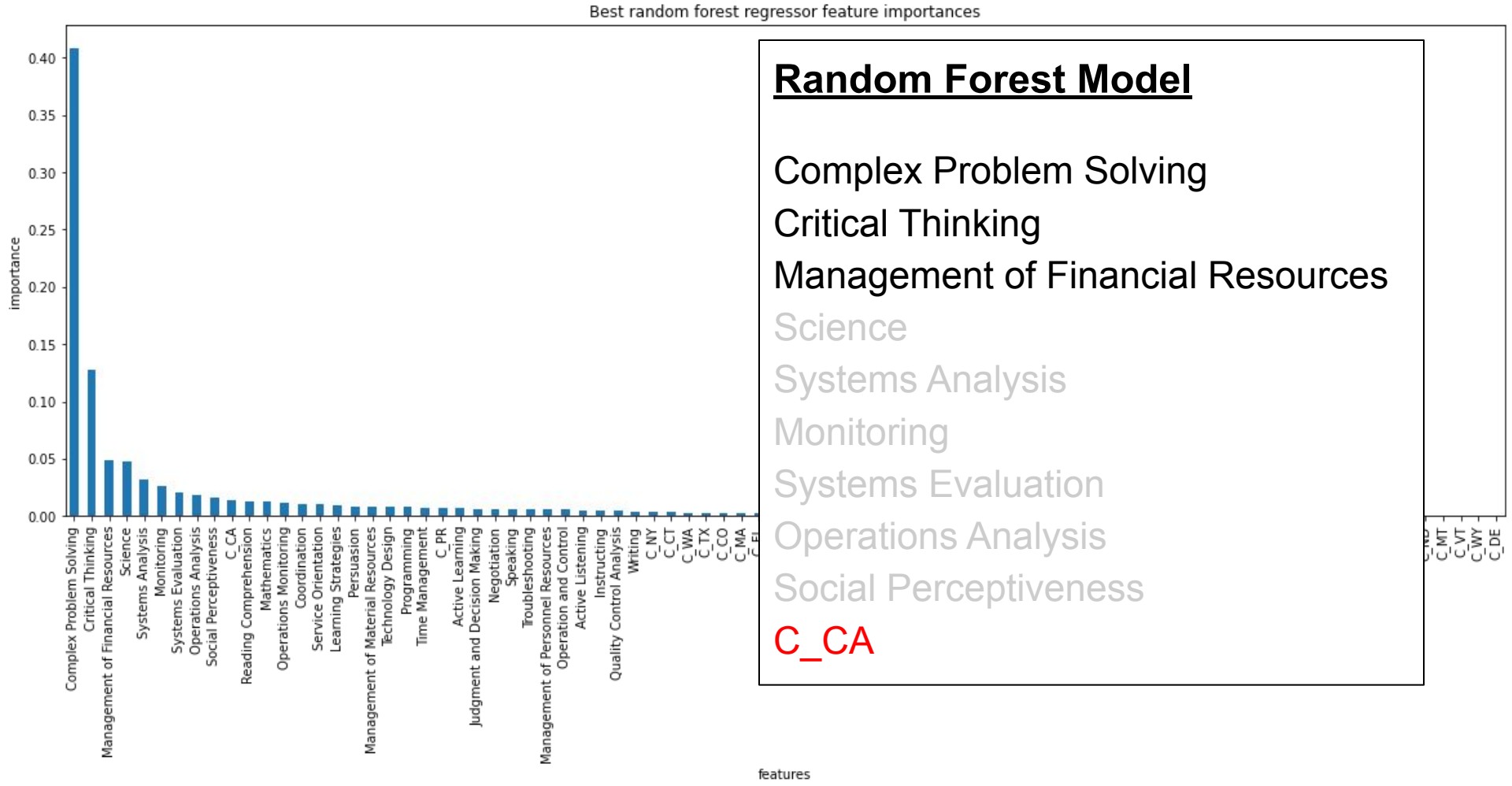
Management of Financial Resources
Judgment and Decision Making
Science
Reading Comprehension
Persuasion
Critical Thinking
Management of Personnel Resources
Speaking
Systems Evaluation
Active Learning

# Random Forest Model

(0.8875267860497988, 0.0031824517006334503)

Fit time: 92.8323

Score time: 0.5231




## Random Forest Model

Complex Problem Solving

Critical Thinking

Management of Financial Resources

Science

Systems Analysis

Monitoring

Systems Evaluation

Operations Analysis

Social Perceptiveness

C_CA