1 A1-10, ANOVA Potato

1.1 Introduction

This study investigates the cooking quality of Oregon-grown Russet potatoes. Specifically, it examines how different growing areas, storage conditions, and cooking methods affect the flavor of the potatoes. The `Flavor score` is modeled as a function of:

- **Growing Area**: Southern Oregon vs. Central Oregon
- **Two-week Holding Temperature**: 75°F vs. 40°F
- **Size**: Large vs. Medium
- **Storage Period**: 0, 2, 4, and 6 months
- **Cooking Method**: Boiling, Steaming, Mashing, Baking at 350°F, Baking at 450°F

1.2 Exploratory Data Analysis (EDA)

1.2.1 Summary Statistics

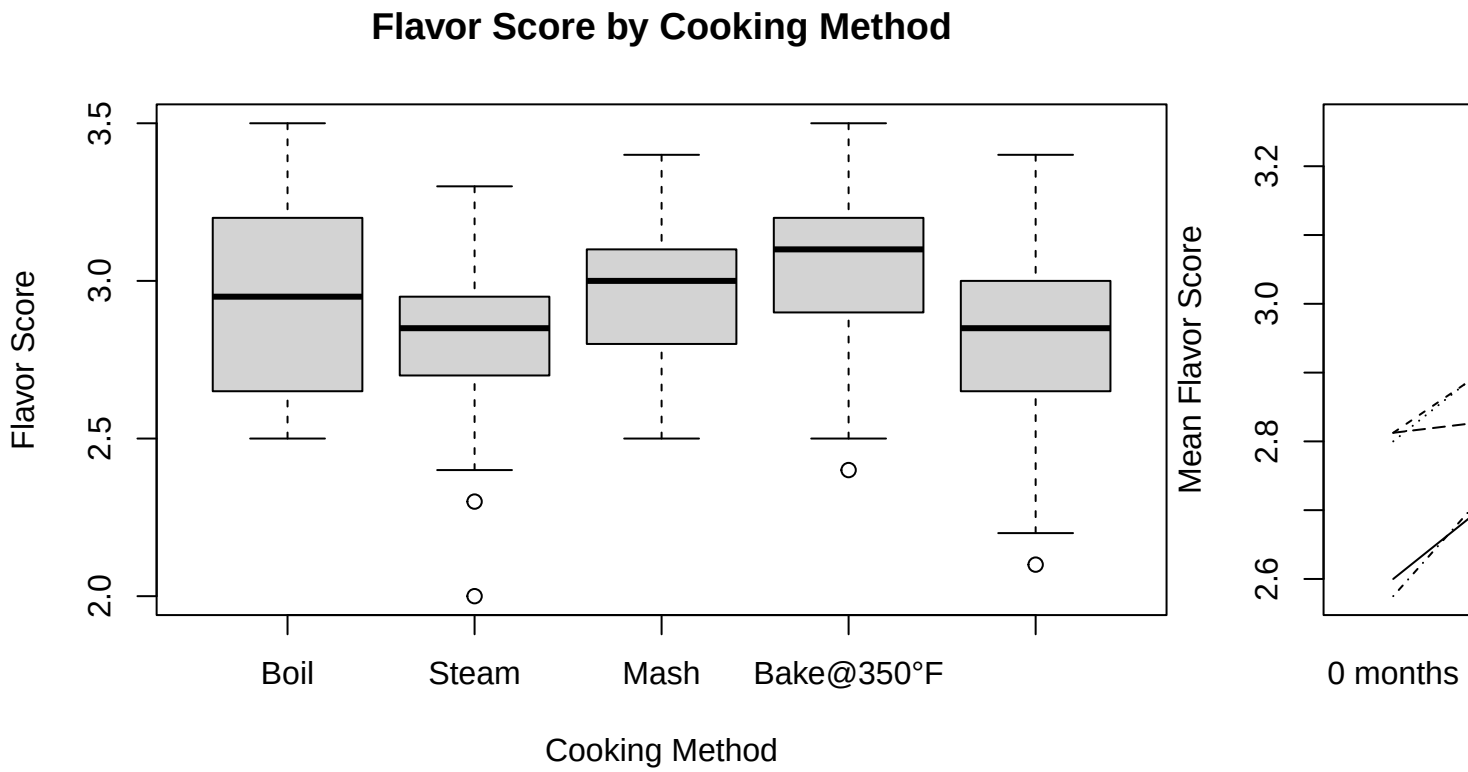
Table 1: Summary Statistics (Categorical Variables)

Variable	Southern Oregon	Central Oregon	75°F	40°F	Large	Medium	0 months	2 months	4 months	6 months	Boil	Steam	Mash	Bake@350°F	Bake@450°F
Area	80	80													
Temp			80	80											
Size					80	80									
Storage							40	40	40	40					
Cooking											32	32	32	32	32

Table 2: Summary Statistics (Numeric Variables)

Statistic	Texture	Flavor	Moistness
Min	1.40	2.00	1.30
1st Quartile	2.20	2.70	2.18
Median	2.60	2.90	2.50
Mean	2.54	2.91	2.42
3rd Quartile	2.90	3.10	2.70
Max	3.70	3.50	3.30

1.2.2 Visualizations



1.3 Model Fitting

```
##              Df Sum Sq Mean Sq F value   Pr(>F)
## Area          1  0.529  0.5290  10.192  0.00172 **
## Temp          1  1.089  1.0890  20.981 9.73e-06 ***
## Size          1  0.000  0.0002   0.005  0.94476
## Storage       3  2.024  0.6747  13.000 1.37e-07 ***
## Cooking       4  1.344  0.3359   6.471 7.90e-05 ***
## Residuals   149  7.734  0.0519
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

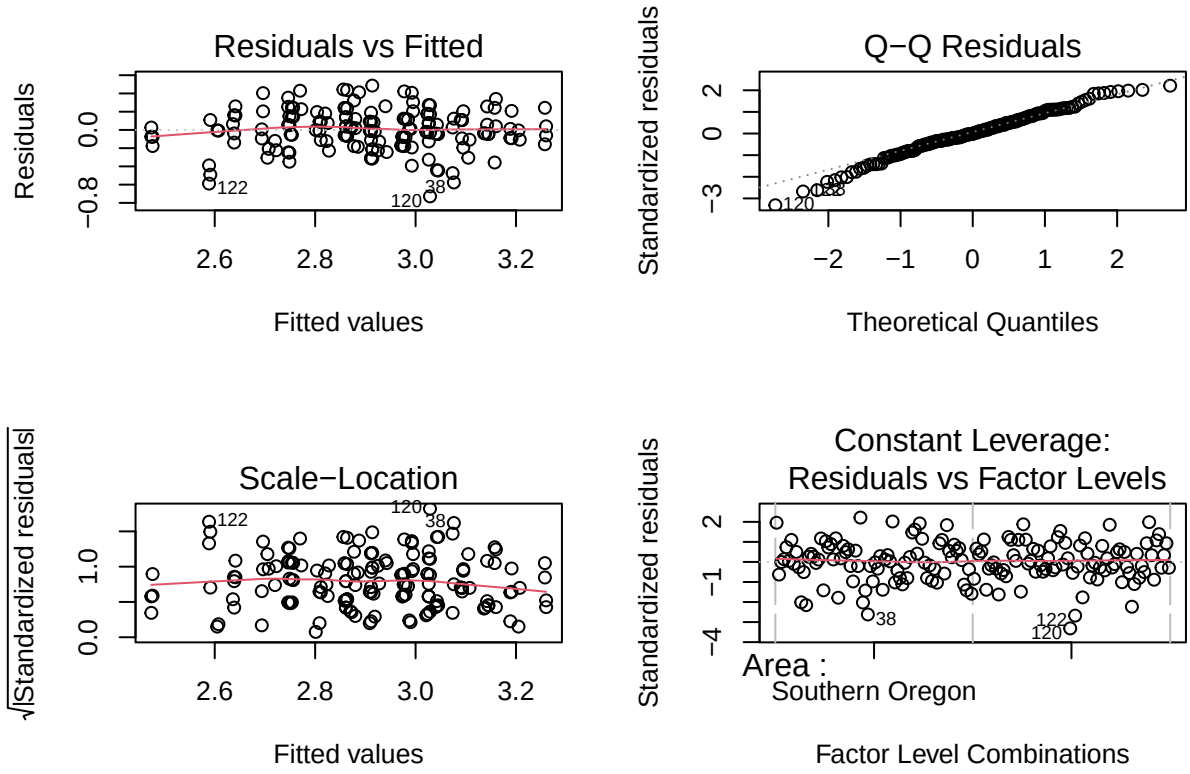
1.3.1 Model Selection

```
## Start:  AIC=-462.73
## Flavor ~ Area + Temp + Size + Storage + Cooking
##
##           Df Sum of Sq    RSS     AIC
## - Size     1   0.00025 7.7340 -464.73
## <none>                 7.7338 -462.73
## - Area     1   0.52900 8.2628 -454.15
## - Cooking  4   1.34350 9.0773 -445.10
```

```
## - Temp     1   1.08900 8.8228 -443.65
## - Storage  3   2.02425 9.7580 -431.53
##
## Step:  AIC=-464.73
## Flavor ~ Area + Temp + Storage + Cooking
##
##           Df Sum of Sq    RSS     AIC
## <none>                 7.7340 -464.73
## - Area     1    0.5290 8.2630 -456.14
## - Cooking  4    1.3435 9.0775 -447.10
## - Temp     1    1.0890 8.8230 -445.65
## - Storage  3    2.0242 9.7582 -433.53

## Call:
##    aov(formula = Flavor ~ Area + Temp + Storage + Cooking, data = potato)
##
## Terms:
##                     Area    Temp Storage Cooking Residuals
## Sum of Squares  0.52900 1.08900 2.02425 1.34350   7.73400
## Deg. of Freedom       1       1       3       4       150
##
## Residual standard error: 0.2270683
## Estimated effects may be unbalanced
```

1.4 Model Assessment



1.5 Results & Conclusion

```
##              Df Sum Sq Mean Sq F value   Pr(>F)
## Area          1  0.529  0.5290  10.192  0.00172 **
## Temp          1  1.089  1.0890  20.981 9.73e-06 ***
## Size          1  0.000  0.0002   0.005  0.94476
## Storage       3  2.024  0.6747  13.000 1.37e-07 ***
## Cooking       4  1.344  0.3359   6.471 7.90e-05 ***
## Residuals   149  7.734  0.0519
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

This analysis confirms that cooking method and storage conditions significantly impact potato flavor. Baking at 350°F generally produces the best flavor, while extended storage at 40°F may reduce desirable taste characteristics.