# Machine Learning Assignment 1

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UMS level: 3

Epochs Vs MSE

| Epochs | Feature with Lowest MSE | MSE val |
|--------|------------------------|---------|
| 50 | NCustomersPerDay | 9.0752756 |
| 100 | NCustomersPerDay | 18.1503520 |
| 150 | NCustomersPerDay | 27.2252293 |
| 200 | NCustomersPerDay | 36.2999073 |
| 250 | NCustomersPerDay | 45.3743862 |
| 300 | NCustomersPerDay | 54.4486658 |

| Epochs | Feature 1 | Feature 2 | Feature 3 | Feature 4 | Feature 5 | Feature 6 |
|--------|-----------|-----------|-----------|-----------|-----------|-----------|
| 50 | 9.0752756 | 9.07527795 | 9.07528315 | 9.07528452 | 9.07528181 | 9.07528326 |
| 100 | 18.1503520 | 18.1503612 | 18.1503817 | 18.1503872 | 18.15037648 | 18.15038223 |
| 150 | 27.2252293 | 27.2252497 | 27.2252958 | 27.2253080 | 27.22528401 | 27.22529691 |
| 200 | 36.2999073 | 36.2999436 | 36.3000255 | 36.3000471 | 36.30000442 | 36.30002731 |
| 250 | 45.3743862 | 45.3744428 | 45.3745706 | 45.3746044 | 45.37453772 | 45.37457344 |
| 300 | 54.4486658 | 54.4487473 | 54.4489312 | 54.4489798 | 54.44888389 | 54.44893530 |
| 350 | 63.5227463 | 63.5228572 | 63.5231073 | 63.5231735 | 63.52304297 | 63.52311291 |

| 400 | 72.5966276 | 72.5967724 | 72.5970990 | 72.5971854 | 72.59701495 | 72.59710626 |
|-----|------------|------------|------------|------------|-------------|-------------|

## Learning rate Vs MSE

| Learning rate | Feature with Lowest MSE | MSE val |
|---------------|-------------------------|---------|
| 1.25e-06 | NCustomersPerDay | 18.15 |
| 1.25e-05 | NCustomersPerDay | 18.10 |
| 0.000125 | NCustomersPerDay | 17.66 |
| 0.00125 | NCustomersPerDay | 14.36 |
| 0.0125 | NCustomersPerDay | 7.53 |

| Learning Rate | Feature 1 | Feature 2 | Feature 3 | Feature 4 | Feature 5 | Feature 6 |
|---------------|-----------|-----------|-----------|-----------|-----------|-----------|
| 1.25e-06 | 18.145725 | 18.145839 | 18.146096 | 18.146164 | 18.146030 | 18.146102 |
| 1.25e-05 | 18.100609 | 18.101746 | 18.104313 | 18.104990 | 18.103650 | 18.104369 |
| 0.000125 | 17.663133 | 17.674324 | 17.699625 | 17.706123 | 17.692978 | 17.700125 |
| 0.00125 | 14.364438 | 14.461116 | 14.681832 | 14.726637 | 14.615813 | 14.682536 |
| 0.0125 | 7.5340486 | 8.0402635 | 9.2065881 | 9.2813176 | 8.7557589 | 9.1644048 |
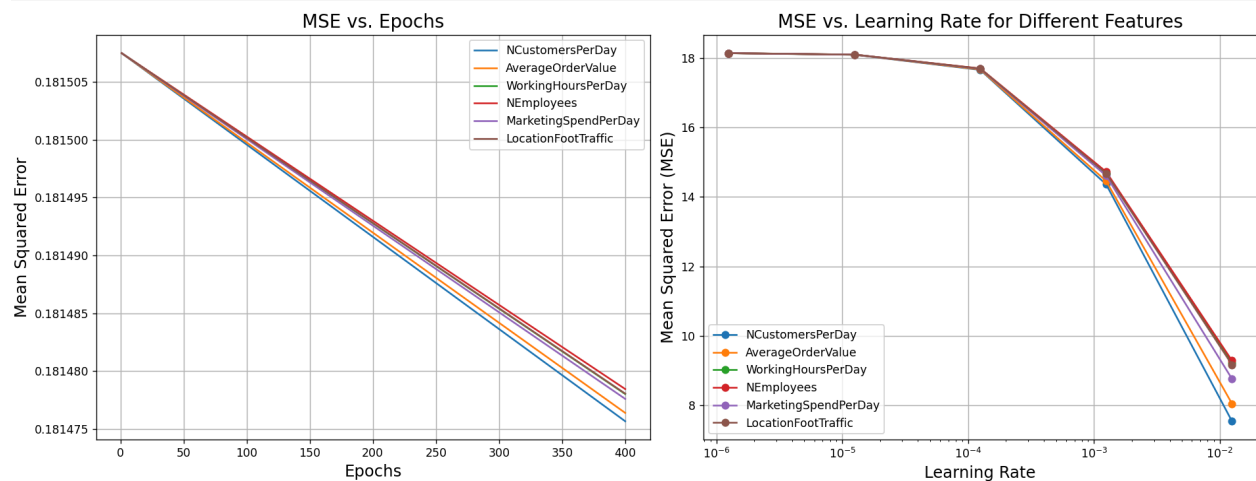
*Conclusion:*

**Across all tested configurations, Feature 1(NCustomersPerDay) consistently outperformed other features, indicating its strong predictive capability.The MSE values for Feature 1 were consistently lower than those of other features, reinforcing its effectiveness**.

**As the number of epochs increases and the learning rate is fine-tuned, the MSE consistently**
**Decreases**

**The Least MSE is when learning rate is 0.01 and the no of epochs is 400**