UCLA Samueli School of Engineering

TrackStars

Daniel Smith 205212977

UCLA CS MS Capstone Project

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Engineer Change.

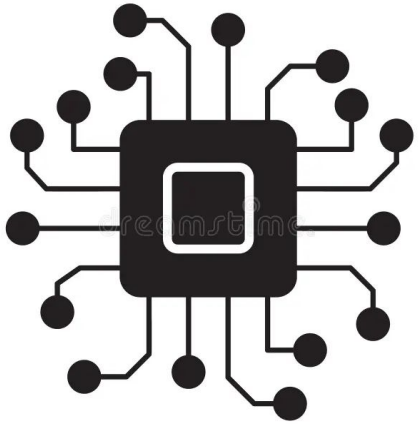
Overview |

- History and Reasoning
- Overview and Map of Application
- Front End
- Back End
- Machine Learning Algorithms
- Future Work
- Conclusion

History and Reasoning

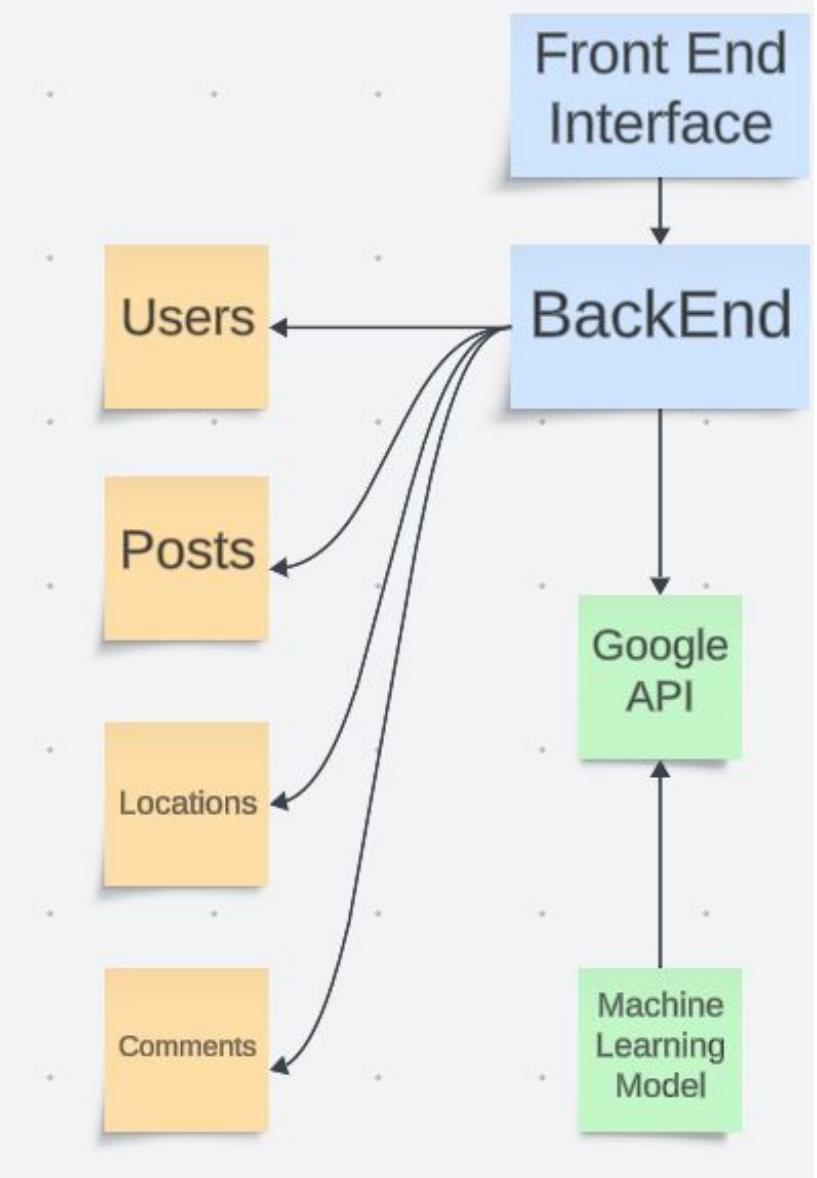
- Only 22.9% of adults (18-49) and 24% of children (6-17) have sufficient physical activity.
- making exercise fun is the best way to encourage people to develop/adhere to a routine.

Can we combine the two with Technology?



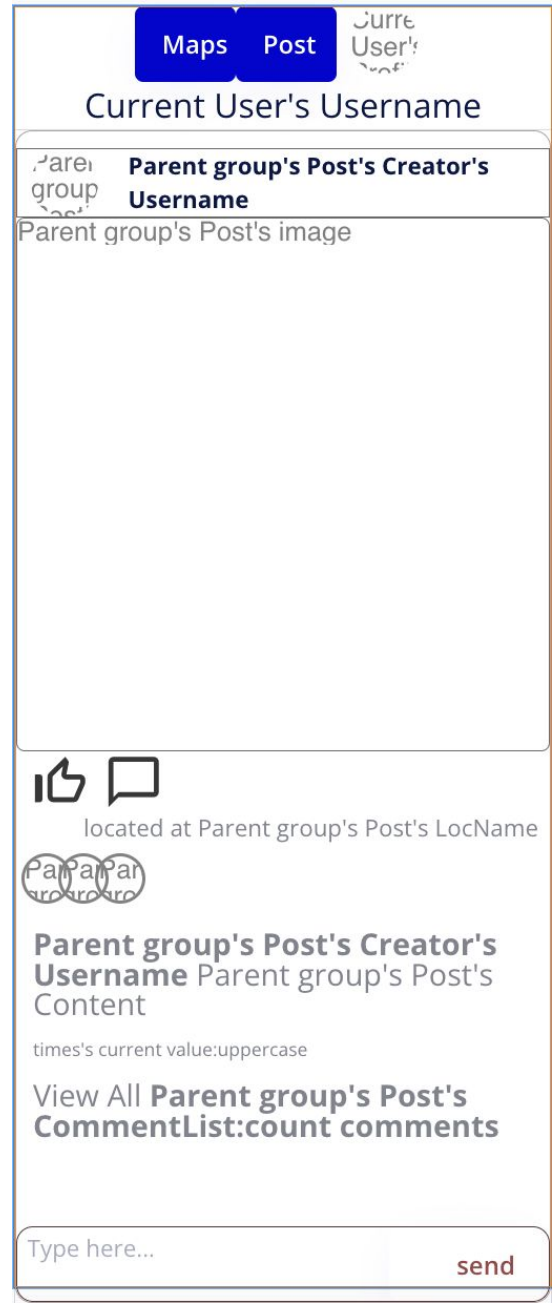
Overview

- Full Stack Platform
- Backend Database
- Front End Interface
- Google API calls to Machine Learning Model and Maps API



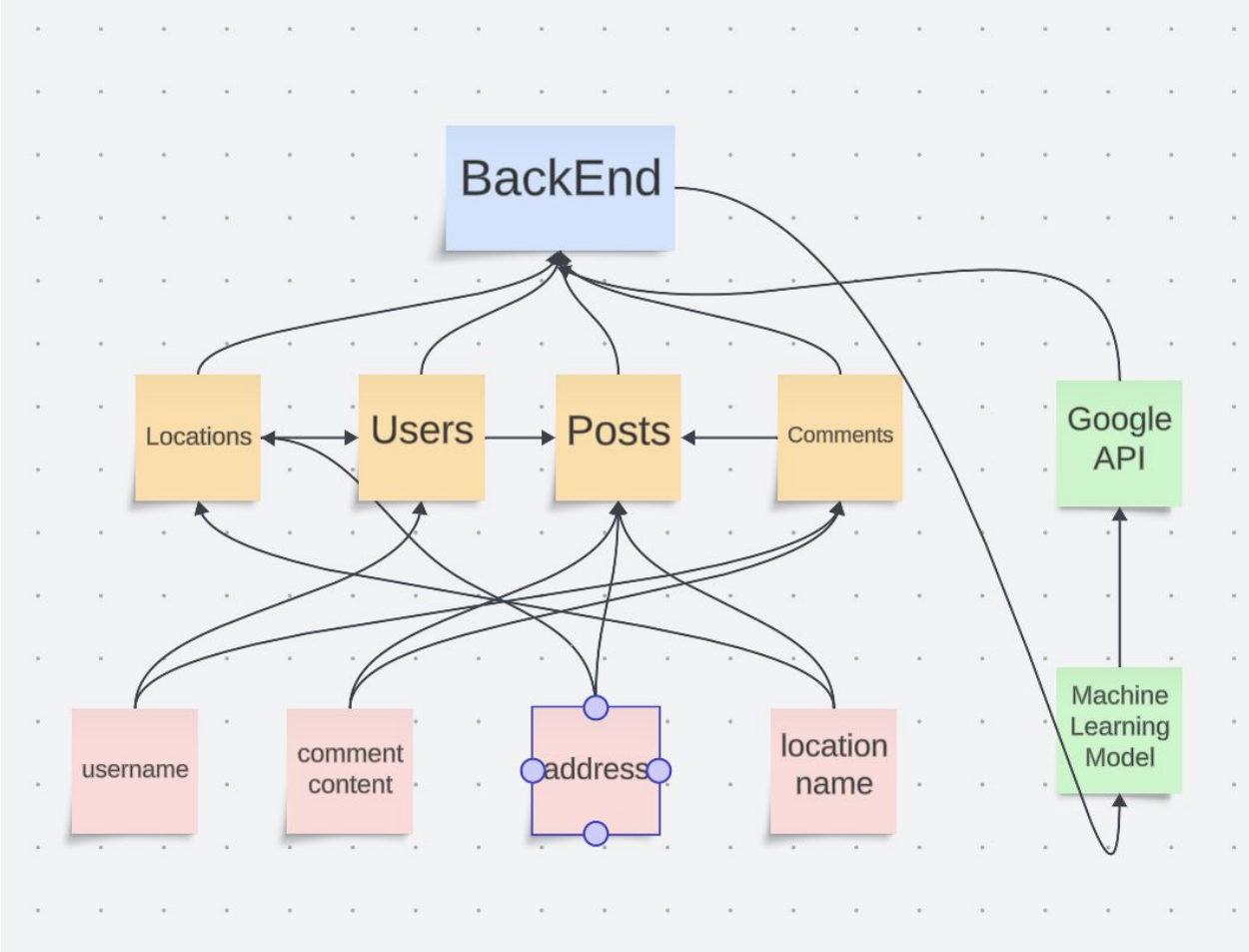
Front End Overview

- Bubble io
- Proprietary Software
- Abstraction of Visuals
- Robust Forum & Community



BackEnd Overview

- Data Tables
- User Defined Data Types
- Cloud hosted Machine Learning Model



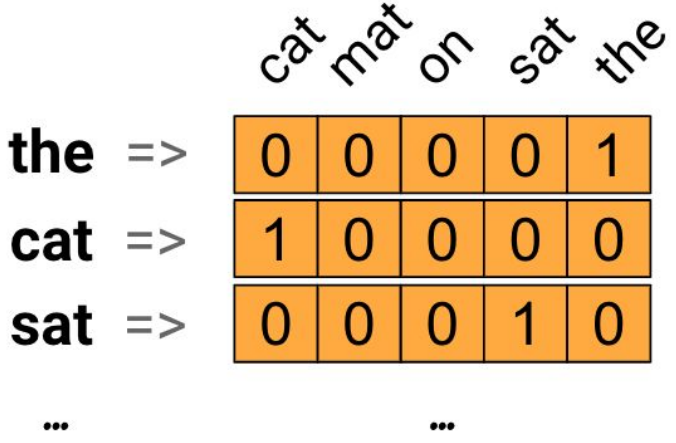
Data PreProcessing

- 10_000 rows, 5 features
- Standard Scaler
- One Hot encoding
- Transform data using Mean and Standard deviation from training data
- K-Fold (5 -Folds)

$$z = \frac{x - \mu}{\sigma}$$

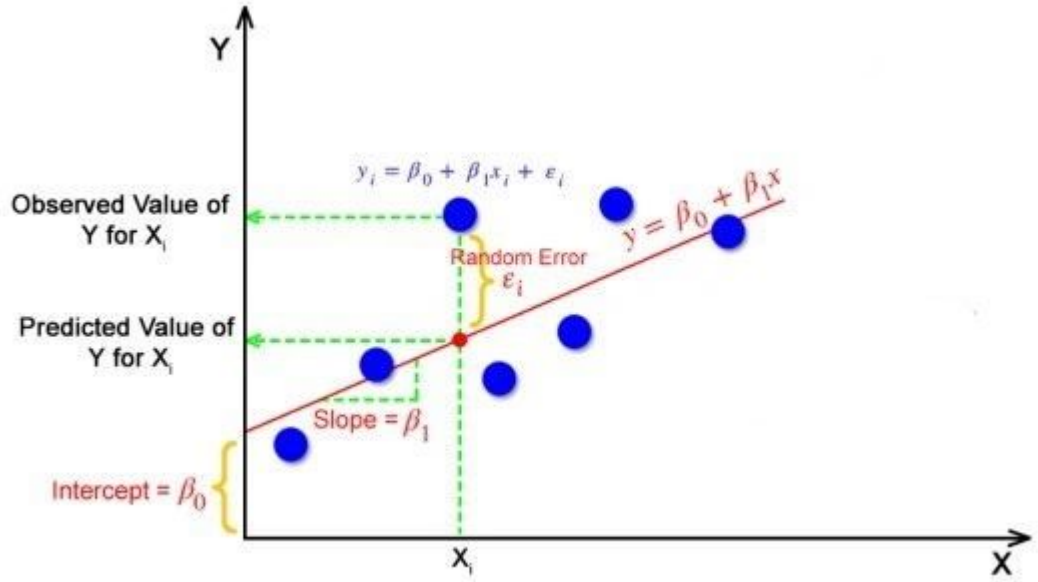
μ = Mean

σ = Standard Deviation



Machine Learning Algorithms (Linear Regression)

- Linear Regression
  - Coefficients tells importance!
    - Largest coefficient: Steps walked
- MSE: 1.00098233716381

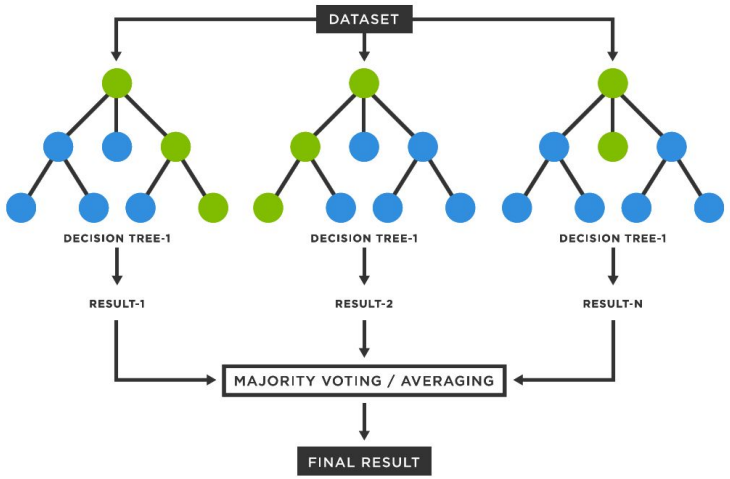


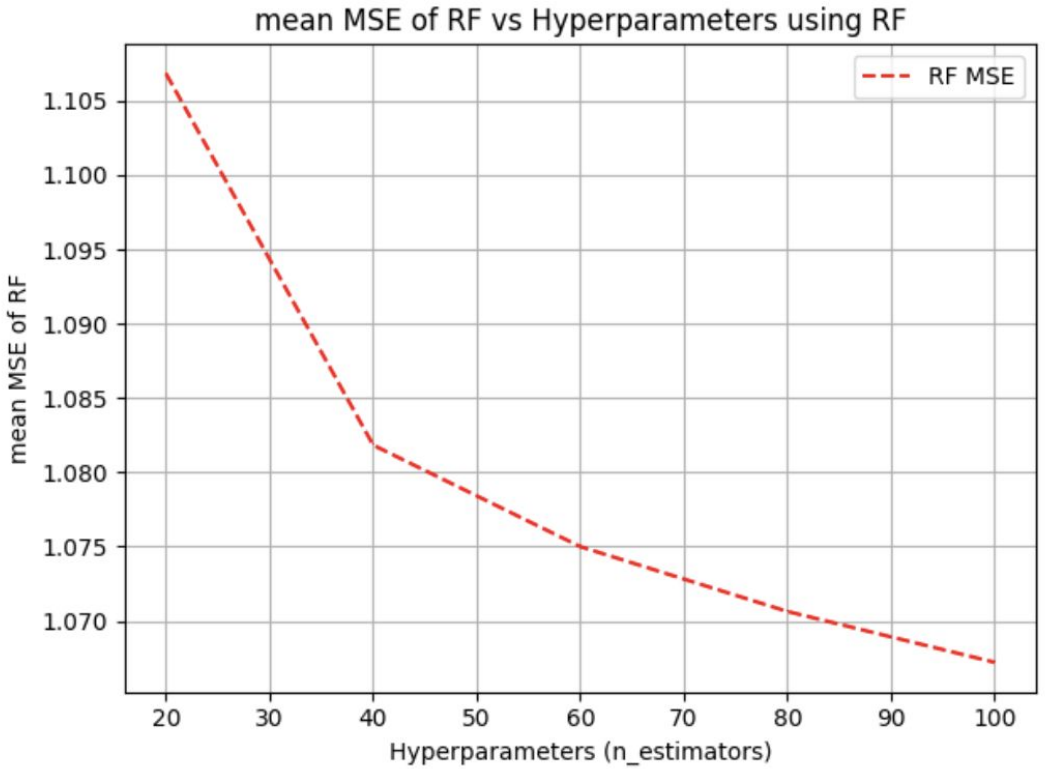
$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_n + \epsilon$$

Machine Learning Algorithms (Random Forest)

- Ensemble Method
- prevents Overfitting
- Minimize Entropy

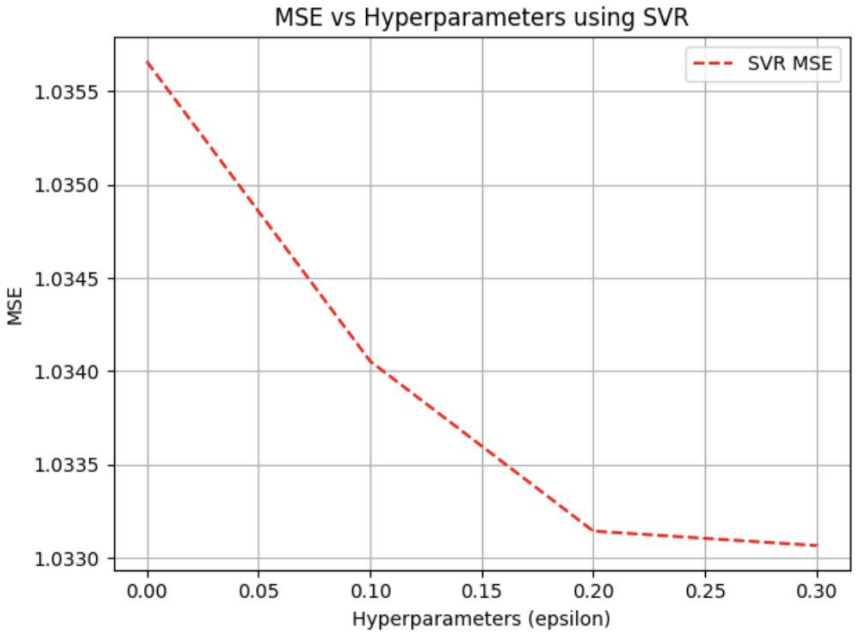
- MSE: 1.0672166860929664

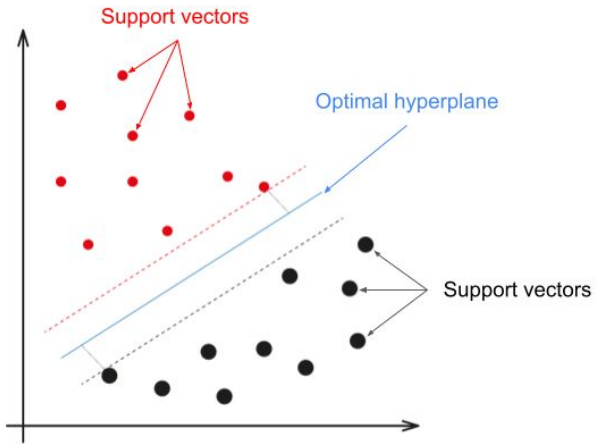




Machine Learning Algorithms (SVM)

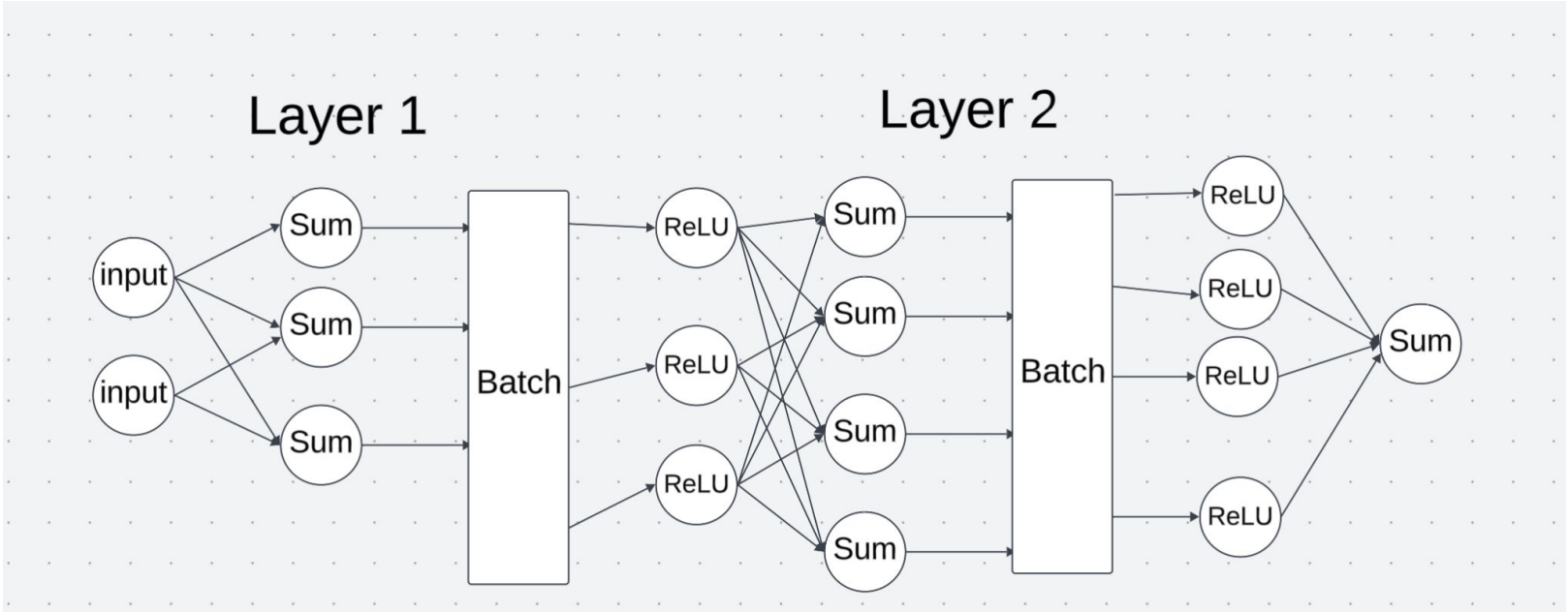
- SVM/SVR
- Creating HyperPlane
- Kernel Function polynomial
- MSE: 1.0330659373144127





Machine Learning Algorithms (Neural Network)

- Summation
- Batch
- Activation
- Repeat



Machine Learning Algorithms (Regularizer)

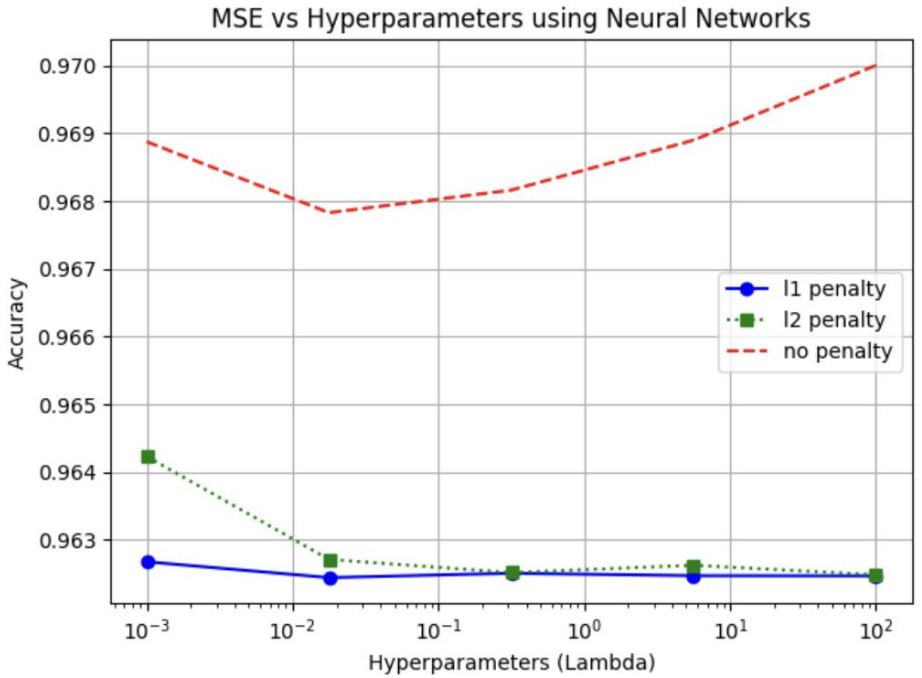
- L1 Penalty

$$L_{\text{total}} = \frac{1}{m}(\mathbf{y} - \mathbf{X}\mathbf{w})^T(\mathbf{y} - \mathbf{X}\mathbf{w}) + \lambda\|\mathbf{w}\|_1$$

- L2 Penalty

$$L_{\text{total}} = \frac{1}{m}(\mathbf{y} - \mathbf{X}\mathbf{w})^T(\mathbf{y} - \mathbf{X}\mathbf{w}) + \lambda\|\mathbf{w}\|_2^2$$

- lambda is 3.16227766e-01 with an MSE of 0.9624 (lowest MSE)



Future Work

- Google authentication
- cloud training
- UI/UX improvements

Bibliography

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