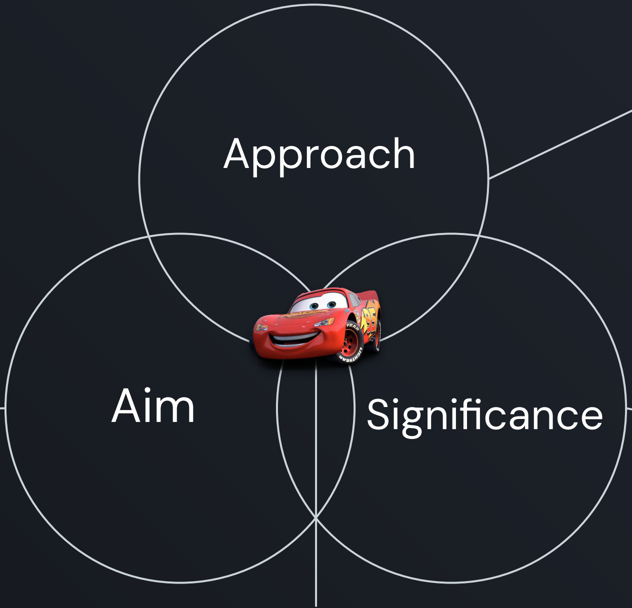
Self Driving Cars

Project idea

Use deep neural networks and clustering algorithms to predict steering angles and navigate autonomously.

Train a neural network for autonomous driving using Udacity's Car Simulator.



Address the challenge of replicating human driving behavior through machine learning.

Self driving car

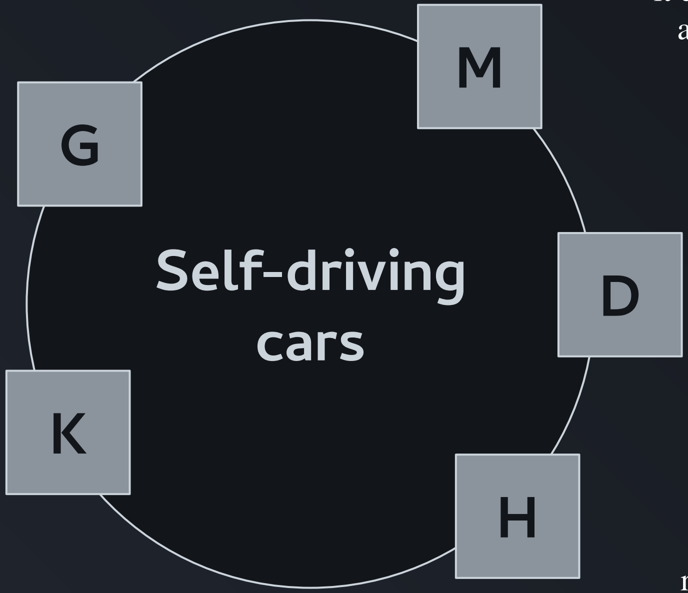
Methodology

Gaussian Mixture Model

For self-driving cars, this can be used for probabilistic modeling of traffic situations.

K-Means

For a self-driving car project, it might be useful for segmenting similar traffic patterns or clustering static objects.



Mean-Shift

it could be used for tracking applications or identifying vehicle groupings.

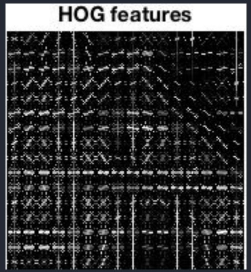
DBSCAN

Useful in a self-driving context for identifying outliers or 'noise'

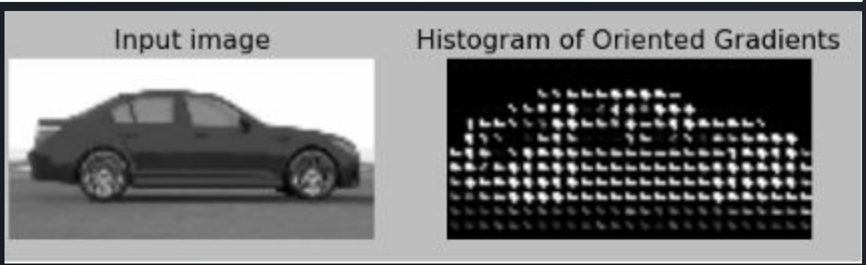
Hierarchical

It could be used for understanding hierarchical relationships in road features.

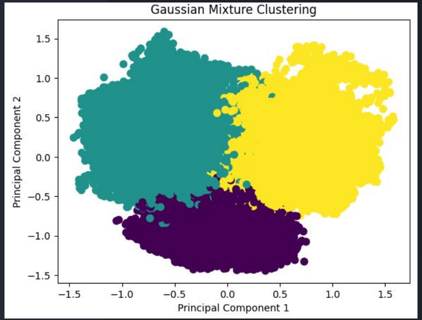
Core Algorithms and Technologies

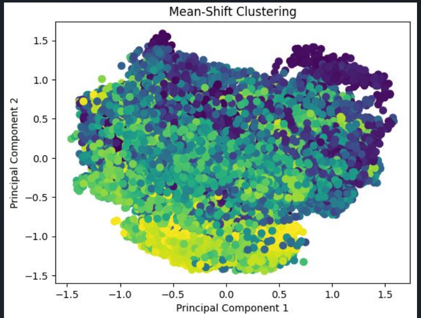


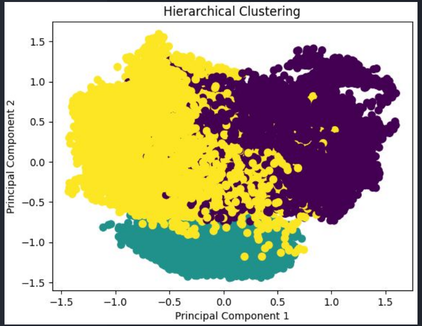
Deep learning algorithms: Recurrent Neural Networks & Convolutional Neural Networks for spatial feature extraction and driving behavior prediction.
Clustering Algorithms: K-Means, DBSCAN, Hierarchical, Mean-Shift, and Gaussian Mixture Model for enhanced autonomous capabilities.
Technologies: TensorFlow, Keras, NumPy, scikit-learn, OpenCV, and Conda Environment for efficient data processing and model training.
The neural network model architecture is based on the NVIDIA model, known for end-to-end self-driving tests. Adjustments, such as using the Lambda layer for input image normalization, adding dropout layers to prevent overfitting, and incorporating the ELU activation function, enhance the model's predictive capabilities.

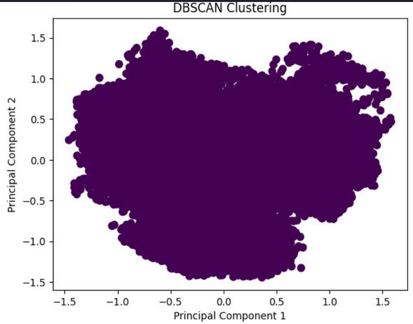


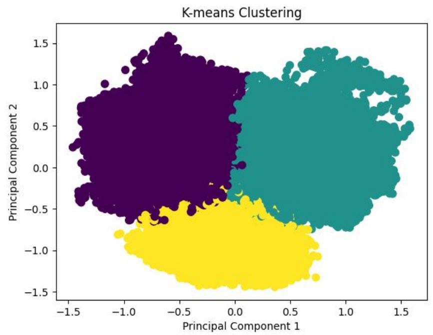
Results & Discussion











Algorithms	Time
K-Means	16.08 sec
DBSCAN	42.32 sec
Hierarchical	0.05 sec
Mean-Shift	2902.64 sec
GMM	223.71 sec

Concluding Insights & Recommendations

Summary of Findings: Gaussian Mixture is a potential best fit for unpredictable driving conditions.

Considerations: Computational constraints, real-time application feasibility, and integration with decision-making systems.

Future Prospects: Exploration of noise robustness and probabilistic decision-making in autonomous driving.

Thank you!