Objective: To develop automated methods for creating geofences for GM dealerships and apply the geofences to visitation-related business use cases.

**Methods**

1. **Clustering**
   - Grouping points near a dealership together ➔ clustering
   - Clustering algorithms: DBSCAN is best at outlining shapes

   ![DBSCAN hyperparameter epsilon (ε)](image)

   - Small ε
   - Big ε

   - Dense clusters
   - Less dense clusters

2. **Tuning hyperparameters**
   - No existing metrics for this application ➔ Create our own

   - Capture red points that are “close” to blue points (more likely to be at dealership)
   - Do not capture red points that are “not close” to blue points

   - Proportion of “close” points captured ➔ true positive rate
   - Proportion of “not close” points captured ➔ false positive rate

   - Final rule: max \( \epsilon \) s.t. false positive rate = 0

   ![Geofence accuracy metric](image)

   - Median value (MI & TX dealers): Precision = 0.9779, Recall = 0.9861, Daily visit correlation = 0.9947

3. **Results**

**Use case 1 – Sales prediction**

Today: Dec 15
Goal: get the Dec 1-31 sales prediction

- Get the visit for Dec 1-15 by geofence
- Predict the visit for Dec 16-31
- Predict the sales by using Dec 1-31 visit
- Generate the early warning list

![Linear regression](image)

**Use case 2: Conversion rate = sales/visits**

- Avg conversion rate by week, TX
- Conversion rate distribution, TX

- Incentivize dealerships in 0-3% conversion rate bin to improve sales processes

**Use case 3 - Oil change duration**

- Incentivize poor-performing dealerships to improve service processes

**Impact**

- Immediate: $20K
- Near term: $20M/yr
- Long term: Unlock full potential of location data

- Early detection + resource reallocation to boost sales
- Real-time personalized promotions

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