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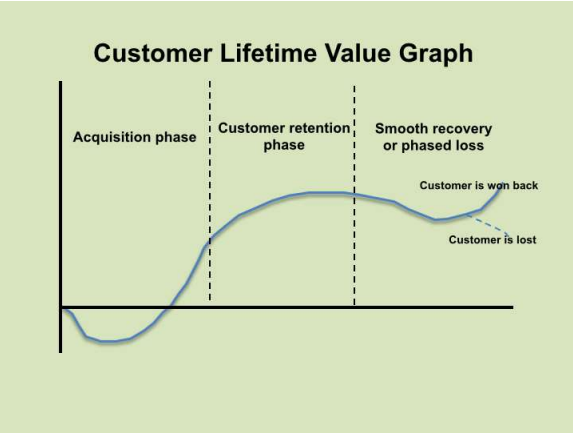
Unsupervised Learning applied to the Customer Lifetime Value (CLV)

SPREAD PREDICTIVE ANALYTICS TOWARDS INSURANCE MARKETING FIELD

A key tool: Customer Lifetime Value. It's the value of a customer for a Company over the span of their lifetime relationship



Github repository: https://github.com/claudio1975/Customer_Lifetime_Value

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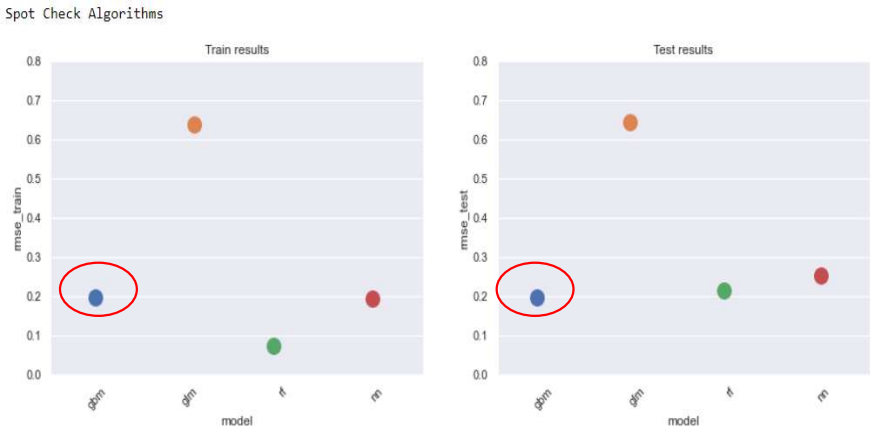
Which model can I use to predict CLV?

USE CASE: AUTOINSURANCE DATA SET

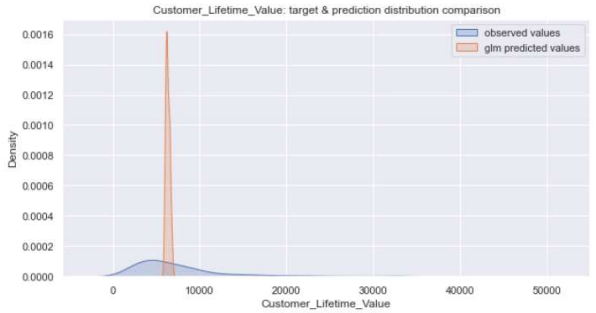
-Generalized Linear Model (GLM); -Random Forest (RF);
-Gradient Boosting Machine (GBM); -Neural Networks (NN)

model	rmse_train	rmse_test
gbm	0.196001	0.197300
glm	0.637301	0.643779
rf	0.073639	0.214578
nn	0.194967	0.252401

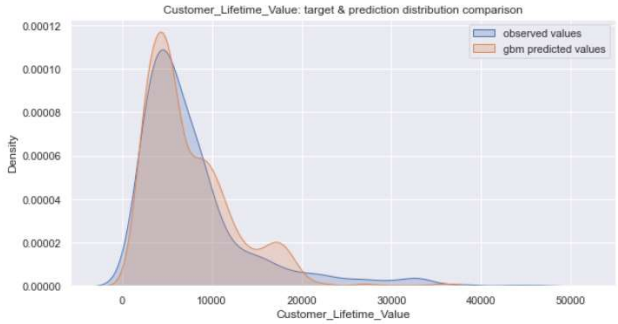


...and the winner is.....GBM!!!...Used as flat (baseline) model for next experiments!!!

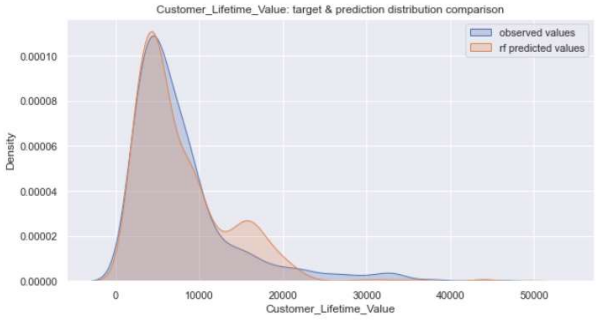
GLM



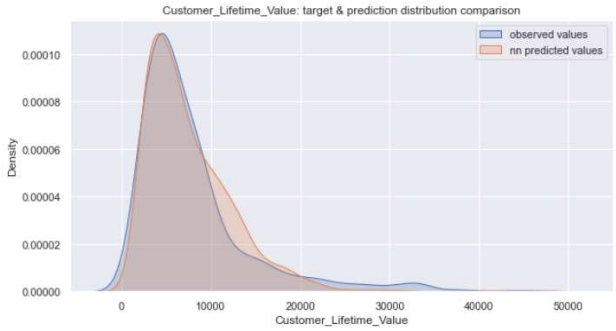
GBM



RF



NN



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Dimensionality reduction as feature engineering

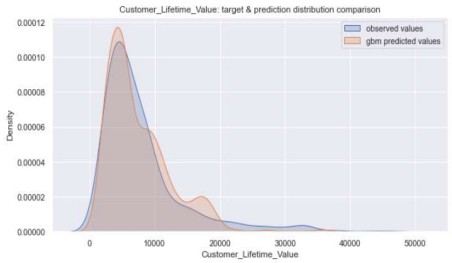
model	rmse_train	rmse_test
gbm_flat	0.196001	0.197300
gbm_pca	0.484353	0.564168
gbm_autoencoder	0.591485	0.627873
gbm_isomap	0.624898	0.665873

CLV prediction using features from dimensionality reduction tools: worst performences compared with flat (baseline) model

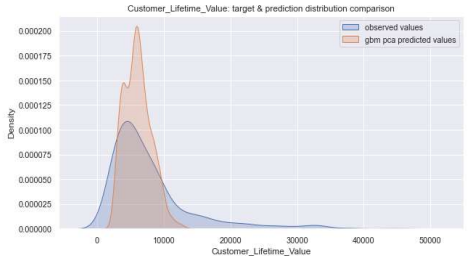
Data augmentation of flat (baseline) model with features extracted by dimensionality reduction tools: improved performences with PCA and Autoencoder features

model	rmse_train	rmse_test
gbm_flat	0.196001	0.197300
gbm_pca_fe	0.192164	0.196431
gbm_autoencoder_fe	0.194582	0.196857
gbm_isomap_fe	0.195837	0.198643

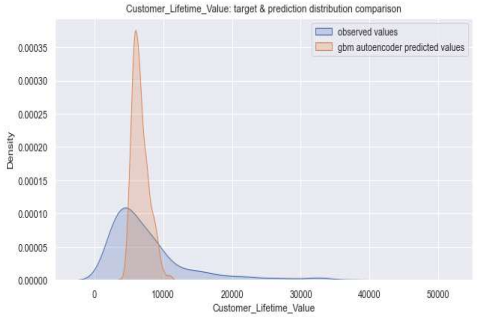
Flat (Baseline)



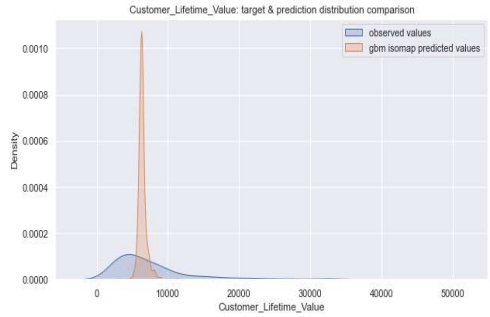
PCA



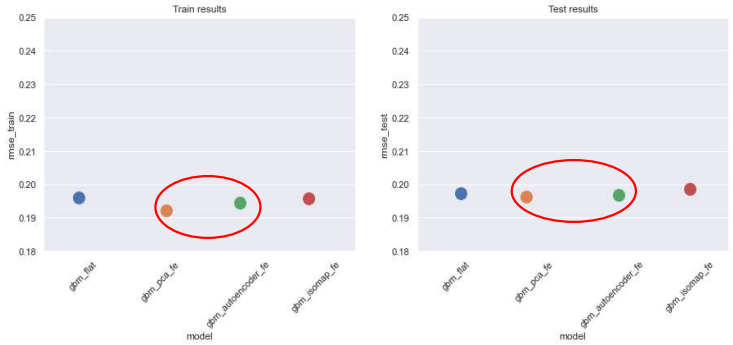
Autoencoder

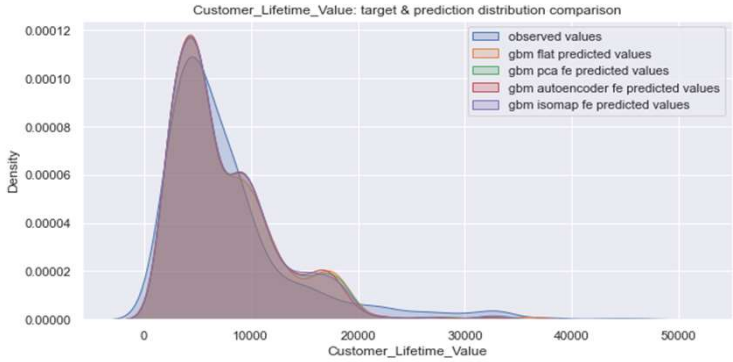


Isomap



Spot Check Algorithms





Claudio G. Giancaterino: «Unsupervised Learning applied to the Customer Lifetime Value (CLV)»

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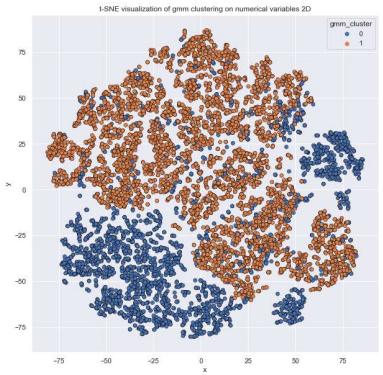
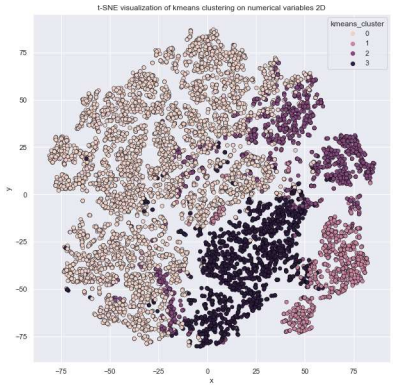
Clustering as portfolio analysis

Improve portfolio analysis by the combination of t-SNE and Clustering tools on numerical features

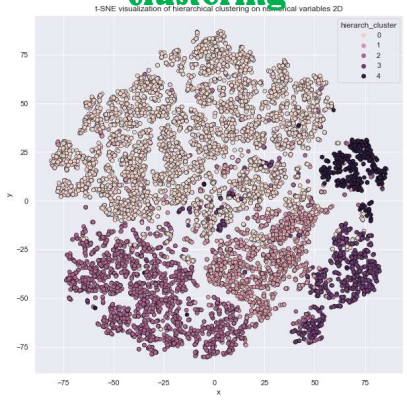
t-SNE with GMM



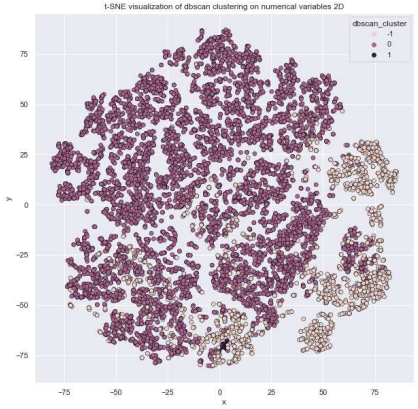
t-SNE with K-Means



t-SNE with Hierarchical Clustering



t-SNE with DBSCAN



Visualization as helpful tool driving porftolio queries

K-Means cluster analysis shows «0» cluster as region with greater density and with greater percentage both of Claim Amount and Monthly Car Premium (around 50%)

kmeans_cluster	Monthly_Premium_Auto	PERCENTAGE
0	454,824.00	53.42
2	187,154.00	21.98
3	141,777.00	16.65
1	67,710.00	7.95

kmeans_cluster	Total_Claim_Amount	PERCENTAGE
0	1,891,867.85	47.71
2	1,151,870.66	29.05
3	621,495.02	15.67
1	299,733.52	7.56

From silhouette score comparison of clustering tools, K-Means seems to be more suitable

	labels	silhouette_score
kmeans	4	0.175795
dbscan	3	0.127336
gmm	2	0.138758
hierarchical_clustering	5	0.159866