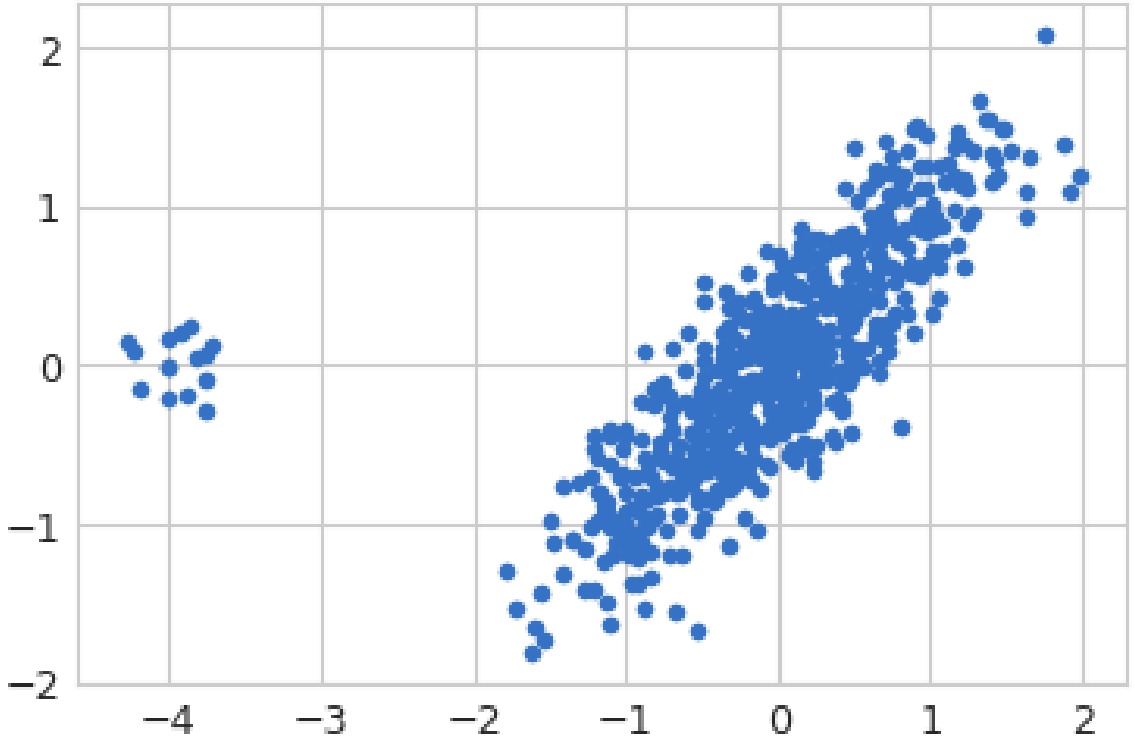
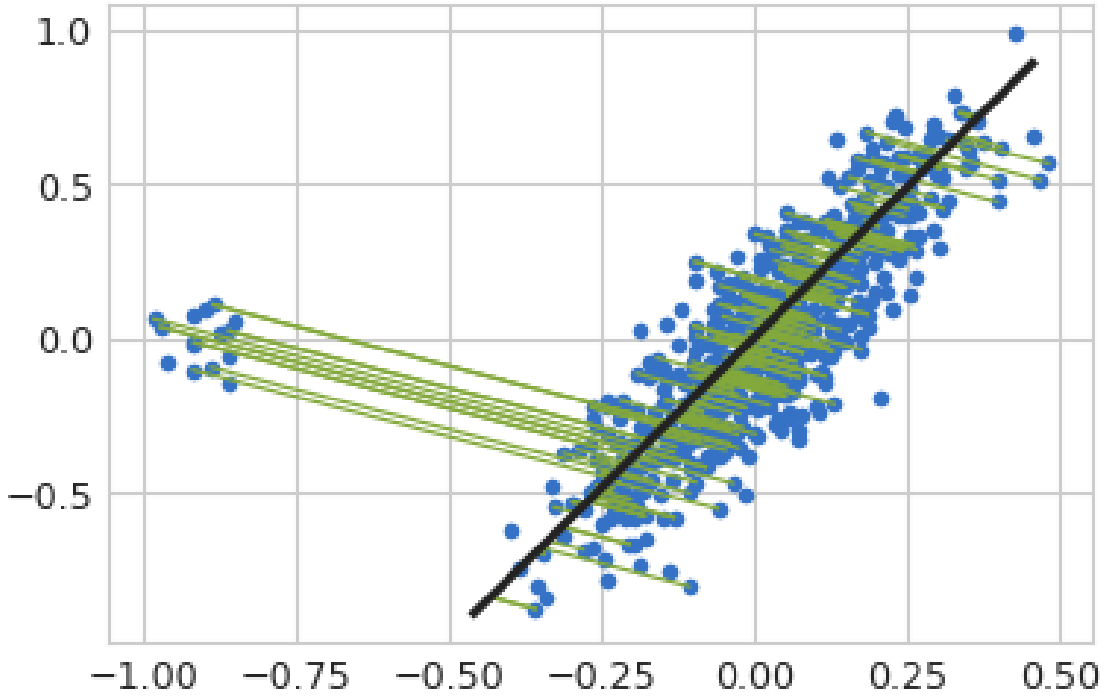
Dimensionality Reduction



Initial Dataset= [625,2] R^2

Dimensionality Reduction
Using Direction -1

Maximum Variance
Eigen vec of Co-Variance

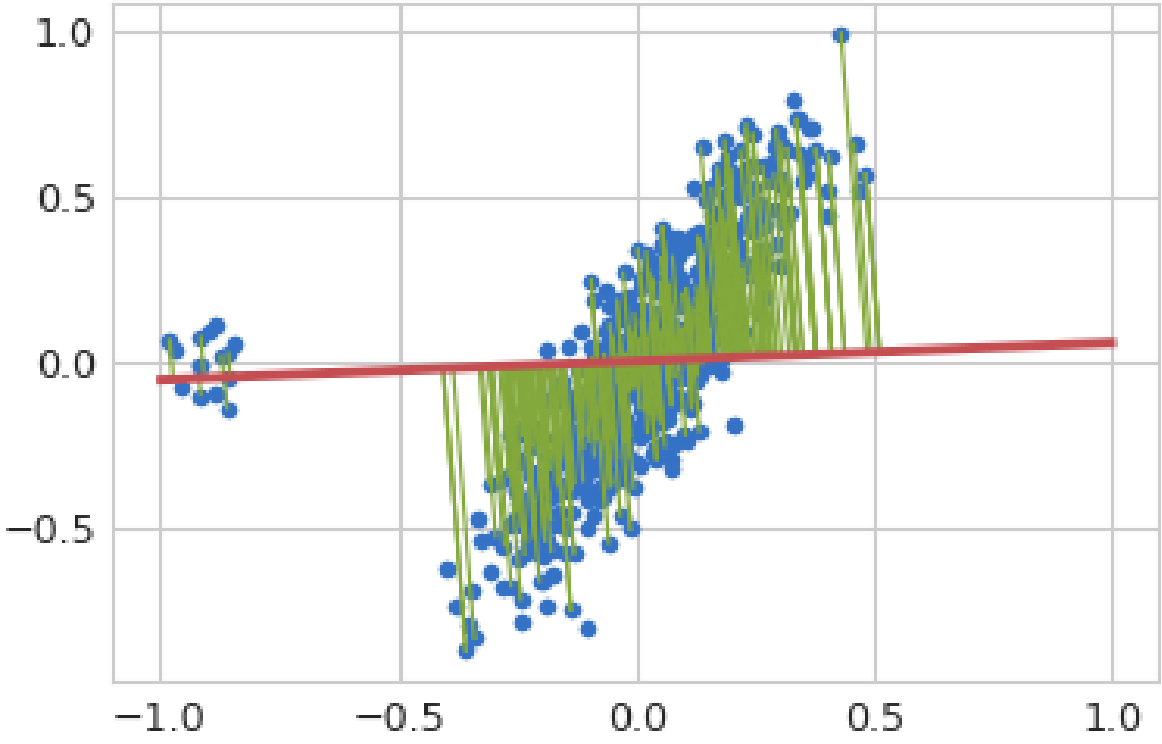


Green segments show
Reconstruction Error

Reduced Dataset= [625,1] R^1

Dimensionality Reduction
using Direction-2

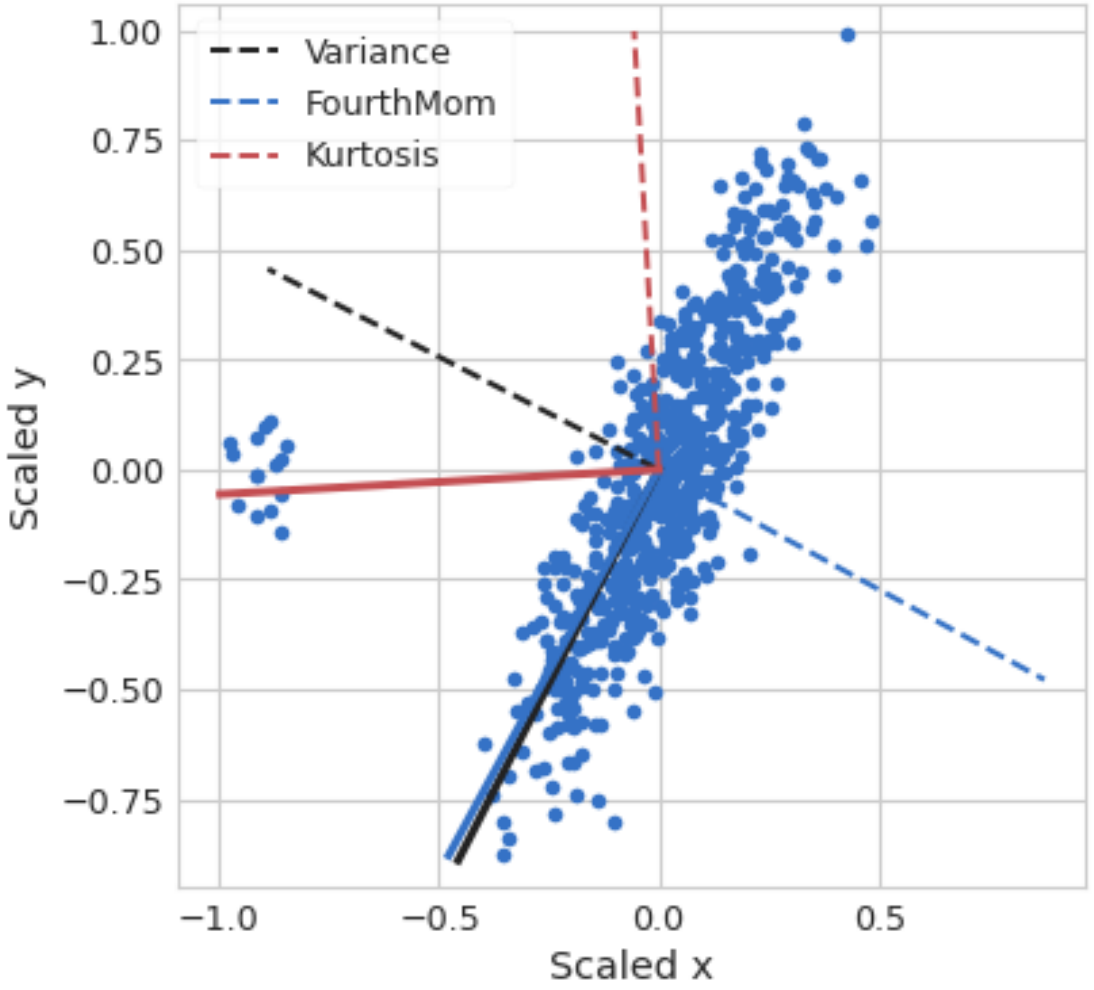
co-Kurtosis
Comulant tensor of
Fourth Moment



Reduced Dataset= [625,1] R^1

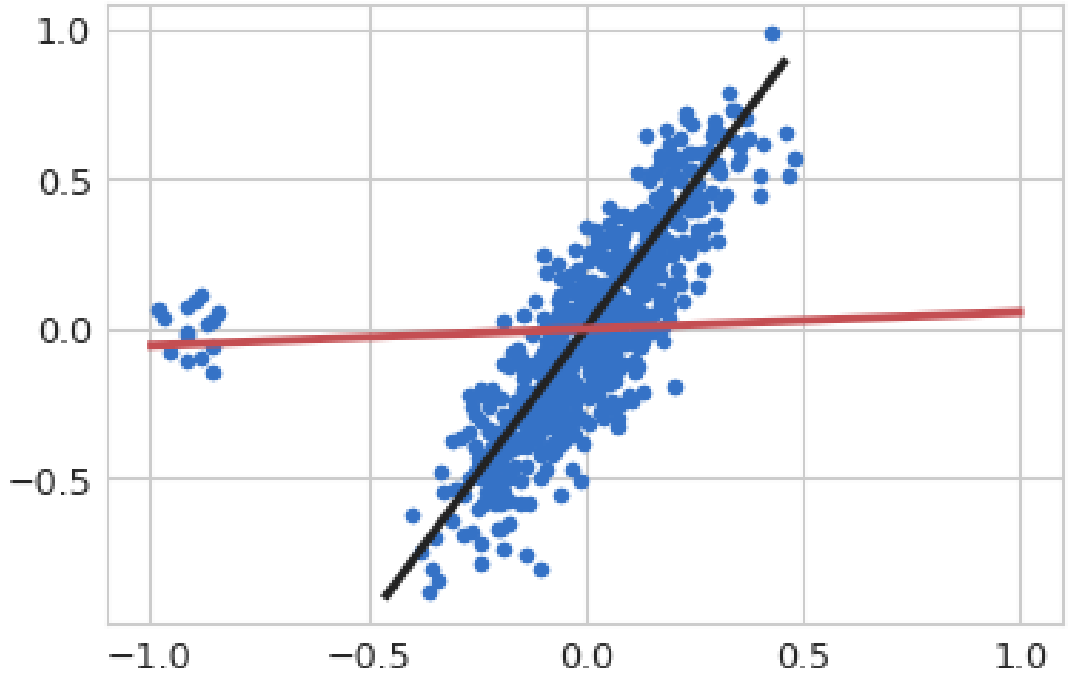
- Priciple Vectors for
  Second Moment
  Fourth Moment

- Optimal Direction
  For anomalous cluster



Optimal Reconstruction
1. Anomalous Cluster
Using Red Vector

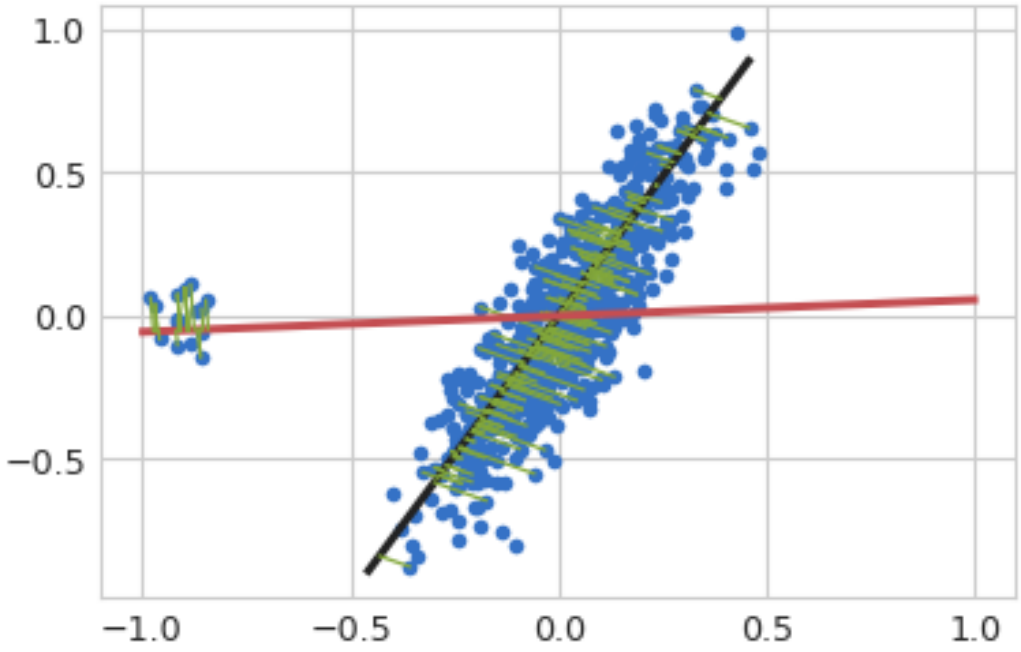
2. Normal Datapoints
Using Black Vector



Optimal Reconstruction
1. Anomalous Cluster
Using Red Vector

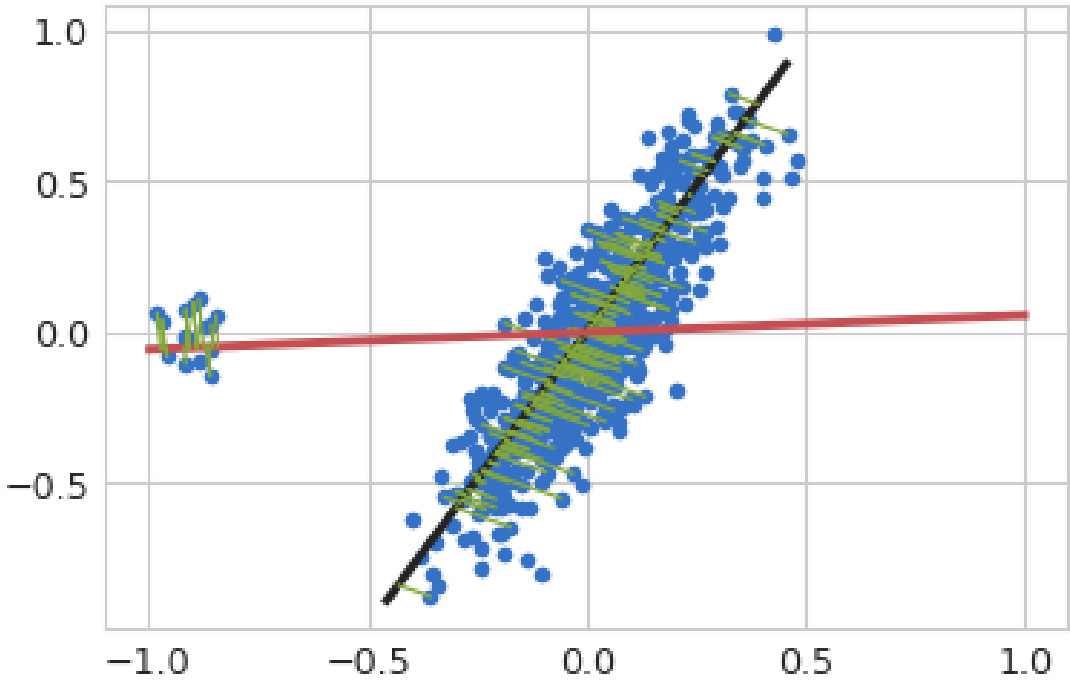
2. Normal Datapoints
Using Black Vector

Minimum
Total Reconstruction Error

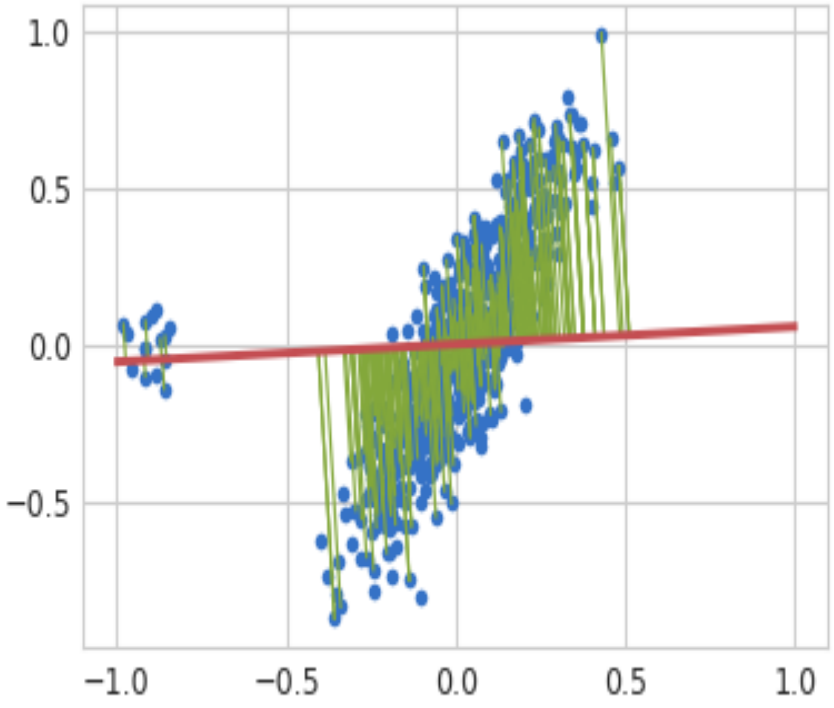


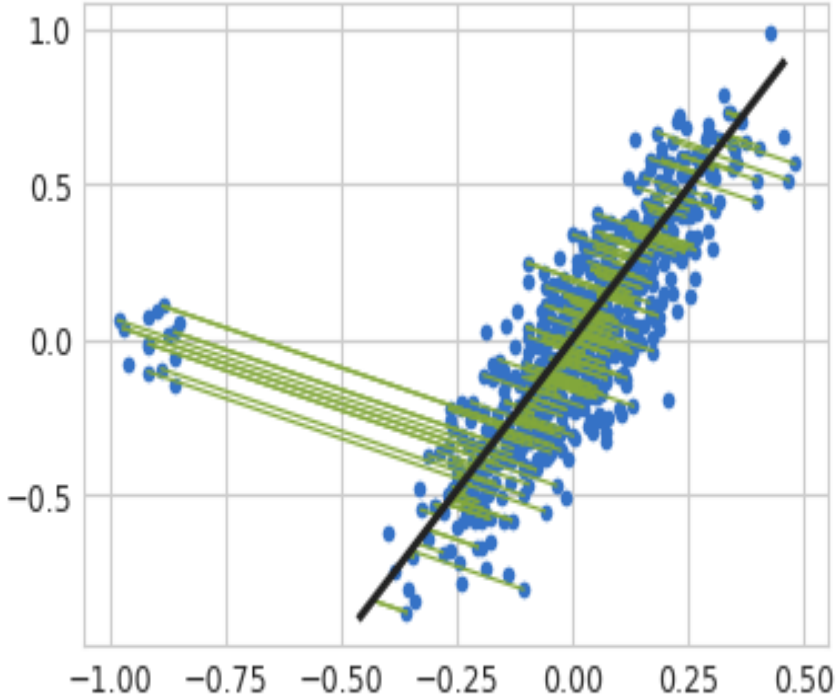
Optimal Reconstruction
1. Anomalous Cluster
Using Red Vector

2. Normal Datapoints
Using Black Vector

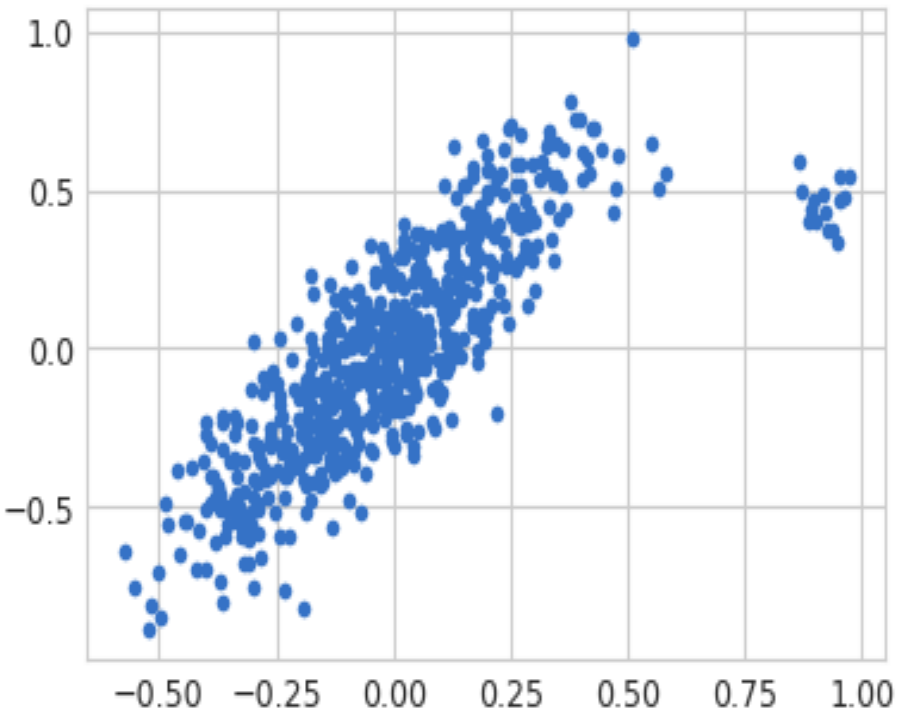


Minimum
Total Reconstruction Error
Requirement:
Prior Identification of Anomalies

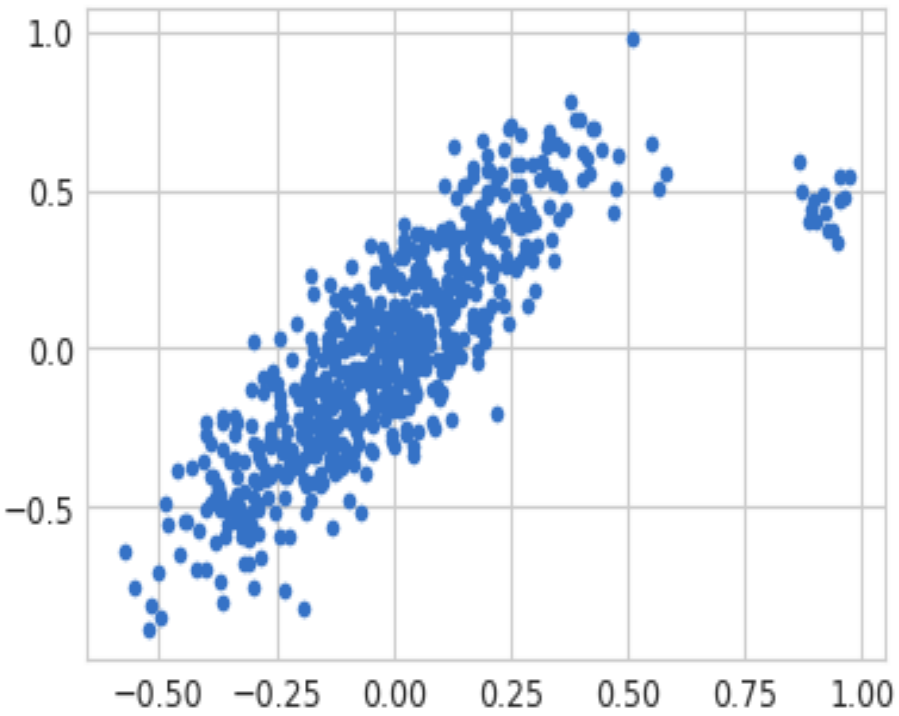

1.0
0.5
0.0
−0.5
−1.0
−0.5
0.0
0.5
1.0


1.0
0.5
0.0
−0.5
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50

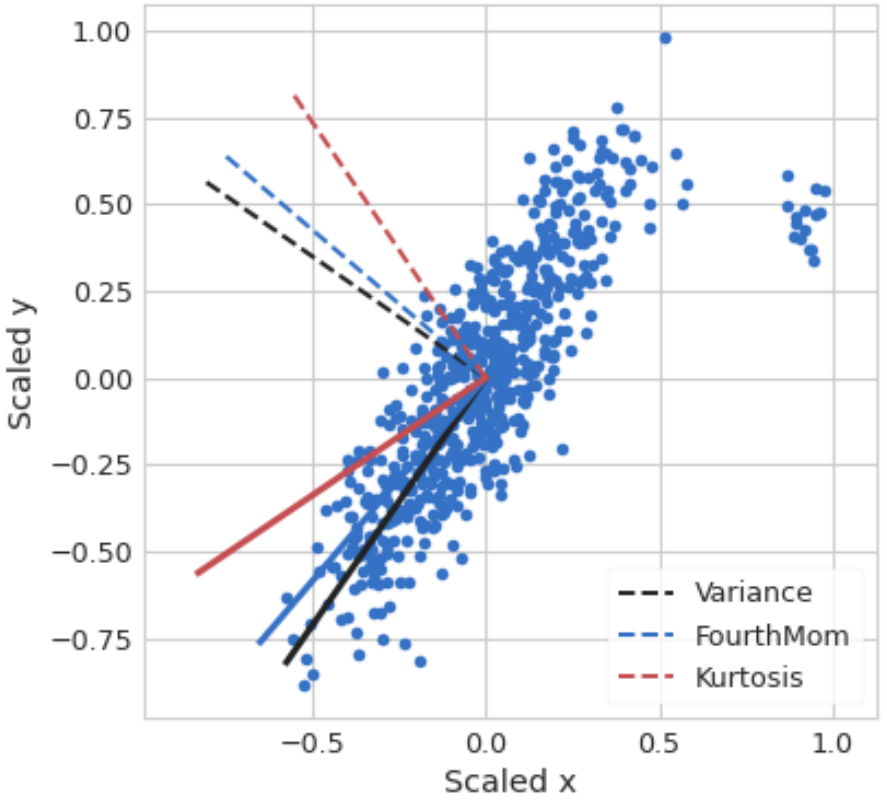
The Process is reproducible for different datasets.



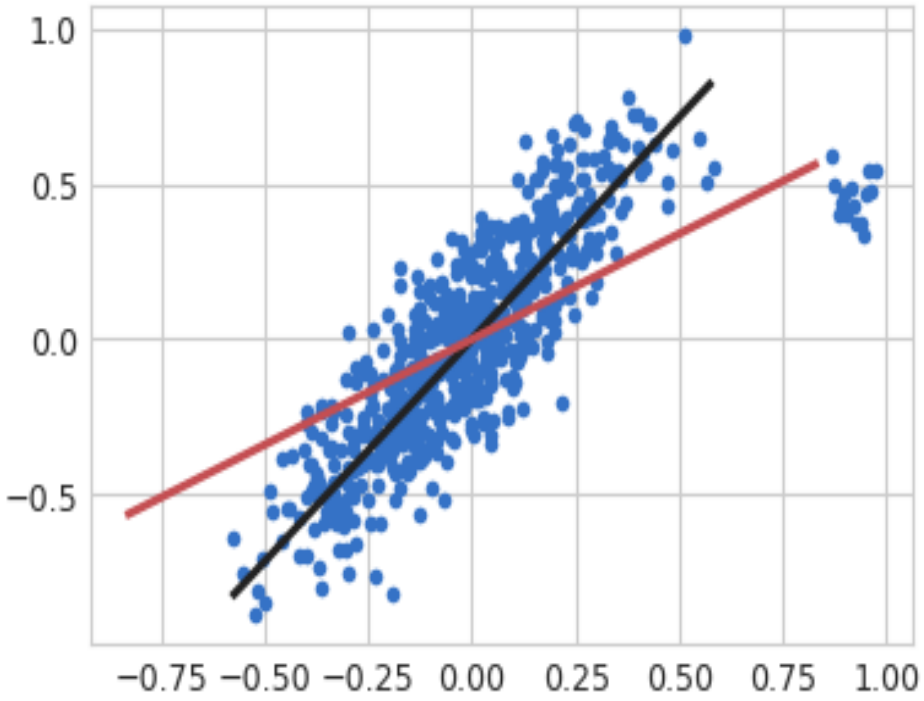
Original Dataset, {625,2}



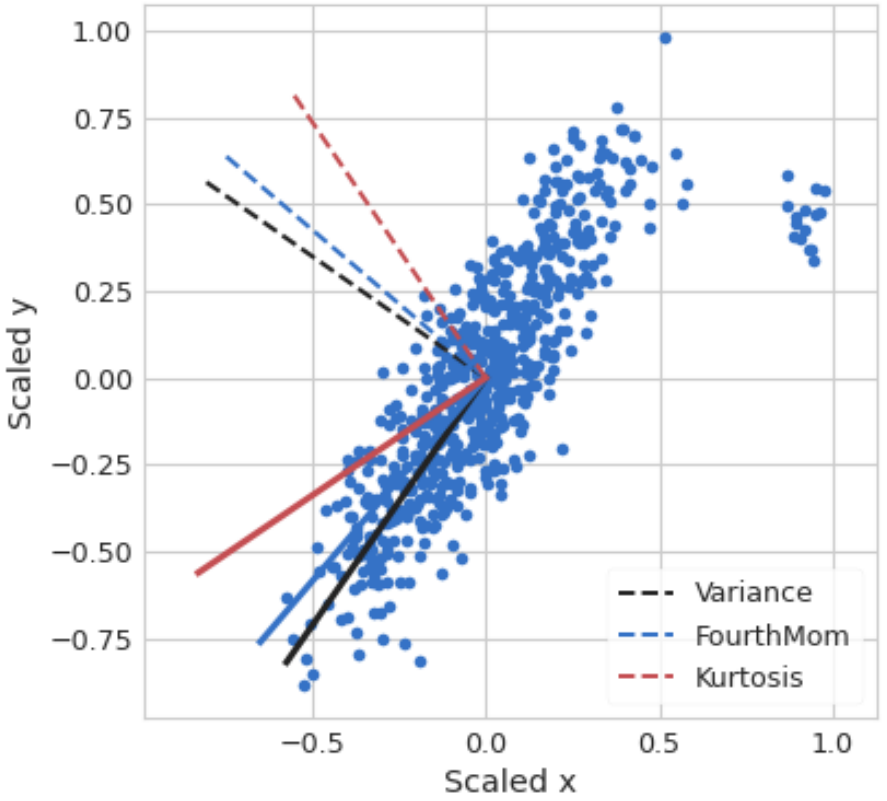
Original Dataset, {625,2}



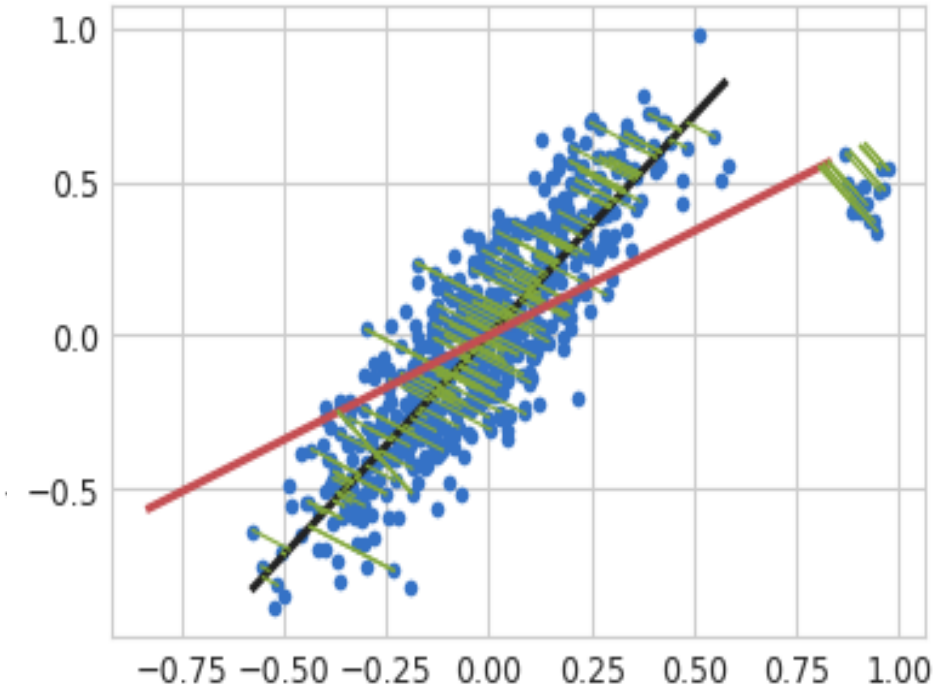
Principle Vectors



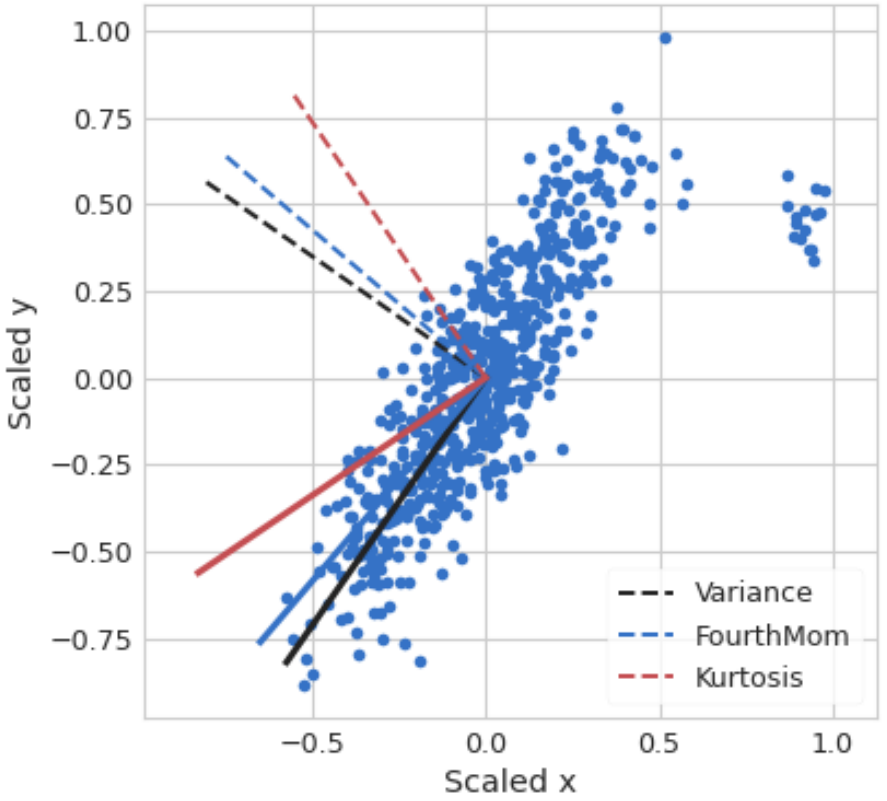
Adoptive Dim Reduction



Principle Vectors



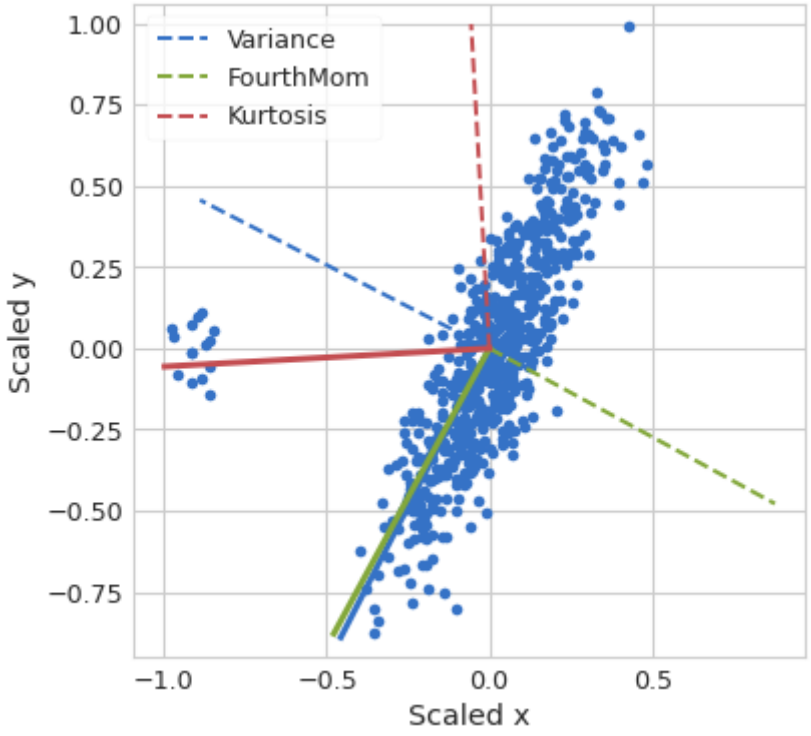
Reduced Data at [625,1], R^1

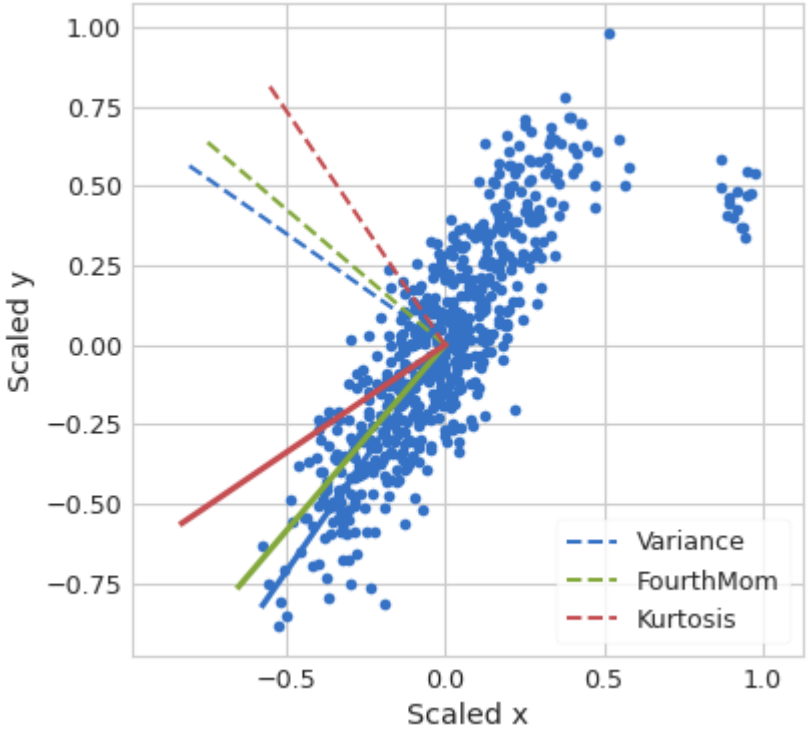


Principle Vectors

Conclusion:

- Tests on HCCI Datasets
- Accuracy on Reconstructed Data
- Accuracy on Chemical Computations


Variance
FourthMom
Kurtosis
Scaled y
Scaled x
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.0
−0.5
0.0
0.5


Variance
FourthMom
Kurtosis
Scaled y
Scaled x
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−0.5
0.0
0.5
1.0