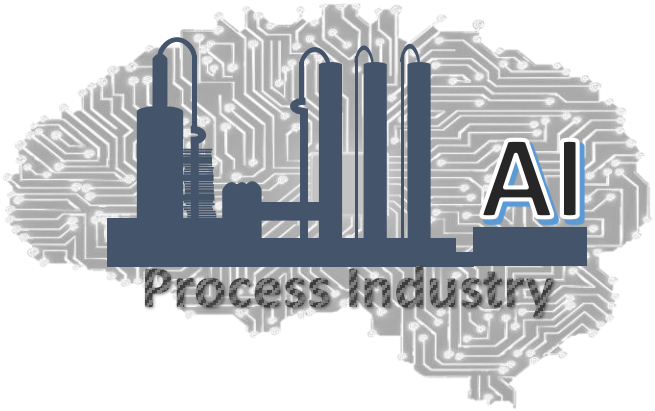
Statistical Techniques for Monitoring Industrial Processes



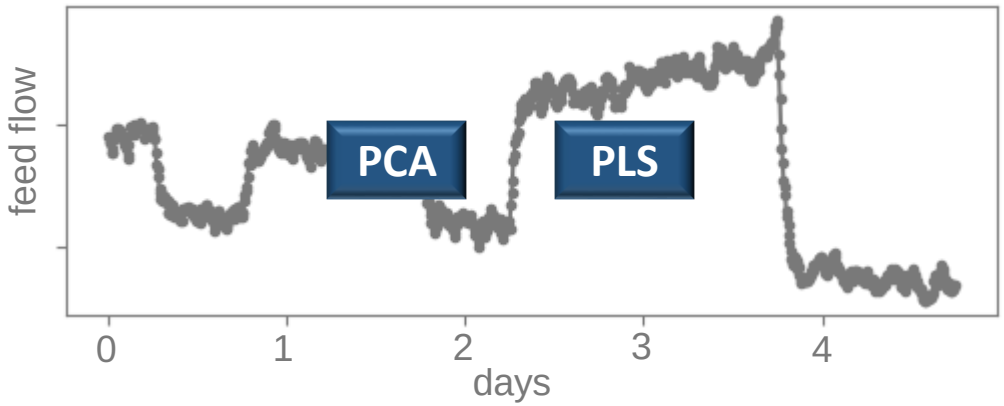
Extensions of Classical PCA and PLS

Course TOC

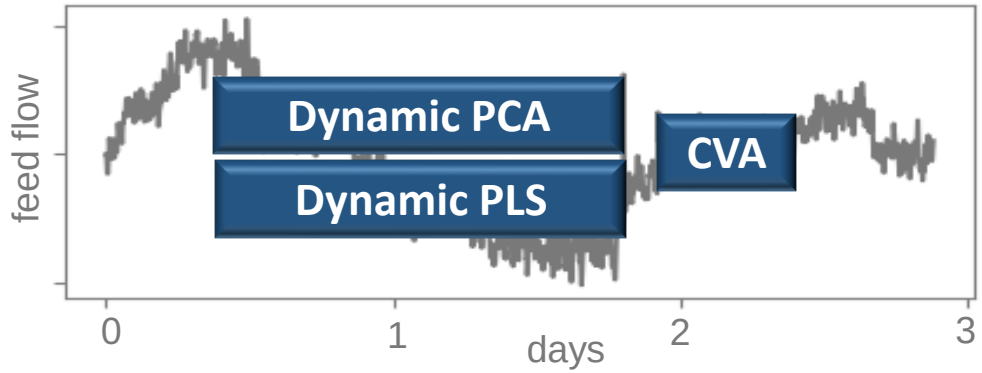
- ❑ Introduction to Statistical Process Monitoring (SPM)
- ❑ Python Installation and basics (optional)
- ❑ Univariate SPM
  - ➢ Shewhart Charts
  - ➢ CUSUM Charts
  - ➢ EWMA Charts
- ❑ Multivariate SPM
  - ➢ Fault detection using Principal Component Analysis (PCA)
  - ➢ Fault detection using Partial Least Squares (PLS) regression
  - ➢ Fault diagnosis using PCA/PLS contribution charts
  - ➢ Strategies for handling nonlinear, dynamic, multimode systems
- ❑ Deploying SPM solutions

Process Type - MSPM Techniques Mapping

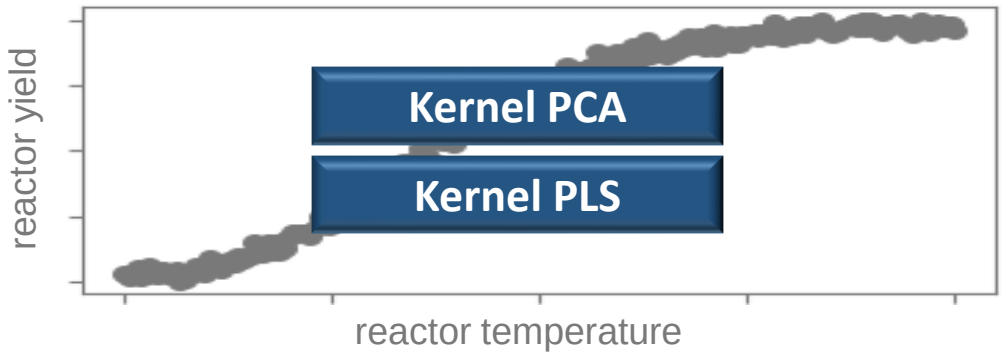
Steady-state process



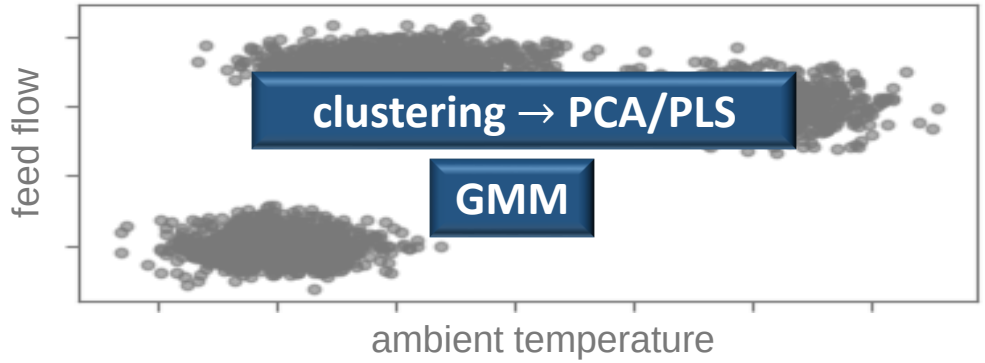
Dynamic process



Nonlinear process

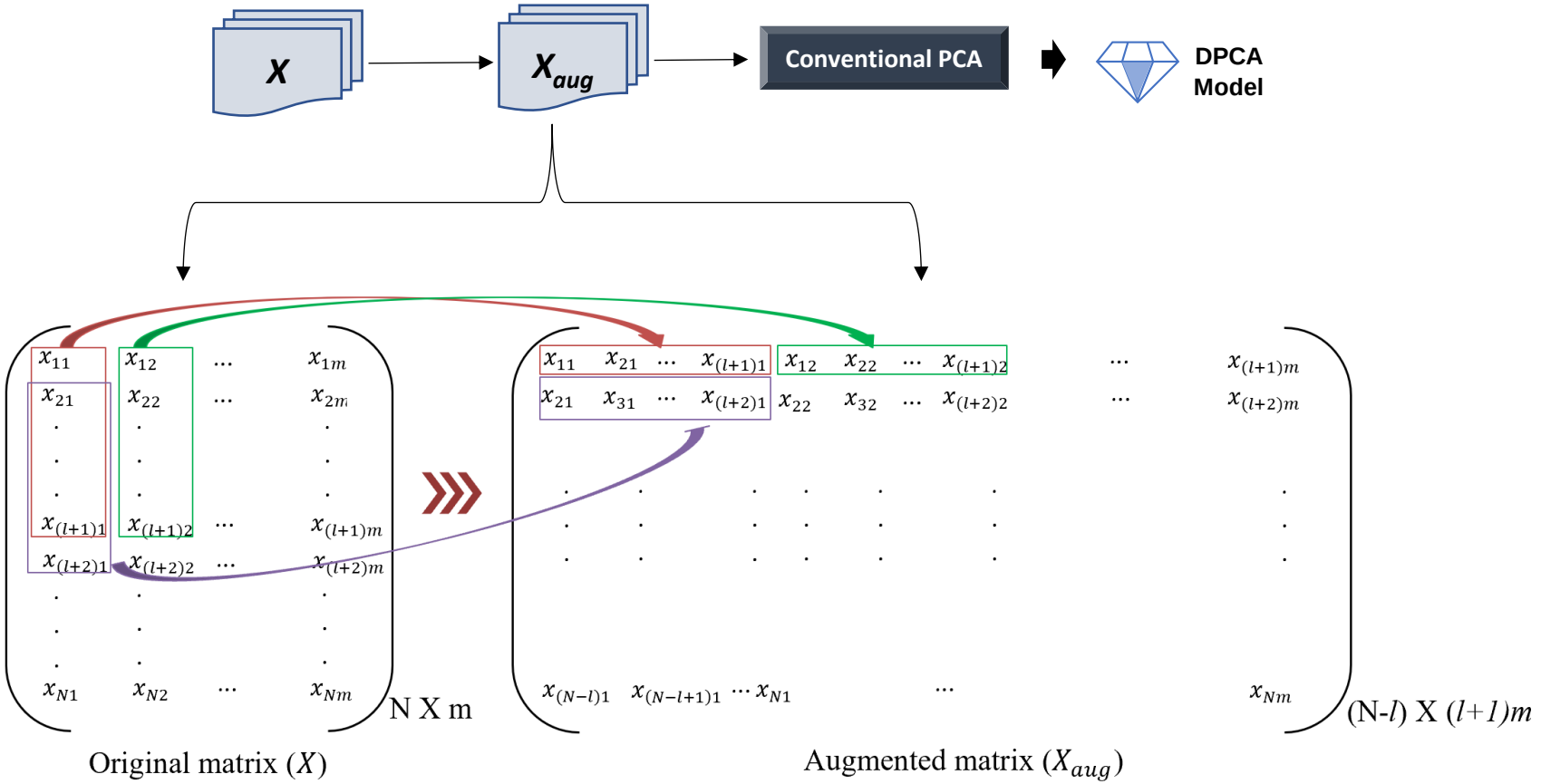


Multimode process



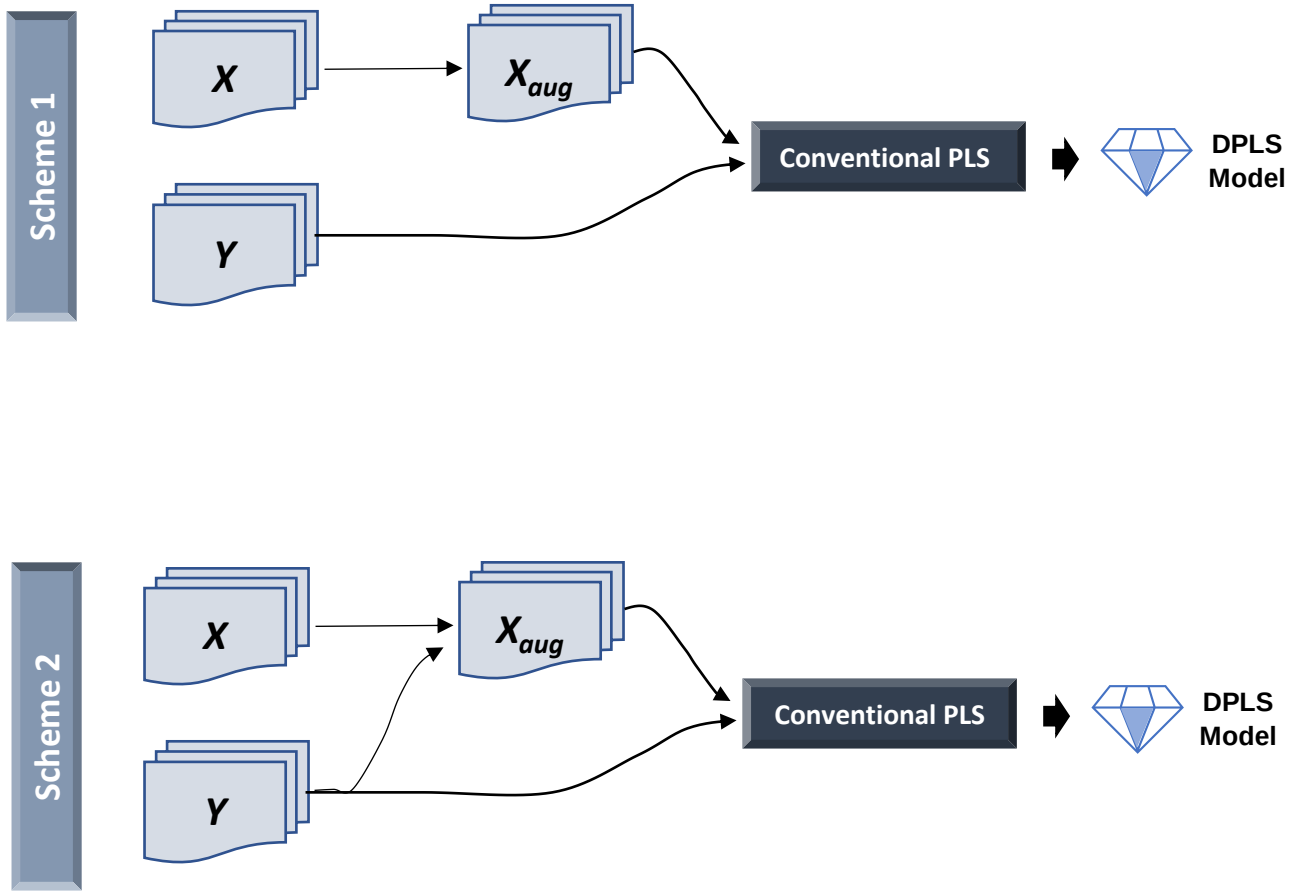
PCA/PLS Variant for Dynamic Processes

Dynamic PCA



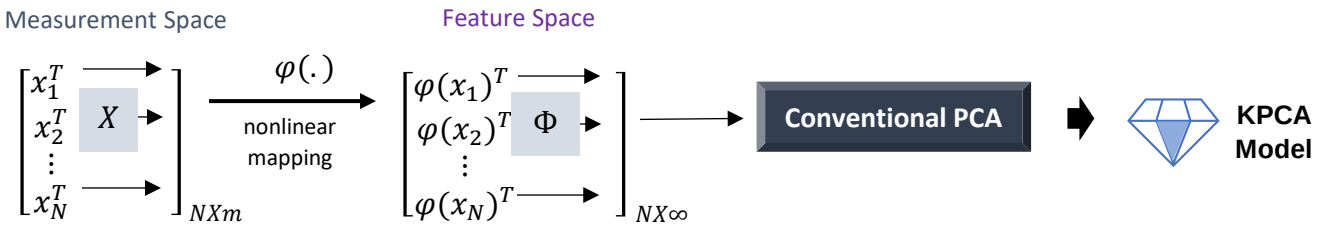
PCA/PLS Variant for Dynamic Processes

Dynamic PLS

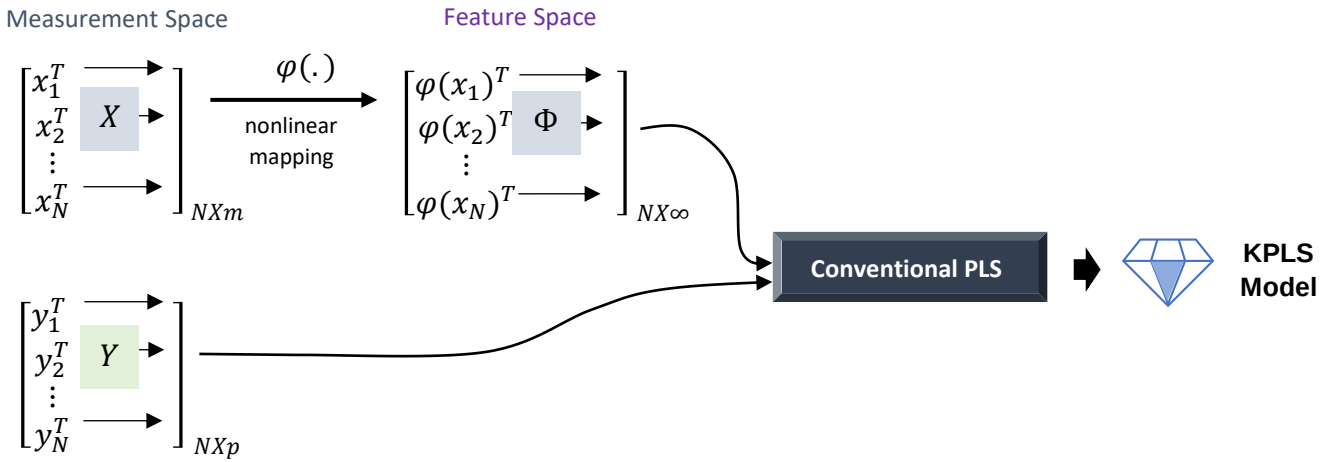


PCA/PLS Variant for Nonlinear Processes

Kernel PCA

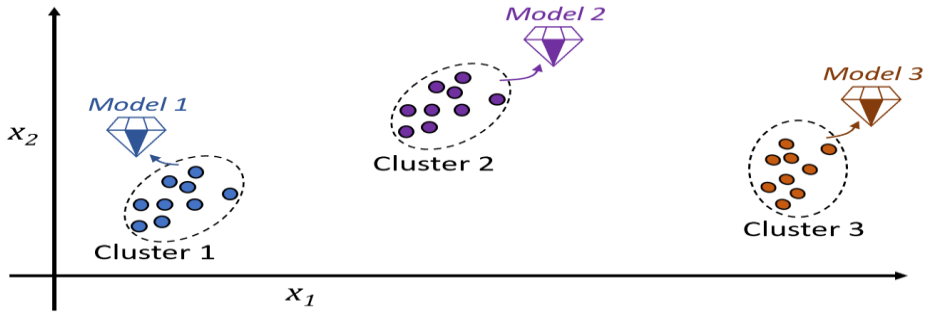


Kernel PLS

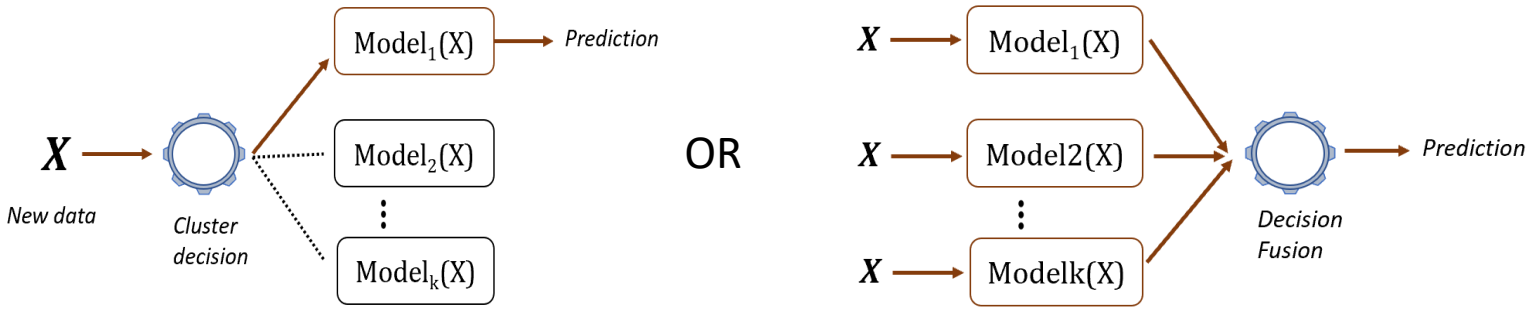


PCA/PLS Modeling for Multimode Processes

Step 1: Cluster determination using training



Step 2: Decision Fusion



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Next Lecture : Concluding Remarks