**\*\*Project 4 (Big Data Applications)\*\***

**Project Overview:**

* This project aims to process real-world sensor measurements for machine learning robot force prediction model.
* We have 12 sets of asynchronous multivariate time series dataset from 6 different sensors which should be processed into a single data matrix.
* The dataset also includes sensor bias, variance shifts, noises, outliers etc those should be cleansed and corrected.

**Presentation and Q&A:**

* **Submission and Presentation Deadline:** To be decided in class.
* **Presentation Duration:** 15 – 20 minutes.
* **Q&A Session:** 10 – 15 minutes following the presentation. Each team member must be prepared to answer questions individually.

**Project Goals:**

* To synchronize all asynchronous multivariate time series into a single matrix.
* Eliminate experiment-wise bias, variance, noises, and outliers.
* Perform trend-residual decomposition using Fourier transformation.

**Project Tasks:**

1. **Time vectors synchronization:** Interpolate in time and synchronize time vectors to create data matrix for machine learning computations, with minimum arbitrary value estimations for missing time steps.
2. **Sensor bias correction:** Remove experiment-wise initial bias within each sensor to stabilize training convergence.
3. **Noise filtering:** Eliminate exceedingly high-frequency components from measured time series, which may hinder the model’s prediction by Fourier filtering.
4. **Outlier removal:** Cut-out invalid measurements, such as negative pressures or anomalies with appropriate method.
5. **Sensor coordinate unification:** Unify different sensor coordinates into global coordinate.
6. **Trend-Residual decomposition:** Extract trend using Fourier transformation and residuals (remainders) by summation decomposition.
7. **Residual variance correction:** Correct serious shifts in residual series variances along experiments.
8. **Visualization:** For all above processes.

**Project Allocation:**

* This project will be assigned to the first group that applies.
* To apply, email me as soon as possible.

**Good Luck!**