High Integrity Systems Project
TSA Tasks 04

Prof. Dr. Matthias F. Wagner
Dr. Fatima Sajid Butt

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We are moving forward in *Time Series Analysis*, getting to *Machine Learning*, at first with single step forecasts:

1. But before that: Please research the principal ideas of the *Kalman Filter* and look for applications, f.i. forecasting!
    - Mathematical foundation with the important terms in the equations
    - Different variants
    - Practical examples in Matlab
    - Practical examples in Python
2. Please summarize chapter 8 of the book *Modern time series forecasting with Python*! Explain the training, prediction and forecasting. Especially explain:
    - the data preprocessing steps,
    - the model configuration,
    - the important functions, which also link to preceding chapters,
    - the classical *Machine Learning (ML)* models for practical use, and
    - the associated metrics for comparison!
3. Please run the corresponding code of chapter 8, comment the code and explain it! Please explain also errors and how you solved them!
4. Please focus specifically on the model *XGBoost* and search for surrogate models ontop!
5. Please summarize the ideas of chapter 9 of the book *Modern time series forecasting with Python*!
6. Please run the corresponding code of chapter 9, comment the code and explain it! Please explain also errors and how you solved them!
7. Please summarize the foundational chapter 10 of the book *Modern time series forecasting with Python* by turning to *Global Forecasting Models*! Some very powerful methods are appearing.

8. Please run the corresponding code of chapter 10, comment the code and explain it! Please explain also errors and how you solved them!

9. Now we are arriving at the core: Please summarize the foundational chapter 11 of the book *Modern time series forecasting with Python* introduces *Deep Learning (DL)*!

10. Please run the corresponding code of chapter 11, comment the code and explain it! Please explain also errors and how you solved them!

11. As discussed, please provide updated versions of your HIS project document!