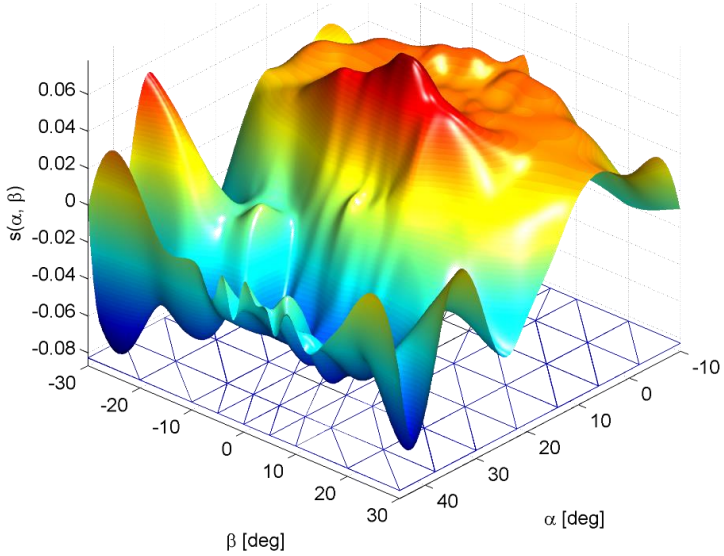
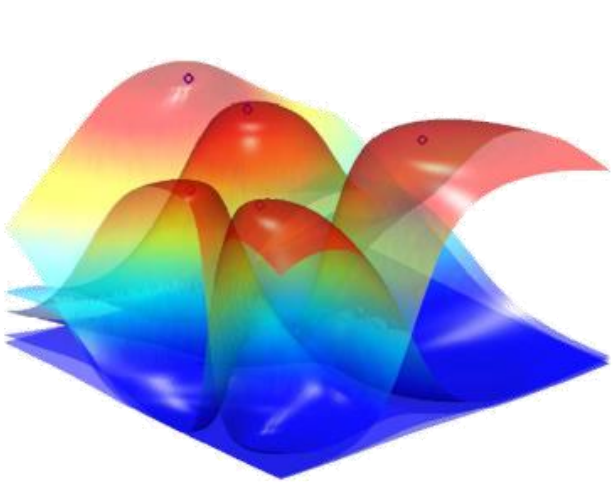
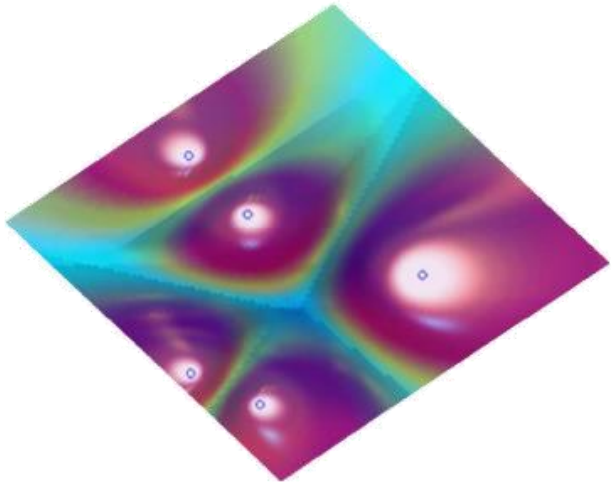
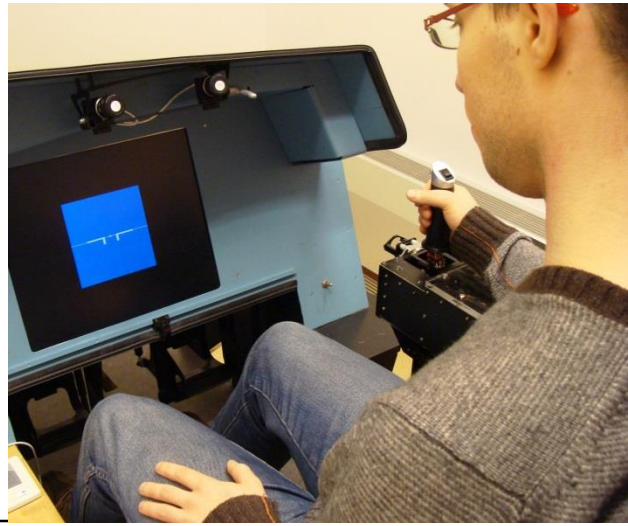
Description of Assignments









Assignment 1: Multivariate Splines

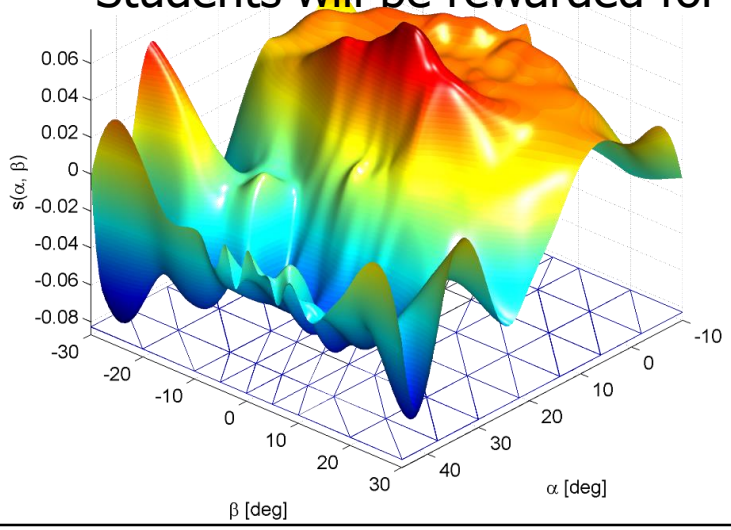
Assignment:

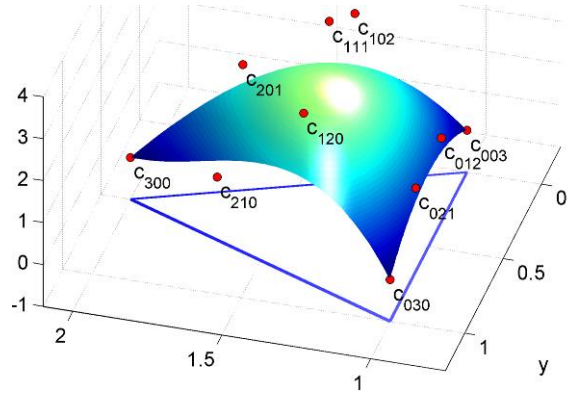
This assignment focusses on a promising new class of function approximator: the multivariate simplex B-spline.

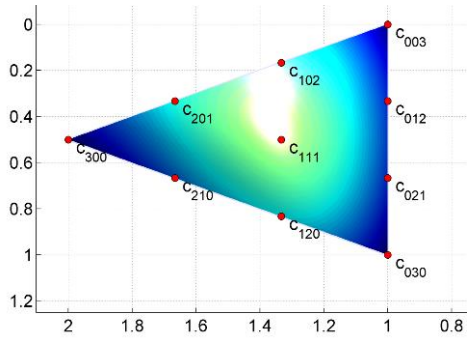
A simple Kalman filter must be designed to remove the bias from the dataset

The assignment concerns the creation of a multivariate simplex B-spline model using a highly nonlinear and noisy wind tunnel dataset of the F-16.

Students will be rewarded for creative thinking and critical reflection!







Assignment 2: Neural Networks

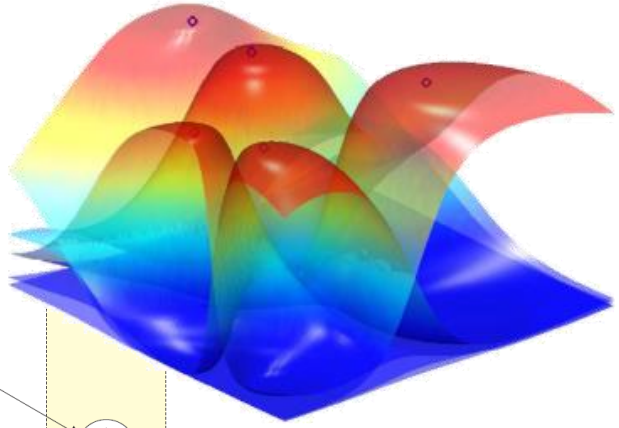
Assignment:

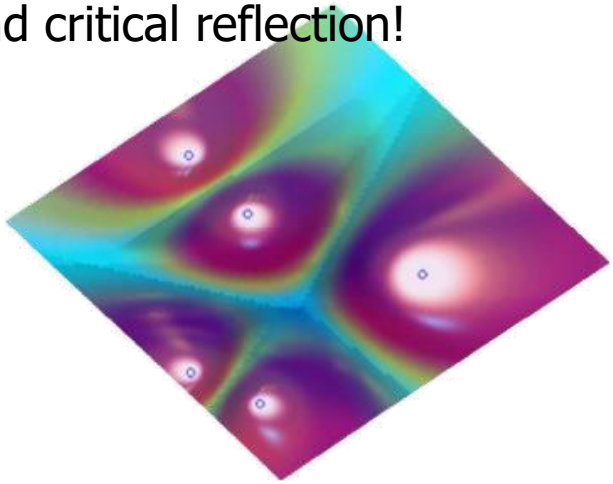
This assignment concerns the creation of a neural network model using a highly nonlinear and noisy wind tunnel dataset of the F-16.

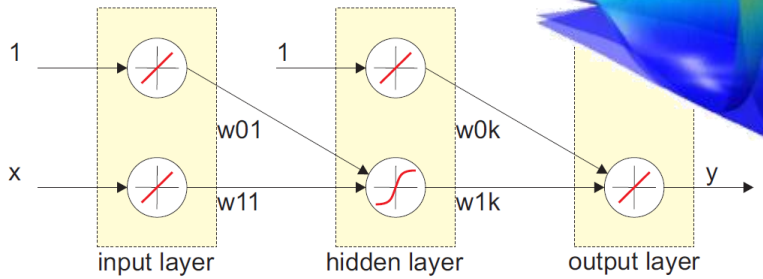
A simple Kalman filter must be designed to remove the bias from the dataset

Both feed-forward and RBF networks are used to model the dataset.

Students will be rewarded for creative thinking and critical reflection!







Assignment 3: Kalman Filter

Assignment:

This assignment concerns the aircraft aerodynamic model identification using flight test data with the two-step approach learnt in the lecture.

Accurate estimation of aircraft position, airspeed body components and attitude with a GPS/IMU/Airdata integrated system with wind will be performed in the first step of the two-step approach applying the Extended or Iterated Extended Kalman Filters EKF/IEKF).

After this, a least squares parameter estimator for a standard polynomial model will be developed.

Finally, the estimated model will be validated using a subset of the test data.

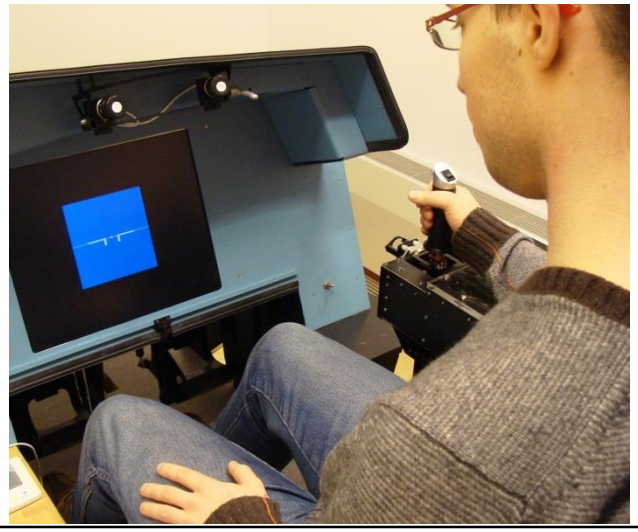
Assignment 4: Pilot Identification

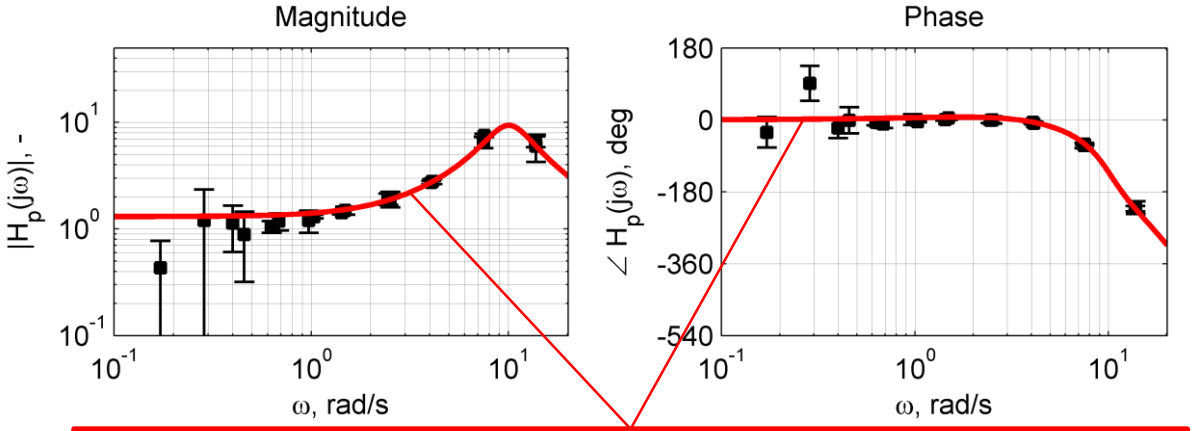
Assignment:

This assignment concerns the identification of unknown pilot dynamics using black-box system identification techniques.

You are asked to select the best possible model for describing the pilot dynamics and fit this model to your provided dataset.

Students will be rewarded for creative thinking and critical reflection on their selected model!





$$H_p(j\omega) = K_p \frac{T_L j\omega + 1}{T_I j\omega + 1} e^{-j\omega\tau_p} \frac{\omega_{nm}^2}{(j\omega)^2 + 2\xi_{nm}\omega_{nm} j\omega + \omega_{nm}^2}$$

Assignments

General Remarks

Assignments can be downloaded from BrightSpace (under "Assignments" tab).

You only need to complete 1 of the 4 available assignments!

Soft deadline is **extended** to **July 15 2022**.

Grading of all in-time reports aimed for September 1, 2022.