Mock Data Challenge

Mock Data Challenge!

Given

- Training data containing only noise: **TrainingData.mat**
- Noise is Gaussian, stationary
- Data to be analysed: **analysisData.mat**
- **Signal**: Quadratic chirp
- **Parameter search ranges**:
- $a_1 \in [40, 100]$,
- $a_2 \in [1, 50]$,
- $a_3 \in [1, 15]$

Detection and Estimation

- Detection: Is there a signal in the analysis data?
- Estimation: If so, estimate its parameters
- Use PSO to obtain GLRT and MLE
- Recommended PSO parameters:
  - Best of 8 runs
  - Termination at 2000 iterations

Codes

- Spoiler alert! These codes constitute the solution! Look at them only after you have attempted the solution on your own, or else you will lose a good opportunity to learn
  - To avoid temptation, you can delete the following files from your local copy of GWSC
- **DETEST/qclrfunc.m, qcpso.m**: template codes for computing the fitness function for quadratic chirp in colored Gaussian noise (user-specified PSD); these are the solutions to a preceding lab
- **MDC/mdcanalysis.m**: The full solution to the MDC
- **MDC/mdctfanalysis.m**: Implements a time-frequency analysis
  - This code runs on datafiles 'AnalysisDataTF.mat' and 'TrainingDataTF.mat': The former contains a signal with a higher SNR than the MDC data
- **MDC / mockdatagen.m, verifymockdatagen.m**: Codes that generate the mock data and verify that the mock data is generated correctly
- Note: Some of these codes use JSON format input files; you will need **JSONLAB** from Mathworks File Exchange.

Solution

- Xiaobo and David know the true signal parameters!
- Good luck!