Signal Processing and Analysis with MATLAB

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Agenda

- Manipulate and visualise time-domain data
- Gain insight by applying signal transformations
- Measure standard signal metrics
- Design and apply digital filters
Signal analysis for classification
Application examples

- Mobile sensing
- Structural health monitoring (SHM)
- Automated trading
- Engine event detection
- Radar post-processing
- Advanced surveillance
- ...
Challenges with Signal processing and Analysis

- Need domain-specific knowledge
- Open-ended problem and long discovery cycles
- Bound to fail if done with the wrong tools
Example: Human Activity Analysis and Classification

Courtesy of:
Davide Anguita, Alessandro Ghio, Luca Oneto, Xavier Parra and Jorge L. Reyes-Ortiz.

Dataset available at:
http://archive.ics.uci.edu/ml/datasets/Human+Activity+Recognition+Using+Smartphones
Human Activity Analysis and Classification Solution

- Only core built-in Signal Processing algorithms
- 66 high-quality features extracted with only 65 lines of code!
- Visualisation and automation accelerate insight iterations
Leverage built-in algorithms
How much have I not needed to re-invent?

- **Signal Processing Toolbox**
- **Neural Network Toolbox**

- cheby2
- filter
- rms
- pwelch
- periodogram
- xcov
- findpeaks
- …
Summary
MATLAB for Signal Processing and Analysis

- Extensive set of de-facto standard functions for signal processing and analysis
- Visualisation and App-driven automation accelerate insight iterations
- Compact and concise language, and extensive documentation