BME-2626 Processing of Physiological Signals

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No materials are allowed, the examination is a closed book examination. No calculators, computers or alike are allowed. Maximum number of points for this examination is 60 points.

Examination questions

✓ Performing voluntary activities for extra points (0 points):
  a) Did you attend the Data-driven Medicine seminar for at least half a day and return a report?
  b) Did you attend the dissertation?
  c) Have you made or will you make the 3. exercise?

✓ Describe concisely (i.e., with one to three sentences) the following concepts (2 points each):
  a) Ictal EEG
  b) The Wilson central terminal in ECG measurements
  c) Electromyogram
  d) Unipolar EEG measurement
  e) Heart beat morphology

✓ a) What is the main artifact seen in the third ECG signal in Fig. 1A? Also, describe concisely one good method for the reduction of this artifact. (5 points)

✓ b) There is a horrible artifact in both ECG signals in Fig. 1B. What artifact is seen in Fig. 1B and how to reduce this artifact? (5 points)

![Fig. 1. (A) Five ECG signals with a major artifact in the third signal. (B) Two ECG signals with a severe artifact.](image)

✓ Describe the principles of independent component analysis. Also, give one example of its possible usage and briefly describe how to use it in this case. (10 points)

✓ Describe the general principles of evoked potentials and their measurement, and specifically describe at least for two different types of evoked potentials. (10 points)

✓ Describe least mean square adaptive filtering (LMS filtering). Also, describe in what kind of cases in biomedical signal processing it can be used? (10 points)

✓ Describe Welch’s method for power spectrum analysis. (10 points)