Neurological Modeling of What Experts vs. Non-Experts Find Interesting

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Motivation

• Extraterrestrial autonomous vehicles, such as satellites, probes and Mars rover are driving space exploration.
• Bandwidth in space is extremely limited.
• Probes need to determine what is of interest to be sent back.
• Currently this is heuristically based.

• Ideally a human-in-the-loop could determine what is of *interest* to be sent.
• Machine Learning allows for the development of discriminative classifiers.
• How to capture what is of interest and build an appropriate model?

• Utilize EEG readings and the 'oddball' experimental paradigm, to capture what an expert finds of interest.
• Objective to build classifiers which capture what an expert finds of interest, and measure performance against a non-expert to determine if difference.

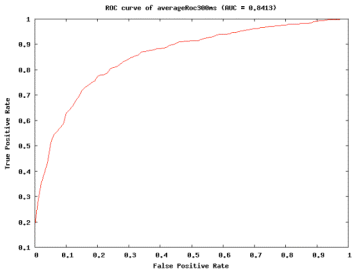
Current Work

• Utilized a cheap 4-node EEG setup, recording at sites Pz, Cz, P3 & P4.
• Initial experiments 'oddball' style to detect outliers in rock corpus.

Non-Oddball

Oddball

• Multiple subjects, varied presentation time, repetitions, experiment length.
• Extracted features from 220ms – 810ms, bandpassed between 0hz-14hz.
• Classification accuracy was good.

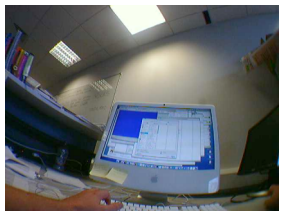


ROC curve of average performance across subjects for presentation rate of 300ms

Future Objectives

• Determine difference between 'expert' and 'non-expert' subjects.
• Utilize 'SenseCam' images, generated from a personal wearable camera, where the images captured have strong association with the SenseCam wearer.

• Measure differences in response between what SenseCam wearer (i.e. expert) finds of interest, against non-expert (i.e. random subject)
• Initial work demonstrates the average waveforms generated are indeed different for the same stimulus.



Example SenseCam Image

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