Online Ethics Center
FOR ENGINEERING AND SCIENCE

Big Data & Neuroscience

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Description

A neuroscientist studies brainwave technologies with the aim of developing brain-machine computer interfaces (BMCI) and biometric systems. In considering projects she might work on, such as developing a database system to identify individuals by EEG biosignatures or advancing the field of neuromarketing, she starts to wonder about the long-term social value of these emerging technologies.

Body

Neuroscientist Samantha Anders works as a research scientist at the US government's National Institutes of Health (NIH). Her job involves researching brainwave technologies with the aim of developing brain-machine computer interfaces (BMCI) and biometric systems. She has recently heard about an interesting job opportunity in the private sector, which would involve work with similar brainwave and neuro-technologies to the ones she is using currently at her NIH job. However, the ultimate goal of the research at the private firm would be to develop and sell goods and services to the general public.

Samantha's current job involves gathering and analysing data from electroencephalograms (EEG). Electroencephalography is a method used by

neurologists to detect electrical activity in the brain using small, flat metal discs, or electrodes, attached to the scalp (MayoClinic.org). It is commonly used in a medical context to detect brain abnormalities and diagnose disorders such as epilepsy. However, Samantha gathers data from many healthy individuals using EEG to create large databases of brain activity for scientists to analyse. The ultimate goal of her department's research is to develop reliable methods to detect biometric signatures from the data, which could be used to identify individuals.

Samantha is somewhat bored in her current job, collecting and annotating data, and she is doubtful that EEG data will ever be robust enough to serve as biometric signatures. She is also slightly troubled with the thought that scientists might eventually develop methods to reliably detect biometric signatures to identify individuals, if not from EEG data, then perhaps from brain data gathered from other neurotechnologies. She thinks this might be problematic even if the research subjects who've volunteered for this research are informed of this possibility and still consent to participate. She thinks more should be done to protect information about individuals and safeguard their right to privacy, much like is being discussed in the context of individuals' genetic information stored in genomic databases. She is therefore contemplating making a career move and leaving her government job for the new position in the private marketing firm.

The new position would also involve work gathering and analyzing data from EEG, as well as functional Magnetic Resonance Imaging (fMRI), on individuals, but in the context of a new field of marketing, referred to as neuromarketing. Neuromarketing involves the application of neurotechnologies in which psychological (cognitive and affective) states of individuals are leveraged to improve marketing strategies, with the ultimate goal of increasing profits (Rodenburg 2014).

Samantha thinks this might be better use of her expertise and skill because it would not rely on using large data sets to identify particular individuals. However, her friend Kara thinks that using EEG and fMRI data for targeting consumers' subconscious is just as problematic and has urged Samantha not to work at the neuromarketing firm. Should Samantha make her career move?

Discussion Questions

1. Were Samantha's reasons for quitting her government job sound? What precautions ought government (and other) research institutions take to protect

individuals' privacy with respect to brainwave data? Should the ethical guidelines and regulation differ from those that are used in the context of genomic databases?

2. Why might Kara think neuromarketing is ethically problematic? Are there any other ways (other than marketing purposes) in which these sorts of databases may be used for consumer and commercial applications in ways that might be morally problematic?
3. What is Samantha's ethical responsibility, as a scientist, with respect to the collection of brainwave and neurological data?

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Notes

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Resource Type

Case Study / Scenario
Hypothetical / Fictional Case

Parent Collection

Big Data Collection

Topics

Big Data
Controversies
Emerging Technologies
Ethics and Society
Privacy and Surveillance
Social Responsibility

Discipline(s)

Life and Environmental Sciences
Neuroscience and Neurobiology