Human Enhancement Technologies and the Possible Dual Use in Cognitive Warfare
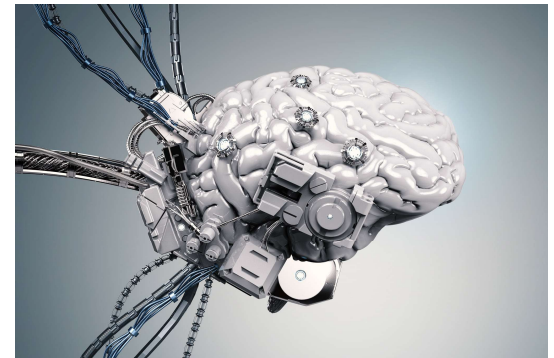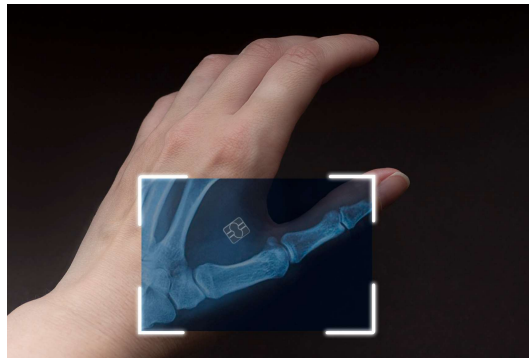
Øyvind Voie and Susanne Glenna

Foto: AdobeStock

Health sector

Cognitive warfare

HE Technology
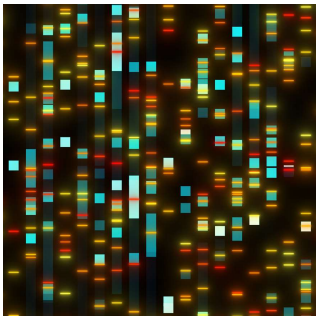
Ethical implications

Human Enhancement Technologies

FFI
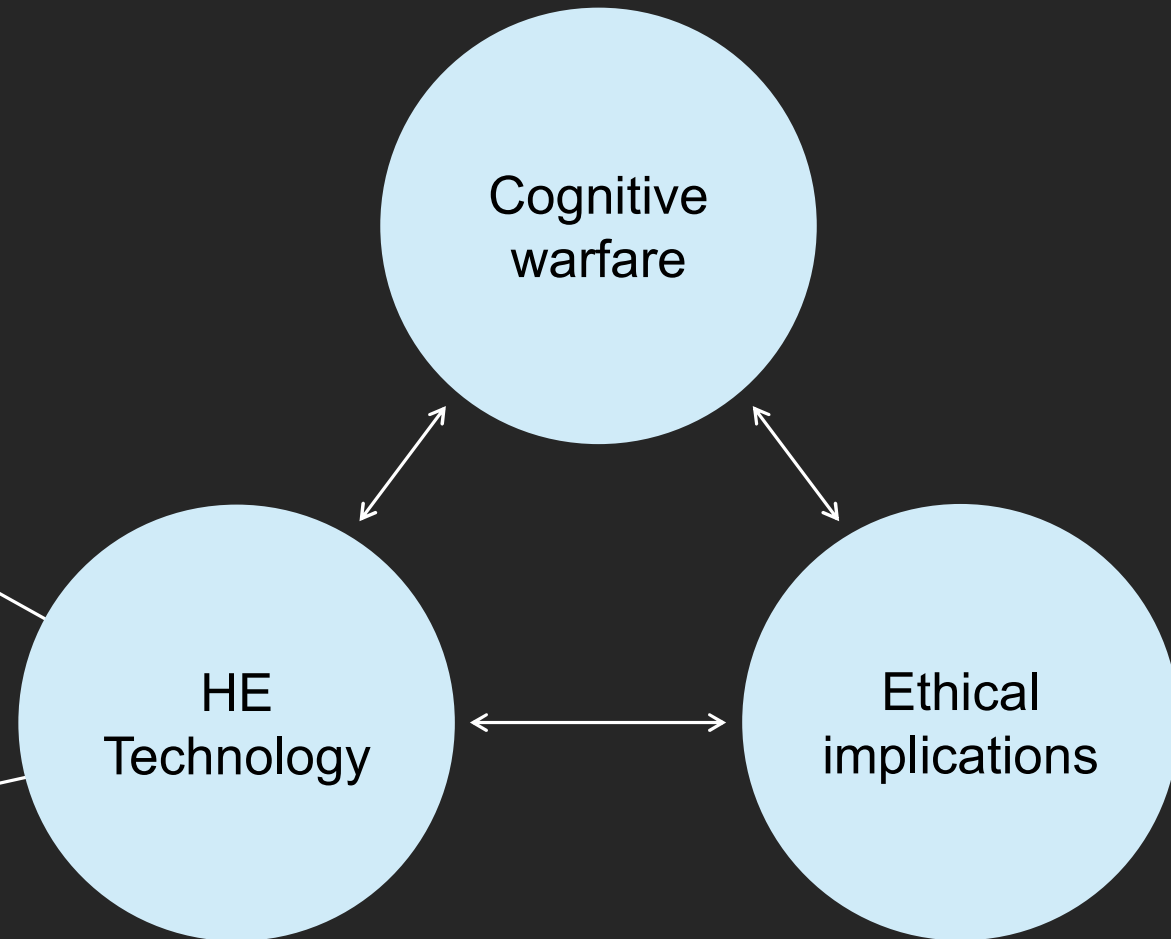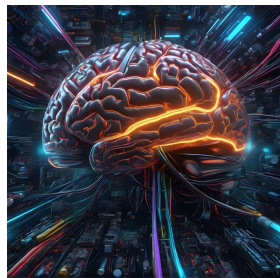
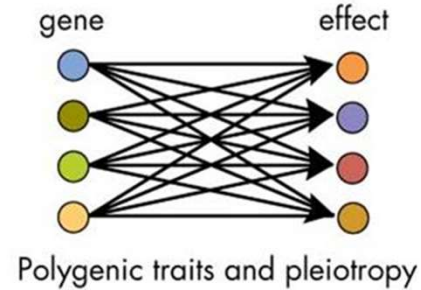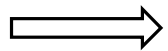# Genome Editing Technologies for Cognitive Enhancement
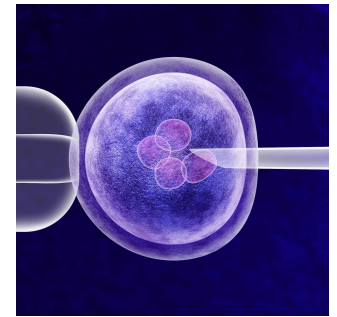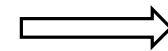
Genome sequencing

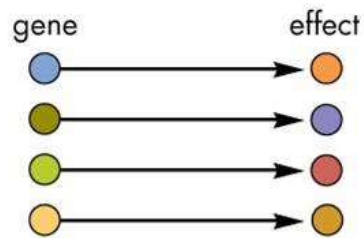Editing simple traits

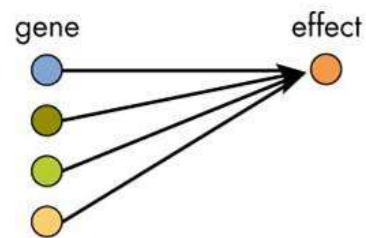Modifications of microorganims

Editing complex traits

Germline editing

gene   effect

Polygenic traits and pleiotropy

Increasing difficulty, invasive degree, controversy, and time horizon

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Genetics and Cognitive Abilities - Challenges

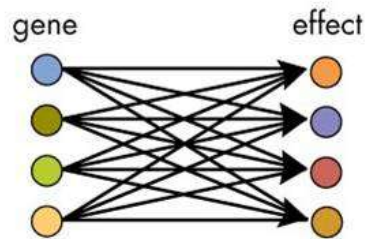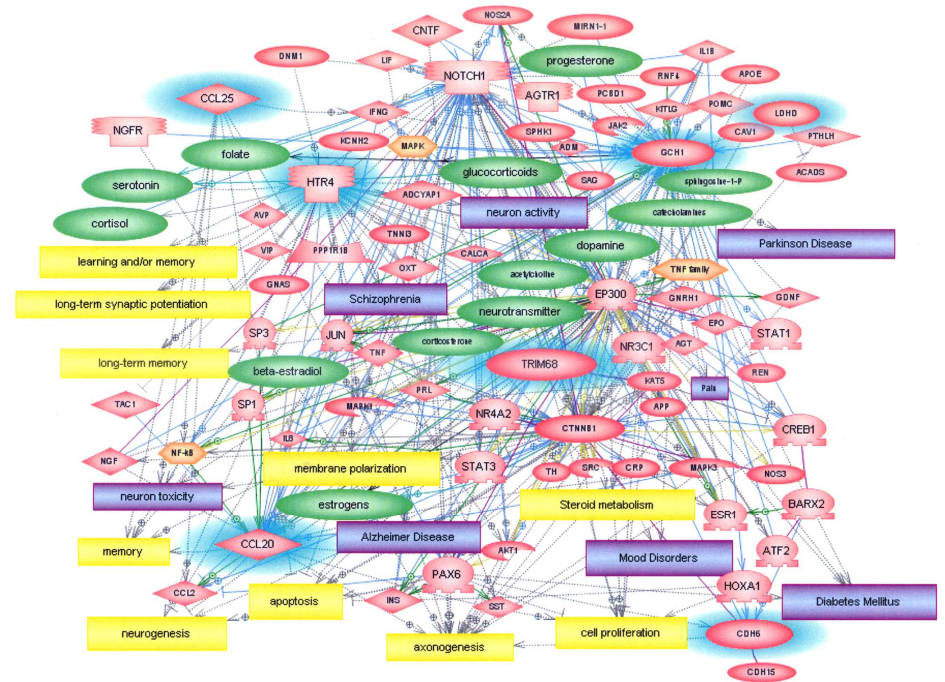# Genetics and Cognitive Abilities - Advances

- Human Genome Project & GWAS: Building the knowledge base.
- 70 Genomic Loci, 350 Genes: Identified links to cognitive function.
- Role of AI in Functional Genomics: Speeding up mapping and analysis.

Photo: AdobeStock

Brain-Computer Interfaces (BCIs)

Images from neuralink.com, article posted 02.08.2019
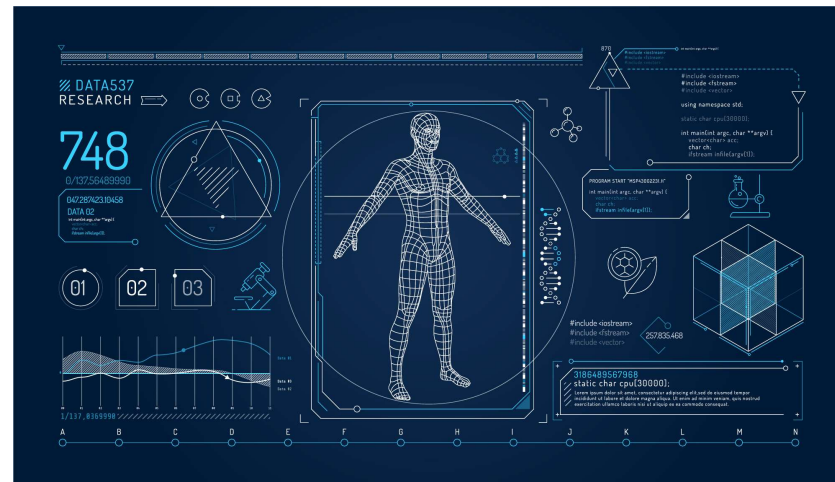
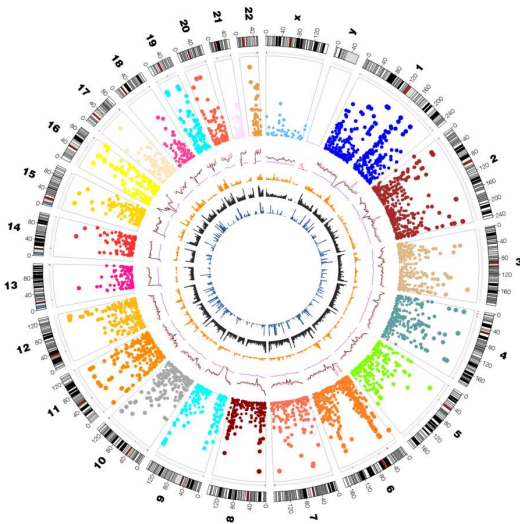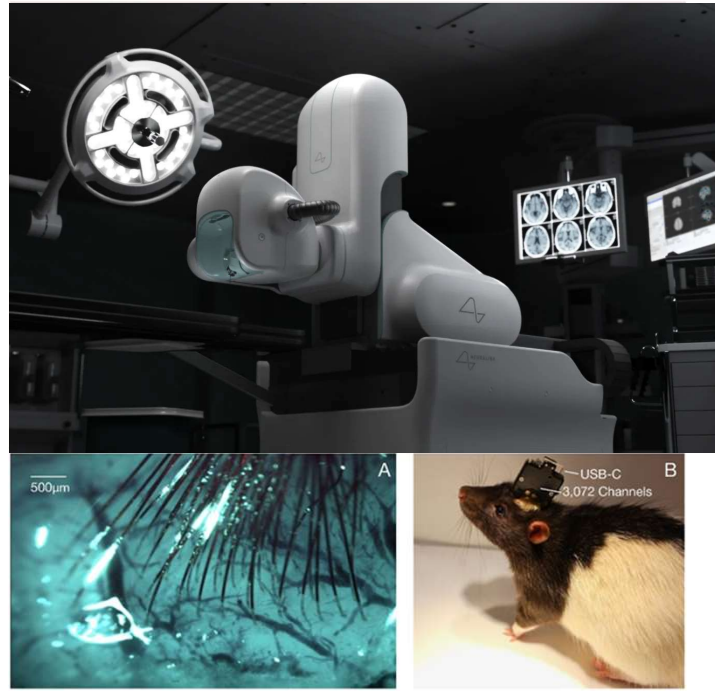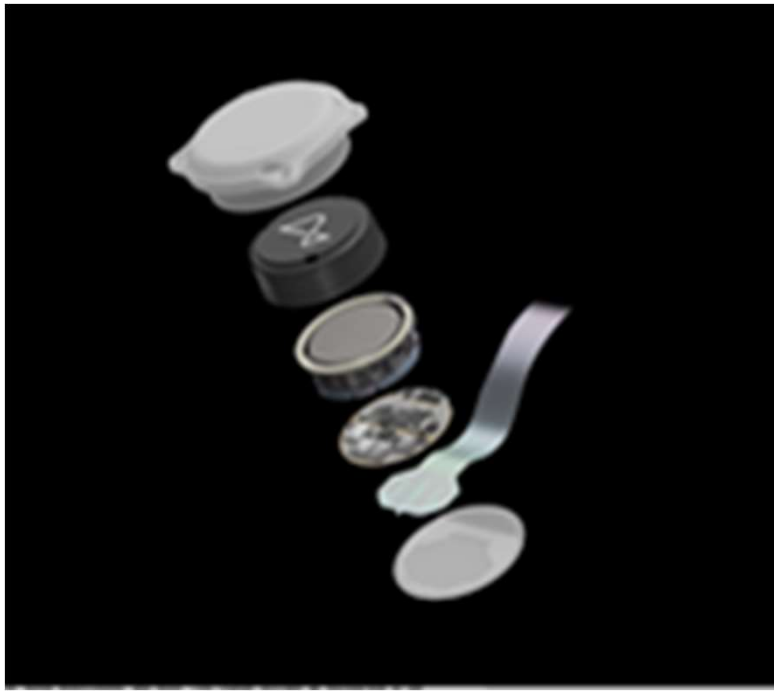# Human Enhancement Technologies in Cognitive Warfare

- Both genome editing and BCI are technologies that enhance cognitive abilities, such as decision-making, perception, and memory, and could play a significant role in cognitive warfare.

- These could be used for both offense (gaining cognitive superiority) and defense (against cognitive warfare tactics), and even for cognitive deterioriation.

- There are both technical and societal challenges to be considered in the application of these technologies in cognitive warfare.

Photo: Forsvaret

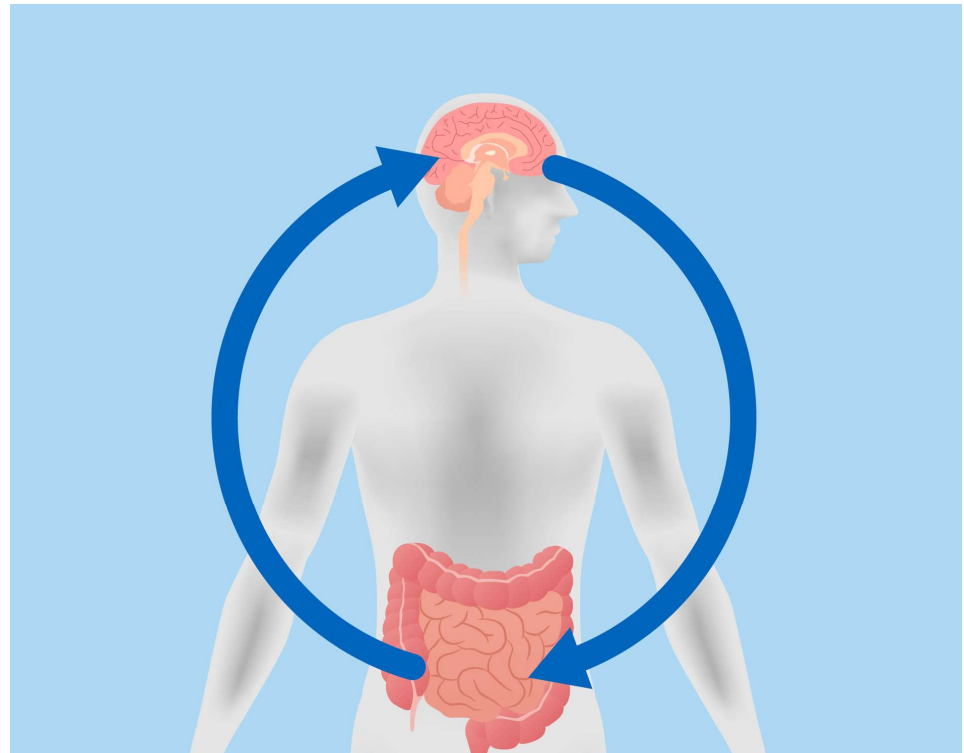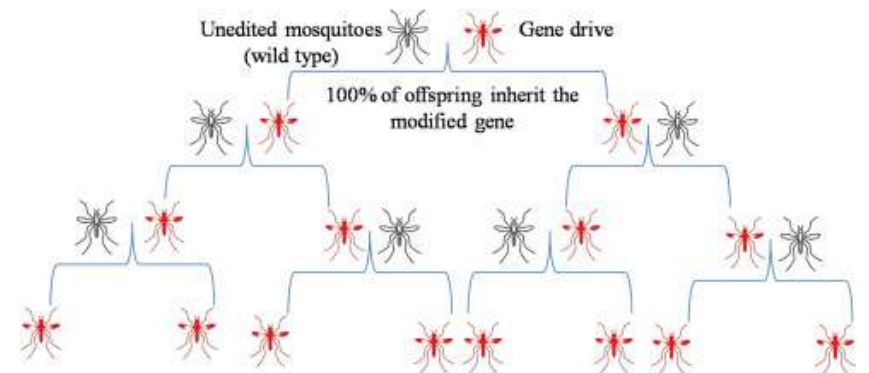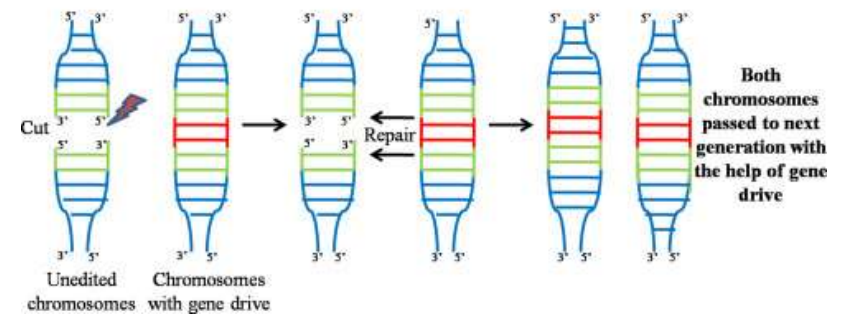# Genome editing of military personnel

Dual use of gene therapy

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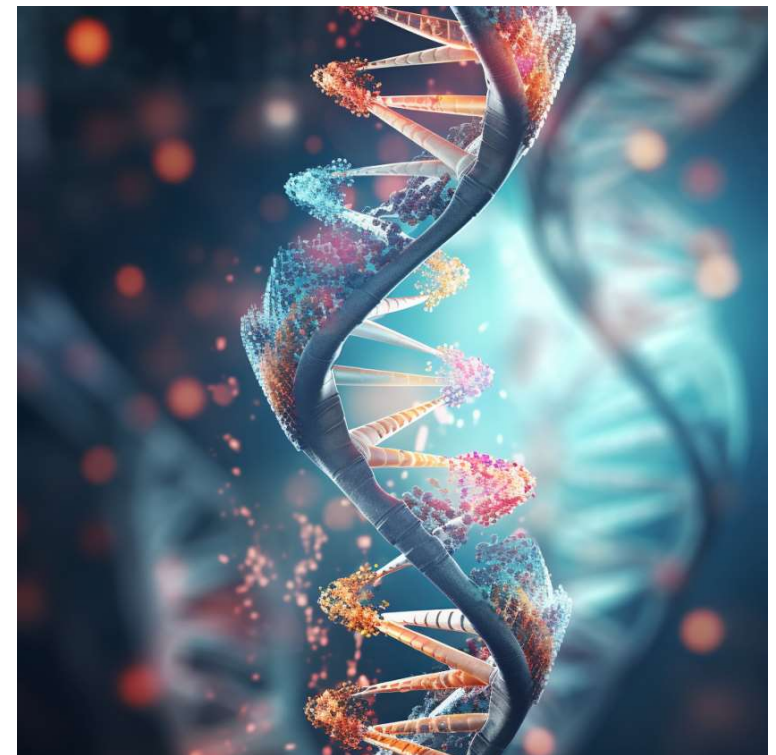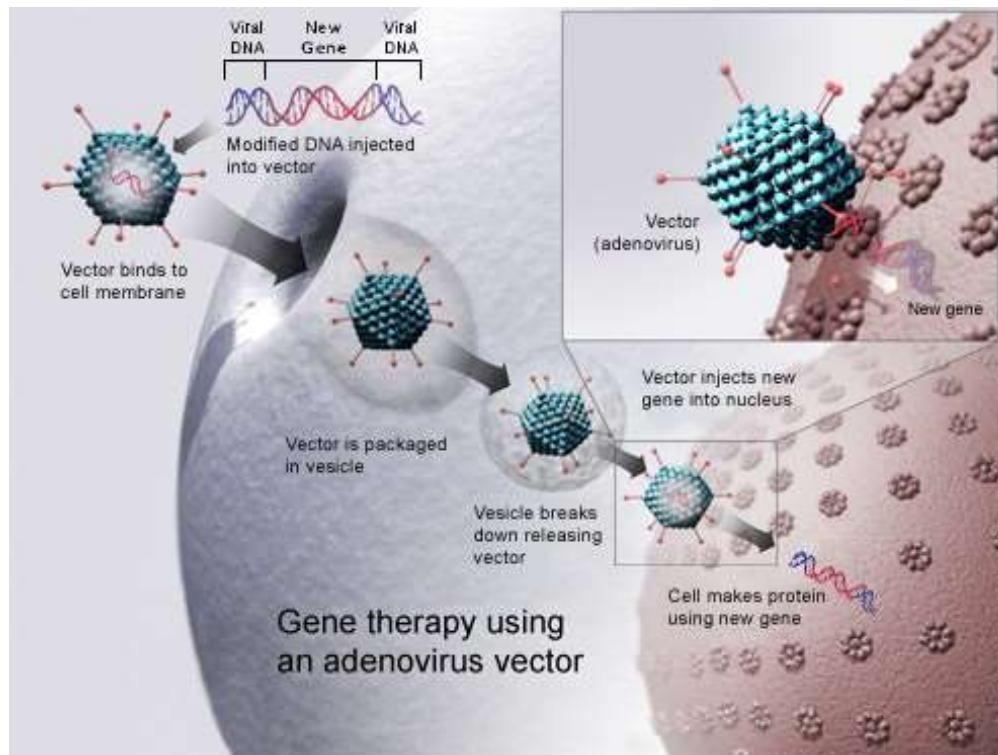
Modifying the gut microbiome
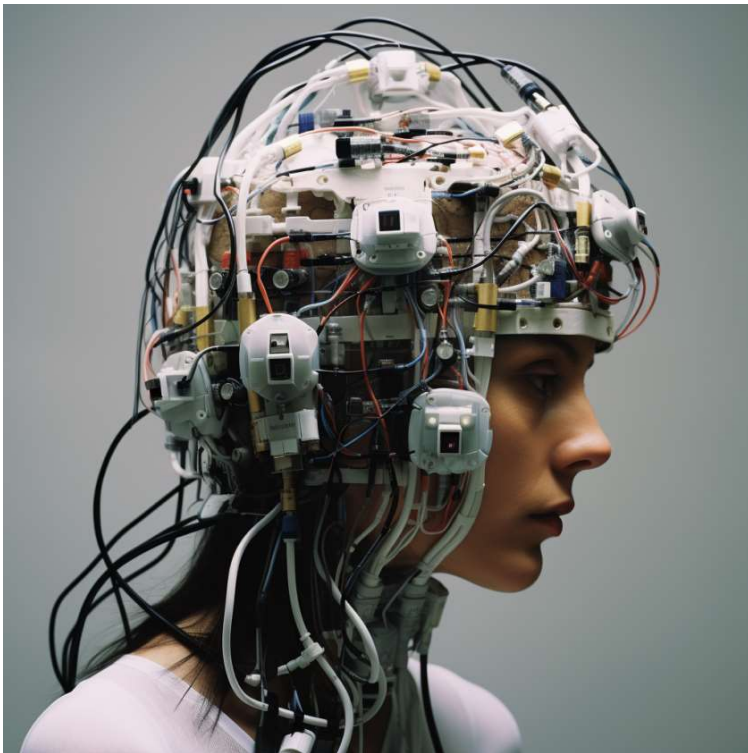
Photo: AdobeStock

Pathogen modification and gene drives

Military implications of Brain-Computer Interfaces (BCIs)

FFI

BCIs and Cognitive Warfare

Conclusions

Technological Maturity
- BCI > GE
- Health sector increasing maturity
- Traits controlled by multiple genes
- BCI has a security challenge

Ethical Barriers
- Both potential use in CogW
- GE > BCI
- Germline editing difficult
- Privacy, inequality, irreversible
- Private companies and responsibility

The Way Forward
- Regulatory strategies
- Public Inclusion
- Equitable Distribution
- Continuous Public Dialogue