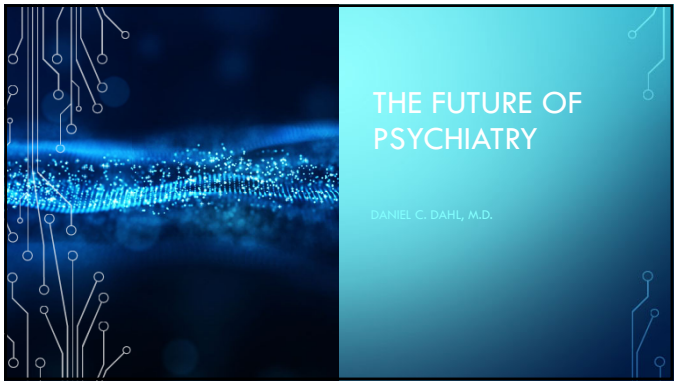


# THE FUTURE OF PSYCHIATRY

DANIEL C. DAHL, M.D.

## DISCLOSURES FOR DANIEL C. DAHL, M.D.

- None

## OUTLINE

- A. Introduction
- B. Films predicting the future
- C. Predictions and Discussion

## MOVIES

## MOVIES ABOUT THE FUTURE

STAR TREK

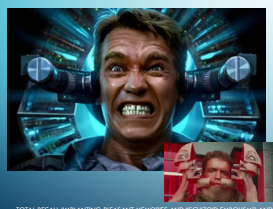
## MOVIES ABOUT THE FUTURE

READY PLAYER ONE (VIRTUAL REALITY TO ESCAPE THE WORLD); ALITA: BATTLE ANGEL (CYBORGS)

## MOVIES PREDICTING THE FUTURE

MINORITY REPORT AND WESTWORLD (PRECRIME DIVISION PREDICTING AND ARRESTING FUTURE CRIMINALS; FUTURISTIC AMUSEMENT PARK TO GATHER DATA, TODD ITT)

## MOVIES ABOUT THE FUTURE



TOTAL RECALL (IMPLANTING PLEASANT MEMORIES AND "SCHIZOID EMBOLISM") AND AVATAR (PARAPLEGIC MARINE UPLOADS CONSCIOUSNESS INTO A SYNTHETIC BODY)

## MOVIES ABOUT THE FUTURE

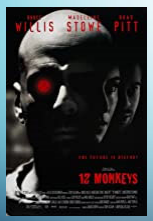
GATTACA (GENETIC ENGINEERING/EUGENICS. EMBRYOS ALTERED BY GENETIC ENGINEERING ARE "I-VALID") AND BLADE RUNNER (BIOENGINEERED HUMANS OR REPLICANTS AND THEIR RIGHTS. REPLICANTS CAN REPRODUCE)

## MOVIES ABOUT THE FUTURE

ROBOCOP (POLICE OFFICER HAS HIS CONSCIOUSNESS PLACED IN A ROBO-SUIT) AND HER (FALLING IN LOVE WITH AI)

## MOVIES ABOUT THE FUTURE

THE MATRIX (COMPUTER GENERATED WORLD ROBOTS USE TO KEEP HUMANS SUBDUED. RED OR BLUE PILL) AND A CLOCKWORK ORANGE (FORCED AVERSION THERAPY)



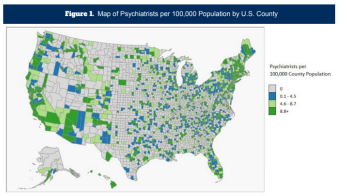


MAN-MADE VIRUS TAKES OVER; HUMAN QUALITIES OF HUMANOID AI


## WORKFORCE

Figure 1 shows the relative concentration of psychiatrists per 100,000 population for all U.S. counties. The highest concentrations of psychiatrists could be found along the pacific coast and within the northeast. Large swaths of counties without psychiatrists were found throughout the center, northern, and southern states.

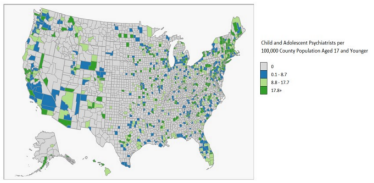
**Figure 1.** Map of Psychiatrists per 100,000 Population by U.S. County




HTTPS://WWW.BEHAVIORALHEALTHWORKFORCE.ORG/WP-CONTENT/UPLOADS/2019/02/Y3-FA2-F2-PSYCH-SUB_FULL-REPORT-FINAL2.19.2019.PDF

Like psychiatrists, CAPs were mostly concentrated on the Pacific coast and within the northeast (Figure 2). Counties without any CAPs were spread throughout most of the middle of the country, predominately in non-metropolitan areas.

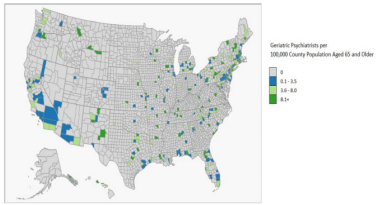
**Figure 2.** Map of Child & Adolescent Psychiatrists per 100,000 Population Under Age 18 by U.S. County




HTTPS://WWW.BEHAVIORALHEALTHWORKFORCE.ORG/WP-CONTENT/UPLOADS/2019/02/Y3-FA2-P2-PSYCH-SUB_FULL-REPORT-FINAL2.19.2019.PDF

Figure 3 shows the relative concentration of geriatric psychiatrists per 100,000 population aged 65 and older for all U.S. counties. The highest concentrations of GPs could be found within the northeast.

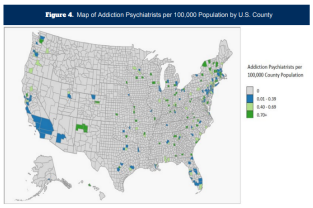
**Figure 3.** Map of Geriatric Psychiatrists per 100,000 Population Over Age 64 by U.S. County




HTTPS://WWW.BEHAVIORALHEALTHWORKFORCE.ORG/WP-CONTENT/UPLOADS/2019/02/Y3-FA2-P3-PSYCH-SUB_FULL-REPORT-FINAL2.19.2019.PDF

Figure 4 shows the relative concentration of addiction psychiatrists per 100,000 residents for all U.S. counties. The highest concentrations of APs could be found within the northeast.

**Figure 4.** Map of Addiction Psychiatrists per 100,000 Population by U.S. County




12 | December 2018

BEHAVIORAL HEALTH WORKFORCE RESEARCH CENTER

HTTPS://WWW.BEHAVIORALHEALTHWORKFORCE.ORG/WP-CONTENT/UPLOADS/2019/02/Y3-FA2-P3-PSYCH-SUB_FULL-REPORT-FINAL2.19.2019.PDF

## AAMC: ADDRESSING THE ESCALATING PSYCHIATRIST SHORTAGE (FEBRUARY 2018)

- "The shortage of psychiatrists is an escalating crisis," notes the physician search firm Merritt Hawkins in a 2017 report. "[The gap is] of more severity than shortages faced in virtually any other specialty."
- What's more, the need for treatment is expected to rise as the number of psychiatrists falls. In 2025, demand may outstrip supply by 6,090 to 15,600 psychiatrists, according to a 2017 National Council for Behavioral Health report that explores the shortage's causes and suggests solutions.
- A number of factors fuel the shortage, including a greater awareness of mental health problems that has spurred people to seek treatment. Also, mental health providers frequently are reimbursed less than physical health providers, a 2017 report notes, leaving institutions sometimes struggling to cover salaries. And then there's a retirement drain: More than 60% of practicing psychiatrists are over the age of 55—one of the highest proportions among all specialties, AAMC 2015 data indicate.

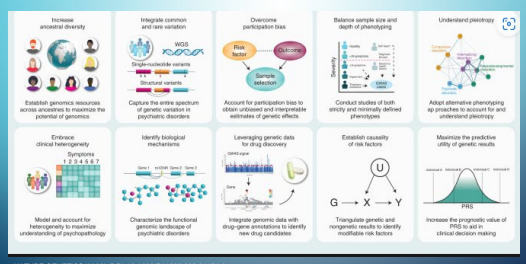
HTTPS://WWW.AAMC.ORG/NEWS-INSIGHTS/ADDRESSING-ESCALATING-PSYCHIATRIST-SHORTAGE

## GENETICS

## GENETICS

- Scientists have discovered hundreds, and in some cases, thousands of genes linked to the full range of mental health conditions, including anxiety, depression, anorexia nervosa, schizophrenia, bipolar disorder, autism spectrum disorder, and ADHD. **This has been made possible thanks to new genetic data sets of DNA donated by millions of people, and advancements in supercomputing technology.**

*NATURE GENETICS* (2022). DOI: 10.1038/S41588-022-01174-0




*NATURE GENETICS* (2022). DOI: 10.1038/S41588-022-01174-0

## SCHIZOPHRENIA GENETICS

- A previous genetic study of schizophrenia risk found common variation to be present in **270** different locations across the genome, primarily in areas that impact the regulation of genes. Other past genetic studies of schizophrenia identified ultra-rare genetic variations that confer substantial risk for this mental disorder, although more studies are needed to definitively confirm these findings.

MAPPING GENOMIC LOCI IMPLICATES GENES AND SYNAPTIC BIOLOGY IN SCHIZOPHRENIA | NATURE

## SCHIZOPHRENIA GENETICS

- Schizophrenia has a heritability of 60–80%, much of which is attributable to common risk alleles. Here, in a two-stage genome-wide association study of up to **76,755** individuals with schizophrenia and **243,649** control individuals, we report common variant associations at 287 distinct genomic loci. Associations were concentrated in genes that are expressed in excitatory and inhibitory neurons of the central nervous system, but not in other tissues or cell types. Using fine-mapping and functional genomic data, we identify **120 genes (106 protein-coding)** that are likely to underpin associations at some of these loci, including 16 genes with credible causal non-synonymous or untranslated region variation. We also implicate fundamental processes related to neuronal function, including synaptic organization, differentiation and transmission. Fine-mapped candidates were enriched for genes associated with rare disruptive coding variants in people with schizophrenia, including the glutamate receptor subunit *GRIN2A* and transcription factor *SP4*, and were also enriched for genes implicated by such variants in neurodevelopmental disorders. We identify biological processes relevant to schizophrenia pathophysiology; **show convergence of common and rare variant associations** in schizophrenia and neurodevelopmental disorders; and provide a resource of prioritized genes and variants to advance mechanistic studies.

MAPPING GENOMIC LOCI IMPLICATES GENES AND SYNAPTIC BIOLOGY IN SCHIZOPHRENIA | NATURE

## SCHIZOPHRENIA EXOME SEQUENCING META-ANALYSIS (SCHEMA) CONSORTIUM

- In the current analysis, researchers used SCHEMA data to examine the coding sequences in the genome of **24,248** people with schizophrenia and **97,322** people without schizophrenia located across seven continents.
- The researchers found that the functions of the genes affected by the ultra-rare variants included those involved in:
- The movement of charged particles into and out of cells and synaptic functioning (*CACNA1G, GRIN2A,* and *GRIA3*)
- The control of transcription—the copying of instructions coded in DNA that are used to make proteins (*SP4, RB1CC1, and SETD1A*)
- The movement and growth of neurons during development (*TRIO*)
- The movement of substances into and out of the nucleus of cells (*XPO7*)
- The modification of proteins by adding ubiquitin, which helps tell the cell where the protein should go (*CUL1* and *HERC1*).
- Ultra-rare genetic variations found in GRIN2A and GRIA3 provide support for the hypothesis that disruptions of the **glutamatergic system—a system involved in communication between neurons—may lead to the development of schizophrenia**, as GRIN2A and GRIA3 code for proteins used by glutamate receptors called NMDA and AMPA.

NEWS IN RARE GENETIC VARIATION IN 10 DISEASES REPRESENTING A MAJOR STEP FORWARD IN SCHIZOPHRENIA INSIGHTS

## MOOD DISORDER GENETICS

- To clarify the shared molecular genetic basis of major depressive disorder and bipolar disorder and to highlight disorder-specific associations, we meta-analyzed data from the latest Psychiatric Genomics Consortium genome-wide association studies of major depression (including data from 23andMe) and bipolar disorder, and an additional major depressive disorder cohort from UK Biobank (total: **185,285 cases, 439,741** controls; nonoverlapping *N* = 609,424).
- **Seventy-three** loci reached genome-wide significance in the meta-analysis, including **15 that are novel for mood disorders**.

THE GENETICS OF THE MOOD DISORDER SPECTRUM: GENOME-WIDE ASSOCIATION ANALYSES OF MORE THAN 185,000 CASES AND 439,000 CONTROLS | BIOLPSYCHIATRY

**Fig. 1: Barriers to genetic testing in clinical psychiatry settings and recommendations on how to overcome them.**

| Barriers | Recommendations |
|---|---|
| Methodological | |
| • Applicability and generalization across populations<br>• Inequities in health provision | • Translation of group level findings to individual risk prediction metrics<br>• Fostering of international, cross-population collaborations<br>• Making summary statistics publicly available |
| Implementational | |
| • Perceived lack of cost-effectiveness<br>• Coverage of costs<br>• Facilities needed for implantation | • Informing policy makers and insurers about genetic research findings<br>• Implementation of projects and genetic testing/counseling clinics<br>• Large-scale international collaborations and sharing resources between institutions |
| Clinicians' knowledge, attitudes, and practices | |
| • Perceived lack of utility<br>• Lack of knowledge, experience, and education<br>• Lack of incorporation of genetic etiology into most psychiatric diagnostic systems | • Improved and intensified training programs<br>• Interdisciplinary collaborations<br>• Adding genetic etiology as specifier to our diagnostic systems and inclusion of genetic testing in diagnostic work-up |
| Potential harms of genetic testing | |
| • Psychological distress for patients and family members<br>• Possible negative impact on self-perception, perceived control, stigmatization, and discrimination | • More research focused on genetic testing and counseling outcomes, including quality of life |
| Ethical concerns of clinicians, patients, and families | |
| • Ethical, social, and cultural issues<br>• Inequalities between low-, middle-, and high-income countries<br>• Possible mental incompetence | • Development of guidelines with special considerations for psychiatric disorders<br>• Implementation of moral case deliberation sessions in clinical guidelines |
| Access to genetic counseling and understand of risk by patients | |
| • Low uptake of genetic counseling services<br>• Limited availability of genetic counseling services<br>• Possible misunderstanding of findings | • Increased involvement of patients and families in the development, implementation, and evaluation of genetic testing<br>• Broad access to genetic counseling |

BARRIERS TO GENETIC TESTING IN CLINICAL PSYCHIATRY AND WAYS TO OVERCOME THEM: FROM CLINICIANS' ATTITUDES TO SOCIOCULTURAL DIFFERENCES BETWEEN PATIENTS ACROSS THE GLOBE | TRANSLATIONAL PSYCHIATRY (NATURE.COM)

## CRISPR CLINICAL TRIALS in 2023

- 10th Anniversary
- CRISPR can be used as a therapeutic platform technology in the clinic
- We're also learning that this platform can be an approved medicine.
- The third shift is the growth of the clinical CRISPR ecosystem, that is, the variety of different types of CRISPR-based genome editing that are being used in research and in patients.

CRISPR CLINICAL TRIALS: A 2023 UPDATE - INNOVATIVE GENOMICS INSTITUTE (IGI)

## CRISPR

## CRISPR CLINICAL TRIALS in 2023

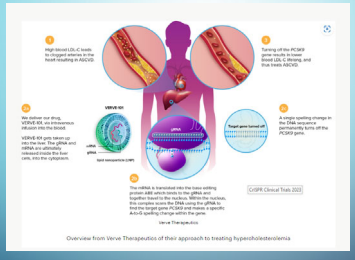
- Sickle Cell and Beta Thalassemia (Activating HbF vs changing mutation)
- Leukemias and Lymphomas (CAR-T cells; autologous vs allogenic; avoid immune response)
- Genetic Blindness
- Diabetes (Pancreatic stem cells in a pouch edited to avoid immune response)
- Chronic Infection (Bacteriophages that attack genome of E. Coli -95% of UTIs)
- Protein-Folding Disease (Hereditary Transthyretin Amyloidosis mutation in single DNA letter in gene TTR; similar to Alzheimer's and Parkinson's Diseases)

CRISPR CLINICAL TRIALS: A 2023 UPDATE - INNOVATIVE GENOMICS INSTITUTE (IGI)

## CRISPR CLINICAL TRIALS 2023

- Inflammatory Disease (Hereditary Angioedema; break the hATTR gene in the liver using a lipid nanoparticle to deliver therapy)
- CV Disease (Familial Hypercholesterolemia using base editing so no double stranded break)
- HIV (Targets HIV DNA sequence stored in host cell genome. Cuts two sites within HIV genome)
- Muscular Dystrophy (Duchenne Muscular Dystrophy X-linked; first death associated with a CRISPR clinical trial)

CRISPR CLINICAL TRIALS: A 2023 UPDATE - INNOVATIVE GENOMICS INSTITUTE (IGI)




Overview from Verve Therapeutics of their approach to treating hypercholesterolemia

CRISPR CLINICAL TRIALS: A 2023 UPDATE - INNOVATIVE GENOMICS INSTITUTE (IGI)

## QUANTUM COMPUTING

## QUANTUM COMPUTING

- New research published in *Nature Physics* by collaborating scientists from Stanford University in the U.S. and University College Dublin (UCD) in Ireland has shown that a novel type of **highly-specialized analog computer, whose circuits feature quantum components,** can solve problems from the cutting edge of quantum physics that were previously beyond reach. When scaled up, such devices may be able to shed light on some of the most important unsolved problems in physics.

NEW ANALOG QUANTUM COMPUTERS TO SOLVE PREVIOUSLY UNSOLVABLE PROBLEMS (PHYS.ORG)


QUANTUM COMPUTING ADVANCE BEGINS NEW ERA, IBM SAYS - THE NEW YORK TIMES (NYTIMES.COM)

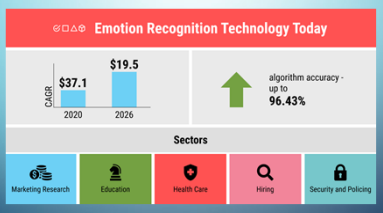
## QUANTUM COMPUTING

- Quantum computing promises to offer substantial speed-ups over its classical counterpart for certain problems. However, the greatest impediment to realizing its full potential is **noise** that is inherent to these systems. The widely accepted solution to this challenge is the implementation of **fault-tolerant** quantum circuits, which is out of reach for current processors. Here we report experiments on a noisy 127-qubit processor and demonstrate the measurement of accurate expectation values for circuit volumes at a scale beyond brute-force classical computation. We argue that this represents evidence for the utility of quantum computing in a pre-fault-tolerant era.

EVIDENCE FOR THE UTILITY OF QUANTUM COMPUTING BEFORE FAULT TOLERANCE | NATURE

## DIGITAL PHENOTYPES

## AI EMOTION RECOGNITION



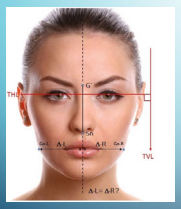

AI IN EMOTION RECOGNITION: CAN AI DETECT EMOTIONS IN ARE YOUR DATA COMI

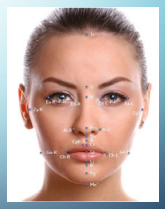
## MACHINE LEARNING ANALYSIS OF LINGUISTIC AND ACOUSTIC CHARACTERISTICS TO IDENTIFY SUICIDAL SUBJECTS

- Death by suicide demonstrates profound personal suffering and societal failure. While basic sciences provide the opportunity to understand biological markers related to suicide, computer science provides opportunities to understand suicide thought markers. In this novel prospective, multimodal, multicenter, mixed demographic study, we used machine learning to measure and fuse two classes of suicidal thought markers: verbal and nonverbal. Machine learning algorithms were used with the subjects' words and vocal characteristics to classify 379 subjects recruited from two academic medical centers and a rural community hospital into one of three groups: suicidal, mentally ill but not suicidal, or controls. **By combining linguistic and acoustic characteristics, subjects could be classified into one of the three groups with up to 85% accuracy.** The results provide insight into how advanced technology can be used for suicide assessment and prevention.

A MACHINE LEARNING APPROACH TO IDENTIFYING THE THOUGHT MARKERS OF SUICIDAL SUBJECTS: A PROSPECTIVE MULTICENTER TRIAL - POESTIAN - 2017 - SUICIDE AND LIFE-THREATENING BEHAVIOR - WILEY ONLINE LIBRARY

## FACIOMETRICS



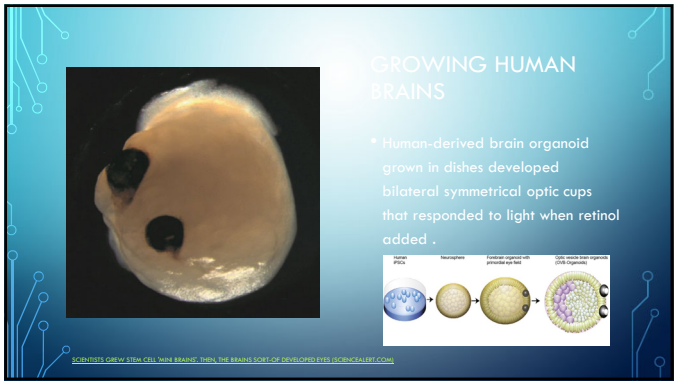


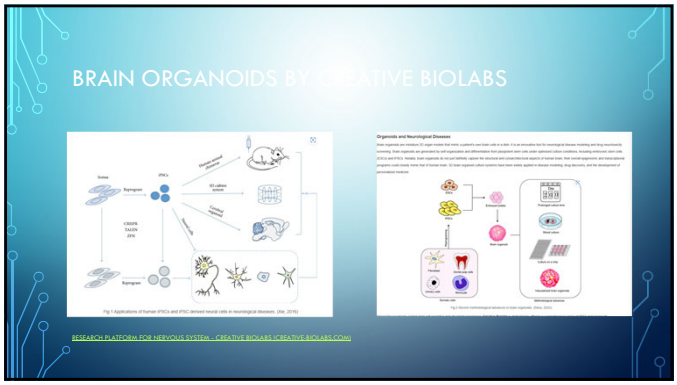
FACIOMETRICS: A PRACTICAL GUIDE FOR ORTHOFACIAL HARMONIZATION | MATHEWSOPENACCESS.COM

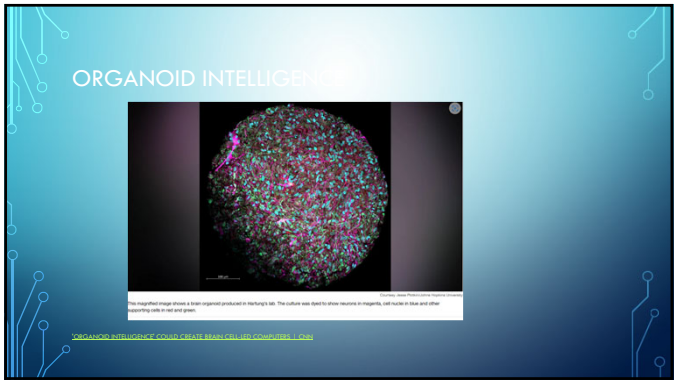
## AI EMOTION ANALYSIS: VISO COMPANY

- There is a common discrepancy of accuracy when testing on controlled environment databases compared to wild environment databases. Hence, it is difficult to translate the good results in controlled environments (JAFFE, etc.) to uncontrolled environments (SFEW, FER-2013, etc.). For example, a model obtaining 98.9% accuracy on the CK+ database only achieves 55.27% on the SFEW database. This is mainly due to head pose variation and lighting conditions in real-world scenarios.
- The classification accuracy of different methods of emotion analysis can be compared and benchmarked using a large-scale dataset such as the FI with over 3 million weakly labeled images.
- **Algorithm #1:** SentiBank (Hand-crafted), 49.23%
- **Algorithm #2:** Zhao et al. (Hand-crafted), 49.13%
- **Algorithm #3:** AlexNet (CNN, fine-tuned), 59.85%
- **Algorithm #4:** VGG-16 (CNN, fine-tuned) 65.52%
- **Algorithm #5:** ResNet-50 (CNN, fine-tuned) 67.53%
- **Algorithm #6:** MidrNet, 65.23%
- **Algorithm #7:** WILDCAT, 67.03%
- **Algorithm #8:** WSCNet, 70.07%

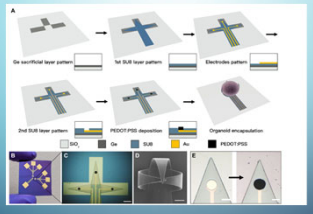
AI EMOTION AND SENTIMENT ANALYSIS WITH COMPUTER VISION IN 2022 - VISO.AI


GROWING HUMAN BRAINS
• Human-derived brain organoid grown in dishes developed bilateral symmetrical optic cups that responded to light when retinol added .
SCIENTISTS GREW STEM CELL 'MINI BRAINS' THEN, THE BRAINS SOUT-OF DEVELOPED EYES (SCIENCEALERT.COM)


BRAIN ORGANOIDS BY CREATIVE BIOLABS
RESEARCH PLATFORM FOR NERVOUS SYSTEM - CREATIVE BIOLABS (CREATIVE-BIOLABS.COM)


ORGANOID INTELLIGENCE (OCOID) CREATE BRAIN CREATED COMPUTERS (LCNR)

## SHELL MICROELECTRODE ARRAYS (MEAS) FOR BRAIN ORGANOIDS



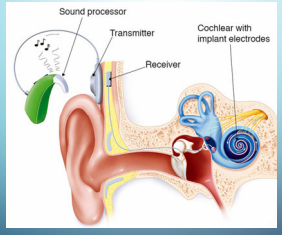
SHELL MICROELECTRODE ARRAYS (MEAS) FOR BRAIN ORGANOIDS | SCIENCE ADVANCES

## BIOCOMPUTERS

- He (Dr. Thomas Hartung) and his colleagues envision combining the power of brain organoids into a type of biological hardware more energy efficient than supercomputers. These **"biocomputers" would employ networks of brain organoids** to potentially revolutionize pharmaceutical testing for diseases like Alzheimer's, provide insight into the human brain and change the future of computing.

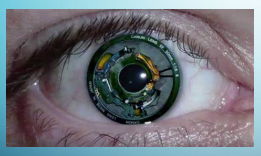
'ORGANOID INTELLIGENCE' COULD CREATE BRAIN CELL-LED COMPUTERS | CNN

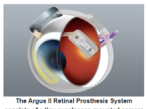
## COCHLEAR IMPLANTS




COCHLEAR IMPLANTS - NIDCD IMAGES

## BIONIC EYE IMPLANT (ONLY FDA APPROVED-ARGUS II)

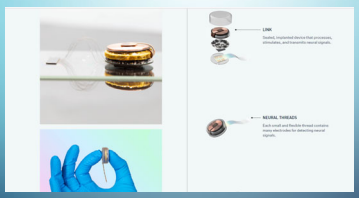




The Argus II Retinal Prosthesis System consists of a tiny eyeglasses-mounted camera and a transmitter that wirelessly sends signals to an electrode array that is implanted onto the damaged retina of a blind person.

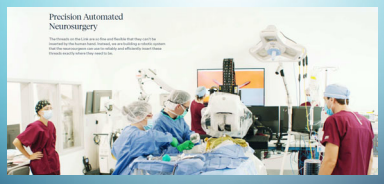
VISUAL IMPLANTS HUMANS - BING IMAGES, EYE IMPLANTS BIONIC EYES, LENSES AND PROSTHETIC EYES (ALLABOUTVISION.COM)

## NEURALINK



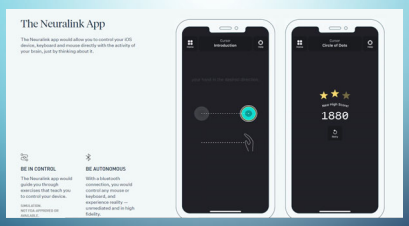

APPROACH - NEURALINK

## NEURALINK




APPROACH - NEURALINK

## NEURALINK




APPROACH – NEURALINK (1024 ELECTRODES/BRAIN COMPUTER INTERFACE)

## NEURALINK PRIME STUDY

Announcement • September 19, 2023

### Neuralink's First-in-Human Clinical Trial is Open for Recruitment

We are happy to announce that we've received approval from the reviewing independent institutional review board and our first hospital site to begin recruitment for our first-in-human clinical trial. The PRIME Study (short for **P**recise **R**obotically **I**mplanted Brain-Computer Interface) – a groundbreaking investigational medical device trial for our fully-implantable, wireless brain-computer interface (BCI) – aims to evaluate the safety of our implant (N1) and surgical robot (R1) and assess the initial functionality of our BCI for enabling people with paralysis to control external devices with their thoughts.

NEURALINK'S FIRST-IN-HUMAN CLINICAL TRIAL IS OPEN FOR RECRUITMENT | BLOG | NEURALINK

## BRAIN-MACHINE INTERFACE COSTS

- However, we remain years away from the widespread adoption of brain-machine interfaces.
- Development and production costs of brain chip technologies. Silicon, is too rigid to facilitate long-lasting connections with brain tissue (need polymers).
- While there are roughly 42.5 million people in the United and a further 1.3 billion people worldwide living with a significant disability, the vast majority will not be able to afford a costly intervention
- Risks of brain damage, hemorrhaging, infections, and so on. Chips will also require regular upkeep to maintain effective function,

CURRENT COSTS AND TECHNOLOGY LIMIT BRAIN-MACHINE INTERFACES (FORBES.COM)

## BRAIN MACHINE INTERFACE COMPANIES

- Neuralink (brain chip)
- Bitbrain (wearable EEG with AI)
- NextMind (Snapchat; visual cortex signals into digital commands)

AI'S NEXT FRONTIER: ARE BRAIN-COMPUTER INTERFACES THE FUTURE OF COMMUNICATION? (FORBES.COM)

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## CHAT GPT OUTLINE

- Certainly! Here's a 20-point outline on the potential future of psychiatry:

1. **Personalized Psychiatry**:
2. **Integration of Neuroscience**:
3. **Technological Innovations**:
4. **Telepsychiatry**:
5. **Digital Therapeutics**:
6. **Early Intervention**:
7. **Psychedelic Research**:

CHATGPT (OPENAI.COM)

## CHAT GPT OUTLINE

1. Microbiome and Mental Health:
2. Improved Training:
3. Holistic Approaches:
4. Enhanced Imaging Techniques:
5. AI and Machine Learning:
6. Ethical Considerations:
7. Integration with General Medicine:

CHATGPT.OPENAI.COM

## CHAT GPT OUTLINE

1. Community Psychiatry:
2. Global Mental Health:
3. Stigma Reduction:
4. Focus on Wellness and Prevention:
5. Collaborative Care Models:

CHATGPT.OPENAI.COM

## ETHICAL QUESTIONS

## ETHICAL QUESTIONS

- Genetic Engineering
  - Should we edit the human germline?
  - Is it ethical to select for certain traits?
  - How do we ensure equitable access to these technologies?
- Brain Computer Interfaces
  - How do we address privacy concerns with direct brain access?
  - Who owns the data generated from a person's brain?

## ETHICS

- 3D Printed Organs and Prosthetics
  - Who gets priority access?
  - Is it ethical to enhance human capabilities?
- Smart Drugs
  - Should there be limits on who can access these drugs?
  - How to handle Societal pressure (stimulants)

## ETHICS

- Brain Organoids
  - Consciousness Concerns
  - Use in animals (human brain in other animals)
- Genetic Engineering
  - Playing God?
  - Long-term effects
  - Discrimination
  - Consent
  - Biodiversity

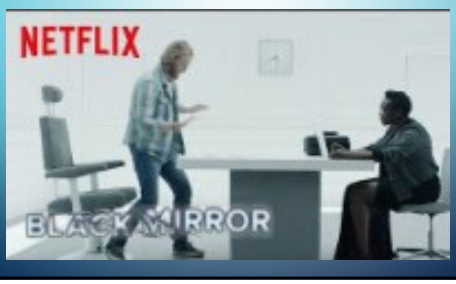
## AI ETHICS

- Regulation
- Transparency
- Bias
- Privacy
- Human in the loop (HITL)
- Economics (job losses, retraining)
- Merging AI with human cognition

## AI ETHICS

- Accountability
- Existential Concerns
- Cultural Considerations

BLACK MIRROR

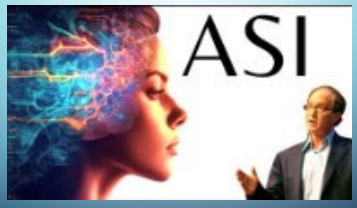




TIMELAPSE OF FUTURE TECH 2022-4000+

[4K] TIMELAPSE OF FUTURE TECHNOLOGY: 2022 - 4000+ - YOUTUBE

## KURWEIL PREDICTIONS



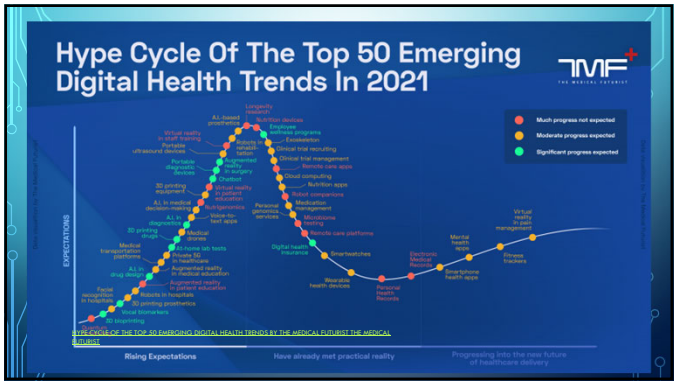

(2455) SINGULARITY AI RAY KURZWEIL REVEALS FUTURE TECH TIMELINE TO 2100 - YOUTUBE

## GEOFFREY HINTON QUIT GOOGLE OVER DANGERS


(2460) WHY 'GODFATHER OF AI' GEOFFREY HINTON QUIT GOOGLE | DANGERS OF ARTIFICIAL INTELLIGENCE EXPLAINED - YOUTUBE

## GENE EDITITING


(2460) THE FUTURE OF GENE EDITED HUMANS (DOCUMENTARY) - YOUTUBE




## APA AND AI

- The Basics of Augmented Intelligence: Some Factors Psychiatrists Need to Know Now: https://www.psychiatry.org/news-room/apa-blogs/the-basics-of-augmented-intelligence
- AI in Psychiatry: What APA Members Need to Know, August session of Policy and Practice Insights Series: https://www.psychiatry.org/Psychiatrists/Meetings/Policy-Practice-Insights-Webinar-Series/Policy-Practice-Insights-Series-Recordings

ABBY WORTHEN OF APA

## APA PROPOSED POSITION STATEMENT ON AUGMENTED INTELLIGENCE

- Patients must be informed, in a culturally and linguistically appropriate way, if clinical decisions are being driven by AI.
- AI must safeguard protected health information and that information should not be used for unauthorized purposes.
- AI used in health care should be labeled as AI-driven and be categorized into: "minimal," "medium," "high," and "unacceptable" risk to patients.

## APA PROPOSED POSITION STATEMENT ON AUGMENTED INTELLIGENCE

- AI must incorporate existing evidence-based practices and standards of care and AI developers should be held accountable and liable for injury caused by their failure to do so, as well as for technology failures.
- Research about AI must include investigation into and solutions for algorithmic bias, ethical use, mental health equity, public trust, and effectiveness.

## GROUP PREDICTIONS

- Dystopian vs. Utopia

## PREDICTIONS

## CONCLUSIONS/PREDICTIONS

- More CRNPs/PAs part of the team
- More Collocated/Collaborative Care
- Rise of Digital Health in all areas of Medicine with 10% of physicians working for Google, Amazon or Apple in 10 years. 50% in 20 years.
- Therapy will become a bigger part of Psychiatry
- Heads Up Display for Clinicians

## CONCLUSIONS/PREDICTIONS

- AI part of each medical visit in 10 years
- Full genome available on all patients within 10 years driving drug development and prescribing
- 3D pills acting on 10+ sites within 10 years
- Neuralink type chips commonplace in 10 years
- Non-compliance decreased through taxes and insurance rates

## CONCLUSIONS/PREDICTIONS

- Individual quantum computer available to public in 10 years.
- Psychedelic drugs in common use
- Addiction to Virtual Reality commonplace
- Cures for common medical illnesses in 25 years with average lifespan of 125 years
- Designer life commonplace in 20 years