



BrainCo

INTRODUCTION

Real-time Brainwave Feedback and Visualization;
The Future of Functional Prosthetics

*Developed by scientists from **Harvard University**,
incubated in the **Harvard Innovation Lab***



「 Boston · Beijing · Shenzhen · Hangzhou 」

Part 1

ABOUT BRAINCO

An Award-Winning Technology Company

BrainCo, incubated in the Harvard Innovation Lab, develops brain-machine interface (BMI) technology products. BrainCo applies its expertise in machine learning, design, and neuroscience to create innovative brain-based applications in the education, fitness, and wellness spaces.

Awards

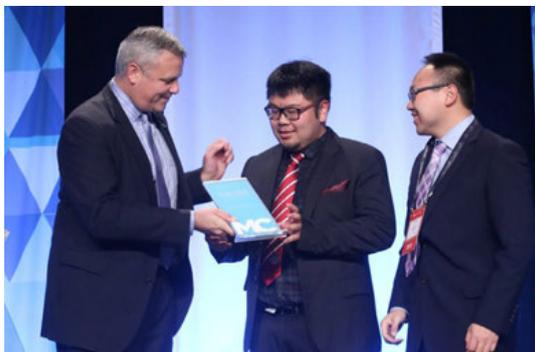
In 2016 BrainCo, a VIP team in the Harvard Innovation Lab, was a Gold Winner at MassChallenge, one of the world's largest accelerators. In 2017, BrainCo won the Most Innovative Award at the International Society for Technology in Education (ISTE) Conference and several other venture competitions. In 2018, BrainCo's founder and CEO, Bicheng Han, was part of Forbes China 30 Under 30, as well as the MIT Technology Review 35 Innovators Under 35 in China.

Impact

BrainCo's products are being used in the USA, Brazil, China, Spain, and throughout Latin America. Our partners around the world use BrainCo's technology to improve education and wellness outcomes.

BrainCo has been a major draw at the International Consumer Electronics Show (CES) for four consecutive years, and has been featured by over 100 major media outlets, including CNN, BBC, Thomson Reuters, Forbes, CNBC, USA Today, AFP, Fox 5, Discovery News, and Yahoo Tech. BrainCo was named one of the "2018 Cool Gadgets that Tease the Future" by CNN and "2017 CES highlights" by AFP. BrainCo was the only startup listed in "8 Takeaways 2016 Consumer Electronics Show", alongside Samsung, Google and other industry-leading companies.

BrainCo has participated in several well-known shows internationally, including CNN Mexico, Spain's Antena 3, the BBC, and an episode of the Chinese TV show "My Future" which attracted more than 300 million views.



Bicheng Han, CEO and Founder, receives a Gold Award at MassChallenge



Max Newlon, President of BrainCo USA, being interviewed on CNN Mexico

BRAINCO'S TEAM

Over 120 team members including Harvard- and MIT-educated scientists and engineers

CORE MEMBERS



Bicheng Han | CEO and Founder
Ph.D. Candidate at Harvard Center for Brain Science
Mr. Han has spent years developing medical equipment and is the owner of several patents associated with his inventions and has conducted neuroscience research in leading scientific institutions in the US and South Korea. He was included in Forbes 30 under 30 and MIT Technology Review 35 under 35.



Max Newlon | President of BrainCo USA
Master's from Harvard Graduate School of Education
Mr. Newlon has years of neuroscience research experience at Beth Israel Deaconess and Massachusetts General Hospital and as a manager for a leading medical education company. He was lead coordinator for a \$1 million IARPA study on cognitive enhancement.



Lawrence Franchini | VP of Sales
Mr. Franchini has spent the past 20 years in multiple sales and operational leadership roles throughout Verizon. He led Retail, B2B, Authorized Agents, and National Retail channels to award winning performance for over 18 years. He was directly responsible for all sales, operations, financial performance and overall customer experience in those areas.



Samuel Prentice | Algorithm Scientist
Ph.D. Candidate at MIT Computer Science and Artificial Intelligence Lab (MIT CSAIL) Mr. Prentice is one of the world's leading scientists in algorithmic research, artificial intelligence, and machine learning. He worked at NASA, and was a lead researcher on DARPA-funded robotics projects.



Wasifa Jamal | Senior Research Scientist, Ph.D.
Former Postdoctoral Associate in MIT's Department of Brain and Cognitive Sciences (BCS) Dr. Jamal has over a decade of experience in signal processing, EEG processing, machine learning, computational neuroscience, complex networks, and statistical analysis. She served as the MIT Postdoctoral Association president.

ADVISORS



James Ryan | BrainCo Advisor, former Dean of the Harvard Graduate School of Education, and President of University of Virginia
Mr. Ryan is a world-renowned expert on law and education. He has written articles to address topics such as school choice, standards and testing, pre-K, and the intersection of special education and neuroscience. He received his A.B., summa cum laude, from Yale University and his J.D. from the University of Virginia. Despite being in high demand for his expertise, BrainCo is the only company Mr. Ryan has ever agreed to advise for.



Mouhsin Shafi | BrainCo Advisor, MD/Ph.D. in Medicine and Neuroscience at the University of California, Los Angeles School of Medicine
Dr. Shafi is an instructor and clinician-scientist at Beth Israel Deaconess Medical Center. He completed his Neurology residency at Massachusetts General Hospital (MGH) and Brigham and Women's Hospital in 2010, followed by a 2-year Clinical and Research Fellowship in Epilepsy and Clinical Neurophysiology at MGH.

Part 2

TECHNOLOGY

Scientific Foundation

Electroencephalography (EEG) technology has been widely used in research and clinical settings for a variety of cognitive functions. Our own studies, as well as decades of EEG research, have shown that brainwave frequency bands are correlated with various brain functions, giving us insight into different states of mind.

BrainCo's Focus1 wearable detects user's brainwaves and compares different frequency bands including beta, alpha, and theta brainwaves. Faster frequencies (like beta) tend to be associated with greater focus, and lower frequencies (like theta) are associated with relaxation or meditation. When we see the desired brain state we give positive feedback to reinforce it and empower users to attain their goals. This type of training has been shown to change the function and structure of the brain. It can also significantly improve attention abilities and learning efficiency. All this works through the principle of neuroplasticity, where deliberate practice helps form new neural connections, which supports the desired changes in brain activity.

References:

Anguera, J. A., Boccanfuso, J., Rintoul, J. L., Al-Hashimi, O., Faraji, F., Janowich, J., ... & Gazzaley, A. (2013). Video game training enhances cognitive control in older adults. *Nature*, 501(7465), 97-101.

Lévesque, J., Beauregard, M., & Mensour, B. (2006). Effect of neurofeedback training on the neural substrates of selective attention in children with attention-deficit/hyperactivity disorder: A functional magnetic resonance imaging study. *Neuroscience letters*, 394(3), 216-221.

Sitaram, R., Ros, T., Stoeckel, L., Haller, S., Scharnowski, F., Lewis-Peacock, J., ... & Birbaumer, N. (2017). Closed-loop brain training: the science of neurofeedback. *Nature Reviews Neuroscience*, 18(2), 86.



Brain-Machine Interface Hardware and Software Platform

The Focus1 wearable contains three (patented) hydrogel electrodes that can accurately detect electrical brain signals at a resolution precision greater than 1 microvolt. We use state-of-the-art AI, utilizing machine and deep learning techniques, to classify brainwave patterns. Our proprietary algorithms help users better understand their focus abilities, and our automated calibration process produces customized results for each individual.



Algorithm:

- Optimized NASA-inspired algorithm and definitive attention level index
- Advanced signal processing and feature extraction techniques

Hardware:

- Medical grade hydrogel electrodes for EEG signal detection
- Proprietary EEG signal detecting circuit board

Software:

- Systematic attention level data management platform
- Attention visualization and cognitive training games for mobile applications

Focus1 Wearable Specifications:

Weight: 95g

Head Circumference: 55-75cm Operating

Temperature: 0-40°C (32-104°F) Battery

Capacity: 400 mAh

Battery Life: Up to 4 hours

Battery Charge Time: 1-1.5 hours

Wireless Connection: Wi-Fi IEEE 802.11 b/g/n

2.4GHz Electrode Material: Hydrogel

Part 3

PRODUCTS



FocusEDU

Provides real-time student engagement to effect a better learning outcome, by empowering teachers and students.

FocusNow

At home training platform for those who want to improve their focus, meditation, and executive functions.



FocusFit

One of the world's first fitness system that uses neurofeedback techniques to help users achieve better training and competition results.

FocusFun

A revolutionary brain controlled slot car racing platform, that helps learn techniques to focus better in a fun and engaging way.



Prosthetic hand STEM Kit

Inspired by our award-winning real prosthetic hand, our kit is an excellent entry point for students to learn about robotics, prosthetics, coding, and all aspects of STEM.

BrainRobotics

Using EMG pattern recognition techniques to build smart prosthetic hands to improve the lives of amputees.





FocusEDU

The world's first integrated solution to improve learning efficiency in the classroom

"The power of focus is essential to success."

James Ryan

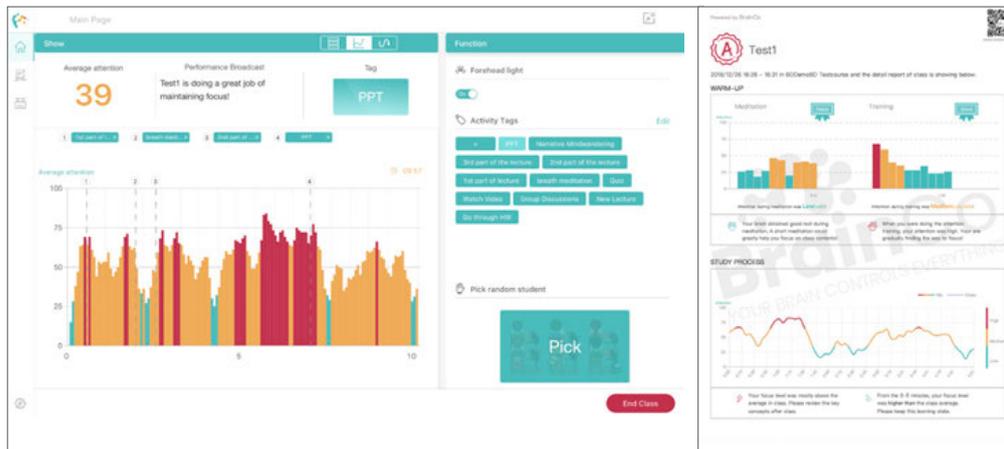
BrainCo Advisor

Former Dean of the Harvard Graduate School of Education

President of University of Virginia



How do you measure student engagement? Today teachers do their best to assess student engagement based on their own intuition and other subjective processes. BrainCo's FocusEDU provides the world's first technology that can quantify real-time student engagement in the classroom. With BrainCo's brainwave-detecting wearable and software platform, educators can track student engagement and class attention levels as they're happening. The FocusEDU platform provides insight into individual student and full classroom engagement. These tools enable educators and administrators to discover which education practices create the most engaging education environment and provides personalized data about each students' optimal learning process. Through brainwave-driven focus and relaxation training games, students can see how their efforts contribute to their own performance. Additionally, parents can see the measurable quality of their child's educational experience. Using FocusEDU, students develop ownership of their learning experience, teachers can continuously improve classroom methods, administrators can track and spread best practices, and parents can feel confident their child is getting the best education possible.



FocusNow

Cultivating efficient and focused habits through neurofeedback training and cognitive psychology

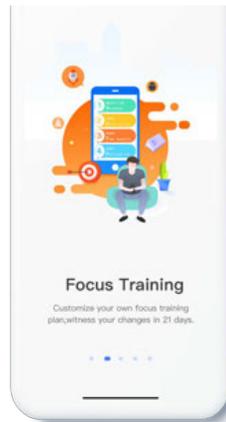


What would your day be like if you had complete control over your focus? FocusNow can help you enhance your mental acuity and memory through science-backed games combined with live neurofeedback. Track your attention levels, play cognitive training games, test your concentration abilities, and measurably improve the depth of your meditation. FocusNow will help you develop your brain's potential through real-time brainwave feedback which translates to better outcomes at home, work, school, and any other endeavor in which you want to improve and succeed.



Ability Analysis

FocusNow Ability Analysis uncovers your strengths and areas for growth to give you a foundation to measure your improvement as you start your cognitive training



Training

FocusNow training method is effective and straightforward.

Each day you complete

- 3 minutes of mindfulness training
- +
- 3 minutes of focus training
- +
- 3 minutes of cognitive skills training.

As your performance improves you can earn points to unlock new levels and game upgrades.



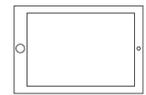
Study & Homework

Real time feedback helps keep you centered while doing homework or any other task that requires your focus.

- Positive rewards for high attention
- +
- Reminders when you have low attention
- +
- Personalized documentation
- +
- Efficient time management

FocusFit

FocusFit is the world's first fitness system that uses neurofeedback training techniques to help users achieve better training results.



Being mentally prepared is essential for getting the most out of your workouts. Whether you're a beginning fitness enthusiast or an elite-level athlete, FocusFit was created to help you maximize your workouts and recover faster. FocusFit trains your mind to achieve the highest level of focus through brain-controlled games that prime you for optimal performance. When you're done with your workout, FocusFit maximizes your post-workout recovery through neurofeedback paired with guided meditation, which has been shown to reduce inflammation and cortisol levels after exercise. FocusFit is the next evolution for better fitness and performance at any level.



Neurofeedback Training
The platform helps train you to perform at your best and helps you recover faster.



Pre-workout Focus training
trains your mind to achieve the highest level of focus for optimal performance.



Post-workout Recovery
Reduce inflammation and cortisol levels after exercise with guided meditations



Real-time brain activity
Provides individualized reports to see how you performed and tracks your improvement over time.

In Partnership with



Realizing that mental preparation is essential for getting the most out of training, USA Weightlifting is excited to provide its athletes and members BrainCo's FocusFit technology.

"FocusFit has been an incredible tool to my training protocols, helping me unlock many new ways to quiet my mind and set focus on the task at hand, I am naturally a very self-reflective person and have tried many meditative techniques, but the live feedback that you get when using the FocusFit band is something that I have never seen before and am using to help me make more lifts."

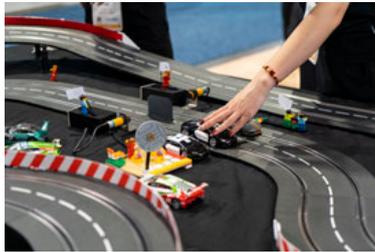
- Jessica Lucero, 4x USA Weightlifting National Champion, 58kg American Record Holder



FocusFun

Unlock Your Brain's Potential

FocusFun is the perfect addition to a STEM Makerspace room. The Focus1 wearable measures students' focus to determine the speed of their car going around the slot car track. Using FocusFun, students can not only custom build their track but also learn techniques to focus better in a fun and engaging way. FocusFun is an excellent way for the students to learn and compete during their time in the STEM Makerspace room to see who can focus more and win the race!



Prosthetic hand STEM Kit

Real world impact

Our prosthetic hand STEM Kit provides a fully customizable learning experience for students of all ages. Inspired by our award-winning real prosthetic hand, our kit is an excellent entry point for students to learn about robotics, prosthetics, coding, and all aspects of STEM.

Technical Exploration

In approximately 2 hours, a pair of students will explore the fundamentals of mechanical, electrical and computer engineering, use infrared sensors with remote controls, program specific gestures, and code micro-controllers to operate servo motors and many other activities.

Neuroscience

Advanced students will enjoy more difficult tasks, such as programming a flex-sensor glove to read the real-time position of their fingers, allowing them to control the movement of the hand. Additionally, students can use their brainwaves to control the hand with our brainwave detecting Focus1 wearable. Students will learn state standard aligned curriculum and explore real-world applications of STEM principles.



BrainRobotics

The Future of Functional Prosthetics

BrainRobotics is developing the world's most affordable AI-powered prosthetic hand. Our award-winning EMG-controlled prosthetic hand mimics the functionality of a human hand with groundbreaking precision. Multi-channel EMG sensors, combined with cutting-edge deep learning techniques, enable us to process high resolution muscle signals. This gives users intuitive control over commonly used grips as well as custom hand motions.

Using the proprietary AI algorithms, our prosthetic hand learns to understand each amputees'desired gestures. The system continually adapts and improves as the individual uses it. This process creates a more natural experience than has ever been possible, and makes the prosthetic hand an innate extension of the user.

We have made breakthroughs in three major aspects in functional prosthetics: affordability, functionality, and usability. Leveraging these breakthroughs, BrainRobotics is building technology that will make a true and lasting difference for millions of people around the world.



Modular Mechanical Design

Traditional prostheses have an integrated design that is vulnerable to damage. To solve this problem, our team is working on a modular mechanical design. It allows working on a modular mechanical design. It allows users to easily replace only the broken components without having to purchase an entirely new hand. Such modular designs will significantly reduce the cost of using prosthetic hands.



The BrainRobotics team develops advanced Deep Neural-network and utilizes multi-channel muscle signal detection devices to allow amputees to intuitively control our prosthetic hands.

DNN Algorithms

Multi-channel EMG Signal Detection

3D Scanning & Printing Sockets

Our team is applying 3D scanning and printing technologies to make sockets accommodate individual differences. Such designs allow for seamless contact between the sensors within the socket and the residual limb for high performance signal detection. They also allow amputees to wear our prostheses comfortably for longer periods of time

Part 4

BrainCo at Conferences

Consumer Electronic Show

CES is the world's gathering place for all those who thrive on the business of consumer technologies. It has served as the proving ground for innovators and breakthrough technologies for 50 years — the global stage where next-generation innovations are introduced to the marketplace.



BrainCo attends CES every year, and was selected to enter the main hall in 2019. At the same time, BrainRobotics' smart prosthetic hand won CES2019 Innovation Awards, as 1 of the 5 honorees under accessibility category



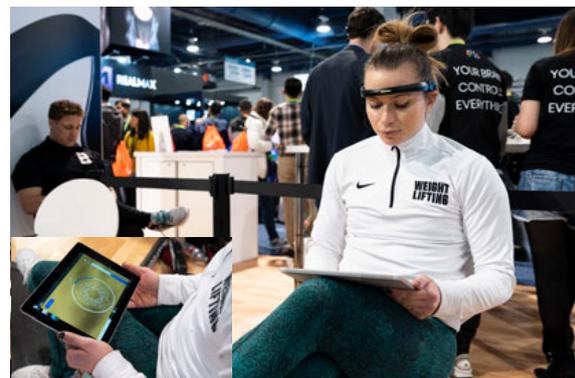
BrainCo Team



Focus EDU Demo



BrainCo CES Booth



Jessica Lucero, Four-time US National Champion of Weightlifting uses FocusFit to train

ISTE Conference & Expo

The International Society for Technology in Education (ISTE) is a nonprofit organization that serves educators interested in the use of technology in education. ISTE serves more than 100,000 education stakeholders throughout the world through individual and organizational membership and support services. The ISTE Conference & Expo is the world's largest EdTech conference. BrainCo has won the Most Innovative Award in 2017.



2019 Arnold Fitness Expo

The Arnold Fitness EXPO, in the Greater Columbus Convention Center, is the nation's largest health and fitness exposition. It annually showcases leading businesses and organizations featuring the latest trends in the industry. The Fitness EXPO is the must-see attraction at the Arnold Sports Festival the weekend's 200,000 attendees.

BrainCo has been able to secure meetings, demos, pilots and sales with elite level athletes, trainers and sports organizations around the globe, such as, Travis Mash, Mark Bell, ASPI (elite athlete coaching system for all sports) Unique Inc, and the ACC. BrainCo also had successful demos for USA Olympic Weightlifting, ASPI, and Aquatic Club of Columbus.



MEDIA COVERAGE

BrainCo shined at the International Consumer Electronics Show (CES) and was featured in 70+ major media outlets, including Forbes, USA Today, AFP, Fox 5, Discovery News, and Yahoo Tech. BrainCo was one of the "2017 CES highlights" by AFP. At 2016 CES, BrainCo was the only startup listed in "8 Takeaways from 2016 CES" (ABS-CBN), along with Samsung, Google and other industry leading companies.

BrainCo has participated in several well-known TV shows, including China's top technology TV show supported by the Chinese Academy of Science. Featuring promising technology entrepreneurs and world-renowned scientists, the show "My Future" attracted more than 300 millions views.



GLOBAL INFLUENCE

In the field of brain science research and development, Brainco always adheres to its principle of utilizing innovative technologies to explore and establish global standards for the brain science industry. We strive to actualize profound changes centered on brain science and advance the human society to a new era of interaction. Our offices are currently in Boston, Beijing, Shenzhen and Hangzhou with more than 120 full-time employees.



We take data privacy seriously, and we work closely with top agencies in the US.





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