



Chiron<sup>TM</sup>

Bringing the Eye of Chiron to Educators Everywhere<sup>TM</sup>

## Executive Summary

In the Greek Myths, Chiron was the ultimate teacher and his students became heroes that changed the world. Our system empowers educators to achieve their fullest potential so that their students can become the newest generation of heroes. Imagine if you could know with complete confidence that your students were focused, attentive, and deeply immersed in your teaching – and you could be alerted in real time if a student could use your help to increase their understanding of a difficult concept. How far could you take them? How far could they go?

Chiron™ uses a Brain Computer Interface (BCI) provided by an Emotiv Insight to derive six basic measures of student mental performance while being taught. The mental performance measures are then correlated and displayed to the educator using a real-time, easy-to understand, and actionable Augmented Reality (AR) overlay for each individual student (which we call the “Eye of Chiron”) that is displayed for the educator using Vuzix Blade® Smart Glasses. The educator can see real time student metrics such as focus, engagement, and interest for individual students or optimize their view in a highly user-configurable fashion to alert the educator when any student’s focus or engagement dips.

## Chiron™ – Brain Computer Interface (BCI)

Chiron™ uses the Emotiv Insight to provide a Brain Computer Interface (BCI). The Emotiv Insight is a head-mounted wirelessly connected device that provides 5 channel EEG whole brain sensing.<sup>1</sup> It is rechargeable and provides 9 axis motion sensors.



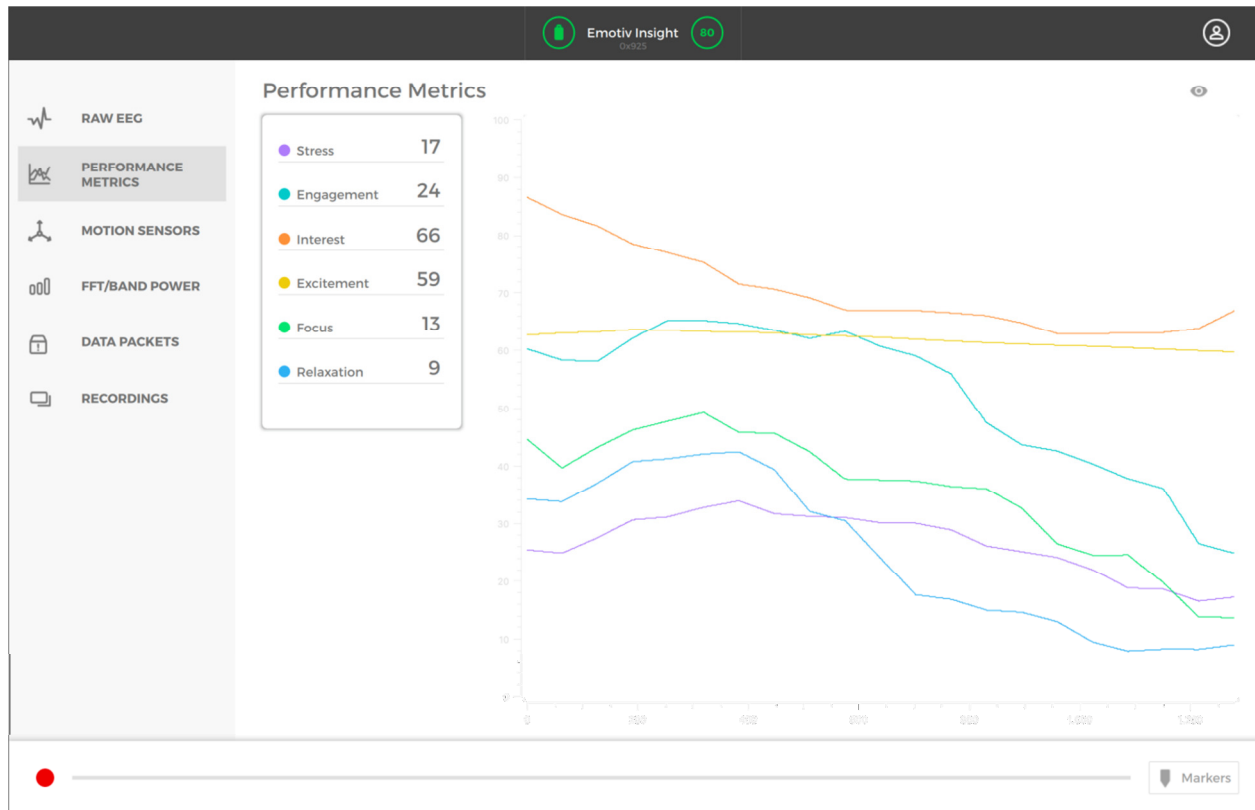
### EmotivBCI

EmotivBCI is Emotiv's flagship software for BCI and has been built for use with the Insight headset. EmotivBCI lets you view your real time Performance Metrics as derived directly from your EEG.

Emotiv provides six basic measures of mental performance. Each measure is automatically scaled to suit your normal range and base level of each condition – the system learns your usual state and capabilities and provides an adjusted value showing your relative performance on each occasion, compared to your overall behavior.

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<sup>1</sup> <https://www.emotiv.com/insight/>



- Focus is a measure of fixed attention to one specific task. Focus measures the depth of attention as well as the frequency that attention switches between tasks. A high level of task switching is an indication of poor focus and distraction.

- Engagement is experienced as alertness and the conscious direction of attention towards task-relevant stimuli. It measures the level of immersion in the moment and is a mixture of attention and concentration and contrasts with boredom. Engagement is characterized by increased physiological arousal and beta waves along with attenuated alpha waves. The greater the attention, focus and workload, the greater the output score reported by the detection.

- Interest is the degree of attraction or aversion to the current stimuli, environment or activity and is commonly referred to as Valence. Low interest scores indicate a strong aversion to the task, high interest indicates a strong affinity with the task while mid-range scores indicate you neither like nor dislike the activity.

- Excitement is an awareness or feeling of physiological arousal with a positive value. It is characterized by activation in the sympathetic nervous system which results in a range of physiological responses including pupil dilation, eye widening, sweat gland stimulation, heart

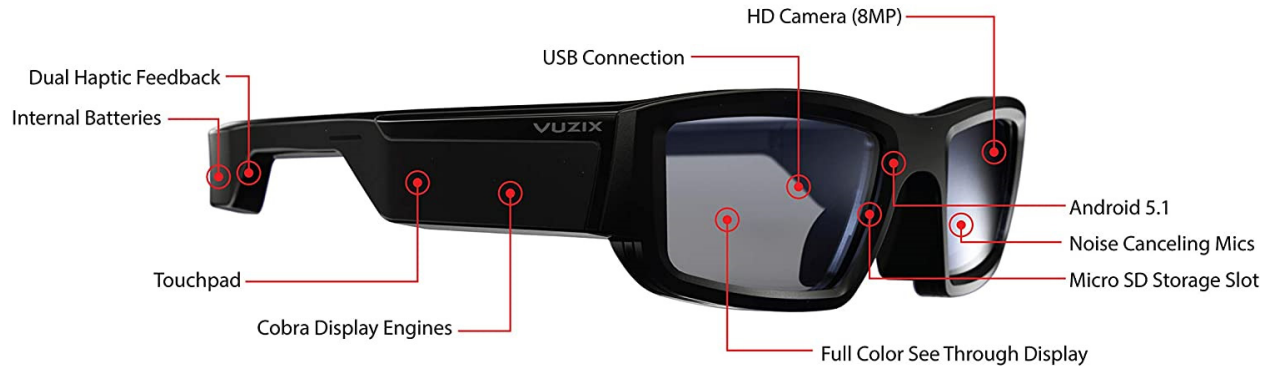
rate and muscle tension increases, blood diversion, and digestive inhibition. In general, the greater the increase in physiological arousal the greater the output score for the detection. The Excitement detection is tuned to provide output scores that reflect short-term changes in excitement over time periods as short as several seconds.

- Stress is a measure of comfort with the current challenge. High stress can result from an inability to complete a difficult task, feeling overwhelmed and fearing negative consequences for failing to satisfy the task requirements. Generally a low to moderate level of stress can improve productivity, whereas a higher level tends to be destructive and can have long term consequences for health and wellbeing.

- Relaxation is a measure of an ability to switch off and recover from intense concentration. Trained meditators can score extremely high relaxation scores.

## Chiron™ – Augmented Reality (AR) Display

Vuzix Blade® Smart Glasses are the world's first Augmented Reality (AR) smart glasses with Wave-Guide technology.<sup>23</sup> Here are some videos of the Vuzix Blade® in action<sup>45</sup>



The Vuzix Blade® includes a full-color see-through display that we use to stream real-time data through the embedded wi-fi connection. The display superimposes on the real world, as shown in the sample display below.



<sup>2</sup> <https://www.vuzix.com/products/blade-smart-glasses-upgraded>

<sup>3</sup> <https://www.amazon.com/Vuzix-Glasses-Amazon-Built-Voice-Controls/dp/B07TKBKTH4?tag=softtesthelp-20&geniuslink=true>

<sup>4</sup> <https://www.youtube.com/watch?v=tziACJVqWUI>

<sup>5</sup> <https://www.youtube.com/watch?v=fgoSZz7uiVw>

## Chiron™ – At the Intersection of BCI and AR

In Chiron™, we take the BCI information from individual Emotiv Insight users, process it, and real-time map the BCI information onto the Vuzix Blade® display to provide an easy-to-understand and actionable Augmented Reality (AR) overlay for the educator. The educator can see real time student metrics such as focus, engagement, and interest for individual students or optimize their view in a highly user-configurable fashion. In homage to Chiron of the Greek myths and in recognition of our use in the educational context, we call our display the Eye of Chiron. Just as the Greek gods frequently gave wondrous tools to humanity to help them to perform heroic tasks, our mission is to empower educators (our modern day heroes) with the Eye of Chiron to allow them to conquer one of the most difficult of challenges - providing our students with the best possible education.

### Display Modes

Several different display modes are available and selectable by the educator. The default display mode identifies when a student is within the field-of-view of the Vuzix Blade® overlay and then provides a display including the student's name and three performance metrics displayed as an AR overlay positioned over the student's head. When multiple students are in the educator's field of view, data displays for individual students are presented in order of proximity to the educator – and the educator can simply scroll among individual student data using the Vuzix Blade®'s touchpad to focus the display on an individual student.

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Bob Chang		



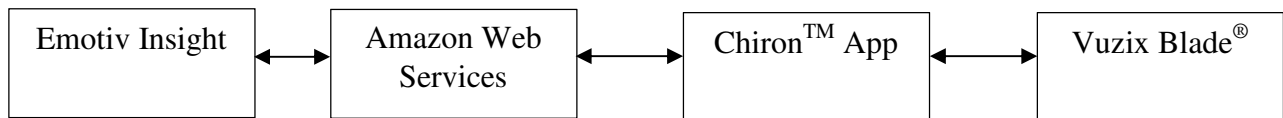
Additionally, the display is highly configurable by the educator and gives the educator the control to display any of the performance metrics, with or without its nominal value and with or without color coding.

An additional display mode includes the ability to establish yes/no thresholding for one or more of the performance metrics. For example, the educator may set the Focus metric at 50 so that only students who exhibit a score of less than 50 in Focus would be highlighted.

In an Alerts display mode, yes/no thresholding may be coupled with a directional indicator that may draw the educator's field-of-view to the student exhibiting a score of less than the threshold – or may provide multiple indicators when multiple students are below the threshold.

## Chiron™ System

The Chiron™ System includes three four parts, the Emotive Insight, Amazon Web Services, the Chiron™ App, and the Vuzix Blade®.



As described above, all the parts of the Chiron™ System operate seamlessly to provide educators with the Eye of Chiron.



## Upcoming Chiron™ Improvements

### 1. Alternate for Emotive Insight

Emotive has released the MN8<sup>6</sup>, which is a considerably smaller form factor than the Insight and likely to be considerably cheaper. However, the MN8 only measures two performance metrics - stress and distraction - using its EEG. Regardless, we can still implement the Eye of Chiron using the stress and distraction performance metrics and we are currently developing our solution.

### 2. Look-Away Timer

As noted above, the Emotive Insight includes motion sensors that can track the student's head positioning. Although some shifting of head positioning is normal in an attentive student, a deviation of head position above a threshold (defaulted at 20 degrees) from the teacher's position for a significant period of time (defaulted at 30 seconds) likely indicates that the student is no longer paying attention – and causes an alert to display for the educator in the Eye of Chiron.

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<sup>6</sup> <https://www.emotiv.com/workplace-wellness-safety-and-productivity-mn8/>

## Other Patents

The CEO passed on your recommendation to search the PTO's website, so I did. I made a list of the patents below. The CEO says that all of these patents look pretty close to what we came up with. However, the CEO says that you are the best patent attorney around and that you will be able to find a way to get us our patent without infringing on these other patents.

### Patents:

US2020/0187841 A1

US2020/0218350 A1

US2020/0219326 A1

US2020/0356171 A1