

A Dallas company wants to use mind-reading technology to let the world hear nonverbal people's thoughts

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Dallas-based Darwin Ecosystem has long been in the business of pattern detection. The company uses machine-learning to predict trends in the financial markets, analyze essays for police academies to determine if trainees would be a good fit and work with human resources departments to identify traits of top performers.

But the [artificial intelligence](#) company is working on its most ambitious project yet—developing a system that tracks brainwaves, recognizes patterns and interprets the intentions behind them. It could unlock communication for adults and children who are unable to speak.

The project is still in its early phases, but it got recognized this spring at South by Southwest. The company, which has about 15 employees, was a finalist in the Austin tech conference's Interactive Innovation Awards for its work in artificial intelligence and machine-learning.

Thierry Hubert, chief executive of Darwin Ecosystem, and his team are testing the technology with a quadriplegic [young woman](#) in Ontario who has a rare neurological disorder. It plans to commercialize aspects of the system, such as its wireless headgear and brainwave-reading sensors, by the end of 2018.

But Hubert said his primary focus is to reach as many people as possible, so he can gather more data and better understand patterns in the brain.

He considers the project his company's research and development unit—a challenge that will keep it on the cutting edge.

The system that Darwin Ecosystem is developing is open source and the mobile app that's part of it will be free. Darwin Ecosystem has collaborated with partners, including IBM and Tanmay Bakshi, a Canadian teenager who's an artificial intelligence prodigy.

Hubert said each headgear costs about \$850 to make, but he'd like to bring down the cost to \$250 or \$350 when it's brought to market.

He said he has been approached by families and individuals who have many different medical conditions that limit their speaking. Some have degenerative diseases, such as Lou Gehrig's disease, and want to train the system so it can speak for them when they no longer can. He has also spoken to an equestrian therapy program that serves people with disabilities, some of whom are nonverbal, that would like a better way to understand their participants.

"Today with innovation, you have to run a parallel course," he said. "If you don't have a vision and you don't put efforts into the fundamentals of your vision and you just look at the mercantile aspect, you will not be able to survive in a world of innovation in technology. You will be good at what you do for a short time, but eventually, you will fail."

Here's how the system works: The person who cannot communicate wears a wireless headgear that's an electroencephalography (or EEG) device. It tracks brain patterns for periods of time. An intimate interpreter helps detect the individual's expressions, movements and social cues and puts his or her observations in a [mobile app](#) to help make meaning of brainwave patterns. The wireless headgear transmits the data, which is gathered into a file.

Software helps detect patterns to start predicting the person's thinking or eventually, speak on behalf of him or her. A visual matrix lights up in different colors to reflect the brain activity back to the individual.

HOW IT BEGAN

The project began with a tweet to a stranger. A friend of Terri Mitchell, the mother of the young woman in Ontario, tweeted an IBM employee. She asked if technology advancements could help Mitchell's daughter, Brittany Horton, speak. The IBM employee connected her to Darwin Ecosystem, which began its research.

Horton has Rett Syndrome, which affects the brain development of women and can impair the ability to speak and move. Darwin Ecosystem has worked with the mother and daughter to test the technology and get it ready to roll out to more people.

Mitchell uses her daughter's facial expressions and noises to read her thoughts. She can tell by her daughter's eye movements if she wants her parents to change the TV channel or by her stirring if she would like a blanket. Mitchell records her daughter's reactions in the app, which links them to brain activity in those moments to help establish a pattern.

Hubert said he'd like to see Horton become less isolated and reliant on caretakers to speak for her.

"If she is in a room and she's uncomfortable, she wants something, she doesn't want something, she has a preference, it would allow her to communicate that to anybody," he said. "That would be my definition of success: If mom is gone, can she be heard."

Mitchell said she's encouraged by Darwin Ecosystem's work—even if it is still in the early stages. "If it can't help my daughter, it is going to help

somebody," she said.

She said it is frustrating to see her daughter and many others unable to share what they think or feel with their doctors, family or friends. "You can see in their eyes that they have more to communicate, but they can't," she said.

Ross Power, the company's chief innovation officer, said he's inspired by what he learned when working at a rehabilitation center with teenagers years ago. He remembers how challenging it was to communicate with the young people, many of whom were close to his own age.

"You can see all the gears working in someone's mind, and they can't express that," he said.

He helped design a headgear that doesn't cause pain or headaches. Instead of a rigid piece with scratchy spikes, he developed one that's made of stretchy elastic and electrodes that look and feel like cloth buttons.

"We want to make sure the data is from you, not the bizarre environment we put you in," he said.

SEEKING SOLUTIONS

After hearing about Darwin Ecosystem, Amber and Dan Weigl went to a South by Southwest showcase in March to meet the company. They brought their 7-year-old daughter, Catherine, who also has Rett Syndrome.

Like other first-graders, Catherine tells jokes, gets nervous before her school's talent show and gets frustrated by her parents—but she can't

express herself the way that other kids do. She communicates by using her eyes to look at symbols and phrases on a retina-scanning computer made by Tobii, which speaks for her. The eye-scanning system can tire out her daughter and sometimes it is difficult for her to reach the upper and lower corners of the screen.

Amber Weigl said she wanted Darwin Ecosystem to meet her daughter and understand how its research could make a difference. She said she's always looking for a better way to unlock the thoughts in her daughter's head.

"We are always looking to give her the biggest world she can have, and we are always trying to make that world bigger," she said.

And Weigl can see a future where technology will help her daughter have a better life.

"I would love to one day have the problem where my 15-year-old is worried about me reading her mind," she said with a laugh. "I don't know if that technology will get there, but I would like to know as much about my kids' thoughts and dreams as she wants to share, and I want to remove all of the physical limitations to that."

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