Justin Kim

Angelabelle Abarientos

Wesley Bower

Anthony Sokry

Yulia Valiakhmetova

Art 104

Future Artificial Intelligence Benefitting Society Through Education: The AI Instructor

If you look up international education rankings, you will find that the U.S. scores lower the top twenty. Many have received firsthand experience through the byproduct of the educational system: unsatisfactory educators that should not be responsible for edifying the young minds of tomorrow. Those who attend may feel a lack of knowledge in certain subjects and, thus, are not receiving an adequate amount of information to excel within and beyond high school. Attending school should be a gratifying experience where everyone has an implicit ideal way of learning instead of punishing students who were unable to follow one particular teaching method. This educational issue can be resolved through artificial intelligence(AI). By empowering the classroom with an AI instructor, it can liberate the students form the fear of error and disappointment. Transforming the views of the U.S. educational system, learning will become a want and not simply a need.

The beginnings of Artificial Intelligence technology were first conceived at a Dartmouth College conference in 1956, and have come a long way from analyzing and learning checker strategies.[1] Technology has advanced immensely in the last half-century, and computers can now gather data from multiple sources simultaneously and use the information to simulate a greater portion of the human existence. Machine learning has always been a controversial topic, and the film industry is constantly addressing the question of what happens when we create sentient technology that surpasses the human race in ability and efficiency. These fears are irrational, however, and as humanity's technology evolves, we gain more understanding of how to use machine learning to benefit our society. Infinite possibilities exist once we envision a future where humans and technology coexist. To demonstrate this, we have proposed one way that artificial intelligence technology could benefit society. Through the educational system. Speech and facial recognition, reading text, emotional analysis, and network communication are all human actions able to be simulated through software. Our suggested artificially intelligent entity, the AI Instructor, would use both current and future technology to perform all of these tasks

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[1] Crevier 1993, pp. 47–49, Russell & Norvig 2003, p. 17

more efficiently, and would be able to learn from its experiences with students to provide the best learning experience possible.

Our AI instructors will be able to provide the best and most efficient education possible and potentially replace current human instructors in grades K-12. Each student will be assigned a personalized AI instructor so that each AI can adapt its learning style to best suit each student's unique needs. The AI instructor is able to adapt on a daily basis, and has the ability to store and link information together to build a greater connection with its student. It works with advanced technology to present the student with the information in different forms for each lesson, whether it be projections, images, and/or text. This allows for a more personal experience than our education system's current classroom settings where the instructor has his or her attention divided and has only one way of teaching based off their own experience. The AI Instructor will be everyone's best teacher.

The AI instructor's design can be tailored to suit both the school or student. However, the standard constructions that will be provided are delivered in two configurations: monitors and mobile machines.

Every desk that students are assigned to will have a **large high-definition touchscreen monitor** either installed into or attached onto the surface of the desk itself. Each student will be able to interact with the touchscreen with their hands or with a provided stylus. The monitors will have discrete **built-in cameras** facing the student to monitor their behavior and engagement, and allow the AI system to learn from both. The AI instructor will be able to communicate with their student using **several options for audio inputs and outputs** including microphones, speakers, audio output jack, or Bluetooth. Monitors will come preinstalled with **basic educational guides**, based on the academic standards of that grade level, which AI instructors can use and eventually adjust to best suit the students.

In a similar function to existing **telepresence machines** today, such as the Suitable Technologies Beam Enhanced, these machines for the AI instructors will be **mobile with a slim design** so it can remain by an individual student's side without interfering heavily on the accessibility of the classroom. These machines will feature **similar functionalities to the previous explained monitors** above including touchscreen capability, built-in cameras, and audio inputs and outputs. However, these machines will also feature other functionalities, such as built-in **regular and holographic projectors** to allow the AI instructor to project visuals or other relevant screenings either directly onto the surface of the student's desk or in front of the student in three-dimensional form.

Of course, an adult will also be stationed within the classrooms such as a supervisor or classroom assistant in case there is a dispute or incident that the AI itself is unable to resolve without requiring human intervention.

These AI instructors will not have to remain within the classrooms either. If outdoor activities are scheduled or if the student, supervisor, and/or the AI instructor feels that it is best for the student to learn in an outdoor environment, the AI instructor's operating system can be installed and then transferred to any mobile device such as a phone or tablet that students may already possess or to one provided by the school. This would allow the AI instructor to remain close by and be able to monitor their students and provide relevant information to continue educating them. The functions and technologies of the AI instructor create an immersive way of learning that improves engagement with students thanks to its adaptive learning capabilities.

To identify the student and model the best lessons around them, our AI instructors gather emotional and behavioral patterns with the use of its cameras, microphones, and other installed equipment. For example, the student might be exhibiting frustration. This could mean the current teaching strategy is not working with the student's most prefered learning style. Our AI Instructor will detect this and compute different ways to diffuse the emotional situation and allow the student to be at ease and in his or her best mood. It will format its teaching methods, ensuring it receives an appropriate emotional and behavioral response from the students.

In the article *Authentic Facial Expression Analysis*, authors Nicu Sebe and others state that, "Emotions are displayed by visual, vocal and other physiological matter"[2]. Having an AI understand emotions provides a whole new level of connection between humans and the AIs. Our Instructor would be able to do this by detecting facial expressions, body languages, and speech patterns with the use of special systems. We will be able to advance beyond N. Sebea et al's Real Time Facial Expression Recognition System, which has been tested for "authentic expression" of four emotions: neutral, happy, surprise, and disgust. They used Bézier volume control parameters also known as motion-units (MU's) to detect changes in the face and determine which emotion fits best. Their systems focus on recognizing real-time expressions that happen more naturally and diversely compared to the system facial action coding system (FACS) that Paul Ekman and his partner had created to detect Universal Expressions based off of image detection[3]. With the use of MU's and advancing technologies, our AI Instructors will be able to detect a wider range of emotions that include: sad, happy, upset, scared, anger, and neutral and the mixtures to create sub-categories of emotions. Body language will be detected with the use of MU's as well. The AI Instructor can determine whether you are propping your head on your hand in a studious manner, or in a slouched manner. Both facial expression and body language would allow the AI to perceive engagement in the student and its own teaching compatibility with the student. It will always adjust its teaching methods accordingly to really connect with each and every student.

Another action that will help discern emotional and behavioral patterns is speech. Companies, like Google, have already come up with a speech recognition system invented by

[2] N. Sebea et al., *Authentic Facial Expression Analysis*, (2006).
[3] Ibid.

Theodore A. Bordeaux, which work with the phonemes in our speech to detect and translate it into language by machine or AI[4]. They have pushed their speech recognition software to understand natural and real time conversation. Our AI instructor would be able to detect language along with with frequencies, pitch and tone and connect it with emotion. It will be able to decipher how the students are receiving the information taught and how they feel just in general. This creates natural and meaningful conversations between AI and the student. The student will feel that they are being listened to and the AI system can care for the student in a progressive manner. Having our AI Instructor understand behavioral and emotional patterns will make sure every student is learning efficiently in his or her own personal way.

The algorithms of AI Instructor are designed to make decisions using real-time data collected from sensors, digital data, and inputs. Combining and analyzing a variety of information from multiple sources simultaneously , the AI Instructor is capable of making decisions which normally require a human level of expertise[5]. Within milliseconds, the AI instructor is able to extract data from the vast wealth of information present on the Internet and get the answer to any question raised by a student. In order to find the most up-to-date and expert-written information in any discipline, the AI searches for scholarly articles published in academic journals and electronic library databases. The AI instructor can also prepare students for a digital future by bringing the latest knowledge into the classroom and developing new lesson plans in any field, by finding instructional videos and helping students get the most out of the classroom.

Our AI instructor stores all the information gathered in a database and then inserts the resources and activities into a learning environment. The database includes information concerning the student, such as personal data, performance data, and data from student interaction with the Instructor. Every student interaction in the environment is saved in the base in the form of a log. Similarly, the student's performance in each of the activities and tasks is stored in the database and updates constantly during every interaction with the student[6].

The hyper-aware AI instructor learns from its students as it teaches and would be able to provide different fun and engaging lessons for its classes each day, although for most days, it would follow a similar schedule. It would also have the ability to switch up the curriculum, maintaining engagement and reducing the lack of interest from students. To provide structured and personally catered learning to each student as well as important social interaction with other classmates, activities in the classroom would consist of both individual and group activities.

[4] IFI CLAIMS Patent Services, *US4852170A - Real Time Computer Speech Recognition System* (1989).
[5] West, Darrell M., and Allen, John R..
[6] Giuffra P, Cecilia E, and Silveira Ricardo A, 53

Outdoor activities would be worked into lower grades' schedules as necessary recess and as physically active learning projects for upper grades. Students could receive a short rest and an unique lesson while taking a stroll around campus if they notify their instructor or supervisor that they feel cooped up inside their classroom, or if the intelligent AI senses this. These types of breaks would increase efficiency by giving students' brains time to recover and allow improved concentration and attention span after returning inside.

A typical day for students might look something like this:
8:00 AM - roll call
      15 min of review of last lesson
      45 minute personal session of new material
      45 min group activity exploring new information with classmates
9:45 - 10:00 AM recess/outdoor break
      15 minute review of last lesson (2nd subject)
      45 min personal session of new material (2nd subject)
      45 min group activity (2nd subject)
11:45 AM - 12:45 PM lunch break
      15 minute review of last lesson (3rd subject)
      45 min personal session of new material (3rd subject)
      45 min group activity (3rd subject)
2:30 school day ends

This schedule would cover three subjects each day, and repeating them would mean that six subjects could be covered twice a week, with Friday left open for field trips, hands-on projects, outdoor activities, and larger group project days. Being equipped with a projection apparatus, the AI instructor would have the ability to simulate learning environments and provide some useful diagrams and examples during lessons, but Fridays would be reserved for lessons that require more materials that what is available in the classroom. This is where students might take a trip to the zoo to learn about biology and animal behavior, or to the local science lab to receive demos on electricity and magnetism. Our AI instructor could simulate some of these demonstrations, but resources for hand-on labs would not always be available in the classroom.

Current elementary school teaching is performed using one classroom for each year, and this new model of teaching with AI would still follow this theme. Similarly, high school is when children first begin to sign up for their own subjects of classes. These students would be able to choose the subjects they attend with schedules still following Monday-Wednesday, Tuesday-Thursday, and Friday regiment. At the college level, we thought it would be important to not only continue to learn subjects from an AI, but also to get real feedback and experience from experts in the fields of study. For this reason we would couple a human professor with the AI to teach this higher level of education. AI could do as much research as possible, but for a

subject like geology, for example, it might be extremely useful for a human geologist to be able to explain excavation and exploration techniques from the point of view of a human. Dance and other physical activities would also benefit from a human instructor. Machine AI could show videos and explain technique for a diving class, but it would be extremely beneficial to have a human expert able to take the class on a field trip and fully demonstrate perfect form in a real scenario to those learning it.

It is likely that AI instructors will replace many teachers currently working in the field, but the occupation of educator will not be solely given to AIs, for professors will still maintain their position within colleges and universities. Even though AI instructor will occupy the classrooms in grades K-12, it is important for professors who have actual first hand experience in their respected careers and subjects to pass on their knowledge to the next generation. Thus, professors who teach in high level academic institutions will still teach their students with the potential option of having the AI instructor as a teaching assistant. This option can even be offered in K-12 schools if seen appropriate. Perhaps an AI instructor could simply replace teachers in grade school and middle school, so students can have interactions with human educators as early as high school instead.

Although the AI instructor seems fantastical and innovative, it would likely be introduced with some understandable speculation. To begin with, the AI instructor is limited to the confines of technology and lacks an actual human element. A human teacher is someone that can be easily identified with and is obviously more relatable than machines. For that reason, a student is more likely to comply and follow instructions with a human teacher whereas it will take time for an AI instructor teaching children to become a norm. But we do have technologies and systems that give it the ability to reach the student on emotional level, which allow a more personal connection with an AI that is truly deeper than just a human using a machine. In the text, *The Reference Shelf: Artificial Intelligence*, Liesl Yearsley explains her experiments in her article, "We Need to Talk about the Power of AI to Manipulate Humans", stating:

> "From 2007 to 2014 I was CEO of Cognea, which offered a platform to rapidly build complex virtual agents, using a combination of structured and deep learning. It was used by tens of thousands of developers, including half a dozen Fortune 100 companies, and acquired by IBM Watson in 2014. As I studied how people interacted with the tens of thousands of agents built on our platform, it became clear that humans are far more willing than most people realize to form a relationship with AI software… People are willing to form relationships with artificial agents, provided they are a sophisticated build, capable of complex personalization. We humans seem to want to maintain the

illusion that the AI truly cares about us...This phenomenon occurred regardless of whether the agent was designed to act as a personal banker, a companion, or a fitness coach. Users spoke to the automated assistants longer than they did to human support agents performing the same function. People would volunteer deep secrets to artificial agents, like their dreams for the future, details of their love lives, even passwords. These surprisingly deep connections mean even today's relatively simple programs can exert a significant influence on people [7]."

A complex machine that can exist without prejudice or malice can be thought of as a blank, pure mind with only good intentions, and a trustworthy and overall good entity. Through Yearsley's experiments at Cognea, she and others found that machines can sometimes make better genuine companions than humans.

There is also the case where an AI instructor lacks the ability to enforce. What will it do when a student chooses not to follow instructions or become a distraction in the classroom? The AI instructor will handle the situation like any other teacher would when faced with an uncontrollable student. Contact school staff who are in charge of disciplinary procedures and escort the student out of the classroom. But unlike other teachers, the AI instructor doesn't need to pick up a phone to make the call. Similarly, it can even contact local authorities or paramedics if the situation deems it necessary.

      As AI applications accelerate across many sectors, it is vital that we reimagine our educational institutions for a world where AIs will become ubiquitous and where they can cater their approach towards individual student's preferred teaching styles. Some students learn more effectively when being outdoors and exploring the world they live in, while others may learn well when more visuals such as graphs, diagrams, and pictures are presented. Others may have their own explicit ways of learning, and regardless of how one learns, it is important to nurture these different methods and to assist students in their field of interests. With an AI instructor, the future educational system will become more efficient and productive while maintaining a versatile and enjoyable teaching style that accommodates individual learning in a classroom environment.

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[7] Yearsley, Liesl. "We Need to Talk about the Power of AI to Manipulate Humans." *The Reference Shelf: Artificial Intelligence*. Hackensack: Salem, 2018.

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