Public Libraries Leading the Way

The Democratization of Artificial Intelligence: One Library's Approach

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Chances are that before you read this article, you probably checked your email, used a mapping app to find your way, or typed a search term online. Without your even perceiving it, artificial intelligence (AI) has already helped you to accomplish something today. Email spam filters use variants of AI to help cut down on harmful or useless emails in your inbox.[1] With AI doing the fact-crunching, mapping apps quickly preview the best route based on a myriad of factors. Search engine companies like Google have been using AI to suggest or produce results faster for longer than anyone outside of the company really knew until recently.[2] According to a recent study by Northeastern University and Gallup, 85% of Americans are already using AI products.[3] The true revelation behind these recent technological developments may not be the fact that AI is already embedded into the fabric of our modern lives. The real surprise might just be the sudden ubiquitous availability (and approachability) of AI tools for all. As Google's former Chief Scientist of AI and Machine Learning, Fei-Fei Li, said in 2017, "The next step for AI must be democratization, lowering the barriers of entry, and making it available to the largest possible community of developers, users and enterprises."[4] This sounds a lot like most public libraries' mission statements. As with other important workforce development efforts, libraries are uniquely placed to participate in this new revolution as key platforms for the discovery and dissemination of emerging tech knowledge. At the Frisco Public Library (https://www.friscolibrary.com), we saw this AI trend surfacing, we see AI as a critical future job skill, and we investigated ways to introduce our patrons into this space. As such, the Frisco Public Library has leveraged readily available technology in a cost-effective way that has engaged community interest. Our efforts are also replicable and scalable in terms of multi-nodal experiences both at home and in classroom-based learning.

SOME BASIC DEFINITIONS

Let's take a few steps back to give some broad definitions and boundaries to the scope of AI. According to the Oxford English Dictionary, artificial intelligence is "the capacity of computers or other machines to exhibit or simulate intelligent behavior."[5] In the literature, you will find a further distinction between General AI, Narrow AI, and something called Machine Learning.[6]

General AI is something that begins to look like science fiction: an artificial intelligence that learns how to learn, then is able to generalize what it has learned and apply that knowledge to a different case. In advanced examples of General AI, scientists are thinking of not putting a specific problem in front of a General AI program to solve, rather, they are giving it an entire dataset so the program *itself* can choose what problems it should work on. Removing the limited point of view of whoever programs the program.[7]

Narrow AI is easier to understand because it is what we interact with the most in our day-to-day lives. It is what powers those little speed ups that help us do things faster every day: search

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through our emails to help us avoid spam, translate speech to text when we dictate a message on a smartphone, or helps to parallel park a car at the touch of a button. Narrow AI accomplishes a specific task extremely fast and accurately, and thus, becomes an extension and multiplier of our own human productivity. A lot of these Narrow AI activities are based in a type of Artificial Intelligence called Machine Learning (ML). ML is a set of very complex processes that can review large sets of information; create and train models based on this data; make predictions of what will happen next; and then to refine that data for better future results.[8] Machine Learning is the focus of our efforts at the Frisco Public Library due to two main reasons: 1) It is what has been made available through free tools such as Google's open AI resources; and 2) It makes AI attainable in a library setting.

OUR APPROACH: MAKERSPACES FOR EVERYONE, AT HOME

The Frisco Public Library has had 4 years of success with circulating Makerspace technology in reasonably-priced, hard shell waterproof boxes with foam inserts. Each kit is cataloged, RFID tagged, security tagged, and sealed with zip ties to enable self-checkouts (zip ties can be easily cut open at home, but prevent items from disappearing in the library). These cases are easy to handle and can take some abuse while protecting their contents. This is important because we circulate about 20 different kinds of robotics kits, no-soldering circuitry kits, 3D scanning kits, programing kits, and Internet of Things kits. Most kits contain the theme item with quick start guides, instruction booklets, and a book to inspire advanced learning. We call these Maker Kits, and we have about 150 total. In our community, they are wildly popular and have circulated more than 4,000 times since their introduction in January 2016.[9]

AIY: ARTIFICIAL INTELLIGENCE KITS FOR EVERYONE

In 2017, Google released their maker-focused AIY Voice project kit (where AIY is a catchy substitute for Do-It-Yourself with Artificial Intelligence Yourself). The kit consists of several components that pairs a Raspberry Pi (entry-level computer) and a small speaker that is housed in a cardboard box with a button prominently placed on top.[10] The result is a stripped-down version of an Amazon Echo or Google Home device — essentially a smart speaker. Although the AIY Voice kit is not necessarily initially set up to play music, it is designed to take voice commands like the other products on the market. With a minimum of Python coding expertise, AIY kits enable mass participation in Artificial Intelligence. There isn't even any soldering required to put this kit together! This is 100% in line with Fei-Fei Li's (Google's former Chief Scientist for AI and ML) remarks about the need to democratize AI. Google has since released another kit called AIY Vision that uses similar components paired with a camera. More information on the kits can be found at https://aiyprojects.withgoogle.com/.

FRISCO PUBLIC LIBRARY'S ARTIFICIAL INTELLIGENCE MAKER KITS

Based on our previous experience with other Maker Kits, we made a few modifications to the original Google design that most librarians with access to a 3D printer can accomplish. The original AIY Voice kit uses a punch-out cardboard box to fold and envelop the device. Apart from being an extremely cost-effective way of making a box, it also seems like there is delicious irony (and message) in the contrasting of cardboard-as a cheap, widely available material-with the advanced tech of AI. Durability being our priority, we knew we needed to upgrade this aspect of Google's original design. Our Maker Librarian, Adam Lamprecht, quickly found a shared design file

uploaded to the website, www.thingiverse.com, that he modified to better suit our needs (see figure 1).[11]

Figure 1. AI Maker Kits with 3D printed AIY Voice device.

We then printed these in a variety of colors on our 3D printers and modified the grid-patterned foam inserts to make room for the device and a few other items (see figure 2). We are currently circulating 21 of these kits without major incident.

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Figure 2. Interior view of the kits.

LIBRARY INSTRUCTION: PYTHON AS A WINDOW ONTO ARTIFICIAL INTELLIGENCE

Our basic Artificial Intelligence classes have been key in the introduction of this technology to the public. We reserve 10 kits for a class and pair them with classroom laptops for ease of use. The structure of the class provides a short introduction to the technology and then walks participants through a basic voice recognition coding challenge. All of this is accomplished in Python. Python is great for beginning coders because it is easier to learn than other programming languages, takes less time to write lines of code, and it can telescope up into a very large number of projects and applications.[12] In fact, according to Neal Ford, Director and Software Architect at Thoughtworks, Python, "is very good at solving bigger kinds of problems."[13] So with Python, a beginning learner has a programming language that continues to be useful beyond the classroom and into the world of work or school.

Python provides another important advantage: "Python provides the front-end method of how to hook into Google's open AI," states tech writer Sardar Yegulalp.[14] It is this combination of a free, accessible coding language with the powerful (and also free) resources of Google's open AI that truly lowers the barrier to entry for anyone interested in a hands-on experience with Artificial Intelligence.

LESSONS LEARNED

The AI Maker Kits are, by far, our most complicated circulating kits. We are hearing back from patrons that the kits are right on the mark. Our users get it, they see the power in getting access to these AI tools (utilizing Python) and by all accounts thus far, are happy with their results. There has been a perception gap between library staff, however, and what an AI kit can reasonably accomplish. Adam Lamprecht reports, "Staff members had the expectation that perhaps with this kit, a rookie coder was going to be able to jump directly into developing Deep Learning neural networks (a very advanced subset of artificial intelligence) and so we definitely benefited from ongoing discussions of those broad AI terms and expectations."[15]

Google's AIY Voice is a good start but there is lots of room to grow AI classes for more depth. AIY Vision is the next logical step that would allow us to enter into the world of basic image recognition. Our approach does rely on one company's platform, but there are more platforms to explore AI now. One of which is Amazon's offerings of Machine Learning on AWS (Amazon Web Services). These services have recently been opened up for a wider audience and Amazon is now offering everyone the same online courses they use to train their own engineers.[16] The AWS ML resources are currently behind paywalls but access to the training alone could be powerful for the right learner.

There are even interesting developments for younger learners in AI with robotics. Anki (www.anki.com) is a consumer robotics company that uses AI to enliven its products. They released *Vector* in 2018: a seemingly simple toy that responds to its environment and simple commands with the aid of AI. With the release of their Software Development Kit the company is allowing others under the hood of their robots-which potentially means an entry-point for autonomous (or semi-autonomous) robotic vehicle technology powered by AI.

What is clear is that the world of AI is already upon us. Public Libraries are well positioned to help meet the challenge of developing the workforce of the near- and far future with AI classes being a vital tool. The doorway to artificial intelligence is now open, the only question that remains is this: Do you step through it?

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