ARTIFICIAL INTELLIGENCE CLUB AT MSU

Newsletter Volume 2

MAY 2022

Preface

Dear members, students, partners, and public,

With triumphant excitement, I am proud to say that the Artificial Intelligence Club at MSU has concluded its first year of activity as a Registered Student Organization. It's been a year of large growth for us. After eight months of constant hands-on practice with state-of-the-art A.I. tools, our members have learned and taken large steps toward getting involved in the field.

I would like to personally recognize the hard work and perseverance of my team, the people to whom we can attribute the success of the club: Owen, Sanya, Josh, Karoline, Fanurs, and Rachel.

With recruitment underway, I am excited to keep imagining what is yet to come for the next academic year. We'll continue putting in our best efforts to provide the highest quality of services and keep living up to the expectations and demands of our members.

Have a wonderful summer! The A.I. Club will be back in Fall 2022.

— GABRIEL SOTELO

WORKSHOP RECAP

Spring 2022

In our workshops this semester, AI Club members got to learn about and apply their knowledge of topics such as:

- the *minimax algorithm* (to program a computer to play strategy games)
- the *Q-Learning* strategy (to train an AI to make decisions)

and much more. Each of these workshops is made for members of all skill levels, which means everyone is welcome and encouraged to participate!

Build Your Own "Siri" Workshop

March 21st, 2022

If you ever ask Siri to answer a math question, she'll consult with Wolfram Alpha.

This is possible because Wolfram Alpha provides a question-answering API where you can use code to send in a question and Wolfram Alpha will send an answer back to your code.

In this workshop, members took advantage of this API to build their own *chatbots*, along with *Python* packages for turning speech into text and turning text into speech. Members' chatbots could answer questions about the world, solve math problems, and more. Some members even added custom responses to their chatbot for certain questions.

Reinforcement Learning with OpenAI Gym

March 14th, 2022

Most of *machine learning* is about finding correlations in data and making predictions. But the most exciting AI projects are the ones that feel alive. *Reinforcement learning* is all about teaching an "agent" how to live in the world.

In this workshop, members used the *OpenAI Gym* library, which provides a simple game with a swinging pendulum on a cart. By controlling the cart, it's possible to keep the pendulum balanced upright, like a broom on your hand. Using reinforcement learning, members helped the computer learn how to balance the pendulum. At first, the computer failed. Many, many times. But, like a baby learning to crawl, it eventually made progress and learned to balance the pole.

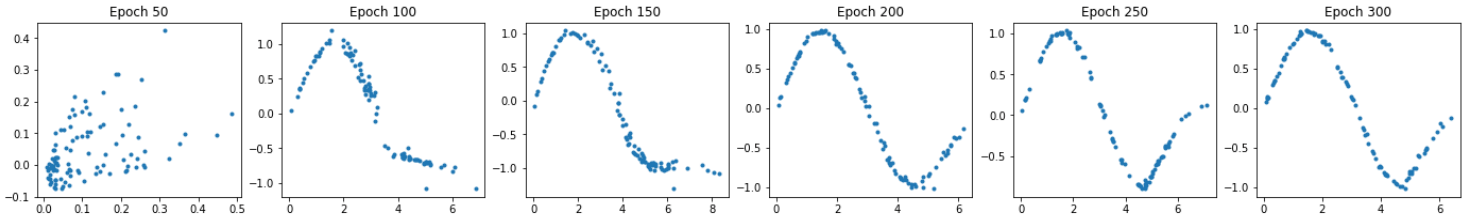
The lessons from this workshop are applicable to far more than just pendulum balancing. They set the groundwork for all kinds of reinforcement learning, which is one of the most active areas of current AI research.

Battle of the GANs (Generative Adversarial Networks)

April 4th, 2022

Generative Adversarial Networks (or *GANs*) are used to produce stunning images that are indistinguishable from reality. They can be used to produce photorealistic renders of humans who don't exist (thispersondoesnotexist.com), generate images of beautiful scenery, emulate the styles of artists, and more.

Training a GAN takes a long time because there is a lot of data to crunch, so in this workshop, members created an extremely simple GAN that learns to produce 2D points on a sine wave. But the principles learned through this activity apply directly to generating images. In fact, with extremely similar code, it's possible to produce new hand-drawn digit images.



AI Plays Connect 4

April 11th, 2022

For the final workshop of the semester, we decided to have some fun and play some games! Members built their own Connect 4 AI player and then competed against their own creation. The simple AI techniques were quite effective, building towards a minimax algorithm approach to game playing.

"Beat the Bot" Career Workshop

March 28th, 2022

The AI Club was lucky to have special guests Jane Evarian from MSU Engineering Career Center and Kyle Liechty from Tesla Recruiting for a special career-focused workshop. Members received valuable insight on AI-based application tracking software used by most companies in the recruitment process and tips on how to "beat the bot." With interactive exercises, members learned how to leverage tactics, like keyword matching with job descriptions, to draft an effective resume.

Don't forget to follow our Instagram for more frequent updates on workshops, meeting reminders, and photos of our events!

msu_ai_club

PROJECT UPDATE

In Fall 2022, our club began working on the *Smart Attendance project*. The goal of this project is to create a device that tracks attendance at our club meetings using AI technologies like *facial and gesture recognition*. This project is being completed by 4 teams: front-end, back-end, database, coding.

The *user interactivity* of this application is implemented by processing a stream of video frames from a webcam. There are two components: hand gesture recognition and face recognition. Hand gesture recognition offers the possibility for users to interact with the application through a set of pre-defined gestures like thumbs up and thumbs down, whereas face recognition identifies the members uniquely to track attendance.

Gesture Recognition Technology

To develop the hand gesture recognition component, we have leveraged the *MediaPipe* library to convert an image frame into some 3D hand keypoints. *MediaPipe* is an open-source package developed by Google in 2019, offering customizable *machine learning solutions* for streaming media. Once the hand keypoints are extracted from a video frame, we can train our own classifier to identify gestures to support the user interface. For this step, we found that a simple *support vector machine (SVM)* is sufficient. Currently, the application is able to identify the gestures of “one”, “two”, “three”, “thumbs up” and “thumbs down”, with each gesture being assigned to specific interface roles. In the future, this set of gestures could also be easily expanded by re-training the classifier with less than 50 labeled images for each new gesture.

Facial Recognition Technology

To develop the face recognition component, we have adopted the *deep learning* face model in *Dlib* that has an accuracy of 99.38% on the standard “Labeled Faces in the Wild” benchmark. The model is a *residual neural network (ResNet)* with 29 *convolutional layers*, adopted from the famous ResNet-34 by K. He, et al. (2016). It takes in an image with a face and outputs an array of 128 floating-point numbers, which can be seen as some “encoded face”, independent of how the picture was taken. In our application, we “encode” each video frame into a 128D array. To check if the faces appearing in two frames are the same person, we only have to compare the similarity of the two 128D arrays, without having to analyze the actual pixels from the original frames. In a few tests we did, this approach was shown to be robust against light conditions, hairstyle, makeup, glasses, and so on — just as a human would perform, and sometimes even better.

Get Involved!

Our projects are an opportunity for our especially committed members to *collaborate* on a *larger scale*! Generally, these projects are controlled entirely by the members of the club and allow its participants to expand on the knowledge they gain at workshops as well as their prior skills. By becoming a member of the club, you'll have the opportunity to apply to be part of one of these *specialized* projects!

MEMBERS HIGHLIGHT

Swetha Jagannathan

Hometown: Michigan

Major: Biochemistry

Class Standing: Sophomore

What is your favorite part about the club?
My favorite part is working through the notebooks and going back through to try to improve my code at the end of each one.

What do you hope to get out of the club?
I hope to expand my outlook on the kinds of practical applications that are possible in this field!

What have you learned from the club?
I've learned that AI has a lot more applications than I thought it would have, and that there are lots of different types that each have their own function that is invaluable in its own way.

What is your favorite memory/event of the club?
My favorite memory is the closing ceremony because it's nice to see how everyone's hard work has played out :)

Mate Paa Kwesi Narh

Hometown: Accra, Ghana

Major: Electrical Engineering

Class Standing: Freshman

What is your favorite part about the club?
Baby steps. I really love being taken all the way when learning something new, or relearning something I need to rethink. That's why I love how progressive the weekly in-club sets are. They are so carefully crafted to take you from A to Z, and when I ever need any help understanding all that lies in between, not only are the members of the instructional team ready to help, but the collaborative aura within the club makes it easy just hit up the person next to you so you both bulldoze through the problem together.

What do you hope to get out of the club?
I am crazy about robotics and automation. I've always loved the idea of color and motion, and the possibility of using pre-programmed directives to bring various things to life. As time goes on, I hope to learn more about the various possibilities of AI, and hopefully intersect the lessons I draw with what I explore in my major.

What have you learned from the club?
One thing that I've learned from AI club is that it's less about all the technical lessons, it's less about the network opportunities and all the other golden stuff. Yes, all those are awesome, but it's the genuine relationships that we've been making with each other that make all the learning worthwhile. Building real relationships and being intentional are two things I've imbibed from the club.

What is your favorite memory/event of the club?
Definitely the 'Fruit Ninja' battle at Minskoff, the one time when we were learning about OpenCV.

We want to send a big thanks to every member of the project team. You have all made great progress and have a great product to show for it. We hope you all have enjoyed working on this project and have learned a lot from it! Thanks to:

Coding Team

Fanurs Teh

Kevin Hong

Abdullah Baqai

Noah O'Bryan

Abigail Murray

Akhil Nair

Daniel Ngyuen

Uzair Mohammed

Noel Vazquez

Abhiyash Pratap Singh

Backend Team

Owen Cochell

Kyle Taft

Emily Feuer

Felipe Allevato

Frontend Team

Reeve Fernandes

Manan Vyas

Sania Sinha

Database Team

Alexander Grunewald

Halle Loveday

We also want to extend a special thank you to our most involved members this semester! These members had the most frequent attendance to our meetings and have contributed to the club in significant ways.

Kevin Hong

Alfredo Sanchez

Swetha Jagannathan

Michael Plante

Mate Narh

Kollin Bartz

Kyle Taft

A last thank you to members new, old, and upcoming. We appreciate every single one of you and we hope to see you next year!

Make sure to follow all of our social medias for more updates on what we've been up to!