Alice and Bob Work Project Raven

A 10-minute play

By

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CHARACTERS

Bob, 30

Alice, 26

CEO of Intelligence Incorporated, 46

Ensemble

Time

This play takes place in 2017. Neural networks are still a relatively new technology for use in computer vision and definitely for use in the government. An uproar will soon break out over Intelligence Incorporated’s role in the technology.

PLACE

The play takes place at the pentagon and follows a meeting between the military and Intelligence Incorporated surrounding Project Raven, based on a real-life project to incorporate AI in drone detection. The final part of the play takes place in the aftermath of the project.

The ensemble is composed of at least six people and is wearing different colored t-shirts. Some are blue. Some are red. One is wearing both a red t-shirt over a blue t-shirt.

Scene I-1: Meeting at DoD

(The ensemble is on the right side of the stage while Bob, Alice, and General Smith sit at a conference table in the middle.)

General Smith

Well, I thank you two for coming here today. I won’t sugar coat it; our drone project is floundering. We spend countless billions paying people to monitor thousands of hours of video. Government tends to be behind the 8-ball when it comes to automation, but I am looking to change that with your help.

Bob

Well, you came to the right people. I helped build Intelligence Incorporated Image’s recognition algorithm. Alice has been with Intelligence Incorporated for years and is an expert in machine learning. We believe we can dramatically reduce the time spent looking at these images while increasing accuracy.

general smith

That sounds terrific…

Alice

Well, we will do our best. We don’t want to overpromise.

general SMith

Sure… Sure… Why don’t you walk me through how this process works?

alice

The modelling process starts by dividing the data into three different sets.

(ENSEMBLE divides itself into three separate groups, standing apart.)

A training set, a cross validation set, and a testing set. We will create a bunch of models on the training dataset.

(ENSEMBLE in training groups raises hands.)

bob

Then we choose parameters and determine the best models on the cross-validation dataset to see how well each model performs. Some models will do a very bad job.

(ENSEMBLE in cross validation group raises hands then moves to opposite sides of stage with reds mixed with blue on each side.)

alice

Sometimes this is because the model is a bad choice, but other times parameters can be tuned using the data.

(ENSEMBLE in cross validation group rearranges so both sides nearly all one color of shirt.)

bob

When model performance is satisfactory, the model can be tested on the test data.

(ENSEMBLE in test group raises hands and sorts itself with some mixing on each side in terms of color.)

General smith

Why test on new data at all? Don’t you want more data to train with? Why throw out so much?

alice

It’s important to understand how well the model performs with data it hasn’t seen before.

bob

We’re worried about overfitting. Sometimes the model works really well on the training data.

(ENSEMBLE in training group separates fully between red and blue.)

But it only does that because the model is too complex. It then performs terribly on the testing data.

(ENSEMBLE in testing group mixes up between red and blue.)

General smith

I appreciate the thoroughness. People’s lives depend on the software working correctly. I would like to know about some of the models you are considering.

bob

Well, we have not settled on anything. But we have four models in mind: Logistic regression, K-Nearest Neighbor, kmeans, and a neural network.

General smith

How do they work? In broad terms. My engineering degree is a bit out of date.

bob

It’s not all that important that you know how they work.

alice

I think it couldn’t be more important.

general smith

I agree with Alice. If this technology gets used on the battleground, I need to know what it’s doing.

Alice

Well, logistic regression is a regression with a logistic error term. It performs a maximum likelihood calculation using Newton’s method.

general Smith

In English!

bob

Logistic regression predicts the probability of a point being in a certain class. It divides data based on propensity to be of a certain type.

(ENSEMBLE lines up on the stage in a diagonal with a blue shirt at one end and a red at the other.)

alice

Then, we choose a threshold probability to assign data to a particular type. For instance, we might want to assign car to things that we are more than 50 percent sure are cars.

(The front few members of ensemble raise hands.)

We might also decide that we need to be extra cautious with some designations. Maybe, we take a look at images with more than 20 percent chance of being an IED.

(The back members of ensemble raise hands with a strong majority having hands raised.)

general smith

Sounds very promising. Any drawbacks?

bob

It creates coefficients on numerical variables, so it works great when you have one-way relationships like between credit score and default—it’s not necessarily the best for images.

general smith

Why don’t we hear about the next one. K-nearest something?

bob

K-nearest neighbors. An image would be classified as the same as the plurality of images closest to it.

(ENSEMBLE members point to closest ensemble members.)

alice

We’d determine some measure of distance in theoretical space and assign class based on similarity.

general smith

Sounds very simple.

alice

Simple yet powerful.

general Smith

Tell me about K-means.

bob

Well, K-means is unsupervised, so it does not require a beginning prediction. Several centroids are initialized as a point.

(ENSEMBLE members scatter around. Two raise their hands.)

alice

And the closest points to those points are classified as the majority vote by the points.

(ENSEMBLE members point to closest centroid.)

bob

The average of the points associated with a centroid is taken, and the new centroid is chosen.

(New ensemble members raise hands as new centroids, members point to new closest centroid.)

alice

This keeps going until, it stops improving.

(ENSEMBLE members quickly repeat process of raising hands and pointing. Hands go down and same hands raised.)

It works well for pictures because images often have distinct regions that can be classified based on similarities.

Bob

And finally, we come to the most exciting technique! Neural networks!

general smith

I have heard a lot of very good things lately about neural networks. Very excited about them!

Bob

They could easily be the future of the military. I think down the road everything you do from NSA spying to drone targeting could be based on neural networks.

alice

Bob’s getting ahead of himself. What he means to say is that they’re a great technology with a lot potential but still too early to be used on that scale.

bob

Of course.

alice

And we would never violate privacy using machine learning.

bob

I mean… Have you seen our advertising work? Haha

Alice

I’ve been meaning to discuss the need for more privacy there too.

General smith

SO! Neural networks!

bob

Right. Well, they used to be a dead technology mainly used for handwriting detection by the postal service. Neural networks were actually believed to be mathematically infeasible for decades.

alice

All this changed in the past ten years with the advent of better computing power via graphical processing units and the creation of multi-layer neural networks.

bob

The basic principle starts with three layers.

(The ensemble forms three lines. One person is in the final line.)

you have data, which are input into the neural network in the input layer.

(The ensemble members in the first line raise their hands.)

Each datapoint is multiplied by weights and summed together in the hidden layer where an activation function decides whether the layer turns on and the output.

(ENSEMBLE members in the first line point to the members of the second line.)

alice

The outputs of the activation layers are then fed into the next hidden layer where the action repeats or the output layer where the outputs of the hidden layers are again weighted, summed and fed into an activation function to find the recommended class.

(ENSEMBLE members in the second line point to the sole member of the third line who points to his t-shirt color.)

bob

You can change the number hidden layers.

(ENSEMBLE members in the second line move apart to more lines between them and the third.)

alice

And the weights are picked through gradient descent.

(ENSEMBLE members line up in a parabola shape, sort of a semi-circle. One other member starts at the top. As Alice speaks, the member moves down towards the top of semi-circle.)

The weights move a little bit to maximize the loss function until the weights stop moving.

bob

Neural networks have many uses previously undreamed of for statistics. They mimic neurons in the brain and are the closest we have gotten to artificial intelligence.

General Smith

Wow! Neural networks sound like a game changer. I’ve heard some people are using them for driverless cars.

bob

And that could easily be used for drones as well! We start with image recognition. Then who knows?

Alice

I don’t know if we should be working on this project at all!

Bob

Alice!

General Smith

No if there are reservations, I want to hear them now rather than later. Alice, do you have a problem working with the DoD?

alice

My dad served two tours in Iraq. I promise, it’s not that.

General Smith

Are you opposed to making weapons? Because at this time, we only plan to use this technology for surveillance.

alice

It’s not that either. It’s just… I’ve worked with these models a long time. I don’t know if they are ready to begin making life and death decisions like this.

bob

We’re worried about error.

Alice

What if the model says a car is a terror cell, and it turns out to be a school bus?

Bob

Obviously, we don’t think that sort of thing will ever happen.

general smith

But care is always important. What are some problems you foresee?

bob

We’re particularly worried about misclassification error.

alice

Sometimes a data point will be mislabeled in the training set, and the algorithm will learn an incorrect association.

(ENSEMBLE member wearing red shirt over blue points to himself, then takes off the red shirt and points to the blue shirt.)

bob

This can lead to dire consequences.

General smith

Let’s say we fixed that.

alice

Another problem will be training bias from the dataset.

general smith

We have exemplary data for you. We’ve purchased a major traffic and landscape dataset that we can combine with your Intelligence Incorporated maps data.

bob

That data is from the US though. It will mainly include white people and urban landscapes that look nothing like the locations where the model will be used.

alice

When we implement the algorithm in practice, it will be crucial that we update parameters in the field very quickly, so we update based on real in-country data.

general smith

Is there anything else you would recommend to avoid error?

alice

Well, I don’t think we can fully automate the process of searching through images.

general Smith

What’s the point of the project then?

bob

We can reduce the amount of human labor to sift through the pictures. We can put in a first layer for detection, so we know what to have humans look at.

general smith

I think this sounds great! You certainly have given me a lot to think about.

bob

Intelligence Incorporated always works to push boundaries sir!

(GENERAL Smith stands. Bob immediately stands up as well. Alice takes a moment, but quickly stands up. General Smith shakes both their hands as the next lines are said.)

general Smith

Well, I look forward to working with you on this project.

bob

I just hope that our partnership doesn’t upset any Intelligence Incorporated workers.

General Smith

I understand. How soon do you think you can have a working prototype?

alice

Building a model this complex and important will not happen overnight. It’s important to take our time.

Bob

I think we should have a product by Christmas.

alice

That’s optim—

general smith

That’s what I like to hear Bob! We look forward to a long productive relationship on project Raven!

(GENERAL SMITH walks out. Lights go off.)

Scene I-2: Intelligence Incorporated Press Conference

(The ensemble is walking in circles, holding signs, and miming chanting stage right. A podium is center stage. Alice and Bob are on the side away on stage left.)

alice

Did you check the company Slack today?

bob

I don’t think I want to.

alice

A lot of memes about killing people.

bob

These things happen…

alice

I told you Raven was going to be an extraordinarily sensitive endeavor.

bob

It’s working though. Costs are down at the Pentagon, and American soldiers’ lives are being saved.

alice

It’s working too well. The Pentagon wants to expand these programs dramatically.

bob

So our crime is that we were too successful?

alice

No, but we didn’t put guidelines in place. We didn’t push hard enough for AI ethics. You wanted the Defense work so much, you were willing to throw out the baby with the bathwater.

bob

Hey! That is not fair!

alice

Fair! Come on Bob!

(Both are obviously very upset with each other. CEO of Intelligence Incorporated enters.)

CEO

Excuse me.

(ALICE and Bob are very embarrassed. They try and regain composure.)

alice

Sorry, we are just passionate about our work.

CEO

The employees are very upset. Project Raven has been quite the controversy. I think we need to kill it.

bob

I agree fully!

alice

You do?

bob

Ethics are very important.

ceo

Excellent Bob! Do you have the remarks for me?

bob

Right here!

(BOB hands remarks. CEO walks up to the podium. Ensemble stops to watch.)

CEO

Recently, Intelligence Incorporated’s usage of AI in collaboration with the Department of Defense has come under fire. We have heard your concerns and remain committed to our core values and our mission statement of ‘Don’t be evil.’ Our first responsibility is to our stakeholders and employees, and we apologize for the lapse in judgement that led to failure to fully represent the nature of the contract. Intelligence Incorporated is indefinitely suspending AI work with the Defense Department.

(CEO pauses, ensemble claps.)

ensemble member

(MEMBER yells.)

Too little too late!

CEO

Additionally, we are taking personnel action to ensure this will never happen again. Alice Smith, our head of AI who was instrumental to the deal and in fast tracking the AI process, has been asked to resign effective immediately.

(ENSEMBLE cheers. Lights off on CEO. Spotlight on Alice and Bob.)

alice

I can’t believe this! I pushed for safeguards!

bob

You push too hard for safeguards. We may not have defense, but we still own ads. We don’t need your voice gumming the works.

alice

So this is retaliation?

bob

Think of it as misclassification. A bad model predicting ethical nature if you will…

(Bob walks away. Amy throws her face in hands. She is devastated. Fade to black.)