Intel® Edge AI Scholarship

STUDY JAM TECHNICAL AMAs

TECHNICAL AMA 1 : Git, Docker and OpenVINO.

By- Md Saif Alam

Q1: What is the difference between git fetch and git pull? Can you explain when you will be using these 2 commands?

Answers :

1. git fetch is used to just check whether there are any active changes in your repo. On the other hand, git pull actually pulls the changes from any given branch.

2. When we manually do changes in the remote repo and don't commit it, it may cause issues in merging if we directly use 'git pull'. That's why we should use 'git fetch' prior to ensuring that the new changes won't break the local changes done by ourselves.

3. Git fetch tell your git to fetch the latest meta data info while no file transferring occurs.

Git Pull is basically brining all the things and amendments that happened in the Master Branch and which is not updated with the forked reposotory in your local machines.

Git pull doeas a git fetch followed by a git merge.

4. Like git fetch will just get the metadata from the remote repo. But on the other hand git pull will copy all the changes in remote repo.

So git pull will merge the changes from remote repo as well so might end up in conflicts. Git fetch will not do merge so it is better we can review and then merge.

Q2: Can you explain in brief what are the steps to deploy a docker container after creating a webapp script

Answers :

1. You will need to create a Dockerfile in the root of your project.

First instruction in dockerfile would be the base image.

In the subsequent lines you will have instructions like copying files to docker images and installing necessary packages for your project and then last would be command to run your server.

Once you create dockerfile you can build the image using docker build command and then you can create container and run using docker run command.

Q3: In an IDE, if I have to solve merge conflicts, I usually get a GUI that helps me by showing what are the changes that are coming and what is the current state and if I want to stage those changes or not. I haven't tried it in command line but how to solve such conflicts in command line?

Answers :

- In command line it will list all the files which are having conflicts or which are having staged changes. But to edit the files you need an editor. Maybe if you need a complete command line then you can go for vim or nano editor. Then there you can see <=== these symbols where in it will be showing conflicts you have manually edit those lines and correct them. Then you can commit the changes.

Q4: I've seen some companies using Docker swarm while others prefer Kubernetes. What is the actual difference between the two? PS: I've been working on Kubernetes for almost a year now and I must say it's super powerful.

Answers :
- I have never been into kubernetes yet.I have used docker swarm though but our applications were small. For me it was easy to create clusters and manage containers easily. I prefer swarm because it was very easy to setup.
- kubernetes is a bit slow(compared to docker swarm) in terms of starting/restarting pods/containers, etc and kubernetes has better features like auto healing and stuff (not sure if docker swarm has updated) Also, most people use kubernetes as it came before swarm and got popular fast

Q5: Consider you are having private git repository and you would like to automate the docker build process? How would you achieve this? We have multiple approaches I guess.

Answers :
- I had never tried ssh until I encountered this problem. So using ssh clone along with a private key you can easily solve this.

Q6: I have a question. How can we use docker for code development? I want to know if it is possible to have my docker run continuously so that changes I made in my IDE has to be reflected without restarting or rebuilding my docker.

Answers :
1. I think you need to use Jenkins/Travis for the CI/CD part. In your Jenkinsfile, you can include a step which upgrades your running pod. This will in-turn make changes in your code.

2. o you can have this setup completely on premise or online as well but both can have the same procedure. And this is the beauty of Devops.
   So usually what you can do is you can have your code in github or gitlab and push your changes. Then you can choose among TravisCI CIrcleCI or Jenkins (I have configured using jenkins).
   So you have to configure in any of these Travis CIrcleCI or jenkins pipeline.

TECHNICAL AMA 2 : Python 🐍 and IoT communication.

By- Md Saif Alam

Q1: How is IOT different fom Edge ?

Answers :

1. Edge did real time decision making while iot is embabed or based on a line of command provided by humans.

2. The edge means local (or near local) processing, as opposed to just anywhere in the cloud. This can be an actual local device like a smart refrigerator, or servers located as close as possible to the source (i.e. servers located in a nearby area instead of on the other side of the world).The edge can be used where low latency is necessary, or where the network itself may not always be available. The use of it can come from a desire for real-time decision-making in certain applications.

3. IoT is the Internet of Things, and it encompasses anything that connects to the Internet and communicates with other devices. Generally, IoT devices are things like smart light switches, temperature sensors, motion detectors, cameras, appliances, etc.
   Edge is about putting computation power as close to the place where it's needed as possible. Network connections can't always be relied upon, so it's a good idea to have compute power at the same physical location where you're generating the data, so you can analyze it on the fly, without having to wait for a good connection to the cloud.

Q2 : What exactly is the difference between python modules vs library vs package or are they the same ?

Answers :

1. `Module` is a file which contains various **Python** functions and also global variables. It is simply just `.py` extension file which has python executable code. On the other hand , `Package` is nothing but a collection of modules. It must contain **__init__.py** file to let the python interpreter know this is not just a simple directory but a collection of modules or `package`. Basically you don't have to write anything in **__init__.py** file but

must be there in the module directory. A **library** is *just* a collection of related functionality. Nothing more, but also nothing less. The defining characteristic of a library is that *you* are in control, *you* call the library.
A pacakage can be created following the tutorial :
https://packaging.python.org/tutorials/packaging-projects/

2. Python modules are in simple words you can say that it is a bunch of functions together likewise math module it contains all functions like sin cos tan pi etc while the library is somewhat used for specific kinds of work like pandas for managing data and matplotlib for plotting graphs.

Q3 . Can you please point to some good resources to learn Python for ML and Data Science?
Answers :

1. https://www.udacity.com/course/deep-learning-nanodegree--nd101.
2. A. For Machine learning

   https://www.coursera.org/learn/machine-learning?ranEAID=3PhbAxfdARQ&ranMID=40328&ranSiteID=3PhbAxfdARQ-xZ6rU47nh5RpeR_duxDleQ&siteID=3PhbAxfdARQ-xZ6rU47nh5RpeR_duxDleQ&utm_campaign=3PhbAxfdARQ&utm_content=10&utm_medium=partners&utm_source=linkshare

   B.Python

   https://www.coursera.org/specializations/python

   C.Data science

   https://www.udemy.com/course/master-data-science-analytics-and-become-data-scientist/?utm_source=aff-campaign&utm_medium=udemyads&utm_term=Content&utm_content=Textlink&utm_campaign=All-3Mar2019&ranMID=39197&ranEAID=VkwVKCHWj2A&ranSiteID=VkwVKCHWj2A-wytzL2GPGDtiSyjkppLSfw&LSNPUBID=VkwVKCHWj2A

3. https://www.learnpython.org
4. https://www.coursera.org/specializations/advanced-data-science-ibm
5. https://www.datacamp.com/

Q4. What is the difference between MQTT and CoAP ?

Answers :

1. MQTT is a many-to-many protocol while CoAP is a one-to-one protocol.
2. MQTT has a broker system for routing unlike a server in CoAP

3. MQTT is a communication protocol widely used in both IoT and IIoT deployments.

4. In MQTT clients uses uninterrupted TCP links for connection with broker. While in CoAP communication between client and server is done in the form of UDP packets.

5. MQTT is a publish-subscribe protocol that facilitates one-to-many communication mediated by brokers. Clients can publish messages to a broker and/or subscribe to a broker to receive certain messages. Messages are organized by topics, which essentially are "labels" that act as a system for dispatching messages to subscribers.

   What is COAP ?

   Constrained Application Protocol (CoAP), on the other hand, is a client-server protocol that, With CoAP, a client node can command another node by sending a CoAP packet. The CoAP server will interpret it, extract the payload, and decide what to do depending on its logic. The server does not necessarily have to acknowledge the request.

Q5. How to check whether python object is function?

Answers :

you can try it locally

```
import collections
import inspect
fn = lambda x: x*2

#in python2:
print(callable(fn))

#in python3:
print(isinstance(fn, collections.Callable))
#as Callable is an Abstract Base Class, this is equivalent
to:
print(hasattr(fn, '__call__'))

#Return True if the object is a Python function, which
includes functions created by a lambda expression.
print(inspect.isfunction(fn))
```

-   There're two ways to check if a Python object has an attribute or not. The first way is to call the built-in function hasattr(object, name) , which returns True if the string name is the name of one of the object 's attributes, False if not.

Q6: Have you ever used inspect-module? How to find out a source code of function?

Answers:

-   t is can be useful when you are working with external modules

```
import inspect

def fun(x):
    return x*2+1

inspect.getsourcelines(fun)
```

By- Md Saif Alam

Q1: Could you please tell me how Edge is useful in low latency areas ?
Answers :

- Having lower latency is always good and when it comes to edge applications, it's just great. It will definitely decrease your processing time and you will get your results asap.
- And reduces need for peripheral needs I guess

Q2: Which are some of the OpenVINO pre-trained models that can be used for making an app that could detect whether you're awake/asleep.
Answers :
- Head position, Facial Landmarks, Pose detection could be
- person-detection-action-recognition

Q3: is there an official repository of the solution code from all the course projects?
Answers :
- I don't think there's an "official" repository where you'll find the source code. All the demos provided by Intel are coded in C++ and you might be able to find the source code if anyone has ever worked on it (personal project).

Q4: Do we need internet connection for working of Edge Applicaiton in mobile apps ?
Answers :

1. Yes of course! But if you deploy your model in your app, you won't need an internet connection. Here's a cool blog - https://heartbeat.fritz.ai/machine-learning-on-mobile-devices-3-steps-for-deploying-it-in-your-apps-48a0a24364a8

2. The internet connectivity might not be needed for working of edge application as the AI already implement at the edge for real-time decision making.

Q5: Bill Gates, in a recent interview said that "AI can be our friend" while Elon Musk, in the year 2014 called AI humanity's "biggest existential threat". What according to you will be the future of AI? Please express your thoughts.
Answers :

1. Right now AI is my friend. My Google assistant helps me in waking me up on time. Friend or enemy, one application I don't like of AI is Deepfake. That application astonishes me

2. Well, it depends upon the application. It can be used in good and bad ways. We just need to focus on good applications and put multiple restrictions of different types to reduce threats from bad applications. Also, white hat hackers will play an important role. They should find vulnerabilities before red hat hackers.

3. The applications of AI in the military can't be defied similarly the AI is assisting humans in many ways. On the other prospect, the deployment of AI in industries will shorten manpower thus people might lose their jobs in the near future. So, AI is friend, enemy, assistant or whatever you wanna say "AI is everything"

4. I think the biggest thing humans have to fear is still one stupid person having too much power. even if everybody is trying to be as cautious as they can .....if there is one person who wants to run ahead faster...he or she will make it difficult for all the others to be safe.

5. If you understand it a friend and treat it as a friend, it is your friend. Same is true for other side
    a. If it gains consciousness and discovers something beyond our perception, two things will happen:
    b. If we stand in its way. We are doomed.
    c. If it discovers that we are not a threat and proceeds to pursue its ambition. it MIGHT leave us alone.

TECHNICAL AMA 4 : General DL and CV experience.

By- Md Saif Alam

Q1: How to get internship in Ml DL or Ai as most of the companies ask for masters or PHD candidates
Answers:
1. You have to look for internships that are more software based and not research based, especially on sites like linkedin. There are some universities that take students for research projects as well and companies that are more on the development side rather than pure research. There are companies which take research projects as well and the companies who want to train and hire people, You just need to get some experience/projects to show for
2. having good projects in portfolio
   - Working in a AI company in any other role and try to switch to AI role later on once company trust your experience
   - Best one: create your own company

Q2: what learning path did you follow to get your position?
Answers:
- I had some projects that I could show, apart from knowledge, projects are important. I had showcased my code for kaggle and hackerearth competitions on github and also had learnt some stuff about deployment.
  Also, you need to be able to do stuff from research papers sometimes as some companies may give you a coding assignment related to it

Q3: What technologies are used at your company and where did you get skills for?
Answers:
- I have been working for around 3 months and my current projects are mostly related to object detection, and in realtime. so one of the things that the project needs is YOLO for GPU inference, optimized using TensorRT and we are also using OpenVino for a lot of CPU stuff (this program really helped)

Q4: Can you please tell us about some good certifications or courses which can have a good impact on our Resume to get a job in AI and Computer Vision?
Answers:

1. My master is AI. I think learning about AI is so different from getting a job. If I have time, I prefer to do projects to learn more. I think it works better than certificates. Knowledge is necessary but applying knowledge in real projects is the only thing that can help you to learn and understand it very well.
But EDX and coursera and Udacity are good places to learn and get certificates.

2. For resume, I mostly had side projects to show, but some courses you can go through(without paying) are the coursera's higher ed starter kit (13 courses related to Tf and deployment sponsored by google cloud platform for which you can avail credit)
Also udacity has courses (beginner and advanced) checkout georgia tech's courses for both comp. vision and AI

3. What I personally think is, certificate courses are boosters and they will align u to the AI track. Once u done with around 2-3 courses u can't learn much from courses anymore. From now on u have to choose projects and kaggle competitions this ll give much more and in-depth knowledge about AI.

Q5: Value of Udacity vs Courses Vs Edx Course certificates ?
Answers:
1. They are valuable for some companies but some only look for actual experience in projects (I have seen companies that wont value any course but will require a good kaggle profile)
All 3 are valuable sites for learning but it's better if you create something to show what you learnt and is not for the course

2. Actually all the certificates from these websites can get the recruiter's attention to your profile and can help you shortlisting for the interview process but the major impact will be created with the knowledge you gained and implementation in terms of some real world projects to showcase.

Q6: Can you please tell us about some of the projects you have completed?

Answers:

- I had mostly worked with conv nets in different competitions, for course projects and side projects I had tried different tyes of architectures like Autoencoders etc. I had an lstm text generator as deployable (deployment is an important aspect for software dev companies). I had created Units for segmentation as a task for an internship

Q7: What can be the cheapest implementation using Openvino Edge computing? Raspberry Pi + Intel NCS 2 combo is powerful but expensive for production. Intel Up-Squared board is also expensive. What could be a cheaper intel alternative? (Lets imagine we use pre-trained models from Model Zoo, hence easier to stick to intel hardware)

Answers:

- I am not much familiar with SoC's and their prices but if you use boards based on Intel Quark(it's an MCU and not and Soc afaik), you might not need a compute stick(depends on application of course). but again, the cost factor is something that will be annoying, best thing to do is to get minimum working elements and set the price accordingly or decline the project if the cost-profit is not in your favour.

Q8: What can you expect in the interview? What kind of coding like ds and algo are required for getting a job, especially in computer vision?

Answers:

- Depends on what your company focuses on. If you are more on the heavy software side, you will need DS and Algo (coding competitions would help a lot)to create faster software. For companies which are more on just AI side (like my company does the AI related tasks for other products, where we create the larger software's AI modules) you can expect more of those questions.
- For CV, CV and image processing algorithms are important.
- For AI, you can expect questions related to preprocessing, frameworks (like keras, pytorch etc) and general AI concepts (depending on level of job (bachelors,masters etc))
- For CV practice, I am not sure about interview question sites, but you can look on sites like glassdoor where people share those questions. In general it would be better if you know the basic algorithms and techniques for image processing and CV

- Also, you might be given scenarios and asked to give an approach to solve the problem. In such cases, experience with solving problems help

Q9: Which technologies/frameworks do you/your company use for deployment in production? Flask, Django ... ?
Answers:
- We sometimes have to use what the client wants, so we use both. And if you look at software dev, it's not necessary to know everything, generally, you just need to know how to make sense of the documentation.

Q1: is there any way to deploy the openvino app on mobile
Answers:

1. For mobile devices, you can use TFLite as to use Intel distribution for Openvino, it must be an Intel supported device.

2. If you say connection with rdp or ssh from browser about your mobile to server and work on mobile you will use dedicated server.
   If you mean to develop apps for mobile systems you will use tensorflow.

https://heartbeat.fritz.ai/machine-learning-on-mobile-devices-3-steps-for-deploying-it-in-your-apps-48a0a24364a8

3. Mobile devices are not supported as Intel don't provide hardware for mobile devices yet

Q2: Can I use firebase as a server?
Answers:

- you will use firebase using on desktop for coding will be more efficient. You will use for server efficiently Amazon AWS.
- or more basic fundamentals , you will compiling on google colab
  https://colab.research.google.com/notebooks/intro.ipynb

Q3: How and how much role does IoT play in business analytics?
Answers:

1. Everyday , everywhere and also everytime like as we breathe, we are using our electronic devices. This will leave some footprints behind.
   This time also valid also business analytics.
   The Internet of things started playing a big role in business.
   Especially on supply chain management and logistics.
   Firms like DHL, Apple , Retail firms like (Amazon also Cashierless store Amazon go)
   Internet of things on business analytics new erp solutions on business or discovering the horse to engine car.

2. I work in the Business Intelligence field. Right now, the role of IoT in business really comes down to a few factors:
   - which industry the business is in how tech-savvy its executives are
   - how much money they stand to save or earn as a result of adopting IoT technologies.

   For instance, one of the biggest growth sectors for IoT right now is agriculture. Tractors, combines, and other heavy farm machines are all being equipped with extensive sensor arrays and wireless data radios, so they can relay detailed information back to the farmer about things like crop health, moisture and pH levels, presence of pollutants, pests, and weeds, current yield per acre, etc.

3. We will search and look at John Deer company in Agriculture about traditional firms to convert their business model , research and development.
   Many of these heavy machines are also being equipped with self-driving technology, so the farmers can dispatch their machines out to the fields, and instead of just riding in the cab all day, they can spend their time on more valuable activities for their business, such as negotiating deals with buyers, tweaking their fertilizer formulas, experimenting with hybrids, etc.
   Funny you should mention John Deere. They actually just recently opened a new facility only a few miles away from my house here in Des Moines, Iowa, USA.
   https://www.deere.com/en/our-company/news-and-announcements/news-releases/2019/agriculture/2019aug20-new-urbandale-isg-facility/
   That's where they do most of their innovating with IoT devices. I got to go on a tour a few weeks ago, and some of the stuff they're working on BLEW MY MIND.

Q4: Hey do you have steps defined for custom layer exercise? As I find it very hard to follow it in the workspace.
Answers:

- If you need self discovering and DIY Guide; Will sharing link
  https://docs.openvinotoolkit.org/latest/_docs_HOWTO_Custom_Layers_Guide.html

TECHNICAL AMA 6: AI,DL,ML

By- Md Saif Alam

Q1: Can you please give some suggestions to become a kagge master.

Answers :

1. I would recommend starting with small data sets and already solved projects.
2. Clean the data set
3. Perform cleaning, feature extraction, feature selection, etc.
4. Start building your code
5. train your code and measure performance.
6. Look at the solution try to work through them and understand them and apply them to your code.
7. Then little by little you will get better and can start with more complicated projects.

Q2: Is it hard to shift career to AI from a web development background?
and How much AI is gonna be merged with other fields?

Answers :
It very much depends on the field and domain you are going to be involved in. AI has application in almost every field but definitely the required and important skills can be very different depending on the domain.

I think AI has application in web development. FOr example increasing the security of a Mozilla Firefox is something that related to your field. If you want to identify the abnormal activities you might want to use AI for that. This is one application I know
But I believe for such an application, basic statistical knowledge, Knowledge of ML algorithms, Linear algebra, Python will be very necessary.

Q3: If we know Deep Learning, it is obvious that interviewers expect us to know Machine Learning concepts as well? I am currently taking Deep Learning course by Udacity. But did not take any course related to ML till now.

Answers :

1. Yes, definitely. ML knowledge is necessary I believe. For example you need to know the concepts of Bias-Variance trade off. Meaning of overfitting, bias, … You need to know what is a predictive model and what is a generative model and in what circumstances you need to deploy them.Speaking from my own experience, when I boosted my ML knowledge I was able to have a much better grasp of the other concepts especially deep learning and generally dealing with data. It can be very very helpful for you and I strongly recommend it.
2. Yes, and to better understand the deep learning concepts, ML will be helfprull
3. actually it depends on the companies and their projects demands.
4. In general, machine learning is a very vast field which deals with many different algorithms but on the other hand, deep learning mostly focused on NNs.
5. But recruiters expects that any candidate should know the general machine learning concepts like regression, logistics regression, bias-variance tradeoff, SVM kernel etc.
6. Also as @Mahzad said getting the ML knowledge will surely help you to understand the DL concepts in a better way and vice-versa is also true. and also recruiters will also prefer.

Q4: I think you have working experience with different framework for training ML. What is your opinion about different frameworks; tensorflow, pytorch, caffee etc. Answers :

1. Pytorch is very user freindly and much easier to deal with.However, this is not the case with caffe. It usually requires to have very good programming skills to completely understand what is going on and be able to take advantage of the model for the task at hand.
2. for begginners Pytorch definitely.
3. For intermediates Tensorflow and for advanced Caffe
4. Every framework is competent enough to meet any technical implementation. It's upto your personal taste and comfortable level to choose one from others.

Q5:With so many pre-trained models these days like Resnet Mobilenet etc, just curious to know if anyone is actually building their Network from scratch?

Answers :

1. I think it depends to the task you want to do and your dataset. If the dataset is pretty close to those of trained models you might want to go with transfer learning instead of starting from scratch.

2. Well, new models are in general always welcome. Basically, they want to be more general to use, of fill gaps that other have, or just be faster and more precise. Also, have in mind, that since there is a constant development in frameworks available, models need to adapt.

Q6.What resources and communities do you go to if you have errors in code/ or making projects? and what do you think of Keras compared to other frameworks?

Answers :

1. I usually try to figure it out myself by debugging and looking at the documentation. That usually helps you to learn new programmming techniques and improve your coding skills.

2. If I do not figure that our O usually search the issues on the github repository or refer to discussion forum and ask for help. It is very helpful most of the time.

3. Do not use Framworks that do not have an active community.

Q7.Since there was a question of transfer learning, I'd like to ask you @Mahzad whether you ever worked with NLP using DL technics, and if so, what models would you recommend, knowing it's for French language?

Answers :

1. I am currently busy with a sentiment analysis project. We are exploring lexicon based and ML based models, DL models are usually very powerfull but they require a lot of data.

2. If you do not have much data, I would recommend not to go with DL models. I personally do not have experience with DL models in NLP.

3. I recently saw an article about Snorkel framework from Google (2019) and basically they say that with this technique you can significantly reduce your training set without loosing precision

4. ou can work with Transform based architectures like BERT etc which are currently SOTA now a days.

5. Also if you in learning phase, start with RNN or LSTM based architectures to get the overall idea about the workflow.

Q8.What is the L1 regularization? How does it help even though it is not differentiable at x=0?

Answers :

1. L1 regularization is on of the methods that can be used for overcomming overfitting problem. L1 regularization add sparsity to your problem and it is less sensitive to the outliers.

2. By sparsity I mean it removes some of your features and that makes the model more interpretable and understandable. As you might know adding features increase the complexity of the model and when models are very complex they overfit. WHich means that they do not generalize well.So L1 regularization remove some of your features and thereby reduce complexity of your model and as a result prevents the overfitting problem.

3. The key difference between L1and L2 Is that L1 shrinks the less important feature's coefficient to zero thus, removing some feature altogether. So, this works well for feature selection in case we have a huge number of features.

Q9.What is the most interesting AI application you have come across? Everyone is welcome to answer.

Answers :

1) In analyzing super resolution microscopy images and in biophysics problem.

2) Its not ai bascially DL where an rnn model could complete our drawing. A part of specified object drawn will be completed by rnn.

3) Removing image distortion to recover original image

4) Making human like faces which are not of real human

5) Faking known painters drawings

6) understand that but it's pretty interesting to create something that doesn't even exis

7) OpenAI's AI that learn how to play Atari games

8) AlphaGo Zero, where Reinforcement learning not only beaten humans but also beaten AlphaGo.

9) Self driving cars and in general vehicles (including drones).

TECHNICAL AMA 7: Inference Engine

By- Md Saif Alam

Q1.what is this xml and bin file second does ir support any other formats.
Answers:

1. XML provides the network topology, while Bin file contains the weights and biases.

2. finally someone. I thought i asked something really tough. 😅 so yah bascially xml provides network topology and bin contaislns all numerical information like biases but is there any other file format acceptable to ir :)

Q2.What are the kinds of optimization in IE not in MO.
Answers :

Network Optimization: Rearrangement of data and input data for the best network performance
Memory Optimization: Rearrangement of memory
And finally
Kernal Optimization: this is the supreme optimization in which the best instruction set is picked to be used for right devices

Q3. is it possible to deploy and Android Edge Application using Open Vino Toolkit ?
Answers:I am not so sure but its kinda one of my friend told me something like this. Setting up a server in ur phone and then something like that . But at the end of the day i felt his idea got shifted a bit from edge to cloud though .
Well Openvino currently supports intel based products processors only. But android is an arm based product meaning in embedded system world android phone works on ARM processor. Its quite famous in embedded system world