6 Months As A Machine Learning / Computer Vision Engineer

What it's like to spend half a year in a field I didn't see myself in a few years ago

Richmond Alake Jul 27, 2020 · 13 min read★

Introduction

I can't believe it's already been six months since I wrote an article detailing my first day in my current role.

Time really does fly.

So, welcome again, to an online log of my experiences as a Computer Vision Engineer.

In this article, you can expect a lot of details into the day to day activities of a computer vision engineer working within a startup. Also expect a recollection of some of the mistakes I've made and the achievements I have celebrated.

For you, this article will present what to expect when you take a machine learning/computer vision role within a startup and the typical roles and responsibilities of a machine learning practitioner in current times.

I think this is a good enough introduction.

Let's jump straight in, and summarise six months in 4,000 words, or less.

Machine Learning / Computer Vision / Deep Learning

Hybrid by Vladyslav Ociacia. (Image Licence held by the author)

Let's kick things off with a break down of my role, accompanied by a job role description as well.

In this section, I'll also present to you precisely what is expected of a computer vision engineer.

> ***Machine learning*** *can simply is the development of systems that can learn and improve from data.*
>
> ***Computer Vision*** *is the process by which a machine or a system generates an understanding of visual information by invoking one or more algorithms acting on the information provided. The understanding is translated into decisions, classifications, pattern observation, and many more.*
>
> ***Deep Learning*** *is the utilization of deep convolutional neural networks to solve computer vision tasks such as image classification, pose estimation, semantic*

> *segmentation etc.*

My key responsibilities within my role lie in the research and implementation of computer vision techniques such as pose estimation, semantic segmentation, gesture recognition and facial feature detection. All the listed techniques are implemented on mobile devices.

Techniques

Below are various computer vision techniques I've implemented using deep learning solutions within the last six months.

In some cases, I have included the models I've utilized:

- **Pose Estimation**: This is the estimation of the location of key joints within a person presented in an image or video. I implemented pose estimation by leveraging research devised solution such as Stacked Hourglass, Convolutional Pose Machines(CPM) and Posenet.
- **Gesture Recognition**: The classification of an action taken by a person can be referred to as activity or gesture recognition. The process by which I approach implementing this technique was to leverage the MobileNetV2 network(trained on imagenet) via transfer learning and use custom-built classification head to classify gestures within an image appropriately.
- **Hand Detection/Tracking:** This is a trivial computer vision task that is mainly concerned with the detection and localization of hands within an image or video.
- **Semantic Segmentation:** This can be thought of as granular classification done on the pixel level, as we are classifying each pixel within an image to an object. Implementing this was fun, and it involved the reverse engineering of TensorFlow's DeepLabV3 segmentation example.
- **Face Detection/Tracking:** This is the implementation of a system that can track and localize the position of faces within an image or video.

Tools

If you are a machine learning practitioner, you are probably aware of some tools mentioned below. For those who are just entering the AI field, the tools listed are

utilized by Data scientist, ML Researchers and ML Engineers alike.

These are tools I utilize on a day to day basis.

- ***TensorFlow****: An open-source platform for the implementation, training, and deployment of machine learning models.*
- ***Keras****: An open-source library used for the implementation of neural network architectures that run on both CPUs and GPUs.*
- ***TensorFlow Lite****: An open-source framework aimed at the deployment of machine learning models on edge devices such as smartphones.*

Other notable tools:

Jupyter Lab, ***Anaconda***, ***CoreML***, ***Vision Framework***, ***Visual Studio***

> ***Tip:*** *Don't get attached to tools, techniques and processes. Focus on your ability to learn quickly and adapt to new environments.*

Software Engineering

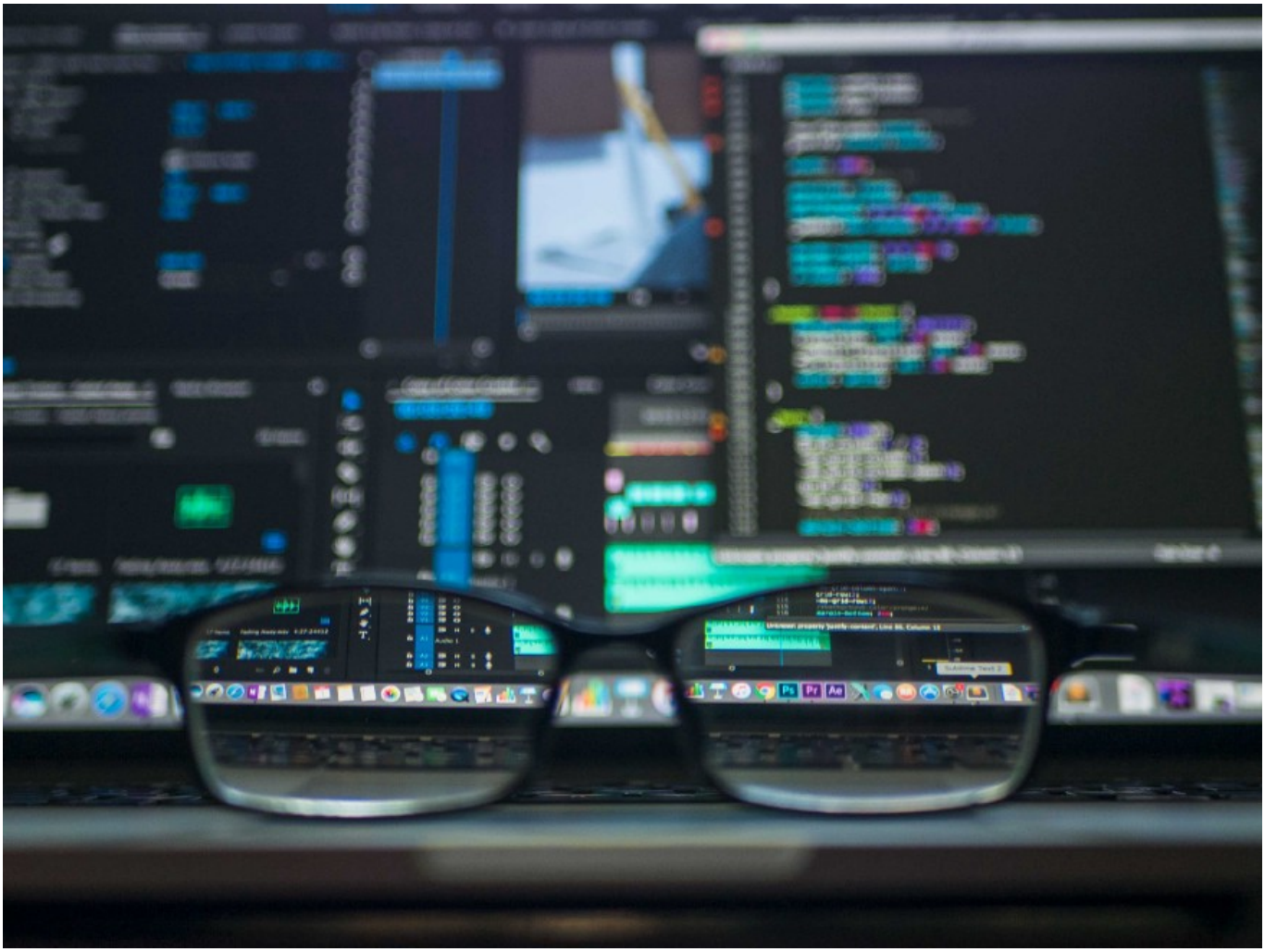


Photo by Kevin Ku on Unsplash

Previously I viewed software engineering as a skill, but as I've developed in my career, I have come to the acceptance of the fact that software engineering is more of a practice.

Sofware Engineering isn't a skill you can gain in three months, but it's a methodology that you develop through years of experience in developing software applications.

So, as a machine learning engineer, I practice software engineering daily. More specifically, I incorporate aspects of software engineering principles within my development workflows and processes.

Most modern-day machine learning engineers have a good knowledge of 3+ programming languages. This might seem like a lot, but building modern applications with an integrated learning system and ML techniques requires a synergy between

various platforms and tools — all of which leverage different programming languages to write executable instructions.

Here are the main programming languages I've utilized these last six months:

- **Swift**: Used for iOS application development
- **Python**: Used for implementation, training and evaluation of ML models
- **JavaScript**: Used for implementation of ML models, also writing custom scripts.

I also have practical knowledge of HTML, CSS, SQL, Kotlin, NodeJS, Flask etc. All of these are tools and languages have picked up over three years of general software engineering.

> ***Tip:*** *Learn the basic principles of OOP(Object Orientated Programming). The knowledge of OOP is applicable and transferable across widely-used programming language.*
>
> *If you understand OOP, learning programming languages is a matter of getting acquainted with language-specific syntax.*

Photo by engin akyurt on Unsplash

No one could have predicted a global pandemic crippling nations across the world in 2020. Toilet rolls became a commodity in western countries; elbow greeting replaced handshakes, and remote working is now the new norm for most tech-based industries.

I was only a month into my current role when the pandemic reached the UK, and then we went into lockdown.

Working remotely changed nothing in terms of the startups' goals, team dynamics and my ambition to get work done. Being a Computer Vision Engineer, and having a heavily tech-based role means that I can work from anywhere with an internet connection.

Things that helped with remote working:

- **Buying a desk lamp**: This is a recent purchase for me, and I'm pretty pleased with it. I read a lot, and late-night coding/writing sessions are becoming ever so

frequent. So having a good source of artificial light is very helpful to visibility when reading and overall productivity.

- **Zoom**: This is probably the most talked-about video conferencing tool in 2020. Zoom has created a seamless virtual extension of presence in a manner its counterparts hasn't. I start my day with a zoom meeting with my work colleagues and end my evening with zoom meetups with friends.
- **TeamViewer**: When away from home, TeamViewer gives me access to the compute resources from my GPU machines.
- **Responsive team**: Having team members that are either a Slack message or Zoom call away has mad the gap caused by the pandemic much smaller. Any problem I have is just a slack message away from a solution.

Some say remote working is going to be a permanent option for employees to take. It's clear that the companies themselves save a lot of money on office space and there is no noticeable lack of productivity or results provided by the company's teams.

> ***Tip**: Have a designated area in your home for working.*
>
> *Also, nearby co-working spaces or cafes are an option if you need a change of environment*

Hardware

When I wrote about my first month as a computer vision engineer, I included a specific task I was allocated, and it was to purchase a GPU workstation.

After gruelling research and some back and forth with GPU provider companies, both in the US and UK, I finally purchased one.

Within the past five months, I have utilized the GPU compute resource to train custom models for days on end. I've also executed scripts that ran concurrently without any problems as a result of the 14 CPU cores the workstation holds.

> ***Tip**: Ensure you purchase a GPU workstation with multiple GPU slots, even though you might be purchasing just one actual GPU. You might need to expand your GPU capability in the foreseeable future, so it's better to be prepared against that.*

I have become slightly interested in the history of GPUs and how they came to be. As a Deep learning practitioner, you and I know that training CNNs with GPUs became popular with the introduction of AlexNet and the advent of deep convolutional neural networks.

I'll probably write an article piece on the history of GPU and other cool facts about their utilization and feats.

Learning / Research

Photo by Road Trip with Raj on Unsplash

Learning within an ML related career doesn't ever end. The AI field itself is advancing at a pace where there are always new developments to be aware of (*currently it's the release of GPT-3*) or new techniques to implement.

Reflecting on the past six months, it genuinely feels like I'm still back in University. After completing my "9–5" job, I return home to reading research papers, writing essays and implementing ML models.

For those looking to get into an ML career, you must be aware that there's an unspoken expectation, where you are assumed to be informed on the latest AI developments. Most people expect you to know more about new AI application releases than the average person.

Currently, I'm acquiring as many practical and theoretical knowledge before I can move onto implementing my ideas of neural network architectures or modifying sub-components of DCNNs.

I'm never 100% knowledgeable in whatever CV technique I am about to implement. There's usually an extensive research period before I even think of approaching any form of implementation. For every new technique, I'm researching or implementing, around 70% of the content is new to me.

The learning never stops.

> ***Tip:*** *Don't be afraid to take some step back to ensure you are building a solid learning foundation. Recently, as opposed to reading deeply into the latest state of the art neural network architecture, I've gone back to research papers that were released in the early years of deep learning.*
>
> *I've done this in order to gain an in-depth understanding of the development of the field itself. I've recorded some of my findings here, here and here.*

Fear

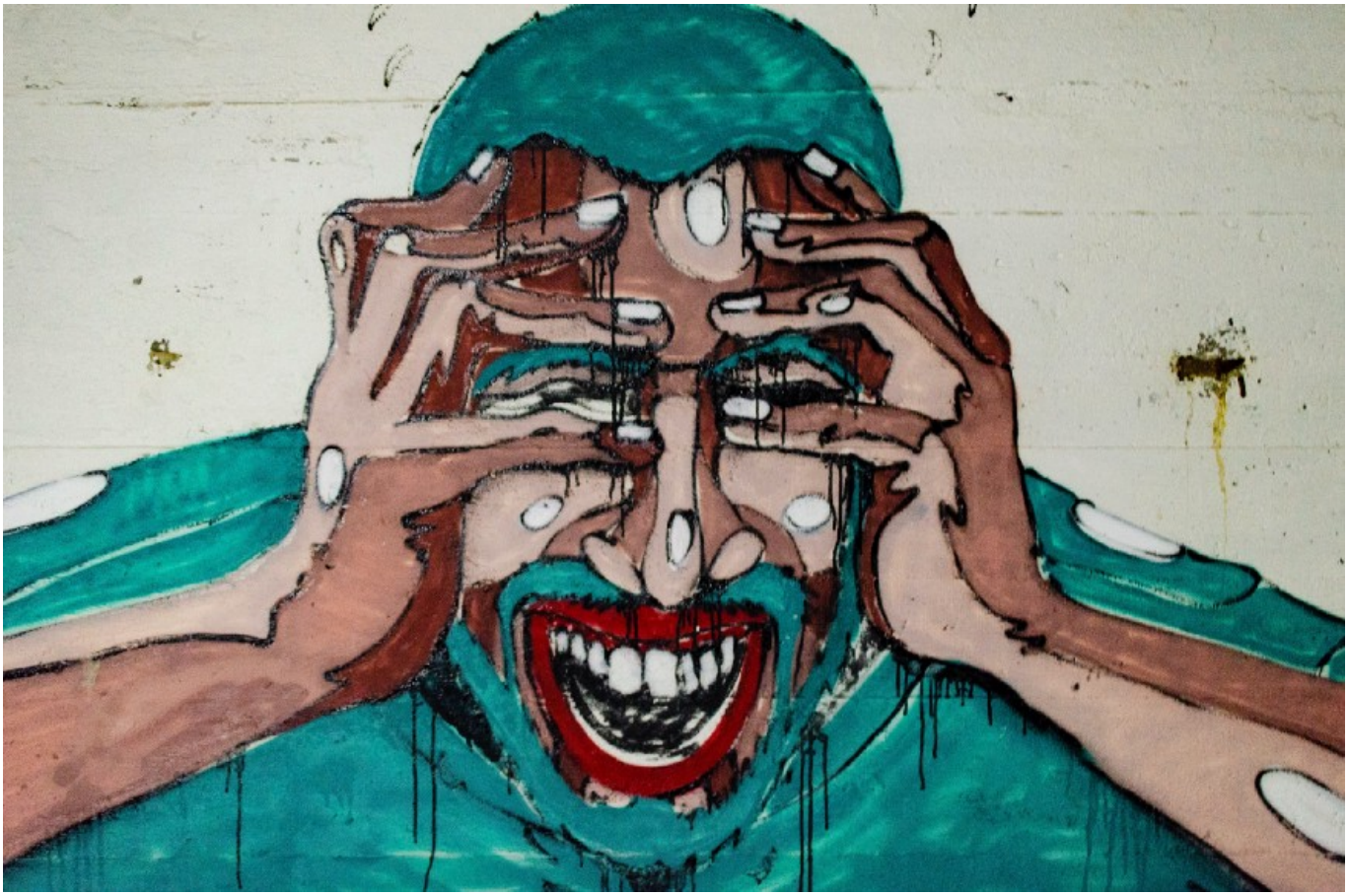


Photo by Aarón Blanco Tejedor on Unsplash

I will be lying to you if I tell you that I haven't questioned my abilities this past six months.

This is my first ML related role, and even more scary is the fact that I am the first machine learning hire for the company.

Have you ever heard of imposter syndrome?

It's a sense of incompetence and insufficiency that you feel, even though you are doing just fine. It's a mixture of self-doubt, lack of self-confidence and false intellectual fraudulence that steals away from your successes and achievements.

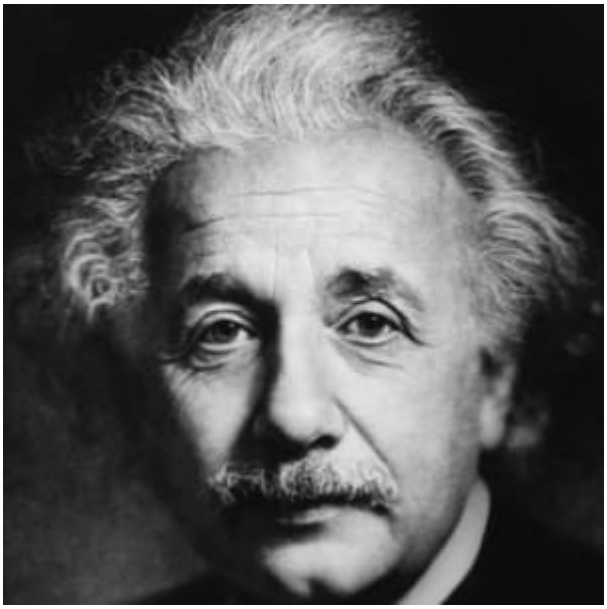
Throughout the past six months, I find myself asking the following questions:

Am I going fast enough? Am I good enough? Am I smart enough? Do I know enough? Is it good enough? What if I fail? What if I'm wrong?

Here is the thing about imposter syndrome; it can be a negative or positive thing, it all depends on the actions you take and how you choose to tackle your self-doubt.

I use my feelings of imposter syndrome to ensure that I am on top of my game, I am not crippled by it, neither am I weakened by it.

Imposter syndrome is more common than you think; even one of the greatest minds suffered from it.



Albert Einstein, Image from biography.com

> “The exaggerated esteem in which my lifework is held makes me very ill at ease. I feel completed to think of myself as an involuntary swindler” — Albert Einstein

> ***Tip:*** *You are enough!*

ML Community

Photo by Annie Spratt on Unsplash

What I do outside my work is equally important as what I do at work.

In the past six months, I have accidentally started building a personal brand within the AI community. Through several different online platforms, I can reach hundreds to thousands of people daily.

And I think you can, and should do the same.

Below is a summary of platforms that I'm utilizing to build a presence within the ML community.

Medium

Image from Medium Design

The AI-related content on Medium has always been a great source of information, both during my academic studies and now in my career.

I've read articles that simplified complex neural network architecture research papers; and articles that provided useful advice on how to approach job selection or salary negotiation within the AI industry.

In the summer of 2019, I decided to become not only a consumer of content on Medium but also a creator. I didn't know what to expect, but I had one aim in mind.

My goal was to use Medium as a tool to reinforce the knowledge and information I was gaining through my studies and projects. Medium to me then was a form of knowledge retention.

Medium to me now is a platform that enables me to reach thousands of people daily. I've written over 70 AI, and ML related articles and I can see that a good number of people are inspired by my writing and are learning and taking away one actionable item.

I've (*for some reason*) been recognized as one of the top writers in the topics: Artificial Intelligence, Technology and Education. This is, in fact, an honour that I hope to retain for as long as I can.

> ***Tip****: Integrate Medium within your learning process. Write articles on concepts and ideas that you are currently learning. This can help with knowledge retention and has the added benefit of providing an online portfolio.*

LinkedIn

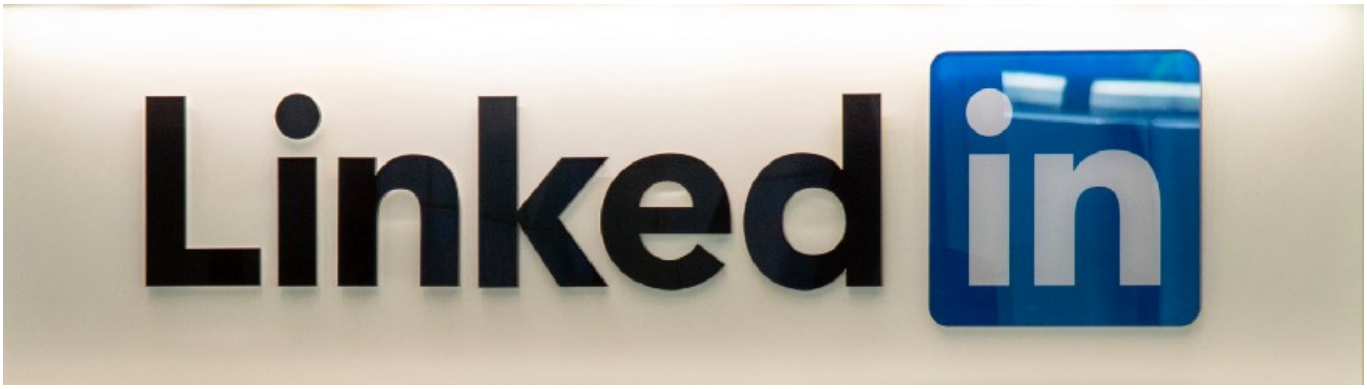


Photo by Greg Bulla on Unsplash

I can't recall when I first made my LinkedIn account, but what I can say is that I've utilized LinkedIn more than I have in 2020 in comparison to any other years.

A fair number of individuals read my work, and some readers have questions in regards to contents within my article. LinkedIn is one of the conventional methods of reaching me.

I am more than happy to answer any questions and give any advice on topics that falls within areas of my technical expertise. To date, I have approximately answered 50+ questions from individuals who have contacted me through LinkedIn. I've also taken some time out to have video conference calls with individuals. Some questions I receive require more extensive answers.

Most of the questions I get asked are around the best methods of learning machine learning, or which career paths to take. Although I am not an expert, I am happy to share the little I've picked up through my studies, research and experiences.

If you would like to send me a message or discuss matters that are ML related, I'm reachable here.

Consultancy

In the last six months, I've sat with individuals that were seeking advice on projects, and in a few cases, I've been paid for my time and expertise. Now, the amount I've been paid is not life-changing, and I won't become a full-time consultant anytime soon. But the fact that individuals place a monetary value on just my expertise is still crazy to me.

In addition to consultancy work, I was recently invited to be a Technical Author for a Computer Vision book that is to be released in the future. Again, the opportunity seemed too good to be true, but here I am today, a few chapters into the unreleased book.

Apart from my learning and career, I can't predict what opportunities I might come across. Every month is different.

YouTube

Photo by Gianandrea Villa on Unsplash

I admire AI/ML YouTube channels, where the host teaches machine learning related topics or explain and implement techniques presented in research papers.

And of course, I'm a fan of Alex Fridman's podcasts and YouTube channel.

On YouTube, I'm a consumer, and I follow ML related channels such as Two Minutes Paper, Daniel Bourke, Sentdex, Deep Lizard, 3Blue1Brown, Yannic Kilcher, Abhishek Thakur etc.

I've decided to start building on the YouTube platform. Soon, I will be posting content that I feel are useful to those starting in machine learning/ deep learning.

Feel free to subscribe to my channel here (*shameless plug*).

> ***Tip****: Don't be afraid to expand your reach. Let the world know you exist.*

Mistakes I've Made

Eye Emoji from iemoji.com

The number of mistakes I've made these past six months are uncountable.

Here are a few "not too" embarrassing mistakes.

- Not pushing to my git repo and losing two weeks worth of work.
- Having an impatient attitude towards my work, which caused a lot of errors and bugs further down the line.
- Not seeking help when I really needed it.
- Spilt water all over the team's desk that contained electronic equipment.
- Pushing to production on a Friday. Then spent the weekend fixing bugs.
- I was late to an online meeting even though I'm working from home (*this mistake takes a certain level of skill lol*).

Everyone makes mistakes; mistakes are inevitable. What's important is that you learn from the mistakes you make and remember that your mistakes don't define you.

I'm sure I will be making some more mistakes in the next six months to come.

Vision For The Year

Photo by Pablò on Unsplash

And there you have it, six months in a nutshell.

To conclude six months, and approach the rest of the year, I will share with you goals that I've set for myself.

These goals are mainly to keep me on track with my career, personal and academic development. Some of the listed goals are ambiguous, and I'll most likely refine them later.

- Read 10 research papers before the year ends
- Release two AI-based applications online
- Implement more computer vision techniques on edge devices

- Build an even stronger presence in the ML community
- Build a solid personal brand
- Obtain the TensorFlow Certificate everyone is raving about

> ***Tip**: Follow me for more AI/ML related content*