Internship At Video Assure

End-June to Mid-August

Intern: *Justin Mandel*
Head Supervisor: *James Miner*
Company: *Video Assure*
Length of Internship: *6 weeks*
Location: *Technopreneur Circle, Raffles City*
Website: *VideoAssure.com*

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Terminology

(As appeared chronologically)

1. ML: Machine-learning
2. MPEG: Moving Picture Expert Group
3. DVB: Digital Video Broadcasting
4. TS/(.ts): Transport Stream
5. HTTP(S): Hypertext Transfer Protocol (Secure)
6. AVC H.264: Advanced Video Coding
7. HEVC H.265: High-Efficiency Video Coding
8. HLS: HTTP Live Streaming
9. DASH: Dynamic Adaptive Streaming over HTTP
10. DTV: Digital Television
11. ABR: Adaptive Bitrate
12. OS: Operating System
13. HID: Human Interface Device
14. OEM: Original Equipment Manufacturer
15. DRM: Digital Rights Management
16. VM: Virtual Machine

Introduction

Over the summer I had the opportunity of interning at Video Assure, a Miner Labs subsidiary. Video Assure is a cloud-based stream quality assessment service, the platform using ML technology to give a forecasted insight of stream quality for companies such as SingTel. In the time I spent under my supervisors, I learnt the basics of computer networking, using a logic loop to create my own algorithm with Azure Cloud and deployed, repaired and networked computers as a sysadmin would.

Communication I: Internal Communications

For the duration of the internship, I took part in meetings in the morning which went over the state and progress of the company's projects and goals. This is where I would be assigned tasks. The office space was a coworking space so our workspace was quite compact so it was easy to communicate with my supervisors. Trello is Video Assure's primary way of keeping track of company goals and milestones. Using Trello, I verified the completion of tasks as well as provide updates to the extent of my assignments. The meetings were also opportunities to develop my workspace etiquette and language. With the support of my supervisors, I was exposed to the interpersonal skills needed to form good relationships in the workspace.

Streaming I: Research Task

At the start of my internship, I was assigned a research task about video formats and web streaming. This helped me understand the basic concepts I needed to get started on various tasks including stream analysis and video formatting. I learnt how video is downloaded by your browser as MPEG transport stream packets (.ts) which the browser uses to buffer videos watched in small segments by stitching them together. This knowledge would go on to help develop my comprehension of DVB and HTTP on the AVC H.264 and HEVC H.265 base compression standard, more specifically HLS and DASH. DASH and HLS

are two different streaming methods utilizing HTTP. HLS is a method developed by Apple to be used in macOS, iOS and other Apple-developed devices, this also includes devices that run any form of Linux. DASH (MPEG-DASH) is a method used by Windows, Android and DTV devices developed by MPEG, Linux is also able to use DASH. The two technologies both download small segments of video footage to be buffered, however, HLS does it sequentially while the much faster DASH uses ABR technology to find and download the highest bitrate video available without causing any rebuffering or stasis.

Hardware I: Hardware Repair

Through this internship, I was also given numerous opportunities to improve my experience with computer hardware repair and knowledge. The assignments in this subject area involved researching potentially viable macOS machines for running 24/7 servers which would be used to monitor HLS streams for clients. I started in hardware, under a supervisor, transplanting a motherboard from a laptop with a dead monitor to one of the same model with a working one, as the dead computer had better components which were soldered to the motherboard. This was in order to run a Windows 2012 server for monitoring streams being broadcasted to Windows 8 users. Once I successfully transplanted the donor motherboard I had to install new RAM and a faster SSD, I completed the task quickly and booted the laptop to success. Subsequently, I reinstalled Windows 8 on the laptop and then updated it to Windows 10. This was necessary as the OEM sold the computer as a Windows 8 product. I then re-installed the necessary drivers needed for the GPU to work with the display as well as drivers for the HIDs. Unfortunately, there was an incompatibility with the touch screen but this was remissible as it wasn't necessary for the intended function of the device. Once this was done I bench tested the computer to check if it would fulfill the performance requirements. While the operation was a success, the device could not be used due to DRM restrictions placed on it by the OEM preventing us from installing a Windows 2012 Server. The use of a VM was not viable either as the GPU lacked the necessary VRAM; it was not sufficient enough to handle a virtual environment, this would also be redundant as the point was to run the stream natively.

Streaming II: Software Deployment

My largest task was rigorously testing multiple HLS and DASH stream analyzers, most required a physical device to gather information about the stream. This assignment involved finding a more 'industrial' analyzer so we could gather more detailed data. I tested the programs primarily on a Linux VM as using Windows in most applications ultimately required me to port to Linux. This way I could test DASH and HLS in parallel. This involved me using Unix to interact with the programs as using the console/terminal was the only way to get information from streams. This task was the longest as it was only partially resolved via a temporary Java application running natively on macOS, however, that meant we were unable to view detailed DASH information (see Communication II). I contacted several potential providers for pricing and overall application information. The most promising solution was BitMovin, an already defined stream analysis provider specializing in advertisement insight. I was put in charge of using BitMovin to monitor a test stream for 2 weeks to see any correlation in stream rebuffer and stall events.

Communication II: External Communications

In finding a suitable application to use for stream analysis I also turned to look for providers as the free programs were mostly insufficient or outdated. This involved me communicating with Elecard to see price plans and features available in their product. Elecard provides commercial and professional stream encoding for consumers, licenced professionals and businesses. In the end, Elecard provided a different kind of analysis that did not fulfill our requirements. I also sent an email to TSLemurs, a company set up to directly deal with HLS and DASH monitoring solutions, and Astra, a provider of industrial tools for TV operators and technicians, but did not receive a response. I did get a response from BitMovin however, who did have tools and features which we could trial that were viable. A meeting was set up with BitMovin solution's architect, Matthew Lee, to go over possible ways of integrating their technology with ours. BitMovin could provide us with a list of error libraries that would help us find error sources for Telcos such as SingTel.

Machine Learning I: Azure Cloud

In the final part of my internship, I was able to use Microsoft's Azure ML Studio to develop my understanding of deep-learning algorithms and machine-learning. The overall aim was for me to recognize how the algorithm used to predict stream quality of service and stability functioned. By using nodes and modules pre-available in the ML studio I was able to create cross-reference algorithms that could, for example, predict the likelihood someone is going to order a specific drink at a restaurant based on their weight, how often they visit a doctor and their relationship status. This experience allowed me to engage with R Script and SQL which I could use to make my own modules.

Conclusion

Over the course of around 6 weeks, I partook in the day-to-day operations of Video Assure. I had the fortune of learning how to interact with machine learning technology to interpret and understand data. My assignments involved me immersing myself in software deployment, computer networking and repair, and how to practically apply them in a real-world scenario. This internship encouraged me to learn about the future of video encoding amongst professionals and industry leaders. Aside from the technical skills I developed, I also learnt business skills, such as etiquette and external communication. The internship was a valuable experience provided by my supervisors to immerse myself in a business environment as well as interact with industrial tools and experienced professionals.