

CS Seminars

Virginia Tech CS 4624 Capstone Project

Eric Parton, Jake Wellington, David Zehr



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Executive Summary

The purpose of the CS Seminar project is to record and archive the weekly Virginia Tech Computer Science seminar series, held each Friday at 11:15AM in Torgerson 2150. These seminars are hosted by professors and Ph. D candidates from Virginia Tech and surrounding universities. The department also hosts several Distinguished Lecturers from around the country.

This semester, our team recorded these seminars, edited them, and made them available through the Computer Science at Virginia Tech website (with the help of client Ryan Chase). This process involved renting equipment at Virginia Tech's InnovationSpace, as well as utilizing their computer lab and video editing software.

While our project was successful, it did suffer from a few issues. Our team occasionally had difficulties securing the high-definition cameras required for taping. We also had problems securing the best lighting and audio inputs in Torgerson 2150.

Users' Manual

Each video is encoded with MPEG-4 compression, at a bitrate of 2532 kbps and the standard NTSC frame rate of 29.97 frames per second. This encoding profile creates videos in an MP4 container with a size of approximately 1GB per video. Since MPEG-4 is a standard codec, a user can play it in every modern operating system without much effort. Free video players such as Quicktime and VLC have built-in support for videos encoded with the MPEG-4 codec.

These videos are located on the Seminars and Distinguished Lecture Series pages of the Computer Science at Virginia Tech webpage (<http://www.cs.vt.edu/seminar-series>). To view these videos, a user should click on the "Download Video" hyperlinks next to lectures on these pages.

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Home Seminars

Seminars

Listed below are the seminars for the current academic year starting with the most recent. These are open events and all are invited to attend.

"Machine Learning in the Bandit Setting: Algorithms, Evaluation, and Case Studies"
Speaker: Lihong Li
Yahoo! Research
Location: Torgerson 2150
Date: Friday, February 10, 2012
Time: 11:15am-12:15pm
See: [Abstract](#)
Download: [Video](#)

"Runtime Systems: Taming the High Performance Computing Beast"
Speaker: Cal Ribbens
Center for High End Computing Systems
Department of Computer Science
Virginia Tech
Location: Torgerson 2150
Date: Friday, February 3, 2012
Time: 11:15am-12:15pm
See: [Abstract](#)
Download: [Video](#)

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Figure 1: The CS@VT Seminar Page with Video Links

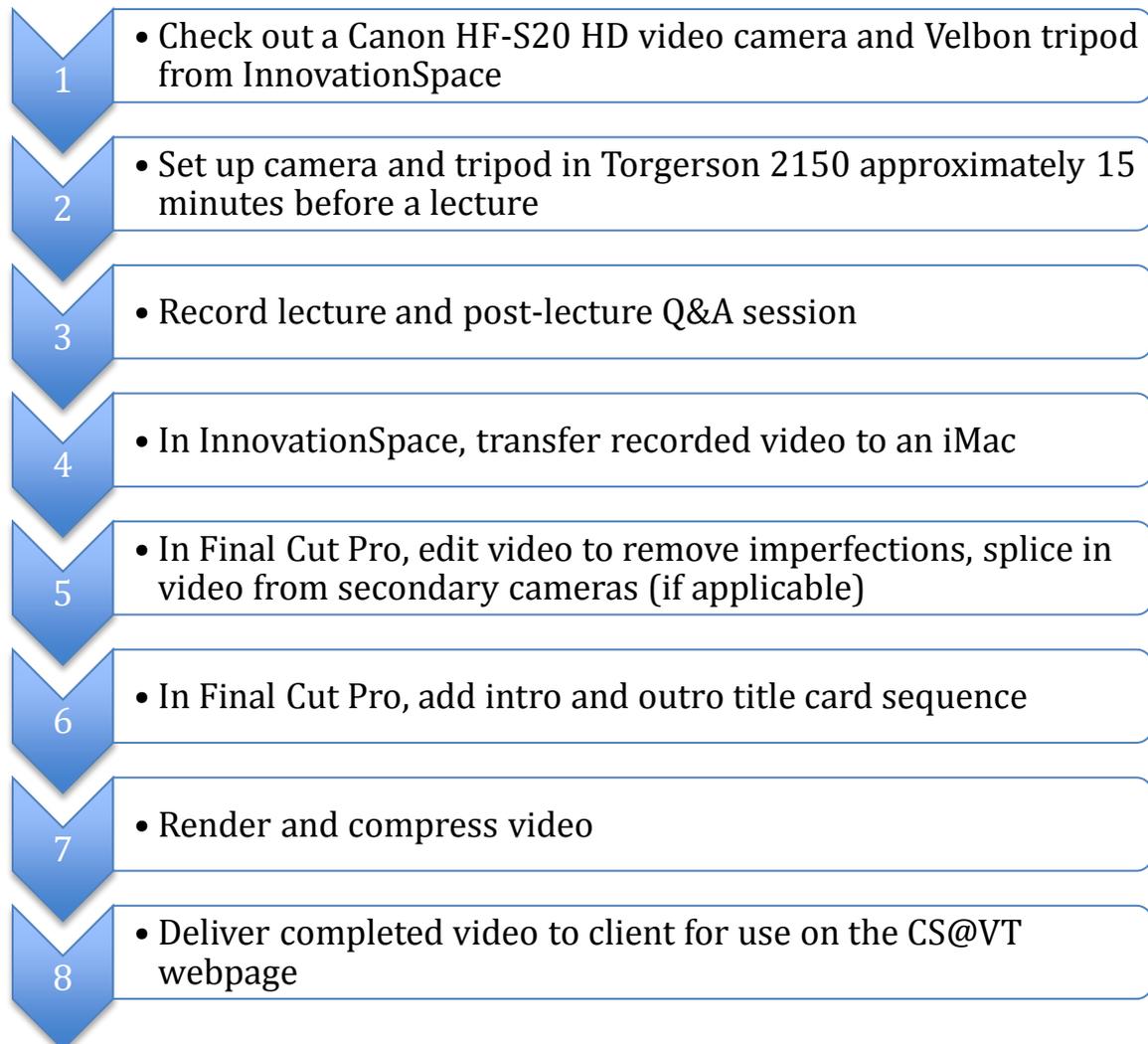
Developer's Manual

Concept

Each semester, Virginia Tech's Computer Science department invites current faculty and other professionals to give seminars/lectures on the CS topic of their choice. These seminars are usually held on Fridays at 11:15am in Torgerson 2150, a 300-seat auditorium on the second floor of Torgerson Hall. The purpose of the CS Seminar project is to record each of these seminars and archive them on the Computer Science at Virginia Tech webpage (CS Seminar, 2012).

Videos recorded for the CS Seminar project are framed so they contain the entire screen the PowerPoint presentation is projected on, along with the speaker. The crowd is not important for these videos, and the camera should be positioned in such a way that crowd disruption is minimal.

Overview of Process



Process

Each week, a Canon HF-S20 HD video camera and a Velbon tripod are rented from Virginia Tech's InnovationSpace, located on the first floor of Torgerson Hall. The equipment can be checked out for free for a period of three days. To minimize availability concerns (since InnovationSpace frequently runs out of cameras to rent), this equipment is checked out at least 24 hours prior to the seminar.

The Canon HF-S20 HD video camera provided by InnovationSpace has a f/1.8-3.0 43.5-435mm lens, and a 1/2.6 inch CMOS sensor that can record video at a resolution of up to 3264x1840 pixels. The camera has 32GB of internal flash memory, allowing it to record 3 hours of full-resolution video or 5 $\frac{3}{4}$ hours in "XP+" mode (Canon). Since the videos from the CS Seminar project are being distributed online, the 12Mbps XP+ recording option is the best choice for recording, since it balances quality and file size. The Velbon tripod is a standard full-size tripod.

Set-up should occur each week approximately 15 minutes before the posted start time for a lecture. The best location to set up the tripod and video camera is in the far back of Torgerson 2150, next to the left wall of the projection room (if facing the stage). This location provides the easiest access to power outlets and a direct audio connection to the room's audio system (this port is located on the left wall of the projection room). If possible, the seats directly in front of the tripod should be blocked off to prevent audience members from walking in front of the camera during the lecture.

The post-processing steps take place in InnovationSpace, which allows students to use iMacs with modern audio and video editing software such as Final Cut Pro. After connecting the camera to the iMac, a video archive is extracted from the camera's internal memory. The footage from this video archive is imported into a new Final Cut Pro event and used during the non-linear editing process. After a new Final Cut Pro project is created, the footage from the event can be dropped onto the project timeline. Techniques such as hum removal and automatic color correction can be easily applied to the footage from the audio/video correction menu of Final Cut Pro. At this point, any unnecessary footage can be removed using the blade tool, and the



Figure 2: Canon HF-S20 HD Video Camera



Figure 3: Velbon Tripod

beginning and ending titles can be added to the timeline (in the appropriate places) from the titles pane. For a smoother transition between the titles and the video, cross dissolves are then added between the titles and the video footage. With the editing finished, the final product can be exported using the “Export for HTTP Live Streaming” option from within the Share menu. Simply specify a location where the files should be stored, click next, then okay, and wait for the process to complete.

Sample Video Frames

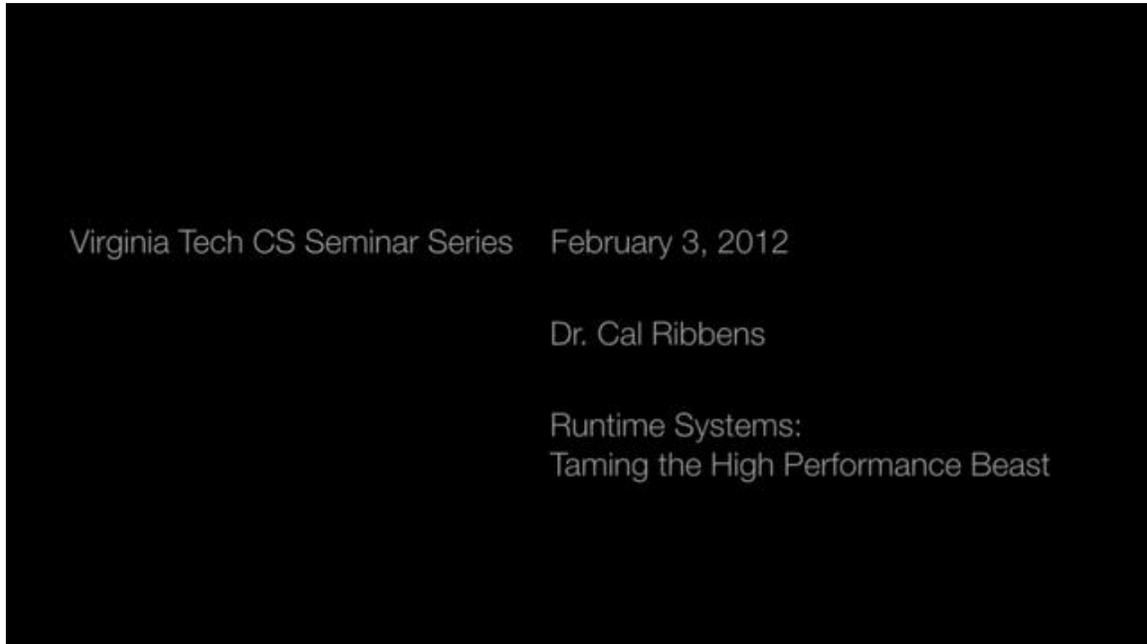


Figure 4: Sample Intro Title Card

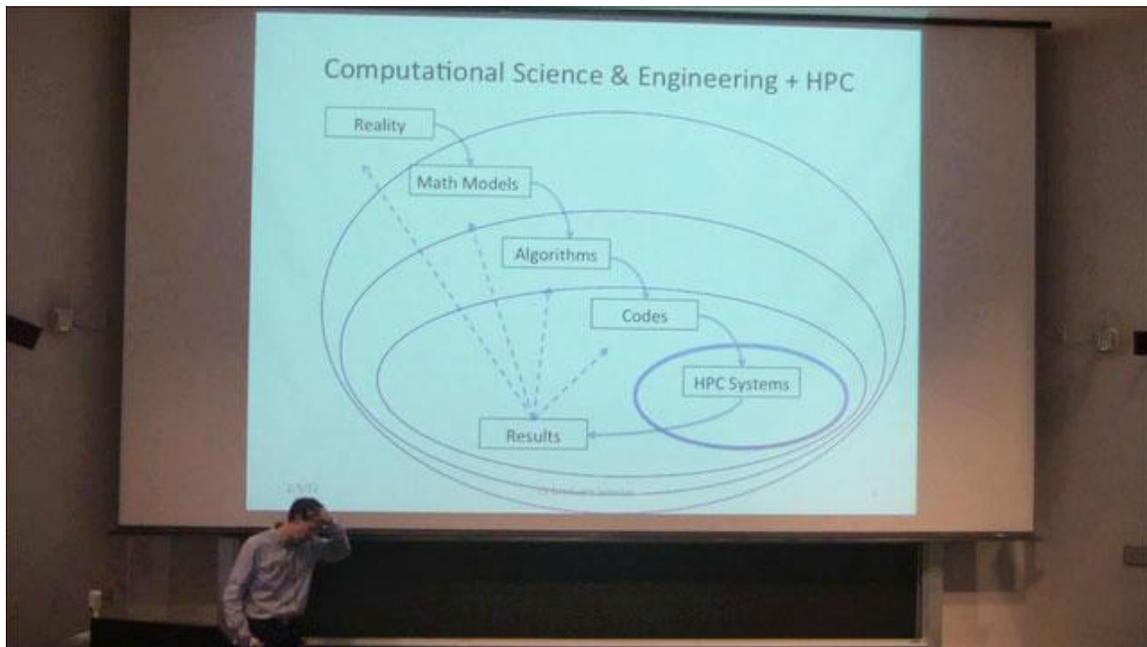


Figure 5: Sample Video Frame from Dr. Cal Ribbens' 2/3/12 Lecture

Lessons Learned

Over the course of this project, several errors became apparent that could have been resolved ahead of time. These issues mainly involved the lack of availability of recording and editing equipment, university bandwidth issues, and poor lighting and sound equipment in Torgerson 2150.

Equipment Availability

Virginia Tech's InnovationSpace only has twenty HD video cameras available to rent. The high demand for cameras coupled with the limited number of cameras means that these cameras are not always available. Several times during the semester, our preferred camera was not available on the filming date, forcing us to use alternative means to record lectures. These alternatives have included using a Lumix DMC-GF2 camera and an iPhone 4S to record lectures. These alternatives produced acceptable (but not ideal) results.

The best solution to this issue is to reserve a Canon HF-S20 video camera for the entire semester, so that a camera is set aside for this project every Friday.

Poor Lighting/Sound Equipment

Torgerson 2150 is primarily a lecture hall for classes at Virginia Tech, not a recording studio. The lighting in the auditorium is subpar for video recording, but sufficient for teaching a class. Unfortunately, there is no way for our group to change the lighting in this room, leading to videos that are flat and lack highs/lows.

Torgerson 2150 has its own sound system, complete with a 1/8" stereo output port located in the rear of the room. This output is not properly grounded, and is subject to a 60Hz hum, pops, and other audio imperfections. We were able to mitigate the imperfections created by this output in our output files, but improving the audio/microphone system in this room would greatly improve the audio quality of videos recorded in this room.

With a few exceptions, we used a one-camera setup for the videos in this project. This setup eased our editing burden at the expense of more interesting videos. Unfortunately, InnovationSpace will only allow our group to check out one camera at a time, due to their limited camera supply. A two- or three-camera setup would likely improve recorded seminar videos, but would require a substantially larger amount of work and more resources than InnovationSpace will allow us to use.

Bandwidth Issues

The camera used to record these lectures is capable of full 1080p/24 (1920x1080 at 24fps) video. However, the client requested that rendered videos not exceed 1GB in size, due to bandwidth concerns (the videos are hosted on Virginia Tech's servers).

As a result, the edited seminar videos must be resized to 640x360, and the video bandwidth must be compressed to 2532kbps.

This problem could be alleviated in the future by using a YouTube Creator account, and hosting seminar videos on YouTube. A YouTube Creator account allows verified content creators to upload full 1080p videos of an hour or longer, and have it available for streaming in all supported resolutions (1080p, 720p, 480p, 320p, and 240p). Since the University would no longer need to host the video files, the CS department would save on server space and bandwidth. The resulting video files would also be of substantially higher quality than our current deliverables.

Deliverables

Our completed project contains the following video files:

- **January 27 – Broadband Low.mp4**
 - 54 minutes 32 seconds
 - 988 MB
- **February 3 – Broadband Low.mp4**
 - 57 minutes 30 seconds
 - 884 MB
- **February 10 – Broadband Low.mp4**
 - 58 minutes 39 seconds
 - 908 MB
- **February 24 – Broadband Low.mp4**
 - 1 hour 8 minutes 9 seconds
 - 453 MB
- **March 2 – Broadband Low.mp4**
 - 46 minutes 50 seconds
 - 687 MB
- **March 16 – Broadband Low.mp4**
 - 57 minutes 57 seconds
 - 1.02 GB
- **March 23 – Broadband Low.mp4**
 - 54 minutes 39 seconds
 - 991 MB
- **March 30 – Broadband Low.mp4**
 - 1 hour 2 minutes 50 seconds
 - 1.11 GB
- **April 13 – Broadband Low.mp4**
 - 56 minutes 37 seconds
 - 1.00 GB
- **April 20 – Broadband Low.mp4**
 - 46 minutes 27 seconds
 - 842 MB

Acknowledgements

We would like to acknowledge the following individuals for their efforts toward the successful completion of this project:

Prof. T. M. Murali and Mr. Ryan Chase

Prof. Murali and Mr. Chase are the clients that requested this project.

Contact: Prof. Murali: murali@cs.vt.edu, (540) 231-8534

Contact: Ryan Chase: rchase@cs.vt.edu, (540) 231-1396

Dr. Edward Fox

Our professor for CS 4624, Multimedia/Hypertext.

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These speakers were the subjects of the videos of the CS Seminars project. Their knowledge and expertise of Computer Science made this project possible.

References

CS Seminar. (2012). *CS4624-CSSeminar*. Retrieved 4 29, 2012, from Virginia Tech Scholar CS4624 Wiki: <https://scholar.vt.edu/portal/site/3a380b23-4505-43dc-9b25-31edc409279a/page/be397a66-5c03-45e9-8457-725e59b39fde>