Zoe Kendall

🌐 **projects.vrac.iastate.edu**/REU2016/people/interns/zoe-kendall/

53/67, 22 July 2016

Posted on July 22, 2016 by zkendallJuly 22, 2016

52/67, 21 July 2016

Posted on July 21, 2016 by zkendallJuly 21, 2016

Before Team EEG's data processing yesterday, I went to the workshop on writing a personal statement. It didn't feel super helpful, though, as it seemed geared toward writing one for an REU, even though we had probably all already been accepted to one, since we were there. In my opinion, a lot of the information couldn't be easily extended to what I have found grad programs expect.

At least Steve got pretty good at working EMSE for our EEG processing. It was kind of hard to follow along with what he was doing, but it didn't seem too hard, just following the manual. Unfortunately there was a snag, but he managed to finish today.

This morning, I made the rather scary commitment of signing up for the GRE's. I will probably be fine, but tests in general freak me out, no matter how prepared I really am. So I'm pretty excited for our prep session tomorrow. And I'll still have a good three weeks to study before I sit for 4.5 hours taking a standardized test.

In Craft of Research, we learned more about making our poster, as well as CV's. Having seen some CV's, I guess I'm now a little less concerned by my utter dearth of publications and what not. So now Team EEG is going to work on our poster, as well as start practicing for our WebX presentations with USC.

Despite the fact that our research is going well and the spaghetti structure is still standing, I wish I were in Amsterdam right now.

50/67, 19 July 2016

Posted on July 19, 2016 by zkendallJuly 19, 2016

Over the weekend, we went out to Ada Hayden Heritage Park to enjoy the great weather. Karen brought her kayaks, so I got to do some paddling on the lake, which was pretty fun. I really just enjoyed the chance to get outside and put the technology away.

After a relaxing weekend at the park, watching Netflix, and registering for Grace Hopper Celebration of Women in Computing, Monday was another fun day of field trips. First we went to Principal, an insurance company that has a UX department we got to learn about. During the discussion about usability testing of their products, I realized how lucky I am to have parents who have talked to me about my future and thinking about and planning for retirement early.

Atop a building housing a history museum, we had lunch at Cafe Baratta's. My entree wasn't too good, there was too much tomato and not enough seafood, but my dessert was delightful. I ordered what I thought would be a single slice of cake, one, maybe two, layers. But what I got was a wide slice of a four-layer coconut raspberry cake. Granted, it tasted more like yellow cake with raspberry jam than coconut, but that didn't stop me from eating all of it. And then wanting to take a long nap as my stomach complained about its task of digesting all the sugar.

Still stuffed and lethargic from the disproportionate amount of food I'd consumed, we then went to the Science Center, where I rediscovered my inner five-year-old. It started in the gift shop, where I checked out the toys sold to kids to get them into science, mugs made to look like beakers, building kits, shiny stones, and stuffed animals. Almost too soon, it was time for our tour, where we got to see all the interactive and modern means the Science Center is attracting kids to science. Would have liked to play around more at the nano section, but then I stopped thinking about that in their Maker's Space area, where I got to build a circuit with their light bulbs, a fan, a robotic arm, and a hand crank for power. My inner child was having a blast, while my twenty-one-year-old brain was just sitting back saying stuff like, "here, just apply circuit theory; you can build a parallel circuit…." We also got to see the AQ, and meet some cute salamanders, Peaches the box turtle, and Hank the gopher snake. Made me want a snake even more, but all the people I may want to live with in the future have already nixed that idea. Oh well. While the animals were cool, I really enjoyed the space section, followed by the area with lots of different activities. Sam and I tried to, with just the two of us, build the Catenary Arch, but I gave up when I couldn't reach to put block nine on my side, even with the step-stool. Then I wandered off to play with the spinning ring table back in the space area, getting four spinning at once, before returning to play in the hydroelectric power generation station. Took a bit, letting the kids have fun splashing around before I could get in and apply some fluid mechanics to it. Reminded me of the time when I was younger when my cousin and I would bike down to the nearby creek and try to build dams with the rocks, only simpler, and with visual feedback that I was doing well. I got to the last bar of the power generation. I wish I could have gotten all the way, but the blocks to dam the water were in no way airtight (or I guess water-tight), so I had some pretty considerable losses in my system. But that's okay, there's no such thing as a completely efficient system. Before buying a cute stuffed neuron the the gift shop, a reminder of what I want to do with my Life (as far as I know), I returned to the circuit station and added a fourth and fifth element to my circuit, hopefully getting some kids interested, too, when they saw I had moving parts.

After so much fun yesterday, returning to work today was kind of a drag. Despite the fact that today is Tuesday, a fact which my watch, phone, and VRAC computer have all said, it totally feels like a Monday after field trips yesterday. Team EEG didn't manage to make much headway in the morning, getting stuck with the semi-automated method of processing our data. But then we got a very interesting Luncheon Lecture from Dr. Daniel Spikes about oppression, the -isms, and how he's trying to rectify that problem in schools. I thought he had a very interesting background with

a lot of experience at seeing firsthand how this sort of thing is unwittingly perpetuated by our system. The institutional and societal status quo was quite clear when we were given thirty seconds to come up with heroes in US history by category: black male, white male, Latino, native American male, white female, Asian-American female. Part of my problem, which was compounded by the time crunch, is that I can usually think of what the person did and not the name. Point was, we know a lot more white males, followed by white females, since history is written by those who win the wars. The discussion made me consider how lucky I am to attend an institution that tries to narrow the gaps of sex, gender, race, ethnicity, religion, ability, and many more. While the social justice training at Smith could certainly be better, the fact that we have a Chief Diversity Officer (or whatever Dwight Hamilton's official title is) is, I think, a huge deal. Even if some people don't like the practice of Identi-trees (you have a big tree with branches that represent facets of what makes us **us**, like religion, sexuality, ethnicity, ability, etc), I feel like it does help people express who they are, which can in turn make you more comfortable in your own skin. It also makes others realize that wait, maybe they're in the majority here but the minority there, that there are others out there who have very different experiences than you. I think that the concept of a socially just campus is more prevalent at the collegiate level, which is sad, because there are kids affected by the -isms who never make it there, who never get to learn that it's just divisions imposed on a fundamentally equal society.

that it's just a social construct

46/67, 15 July 2016

Posted on July 15, 2016 by zkendallJuly 15, 2016

I was feeling rather under the weather yesterday, with my head threatening to split itself open, so I guess I'm going to just cover everything today. Yesterday morning, Team EEG worked on data processing, starting with running an R script to concatenate some files. Not sure why we had to do that, but we did. The script was executing properly on most of them, but sometimes wasn't writing the concatenated file. My semester taking the Theory of Computation finally came in handy when I realized that the script was using a regex to determine the files to read and concatenate.

Later that day we had a great ethics session with Eliot. I really enjoy his teaching style, though the lecture/discussion did make me lose what little faith in humanity I may have left. One of the big topics of conversation was the world population, and how we might be able to save the planet. I thought it was interesting to think that if every female on the planet were restricted to a single child–not that I think that would work, knowing what I know about the One Child Policy in China–that it would take until 2153 (that's 137 years) to reduce the population to a sustainable level.

Then this morning, Team EEG continued on with our data processing at Forker before Journal Club, where we learned about intelligent tutoring systems from Team Tutor. There was a lot of good discussion on how such systems might affect the quality of education, and the difference that could be seen between an online teacher and a tutor who simply supplements class. One point that came up was the possible use of eyetracking to improve learning, but I'm not so sure that it would always do so without fail. What if someone who is an auditory learner were watching a video; ze may be able to focus zer eyes on something other than the screen without compromising learning. Sam also brought up a very good point about how online learning required the student to be self-motivated, which I think could be a possible drawback to an online teaching system. But as a relatively motivated student having taken both online and traditional courses, I can't say that one is better. There have been classes at Smith where I am not a fan of the professor's teaching style, which makes it tedious to go to class, whereas I could probably have learned the material better on my own from an intelligent tutor (not from the textbook, it would have been more useful in starting a fire).

I guess it makes me feel kind of powerless right now, knowing I have no solutions. Maybe someday I will have a few, or some ideas that may help become solutions, but not right now. I think that's part of why I want to be an engineer: I

don't believe in things just fixing themselves, especially when the problem is us. Even so, even with all the people studying and learning and hoping to fix the world, even with the smartest people available, we as a people still need to be able to change. Still need to be willing to change.

alea iacta est

44/67, 13 July 2016

Posted on July 13, 2016 by zkendallJuly 13, 2016

forty-four days into my stay,
went on an adventure yesterday
to find more food for fuel,
considered a new multi-tool,
two pounds of fish is more than I thought,
but at least frozen it won't rot.
then met a random stranger–
with three of us, not too much danger.
at Forker with Team EEG
doing some Ctrl-C, Ctrl-V;
writing some Java code to mark finger-tapping,
so that soon we can get to brain mapping.
now to write a project abstract,
even though we don't have every single fact,
though I can't quite tell,
I think our research is going well,
hopefully more problems won't arise,
and we'll be able to analyze;
though we haven't had the chance yet,
soon we should be using the wireless headset.
and after the climbing that's up ahead,
I can't wait to get into bed
to watch more pro climbing from the IFSC,
the Lead World Cup in Chamonix.

43/67, 12 July 2016

Posted on July 12, 2016 by zkendallJuly 12, 2016

After staying up late last night watching the lightning (and letting my phone take some pictures), waking up this morning wasn't my cup of tea. If I even liked tea.

The first things today went ok I guess, Team EEG powwowed about the Java program to mark our data that Steve and I finished yesterday while Sam marked all the data by hand. (Who got the best deal? I think me and Steve, but Sam just burned through all the manual marking.) We cleaned the code up and commented it, making a nice shiny program that we pushed to GitHub.

I also did some more abstract reading. I think I might need to narrow my search, instead of plowing through hundreds of abstracts. Only problem is, I don't know a whole lot about what I want. Location? I don't know, wherever the research is cool. Program? I don't have any particular ones, though I do have a short list of possibilities.

But then we got a great Luncheon Lecture from Dr. Stephen Gilbert on his research into intelligent tutoring systems.

Had a little stroll down memory lane to elementary school computer class with Mr. Paperclip the Awful Assistant. Turns out part of why it didn't work well is that it was distributed using only a four-deep look-ahead instead of the originally planned and coded for ten-deep due to debugging issues. We also got a look into some of his past projects, including a stealth assessment tutor in a game environment using xPST; a word-based, context-realizing tutor for statistics (adaptable to other subjects) homework; and a study of a 360-degree camera that looked at egocentric and exocentric localization. I found it interesting that the study didn't support the long-held theory that exocentric understanding of position was correlated to the egocentric. I have always felt that I am better at visualizing and giving directions around my campus because of my own wanderings, but this could definitely just be the familiarity that I have gained.

But aside from his fascinating work into intelligent tutors, Dr. Gilbert also provided some helpful insights as to looking for and applying to grad school. The concept of applying to the professor you want to do research with rather than the program is something I didn't really consider too carefully until now. While I'm still nervous about applying grad school in general, especially since the field isn't **exactly** what my undergraduate degree will be in, I think that after Dr. Oliver, Thelma Harding from the Graduate College, and Dr. Gilbert, I know a lot more about it than when I first decided 'hey, maybe I need an M.S. if that's really what I want to do.'

After all, can't just build spaghetti structures all day, every day, though Team EEG's **is** still standing #becauseMATH.

42/67, 11 July 2016

Posted on July 11, 2016 by zkendallJuly 11, 2016

Man, I would like a free slurpie right about now.

After an eventful Saturday-Sunday night, when my smoke detector woke the whole apartment up (and the guys above us could hear, too), I spent most of the day asleep, and this morning woke feeling even more tired. Didn't make the correcting our Introduction section too fun, trying to figure out our actual audience and incorporating our professor's suggestions. But then we had an interesting experience learning etiquette. I thought it would be horrid, but it wasn't too bad; our speaker was very entertaining. Now we've got the hike to Forker to work on our Java program, and hopefully tomorrow we get to do our first data collection with the wireless headset.

Good thing I'm going foraging for sustenance soon, because the spaghetti structure is still standing #becauseMATH.

Losing Myself?

Posted on July 9, 2016 by zkendallJuly 9, 2016

My inspiration? I guess my mind is just feeling a bit jumbled at the moment (or certainly yesterday) from all the reading, research, and dwindling free time being fed to reading abstracts that while interesting, are not as relaxing as Netflix. That and perhaps my tendency to over-complicate things is coming out in this doodle. I'm not sure. Maybe I'm having my second "mini-mid-Life crisis" before, you know, I get to be middle-aged, because I am no longer sure that what I think I want to do with my Life is really what I want to do with my Life.

38/67, 7 July 2016

Posted on July 8, 2016 by zkendallJuly 8, 2016

00:04 – Oops, guess I forgot to finish this earlier….

Yesterday Team EEG learned how to tediously mark movement data "by hand" using The Motion Monitor software. Then we worked with Andrew to write a Java program to do the same thing for us. I was glad to get back to a language I actually understand, after some recent frantic and desperate scrambling in Matlab. This morning Team

EEG continued working on our data marking program prior to an interesting Luncheon Lecture with Dr. Jared Danielson. I found it interesting to hear about the studies ISU's vet school is doing regarding the availability of recorded lectures. I have had a little availability to such aid at Smith, though not too much, mainly when my professors had to be absent. But from what I have seen and gone through, I have to say that being able to watch recorded lectures from your professors isn't always good. Though there are some classes I would much rather have a recorded lecture for than going to class, I am still overall of the opinion that such technology should be an aid, not a replacement or a crutch. Then later during Craft of Research, we discussed posters. It's pretty scary to think that we'll be presenting ours in a little under a month! Hopefully we'll have some good results before then (good being any results at all :)). Afterwards, we got some clarification on our Java code, which meant we could do away with an entire while loop, which was good in terms of time complexity, as we were cutting out an iterative $O(n)$ process. Though I suppose since we had a set number of frames due to our technology, given a good enough processor, it would essentially become $O(1)$. I can't say for sure because I don't want to run time tests on it 😊

On a non-research note, I spent some time last night–or I guess now the night before last–reading abstracts from last year's Biomedical Engineering Society conference in order to figure out where I might consider applying to a grad program. At first I was overwhelmed by the thousands of abstracts, but then I narrowed it down and started plowing through some, to be completely honest, rather dense material. But, to my surprise, four or five abstracts in, I realized I was having fun! Well, maybe not fun as in rock climbing fun, but the material was really interesting, on topics I [somewhat] care about and in a field I [am pretty positive I] want to go into. Hopefully my search will continue on like this and not take too long!

37/67, 6 July 2016

Posted on July 6, 2016 by zkendallJuly 6, 2016

I regret all my bad life decisions.
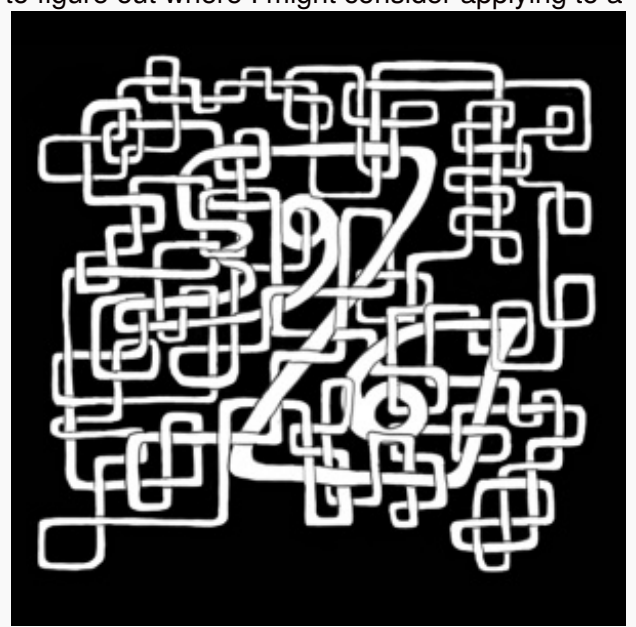
And those that aren't my fault.

Cooking at 21:00 is too late when your school opens dinner at 17:30 and closes it at 19:00. And then there was the rando lighting firecrackers or something at like 23:00. After a long day at work, feeling the impostor syndrome trying to describe literature I didn't really understand, hoping to not need a Laplacian filter and for the wireless system to be a go, and running around in a Unity environment, I was definitely glad to get home and relax with food (which may have been over- or under-cooked, I couldn't tell, it was edible which was all I cared about) and stupid cartoons on Netflix. And today has just been another typical day running around in Unity, scrambling to finish our "game" before our presentation. But at least we got to go to an insightful presentation on applying to grad school, where I learned I better get all my stuff together now. Not that I didn't know that conceptually, it was just good to be reminded to hit the gas. Hopefully Team EEG can mark our movement data pretty quickly, and come up with a way to script it, too.

Better yet, I hope to get out of here on time, eat at a normal hour, and finally have some me time. Guess that's just the 69% I.

"And the maze of the Mind is but a straight path that leads us to where we want to go, obscured by other paths that take others where they wish to go." (me, in another story)

36/67, 5 July 2016

Posted on July 5, 2016 by zkendallJuly 5, 2016

31/67, What a Prime Rhyme (30 June 2016)

Posted on June 30, 2016 by zkendallJune 30, 2016

tap, tap, tap,
my brain to map,
one, two, three, four,
only sixty electrodes more,
trial after trial, you can't blink,
hopefully get the sensors in sync.
ten seconds here, another ten there,
getting the perfect data is quite rare,
won't know until we analyze
what the signal implies.
even after there's still a lot to do,
to get the gel out, you'll need some shampoo.
after all is said and done,
we get to take a walk out under the sun,
try not to get a bad burn,
while returning to work to learn.
new technology in the apparel tool kit,
body scanners to tailor the best fit;
3D printing part by part,
transforming clothing into an art;
cellulose fabrics that are sustainable,
makes saving the world a little more attainable.
in an hour-and-a-half I learned a lot,
never before had I considered what I bought.
next up we are learn the craft
of writing a good research paper draft,
then after work I get to go climb,
gosh, I really wish I had more time.

30/67, Meow, meow meow meow, meow meow. Meow

Posted on June 29, 2016 by zkendallJune 29, 2016

Sam: "You identify as a cat?"

Me: "Yes, both sexually and as my gender."

I regret everything.

Four legs, pointy ears, and a tail,
With nine lives, I'm not too frail.
If you're my friend, I might flop in your lap,
And boy, one of my pastimes is to nap.
Think I might freak when stuck in a tree?
Nah, I'll climb it myself, you'll see.
Rain, sleet, snow, or hail,
I hate them all, without fail.
And if anything goes amiss,
I'll probably utter a frightening hiss.
Sometimes their dislike for humans is just an act,
But for me, that's usually a fact.
Sharing your bed with your feline,
Well, that part of the pillow is all mine.
Sleeping day in and day out,
I'll take the lazy route.
You can go out and leave me on my own,
It's fine, I'm perfectly happy all alone.
MEOWWW. (I'm hungry, feed me human.)

So as to what real work has actually been happening… very little. Team EEG has finalized our Introduction rough draft and sent it off, and this morning I got to see the 48-node computer cluster that powers the C6, as well as test a simple game in it. Hopefully this afternoon we'll get more time working with the C6. However, I don't think I want to work in it for my Major Course Activity, since I definitely won't have the space or monetary means to build myself a C6 after leaving ISU; instead, I'll probably focus on either the Rift (which is at least closer to my price point) or iPhone development.

29/67, 28 June 2016

Posted on June 28, 2016 by zkendallJune 28, 2016

Yesterday afternoon, I got to explore more about building simple Unity apps for iPhone. It was pretty simple to have my cubes respawn after they were shot, but keeping score was a little trickier. Initially, it kept resetting to zero unexpectedly; after some research, it turned out that it was because of where I had created and kept the score variable. In order to fix the issue, I had to make a separate class to keep track of and display the score, and give the script that handled the collisions an instance of that class. Whew.

Team EEG had quite the productive morning today, finishing our Introduction and getting started on our Methodology section. Hopefully Dr. S and Andrew think what we've written is adequate. Then during our Luncheon Lecture, we learned about images and our perception of them from Senior Lecturer Sherry Berghefer. She told us about a pilot study she ran that found that the majority of college-aged people (at least in her sample) could not tell a real, non-Photoshopped image from those that have been edited with software like Photoshop or those that have been created digitally. We got the chance to look at some of the eye-tracking done in her study, but I think we were primed at least a little by knowing what types of images we could have been looking at then. After that, we got to try and tell the difference between three images, which I found interesting, especially the extremely lifelike Morgan Freeman done by artist Kyle Lambert on an iPad. I wish I had that kind of artistic skill. I think there was definitely some semantic or hindsight priming involved though, and would like to see how we would do without such knowledge of types or side-by-side, just looking at one image after another. I doubt I would do very well.

Afterward, in Forker, we ran an EEG on Kayla, and were visited by a few middle-school students of another grad student in the Neurophys lab. It made me a little nervous to have spectators, especially these kids who knew more

about the parts of the brain and various imaging techniques than I do. Hopefully the data turns out good; mine from last week didn't, so I'll get to have coconut smelling hair again.

The spaghetti structure is still standing strong #becauseMATH. And as promised, I have a picture of a flower (it can also be found on Facebook, though you might have to find me first):

28/67, 27 June 2016

Posted on June 27, 2016 by zkendallJune 27, 2016

On Saturday, we adventured out of Ames to the Des Moines Art Festival to see Karen's art. It was great; I was especially a fan of some of the bigger pieces, like the tree and the bird. We then got to walk around in circles for a few hours, looking at all the local artists' works. I would have liked to buy something, but most of the work was over my price point, especially the steampunk metal moving Heart and the standalone moving lawn decorations. Although I would have liked to take some pictures of the beautiful works, I would have felt bad taking pictures of art that was on sale, so I restricted my photos to flowers, grass, and trees. Haven't had a chance to pull them off my computer yet, though, so maybe tomorrow I'll have a nice flower to post.

Fire Flower and Friend. Des Moines Art Festival, 25 June 2016, 18:43.

That night, while I was asleep with my computer, there was a thunderstorm, and I got a couple good pictures of lightning with my phone! (Also a couple of static and one that I kept because the sky looked cool (no bolts in that one, though)). I'm excited because the weather this week shows some chance of thunderstorms, so I hope I can get more good pictures.

My mild success with lightning was followed by a lazy Sunday, with foraging, Netflix, and a rather sad attempt at cooking. I'm not sure why my pasta didn't come out the same way as when my sister makes it; perhaps the recipe is slightly off, since I didn't have her to communicate during my exploits (it was her last night in Sweden). My pasta turned out edible, but the sauce was too thin, and the cheese clumped up. Hopefully next time (about eight meals from now) will go better.

This morning we continued our deeper dives, where Vijay taught the Unity Immersive group how to develop apps for iOS devices. It's pretty complicated; I guess I never thought about what developers go through to put their apps on the App Store for widespread use. I had to get a provision on

Devil's Fork III. 26 June 2016, 03:47.

my phone to be recognized by Apple as a personal developer to run our basic template program where we shoot primitives by focusing on them. I learned how to make a prefab, and I hope I can use this new knowledge to respawn my primitives after shooting them. The good news about using Unity to develop an iOS app is that I can play with a cheap HMD like Google Cardboard that's BYOD. However, the bad news is that, unless XCode runs on Windows, I will need either a Mac or my Linux build.

What a way to say hello,
world awaiting us tomorrow,

teambuilding with a marshmallow
and spaghetti yellow.
Structure falling down
in a small little town;
time to flip it over,
our own four-leaf clover,
made it all the stronger,
enough to stand a good deal longer.
When spaghetti engineering,
keep on persevering,
on and on down that path,
just remember: #becauseMATH.

25/67, 24 June 2016

Posted on June 24, 2016 by zkendallJune 24, 2016

I just wanna nap.

Yesterday's CoR was helpful, as we went over expectations for our Lit Review. It was pretty surprising to learn it may only need to be a paragraph (depending on what our professors want), as I was picturing six or seven paragraphs with twenty to thirty sources. So hopefully, if Dr. S is cool with a short Lit Review, we'll be able to easily expand upon our Problem Area Paragraph. We also learned about the Methodology section, which I think won't be too unbelievably hard since we have a pretty defined project and access to the IRB Dr. S did.

Unfortunately, though, Andrew wasn't able to make it, but we emailed Dr. S's colleague Dr. Allen, who did a lot of the signal processing in previous papers they have co-authored. Hopefully he'll give us some good guidance as to our Laplacian filter. He said it's pretty easy, and I really hope so, since none of us are Matlab experts. After that, I think we will be able to finish our script without excessive effort and desperation.

After spending the evening finishing to brush up on our Journal Club article, watching Netflix, and writing stories, I arrived at work today not feeling super prepared to discuss the article but excited to start our Deeper Dives. I'm with Stan, Karo, and Rocio working more with Unity, especially in designing games for VR. Today we started by getting an overview of the reality-VR spectrum and what's out there. We also got some specs on the Rift and the Vive, which is cool, since I have considered getting one. Sounds like I'll need a new graphics card, since my custom build tower doesn't have one dedicated to high end rendering or gaming (neither Windows nor Linux tower). I guess I'll wanna check that out, considering it will likely be over $1000 to get the new card and the HMD (assuming, that is, that I can get a good high end like the new NVIDIA card that's compatible with my motherboard). I was considering buying more RAM anyway, too.

By the time we finally got around to starting to build a simplistic 1P shooter game, we didn't have much more time left in the morning session (fugit tempus). That, and we had some trouble with the Rift, which thought the computer specs weren't compatible even though Joe knew they were; hopefully it has been resolved for our session at 14:00. Even if I don't end up buying a Rift or a Vive (or even one of the cheap ones), I'm sure the work with Unity will help me make more applications. Maybe I won't get to the level of actual game dev, but I enjoy tinkering, and now that I actually know about Unity, I can't wait to play around on it more.

After our first Deeper Dive session, Team EEG led a Journal Club session discussing our article "Wearable, Wireless EEG Solutions in Daily Life Applications: What are we Missing?". It was a good discussion, and despite the fact that I wasn't super clear on the article, I felt at least relatively competent during the discussion. Some of the

discussion veered off on interesting tangents, which I enjoyed, as it kept it more organic and natural. The possibilities discussed in our article definitely reinvigorated me into the direction of our research after our desperate Matlab adventures. Hopefully we can begin data collection with our wireless EEG this coming week!

> *Built in the first week,*
> *Our spaghetti standing strong:*
> *Demolition failed.*

24/67, 23 June 2016

Posted on June 23, 2016 by zkendallJune 23, 2016

Status: Matlab, you can go die in a hole.

We are still stuck on our Laplacian filter for our EEG data, though after our meeting with Andrew yesterday, we at least conceptually understand what it's supposed to do. Mathematically, though, we don't know how to implement it; hopefully there is a function in UCSD's EEGLAB scripts that we can find to use for this.

Also yesterday was the last of our Unity lessons, during which Karen taught us all about animation. I found it a little difficult at first, possibly because I'm running an older version of Unity. But I managed to get my sphere moving eventually, and Karen also showed us how to import characters and animate them, which was cool. I never did figure out my animation of the particle system to make it disperse on a curve. But I did manage to fix my camera problem in my snowman scene so that the "player" can wander around; the sin and cos functions took radians, not degrees, even though all the Unity display measurements were in degrees. Unfortunately, there is nothing keeping the user bound to the shell that forms my terrain, so maybe I'll have to do some reading up on that.

In preparation for Team EEG's Journal Club presentation tomorrow, I spent the evening going over our article, but fell asleep mid-section. That was something of a bummer, as I had planned to stay up long enough to hear from my sister upon her landing in Sweden. Not that I didn't get the text this morning (or about 14:00 in Sweden), after which I burned my first attempt at breakfast, missed the bus I meant to catch, and found I could barely walk down the stairs because my knee hurt again. **That** made the walk to Forker for my first ever EEG something of a hassle. (Oh, yeah, I tried again with breakfast, and did a much better job, eating it on my walk.)

In Forker, I got prepped for my first EEG with the cap (my head is size medium, which I found pretty surprising, as I was guessing small like the rest of me :P), gel, and sixty-four electrodes as well as four references and three sensors. My FDI (it's a muscle in your hand) isn't quite as defined as Steve's (must be from all the lifting sessions), but I could see my EDC (muscle in your forearm) wiggle as I tapped my finger. Once I was all hooked up, it was time to sit perfectly still, though in the beginning Andrew said I moved too much. We had some trouble at the beginning with noisy signals, mainly on one set of electrodes. Steve and Andrew went about poking each electrode, and more gel was added to several to help make the signal better. Finally, it was time for the tests! Initially there was some synchronization issues, but I think they got resolved by the time I got to the finger tapping set. It was really hard not to blink during data collection, especially since my contacts would get dry and sticky.

Despite our few roadblocks, we finished the EEG in the normal 90-ish minutes, and we headed back to VRAC for our sixth Luncheon Lecture with Dr. Adarsh Krishnamurthy, who does work into GPU CAD computations. I found most all of it interesting, especially the comparison of GPU's to our traditional CPU's. My custom-build Windows tower has a hex-core CPU and a graphics card, but I didn't realize the graphics card (which isn't super high end) had its own dedicated GPU with many more cores than my CPU. I think it would be cool to study how to program for a GPU, which takes advantage of all these cores with parallelism. While the information was all interesting, especially the work Dr. Krishnamurthy does into the biomedical field with heart models and simulations, I found

some parts a little hard to understand. Maybe if I get more into this stuff, I'll need to do more exploring on his website and/or read some of his and others' papers.

So, that's about it for today. Up next is Craft of Research, where it sounds like we're going to learn to write a lit review. This is quite good news, as Team EEG would like to send ours to Dr. S and Andrew this weekend. After that, Andrew is planning to drop by to take a look at the EEGLAB functions with us to try and help with our quite desperate search for a Laplacian filter. MathWorks, the company that produces Matlab, seems to have some information as to Laplacian filters for image processing, but there isn't a whole lot out there about how to process EEG signals in this manner. Hopefully we can figure it out so we can finish our analysis script. Matlab often makes me regret being an engineer.

```
~$ > cd SPIRE-EIT\REU2016_WirelessEEG
~$ > git checkout spaghetti
~$ > notepad README.md
~$ > git commit README.md -m "The spaghetti structure still stands. Reasons to flip it over. #becauseMATH"
[spaghetti af031b6] The spaghetti structure still stands. Reasons to flip it over. #becauseMATH
1 file changed, 1 insertion(+)

~$ > git push origin spaghetti
~$ >
```

23/67, git fetch origin spaghetti (22 June 2016)

Posted on June 22, 2016 by zkendallJune 22, 2016

After struggling through some Matlab and attempting an FFT in Java yesterday, I think I broke our Git/GitHub repo. Whoops. I hopefully fixed it once I got home though.

Had something of an adventure cooking myself dinner last night. The shrimp wanted to jump ship; I guess they didn't like their garlicky olive oil butter bath very much. That, or I was just using a pan that was too small. But the resulting dish was quite delicious, and very garlicky. So much so that my roommates could smell it even outside the apartment ☺ With my tummy full, I got to have a relaxing evening of reading papers, writing stories, and watching Netflix.

Even though I fell asleep pretty early, the morning came too soon. I guess I was still half asleep whilst getting ready, because around 11:00, I realized I was starving and had completely skipped breakfast. Whoops. But at least that realization came after our morning session of Unity, where Karen taught us how to do key scripts and how to make buttons. I'm not sure if I'll be incorporating many buttons into my scenes, but I did manage to get my snowman dancing with an if-elseif statement. Now the "player" can wander around in the scene during play mode to explore the snowy landscape. Hopefully I can get the movement working better, it's currently a little buggy. But now that I understand more about C languages and Unity, it's much more fun than when I tinkered around with it before. Maybe someday I'll be able to build my own mini game in Unity; I'll definitely keep tinkering with it even after the program though.

After our Unity lesson, Team EEG attempted to do some work with our Matlab script. Dr. S had suggested EEGLAB, but it seems to be its own GUI, which is incompatible with the file types we have our data in. It looks like there are some functions we might be able to call from our own script, though. Really, we're stuck on the Laplacian filter, I think partially because we're not entirely sure what exactly it's supposed to do. Hopefully we can get that cleared up so we have an idea of how to implement it; then Uncle Stan the resident Matlab expert might be able to direct us as to what we should do. As for research in general, despite still being stuck on the filtering script, we seem to still be on track. We're starting our Lit Review, we've coded maybe half the analysis script, and I'm getting my Biosemi done tomorrow. Pretty excited to get my head poked and flex my EDC, not to mention get my hair washed (or wash it

myself, I haven't decided) with the coconut-smelling shampoo.

git commit -a -m "Patched the spaghetti structure. It is still standing **#becauseMATH**"

git push origin spaghetti

22/67, 21 June 2016

Posted on June 21, 2016 by zkendallJune 21, 2016

This morning Team EEG had our fourth team meeting at the Neurophys lab at Forker. We went over some more articles we can use for our lit review, and Dr. S showed us EEGLAB by UCSD that she thinks could help us with our Matlab script for the data analysis. We got our burning questions from this weekend answered and are looking forward to attempting a Laplacian filter or digging through the EEGLAB tutorials. Though I hate Matlab and can't wait to go back to Java, I must admit, the engineering side of me is happy to get more experience with this language. And working on this team code is good because it allowed for learning Git and GitHub better; I now feel at least slightly capable at that, though I'm sure there's still a ton more I don't know and have yet to learn.

After our team meeting, we had our fifth Luncheon Lecture with Dr. Jon Kelly, who told us a lot about his research into HMD's. I found it pretty interesting how most people under-perceive distances in VR (not that I can really talk, I feel like I mis-perceive all distances all the time). One fact he noted from previous studies was how with the NVIS and Oculus DK2, distances were more accurately perceived in indoor settings (though still not perfect). We couldn't come up with a definitive answer as to the why, but leading suggestions included a ceiling effect or familiarity with the indoor setting. Those make sense, since there is a back wall to an indoor scene, but a far distant horizon that does not give a sense of depth when outside. However, I am still unsure about this difference, since it has been found not to carry over into real life. I think this research is super cool, having played a little in both the Oculus Rift (DK 1 or 2 I think) and the Vive. They're pretty cheap now compared to the older, now obsolete VR devices, but they also seem to require more computing power. I don't know, maybe I wouldn't have to drop a few grand to get a good enough computer, though, since I run two custom build towers (Windows and Linux), so I could just buy good enough parts to bump up the specs. Who knows, though I doubt I'll be buying a consumer HMD anytime soon.

As for our lessons, C++ and Maya were great, but Solidworks was a little tedious. Now I remember why I we didn't get along back at Smith. Unity is going well, I think, yesterday afternoon we started scripting for our Unity scenes. For some reason, my math is failing me, because my snowman isn't rotating properly. Guess I need to go back to Spaghetti Tower School, since, despite a close call yesterday, the spaghetti tower is still standing.

#becauseMATH

21/67, Is today really Monday?

Posted on June 20, 2016 by zkendallJune 20, 2016

Working on the weekend really throws off your sense of time. Not that time is real anyway, it's just a social construct. "Time is an illusion and so is death" (*Avatar the Last Airbender,* s2e4).

Yesterday, Team EEG decided we needed to work on our Matlab analysis script, so we came in to VRAC in the afternoon to take advantage of the computers here. Since only I had used Matlab before, and not all that much, we were having trouble with most everything, often consulting our friend Google and trying things suggested by MathWorks. In this way, we managed to build what we think is the correct bandpass filter (it allows signals of a certain range of frequencies to pass, while reducing those outside the range to [essentially] zero). Next we had to apply a notch filter at 60 Hz to remove the electricity from our data, followed by a Butterworth filter. However, we hit a roadblock here, as the Matlab built-in Butterworth filter function requires a parameter we do not know. Hopefully we

will be able to figure this out at our team meeting tomorrow.

The Matlab coding resulted in me not having much of my own personal chill time this weekend, since on Saturday, we all went to Marshalltown for team building in the form of a challenge course. I found it really fun to be outside doing activities, especially the climbing (shocking, right?). The spider web activity was also super cool; I still can't quite believe Erik managed a flying leap through it. I wish I had had more time to try leaping through the middle squares, which seemed harder, since we would have to get perfectly horizontal at a lower height. My first try was pretty close, but by then I wanted to finish the activity rather than look cool, and I knew I could get through any of the lowest ones with only one person helping me. Go being small and, while some people don't seem to believe it (including my mother sometimes – but maybe that's just that I lack the leverage), strong.

The big swing was amazing, and kinda heady releasing while upside-down, but I think the climbing still won. They had a 40-ft (which, I will admit, I don't find all that tall, though I'm sure others did) tower with multiple routes up, including three special challenges: Missing Link, Corporate Ladder, and the floating post climbing. I did the first and the last; although our facilitator said the Missing Link was considered the hardest, I found the floating post climbing more challenging in terms of getting pumped (climbing jargon for getting a buildup of lactic acid in your forearms). I guess this was because I decided that once I pulled onto the first post, I would not touch anything other than the holds and posts until I was at the top. Was pretty cool, though you didn't need to actually do a spin leap to the first post. Unfortunately, though, in the process of those two, I managed to get a baby tree stuck in my dominant hand, which was quite a pain to get out. Once we got home, and having borrowed a pair of tweezers, I sent my sister (a self-sufficient adult) the "Sos" text to help solve my problem of getting the splinter out of my hand with just a pocket knife and tweezers. It wasn't until yesterday that I finally got it out, having to slice a couple layers of skin open with my kitchen knife to extract the baby tree I was hosting. **Lessons learned: bring a sewing kit; it's human nature to hesitate before slicing your own hand open with your pocket knife.**

After working yesterday, this morning came too early. And that definitely has no relation to the fact that I watched GoT starting at like 00:15 for over an hour. It was an action-packed episode (of course, since it was the penultimate one of the season), though I predicted pretty much all the outcomes without having read ANYTHING online (which is pretty hard when GoT is in season). Yeah, so that didn't contribute to my reluctance to getting up this morning. But by the time I made it into the office, I was fairly awake and ready to actually get some real instruction into Unity. I had explored it a little back in 2015, but it was mainly me just trying stuff, and I was excited to learn how to actually use it. Too bad my VRAC computer was not of the same mindset as I was, but luckily, I still had Unity installed on my laptop from 2015. We learned about shapes and lighting and the scene, then we got to work making a cute snowman scene. Can't wait to learn about scripting for Unity this afternoon!

Well, it's getting pretty long now, so I'll wrap up. Research is going well, Dr. S thinks we've made a good start on our problem area paragraph and research questions. Hopefully we'll get some good feedback and constructive criticism at our meeting tomorrow. We're still in data collection, and this Thursday it's my turn to get poked in the head. Will be cooking soon, since the spaghetti structure is still standing just as strong as it was at construction. **Lessons learned: flip it upside-down.**

#becauseMATH

post scriptum: Happy birthday to my mom.

18/67, If a frisbee falls in the forest and no one's around to hear it…

Posted on June 17, 2016 by zkendallJune 17, 2016

…does it still make a sound?

After work yesterday, we got to go play frisbee golf. So… all the frisbee golf I've ever seen has been on a field kind of

like a traditional golf green. Imagine my surprise when the ISU frisbee golf course winds through the woods. Not that I'm complaining about the added shade, as it was quite muggy, but it also came with plenty of bugs and the possibility of poison plants (e.g. – poison ivy or poison sumac). I'm pretty good at throwing a normal frisbee like in ultimate, but the golf disks were smaller and of a different balance than I am used to, so my throws always curved in ways I didn't expect. I also almost lost Karen's frisbee in some plants on the second hole/basket (don't worry I found it). But around basket 6, Sam and I got distracted by the calm river running alongside the course, and we took a detour to play there.

After hopping our way onto the stony shore in the middle of the river, we enjoyed the view if not the bugs as we searched for stones to skip. Most of the ones I found were either too big or too round to skip well, though I did get a couple to bounce; one made it almost all the way across the river. I also decided it would be a good idea (at which point you should conclude that it was most certainly not a good idea…) to stick a large branch into the silt of the stone "sandbar." Suffice it to say the branch fell over and splattered me with mud.

The stony shore. PC: Sam.

Eventually, though, we realized that we should probably catch up to the group, so we clambered back up the bank and went in search of our frisbee. After making par on basket 6, we decided to just walk until we caught up. So we set off, enjoying nature (at least I was, I won't speak for Sam) as we wandered through the woods trying our best not to get turned around and lost. We saw a cute little girl playing with her father, throwing a small disk with great enthusiasm. But we didn't find anyone else from SPIRE. Back at the entrance to the course, still all alone, we assumed that everyone had already gone home, so we decided it was time to go. Emerging from the course and being able to see Freddy behind the parking lot fence and across the road, I decided to just hop the fence and cross the [rather busy] road, something I have had great practice doing from my early morning orgo class at Smith.

Idyllic River. PC: Sam.

Finally back at home, but afraid I had accidentally covered myself and my clothing with the oil of a poison plant, my first action was to take a shower and wash all of my clothing. So hopefully I won't be breaking out in crazy rashes (from previous experience I am fairly sure I am very allergic to poison ivy). Once the laundry was in and I was hopefully de-oiled, I still had to make myself some pasta, which I ate while watching half of the Vail World Cup Finals (rock climbing).

In our second session of Solidworks, we learned more about construction, including local coordinate systems and work planes. We used all of this to build a cute little camera; I also decided it would be cool to add a fillet to the body and a chamfer to the lens extrusion. I think it definitely helps that I have worked in Solidworks some before, as I already know several of the types of features I can add to my part. We are currently working on building parts from technical drawings, which I really like. It is a lot like solving a puzzle. Hopefully this afternoon I can finish modeling all the Vise parts.

Future plans: going foraging for sustenance after work, as the spaghetti structure is still standing #becauseMATH

17/67, 16 June 2016

Status: Little of note has happened in the past 23.5 or so hours, the spaghetti structure is still standing.

We got our first lesson into Solidworks yesterday afternoon. A lot of the things we learned I had already heard of from my approximate week of doing Solidworks at Smith. This previous knowledge certainly helped as we worked through a poorly written tutorial into Solidworks, where the menus listed were hard to find and the steps didn't quite follow a logical order. Hopefully tomorrow's Soildworks tinker-time will be much better.

This morning after a pleasant if slightly soupy walk to Forker, I got to practice my shaky skills in setting up the Biosemi EEG (on Sam). I felt a lot more comfortable with the poking and gel squirting. There was a slight hiccup with the data collection, but once that was resolved, the trials went pretty quickly. I don't think Sam is brain dead :p And after the testing was done, I got a lesson in the use and purpose of conditioner.

At our Luncheon Lecture, we heard from Dr. Veronica Dark on sensation, perception, and attention. It was very interesting to hear more about the human brain and psychology, since that isn't a class I will be taking. Playing the "mind games" that tested our processing and perception was interesting, though it made me feel like we kind of live our lives in a fog due to the limited processing power of our brains. As for the "real world" that we all know exists out there, what if, in some common Smith words, "reality is a social construct"? Doesn't our *'reality'* depend on what we perceive?

16/67, 15 June 2016

So… our wireless EEG is broken 🙁

Yesterday afternoon, we had our Skype meeting with Mike about the wireless EEG we hope to validate and test. Steve made a great model of the system, but when we went to collect data, everything was crazy. Turned out the impedance on our electrodes were too high, suggesting a problem with wiring. We brought the precious cargo back to VRAC to have it shipped off to be fixed. Hopefully it'll be back around the same time we finish with the Biosemi EEG tests next week.

We also started attempting to analyze Steve's resting EEG data with Matlab (bleh) yesterday after our meeting. We spent considerable time googling for help, since really none of us are Matlab experts. After several different attempted options, we were finally able to read in data from our Excel sheet. Our next step is to filter it, though none of us are quite sure how to implement what we understand conceptually. Hopefully we will be able to get the filters working relatively quickly so we can epoch (break into sections) our data and run our first analysis, the fast Fourier transform (FFT).

This morning, we got back to playing in Maya, and Maggie taught us how to do textures and light sources. Despite the fact you can still walk off my house's balcony, my scene in general is coming along nicely, with a cute wooden fence and a well with water. Hopefully I'll get more time to add in the final details, like the benches, the exterior walls, chairs, and my cute little bed inside the house. It's been super fun playing around in Maya, but I'm also looking forward to starting Solidworks this afternoon, since I've really only scratched the surface of this more engineering-geared modeling software.

As for research, I'm excited to get more practice setting up the Biosemi EEG tomorrow (on Sam).

15/67, Adventures to Forker (x2), 14 June 2016

Yesterday afternoon, we got more time to play with Maya. It was really fun to just be able to tinker around in the software. I learned that the polygons we make are not actually solid; I found I could zoom in enough to be "inside" my house! So of course I had to put something into my house, constructing a cute little bed with some pillows for my upstairs room. Hopefully I'll be able to color myself a blanket tomorrow without having to do a lot of extra work.

After a disappointing but tiring climbing session, pasta (no, not the spaghetti of our structure, it's still standing), and an evening reading papers (oh, and catching up on GoT), this morning was rather early, as we had our EEG team meeting at 9:00. The trip to Forker was not as easy as I had imagined, forgetting that there is a great deal of construction that happened to be in our most direct route. But we made it on time, and I scarfed down my egg and bacon breakfast sandwich in the hall before the start of our meeting. Dr. S was able to clear up a lot of our general confusion regarding the papers we had read, which was great. I always find that listening to people who know what they're talking about is easier to understand than reading the same information. We also now have some good direction on where to take our code for this week, working on filtering and epoching (breaking the signal into chunks) the data from Steve just chilling for his resting EEG. I think that will be pretty fun; since our end goal is to have a GUI for the data analysis, I'm currently thinking splitting the front-end and back-end into Java and Matlab (ugh), but we'll see where the data analysis path takes us.

And we're going to be collecting more data Thursday morning from the Biosemi EEG (more traditional wet EEG system). Later today, we're going to Skype with someone knowledgeable about the "scorpion" dry wireless system we're hoping to use. From the video we had about it, it looks cool. Ideally, we will be able to test in maybe next week or the week after.

But aside from our exciting research work, I've been slowly catching up on the IFSC (International Federation of Sport Climbing) World Cup tour. The circuit was in Vail, CO this past weekend, an exciting US world cup where last year Alex Puccio, a 9-time US national champion, blew her ACL and where this year (from what I've listened to on the replay so far) GB's Shauna Coxey has just won the overall Bouldering Champion title. Can't wait to finish the semis replay and get to the real crazy moves they do in finals! Wish I was as strong as some of these climbers.

14/67, 13 June 2016

Posted on June 13, 2016 by zkendallJune 13, 2016

Today marked the beginning of our foray into modeling with Maya. Gotta admit, I am a big fan of Autodesk products, having used SketchBook for art and seen Maya and MudBox on Smith's computers. So I was super excited to actually learn how Maya works aside more deeply than "test Maya to make sure it opens and you can save a shape." It was fun to get into the program and just tinker with

The Dry Wireless EEG.
(http://www.cognionics.com/index.php/products/hd-eeg-systems/72-channel-system)

shapes as we started modeling a cute backyard scene. Hopefully, like with SketchBook, Autodesk has a freeware version that I can download on my laptop to play with more. From what I've seen, it's quite a lot like SketchUp, a program I've done some building modeling with. In fact, I wish I had my most recent SketchUp project to play with in my free time, but maybe I'll just start a new Maya project instead.

Aside from our classwork, I am also really excited for our research project. I have been reading articles from our mentors about EEGs, and the parts I could easily understand sound really interesting. If I have time, I'd love to give them a second read-through before our team meeting tomorrow. Last week we started taking data with Steve's first EEG, and it sounds like I might be getting one this week. I think our research is going well, but I haven't seen the data from last week yet; hopefully when we get that we can start to test different analyses, like the wavelet and FFT.
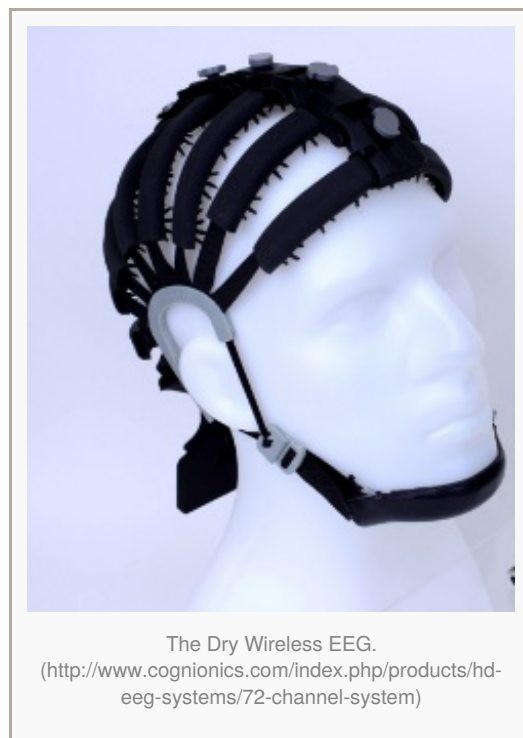
Even with the papers and the hands-on experience of my first EEG, I still feel like I am only scratching the surface of this field of research, and I can't wait to learn more.

Status: In need of more sustenance products, as the spaghetti structure is still standing; must go shopping soon.

11/67, 10 June 2016

Posted on June 10, 2016 by zkendallJune 10, 2016

After our Luncheon Lecture yesterday, we had Craft of Research. The main topic of discussion was plagiarism. I found it interesting to learn that self-plagiarism exists. The exercises we got to do were also cool, checking whether sentences referencing a paper on lesion mimicry (Johal et al. 1995) passed the plagiarism test, and also paraphrasing a quote (Diamond 1998) on our own. Compared to last week, I thought the discussion went far more smoothly. Though most of the information was familiar to some extent, it was nice to learn about lit tables, something I had never used before. I can certainly see how helpful they could be in writing a publication.

I then read some publications during our self-structured work time, before we all went to State Gym for some exercise. Even though I'm not much of a rope climber anymore, I hopped on a 10d that seemed to have no finish. It was smooth sailing up the first couple thirds, but once I hit the crack it got a little tricky. Got super pumped from all the compression moves up to the finish, and actually almost missed the top of the wall. Guess I should have warmed up more. But after the lactic acid died down, I finally sent my V4 boulder project!! (That was pretty much the high point of my gym experience.)

Back in the office this morning, we finally got to OOP in C++. As a Java coder, I had been waiting for classes, as they are the staple of Java. I think I maybe went a little overboard with my shapes inheritance, but it was fun to divert the many specific shapes I know (so far I have only made rectangle, equilateral triangle, and right triangle classes inheriting from the shape class) from the general shape class. Had some issues with overriding the methods, but I think I've figured out the bugs now. It definitely helped to have made cats before in both Python and Java. (I guess my prof liked cats, because in both languages we made a cat class that inherited from an animal class.) Hopefully I'll be able to get an MVC up and running this afternoon.

Before lunch today, we had our second Journal Club course, where we discussed methods for effective skimming and reading of journal articles. Most of this came as review to me, as I have had several classes now that require use of primary literature. I did learn about mediation vs. moderation, which I thought was interesting; I'm sure I've seen them before, but knowing terms and having diagrams made it a lot more clear. Big takeaways: read the interpretation, it's for non-statisticians like me; and be skeptical, think about implications and limitations the authors may not have noted.

Status: Excited for modeling next week; maybe I can model Team EEG's spaghetti structure, which, at Day Number 11, is still standing.

post scriptum: Happy birthday, June!

10/67, 9 June 2016

Posted on June 9, 2016 by zkendallJune 9, 2016

This morning began a little too early for me, as we had to make a pit-stop in VRAC to print our lab trainings before meeting our grad mentor Andrew at the Neurophys lab in Forker around 8:30 to actually work on our initial EEG research. Steve consented to be jabbed in the head as our guinea pig in gathering data from the Biosemi EEG. Which meant that Sam and I got our first experience in setting up an EEG. Suffice it to say that it was quite the event. First we had to fill syringes with a conductive gel, but weren't supposed to have air bubbles, a goal which

crashed and burned quite quickly for me (oops). Once Steve had his nice EEG cap on, we had to fill the little holes in it with the gel before attaching the 64 electrodes. Good thing they were all labelled; made the process much easier. We also hooked Steve up to three EMG sensors for collecting data on finger tapping.

First we verified that we hadn't messed up the gel too bad; we were able to watch each electrode's signal in real time to look for strange patches of staticky noise or flatlines that would suggest we needed more gel. Thankfully, we had done a pretty good job for our first go, and all electrodes showed small signals that jumped when Steve moved or laughed. After verifying our electrodes were reading signals, it was time to collect data. Since the actual signal we want to measure from the brain is very small, any sort of movement like a twitch or a blink could disrupt the signal so much that the data would be all noise. Therefore, everyone in the room had to be quiet during data collection. At first, Andrew ran into some snags with the data collection program, but eventually he got the process working smoothly, and was able to take three sets of data: one resting, one with auditory input, and the last with finger tapping to the auditory input. Sam and I are probably going to get our turns to be poked in the head and have our hair all gelled up next week. Hopefully today's data was good, and next week's will be too!

I can't wait to get to the wireless EEG, which should be much more interesting, especially if we can validate the

signal. Excited for Steve's next modelling job with the wireless EEG. Our research is super interesting, and I'm sure it'll be a fun summer exploring our–and others'–brains. Hopefully, the spaghetti structure will remain standing for the next eight weeks. It's currently looking strong, so fingers crossed.

But after our lab work this morning, we had to rush back to VRAC for our Luncheon Lecture with Jim Oliver. He talked a lot about paths in life, masters, PhD's, and industry. I found everything he said extremely helpful, especially since I plan to go to grad school sometime but don't know that much about it right now. I definitely have a case of impostor syndrome, especially when it comes to doing self-directed research and writing papers about it, but hearing from him helped to cement the fact that there are many different paths out there. Still don't think I want to be a professor or stay too much in academia, but there are still plenty of other options to explore. I guess I'll just have to find the right one for me ☺

9/67, 8 June 2016

Posted on June 8, 2016 by zkendallJune 8, 2016

Day Number 9. Status: in need of more food.

Yesterday afternoon, Karen notified us of the great deal at Caribou Coffee, where we could buy a drink and get a second one free. So Sam and I each got a drink and only paid a couple dollars. My smoothie was quite delicious, and we hope to make weekly trips to Caribou throughout the summer. Also last night was an interesting experience in t-shirt design, as we all got together to plan our program t-shirts. Karo put together an amazing graphic design to incorporate HCI, and Briana provided us with a great Harry Potter quote that we could use on the shirt, but we hit more hurdles in choosing the shirt colors. I wish we had more flexibility in number of colors, since design of a shirt with only one color ink can be difficult. Still a fan of the black on black combination :p

This morning we got to do more C++, which was exciting. Today we learned about control structures, like if/else if/else statements and loops. So far nothing we learned today was new in terms of the concepts, especially since these structures in C++ are syntactically similar to Java. I did, however, run into some snags when trying to increase the robustness of my simple input/switch program to protect against improper user input. Can't wait for the next sessions.

Considering today is only Wednesday, and I wrote yesterday too, I am still excited to go back to the Neurophysiology lab tomorrow to begin taking EEG data. We're also going to be going to State Gym tomorrow, so I'll get plenty of time to rock climb; there's this V4 boulder problem (if you know rope grades, it's about a 11c/d or 12a) I really want to send (get to the top without falling). I don't know how well it will go tomorrow, though, since I seem to have made my wrist sore by hanging out in a tree yesterday. Hopefully I'll be able to get some of the other V3-4's soon, as the setting is pretty stretchy for someone who's just over 5′.

But before tomorrow, I will have to cook myself more sustenance, seeing how the spaghetti structure is still standing.

8/67, 7 June 2016

Posted on June 7, 2016 by zkendallJune 7, 2016

Day Number 8, and the spaghetti structure is still standing.

This morning our research team got our first tour of the Neurophysiology Lab in Forker where our project work will happen. I got a little turned around in the building, but seeing the two lab spaces was very interesting. We even got to do some simple data collection; we recorded Sam's electromyogram (EMG – for muscle movement) while she did some writing. It's super cool that there are methods of recording both brain and muscle signals and how the two can be correlated.

Aside from learning about EMG and the tools for taking a typical EEG, we got to see the two wireless/portable options for the EEG we may be testing later. There are a lot of electrodes involved in the typical EEG, so I'm curious to learn about how the wireless version works. We also got to see the other lab, where the gait sensor is located; hopefully we will get enough done quickly so we get to take data on gait during the program. Also in this lab are computers used for analysis, and our grad mentor Andrew showed us a simple Java program he wrote that filters writing data. It was really cool to see how the filtered data could be used to accurately plot the writing Sam had done earlier. Now that we've gotten to visit the lab, I can't wait to start our actual research on the EEG's later this week.

We also got to hear from Eliot during lunch, which I found quite interesting. He's done almost everything out there, from founding start-ups to academic research to observing in OR's. I liked his more interactive approach as well as his philosophy of looking into students' questions he doesn't know the answer to, two things I sometimes wish happened more in the typical American school system. From what I've seen and heard so far, it sounds like grad school would be much better than the usual K-12 and undergrad, exchanging lectures for more hands-on research, so maybe if I end up going to grad school right away it won't be more of the same monotony.

7/67, 6 June 2016

Posted on [June 6, 2016](#) by [zkendall](#)June 6, 2016

Over the weekend, we got to explore Ames a little between our initial work. On Saturday we got to enjoy root beer floats and a bouncy slide at Summerfest, and on Sunday there was a picnic for all the REU programs held at Brookside Park. The food at the picnic was wonderful, catered by Hickory Park, and we got to play games, including cards and tug-o-war.

Back in the office today, I was excited to start our crash course into C++, especially since Smith doesn't teach any C-based languages. While the planned lectures this morning were fairly basic for those of us who have coded before, there was definitely room for us to explore C++ on our own as well. As a "curly brace language," it does follow some of the same principles I have seen in Java and JS, and I also recognized some simple commands like std::cout from the little C++ I saw in my Assembly course. However, it also has differences I'm still getting used to, like the #include statements (though I suppose this shouldn't be much of a problem, since Java has import statements). I like the format of the course so far, allowing us to have a more structured lecture and also plenty of hands-on programming time, as tinkering is one of my favorite ways to learn.

Tomorrow my research team and I get a tour of the lab we will be working in/for, which I'm really excited about. I've been doing some of the preliminary background understanding for the EEG research, and I'm excited to finally see one up close and have my own EEG taken. Hopefully I'll get more comfortable with C++ through the crash course and with Matlab during research (as we don't get along right now). Also looking forward to learning Maya and going more in-depth into Solidworks and Unity later this summer.

4/67, 3 June 2016

Posted on [June 3, 2016](#) by [zkendall](#)June 3, 2016

I guess you could say we hit the ground with both feet running, but I've heard that that's actually slower than taking off from rest. It's been such a busy few days but also super fun. We've already gotten to build a spaghetti and marshmallow tower in teams and taken a tour of all the fancy technology we're too broke to afford but get to play with while we're here.

While the C6 was definitely amazing to be in, I definitely can't drop millions of dollars on that kind of tech, though I wish I could. It was certainly the fanciest, considering it runs on 48 nodes each with 6-core processors and two high-end scientific research grade graphics cards. However, the HMDs we also got to play around with are much closer to an affordable price-point, even the one needing a powerful tower hookup with an expensive graphics card. I figure

it's possible that we could trick out our own computers to have specs good enough for that. Seeing the 3D printer also got me excited to work more on 3D modeling. We have one at Smith, but I've never personally been able to print anything on it, though several of my friends have, so doing a deep dive on that would be very interesting. Not to say that I wouldn't love going more in depth into Unity and VR as well.

I've done a little with Unity, but it was all pretty basic tinkering around, and I'd love to learn how to better use it. Since Unity uses a lot of C++, I'm really looking forward to a crash course in that language, since we don't have any C-based language courses at school (we'd have to go to a nearby college/university for that). I've also seen Maya on many of my school's computers, but aside from testing it opening and drawing a cube, I haven't done anything with the software. I love to learn this new software, especially if Autodesk offers a free version (I've been building some buildings in SketchUp using Wine, but I'd love more software options to tinker with).

All in all, I think this is much better than spending the summer being a couch potato and arguing with my mom; I get bored at home and ready to leave after a week, tops. Hanging out here learning about the forefront of interface tech research with all of you definitely sounds like a much better option. Very much looking forward to starting research project, as it involves the brain, which I would like to study and work with later in Life, either in research or as a career.