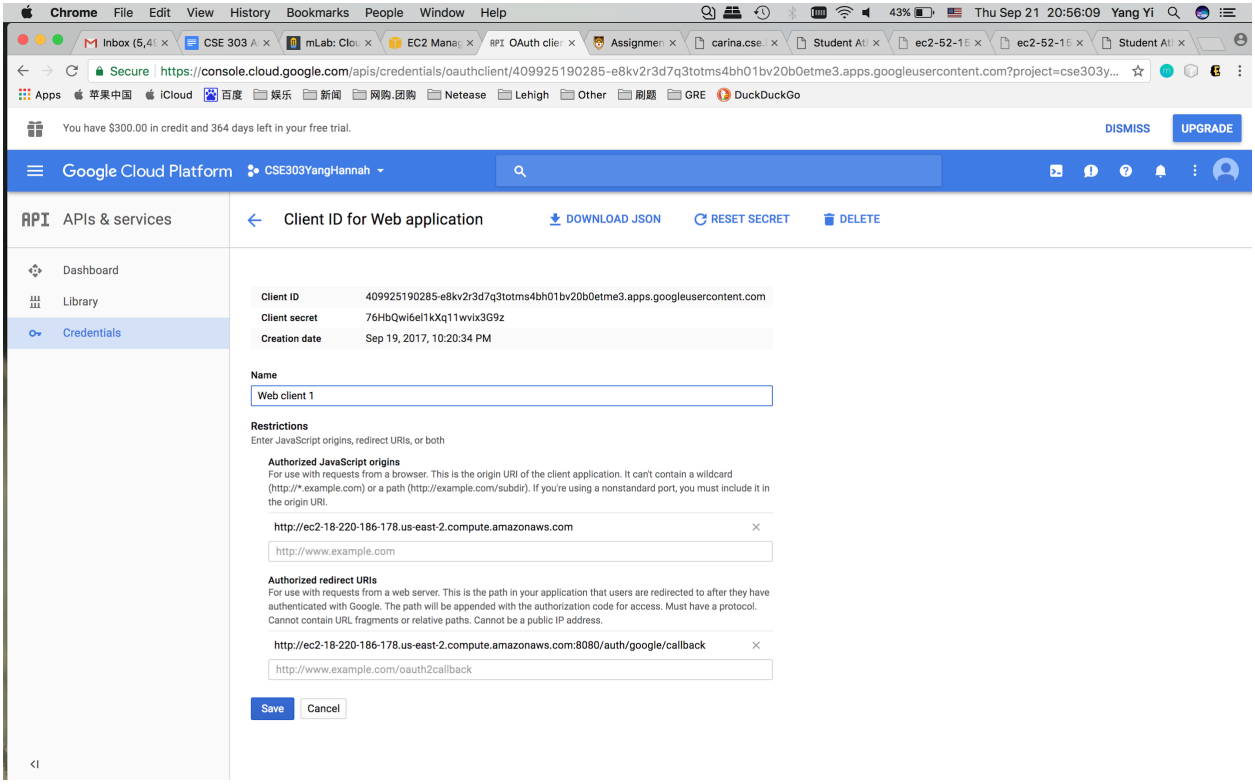
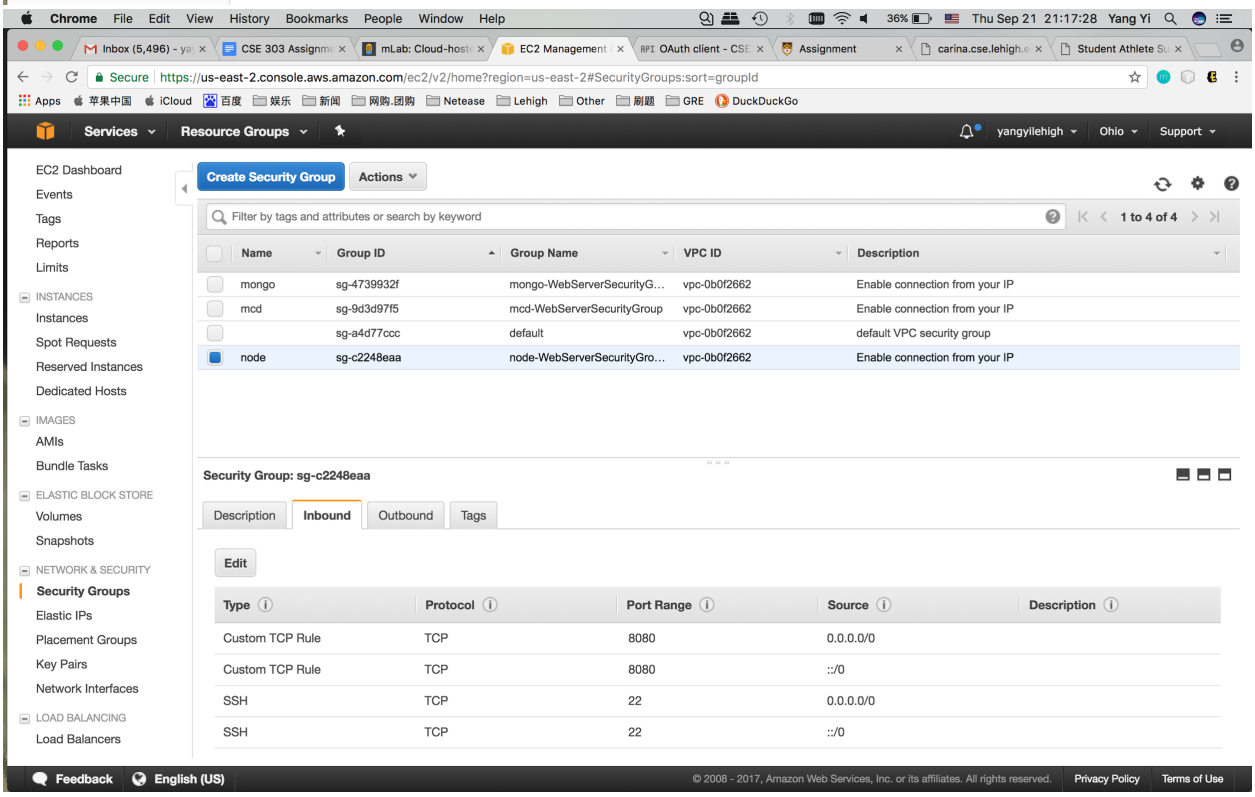
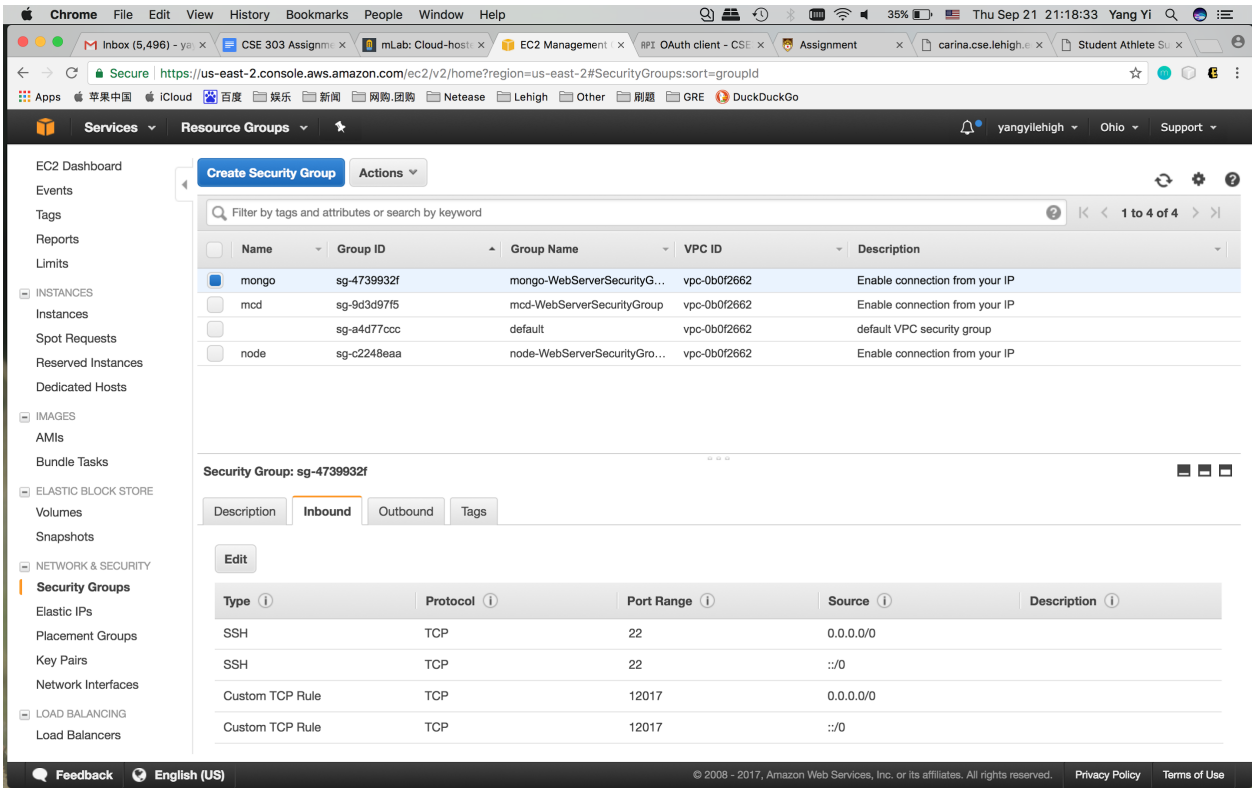
CSE 303 Assignment 2 Virtualization and Cloud Computing

Team Members: Yang Yi (yay218), Hannah Lambert (hml218)






Chrome File Edit View History Bookmarks People Window Help
Thu Sep 21 21:18:33 Yang Yi
https://us-east-2.console.aws.amazon.com/ec2/v2/home?region=us-east-2#SecurityGroups:sort=groupId
Services Resource Groups
yangyilehigh Ohio Support
EC2 Dashboard
Events
Tags
Reports
Limits
INSTANCES
Instances
Spot Requests
Reserved Instances
Dedicated Hosts
IMAGES
AMIs
Bundle Tasks
ELASTIC BLOCK STORE
Volumes
Snapshots
NETWORK & SECURITY
Security Groups
Elastic IPs
Placement Groups
Key Pairs
Network Interfaces
LOAD BALANCING
Load Balancers
Create Security Group
Actions
Filter by tags and attributes or search by keyword
1 to 4 of 4
Name
Group ID
Group Name
VPC ID
Description
mongo sg-4739932f mongo-WebServerSecurityG... vpc-0b0f2662 Enable connection from your IP
mcd sg-9d3d97f5 mcd-WebServerSecurityGroup vpc-0b0f2662 Enable connection from your IP
sg-a4d77ccc default vpc-0b0f2662 default VPC security group
node sg-c2248eaa node-WebServerSecurityGro... vpc-0b0f2662 Enable connection from your IP
Security Group: sg-4739932f
Description
Inbound
Outbound
Tags
Edit
Type
Protocol
Port Range
Source
Description
SSH TCP 22 0.0.0.0/0
SSH TCP 22 ::/0
Custom TCP Rule TCP 12017 0.0.0.0/0
Custom TCP Rule TCP 12017 ::/0
Feedback
English (US)
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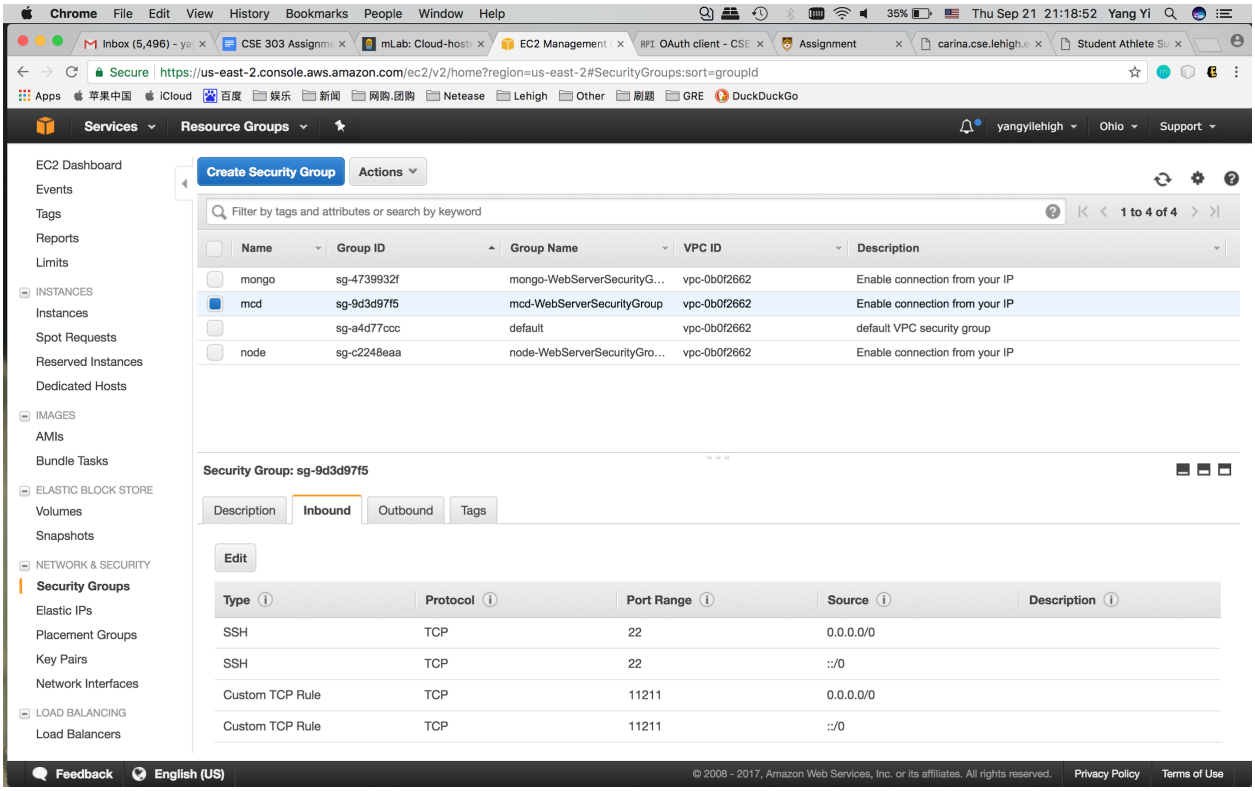
Chrome File Edit View History Bookmarks People Window Help
Thu Sep 21 21:18:52 Yang Yi
https://us-east-2.console.aws.amazon.com/ec2/v2/home?region=us-east-2#SecurityGroups:sort=groupId
Services Resource Groups
yangyilehigh Ohio Support
EC2 Dashboard
Events
Tags
Reports
Limits
INSTANCES
Instances
Spot Requests
Reserved Instances
Dedicated Hosts
IMAGES
AMIs
Bundle Tasks
ELASTIC BLOCK STORE
Volumes
Snapshots
NETWORK & SECURITY
Security Groups
Elastic IPs
Placement Groups
Key Pairs
Network Interfaces
LOAD BALANCING
Load Balancers
Create Security Group
Actions
Filter by tags and attributes or search by keyword
1 to 4 of 4
Name
Group ID
Group Name
VPC ID
Description
mongo sg-4739932f mongo-WebServerSecurityG... vpc-0b0f2662 Enable connection from your IP
mcd sg-9d3d97f5 mcd-WebServerSecurityGroup vpc-0b0f2662 Enable connection from your IP
sg-a4d77ccc default vpc-0b0f2662 default VPC security group
node sg-c2248eaa node-WebServerSecurityGro... vpc-0b0f2662 Enable connection from your IP
Security Group: sg-9d3d97f5
Description
Inbound
Outbound
Tags
Edit
Type
Protocol
Port Range
Source
Description
SSH TCP 22 0.0.0.0/0
SSH TCP 22 ::/0
Custom TCP Rule TCP 11211 0.0.0.0/0
Custom TCP Rule TCP 11211 ::/0
Feedback
English (US)
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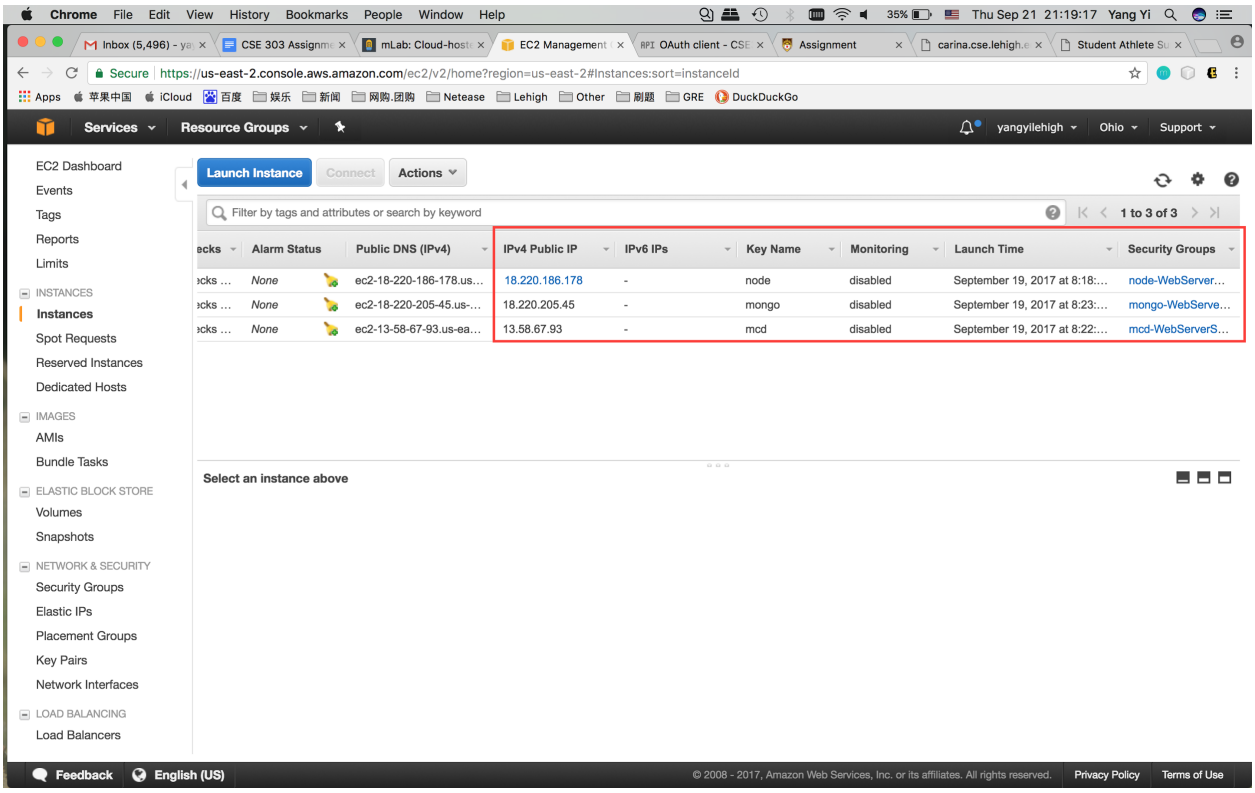
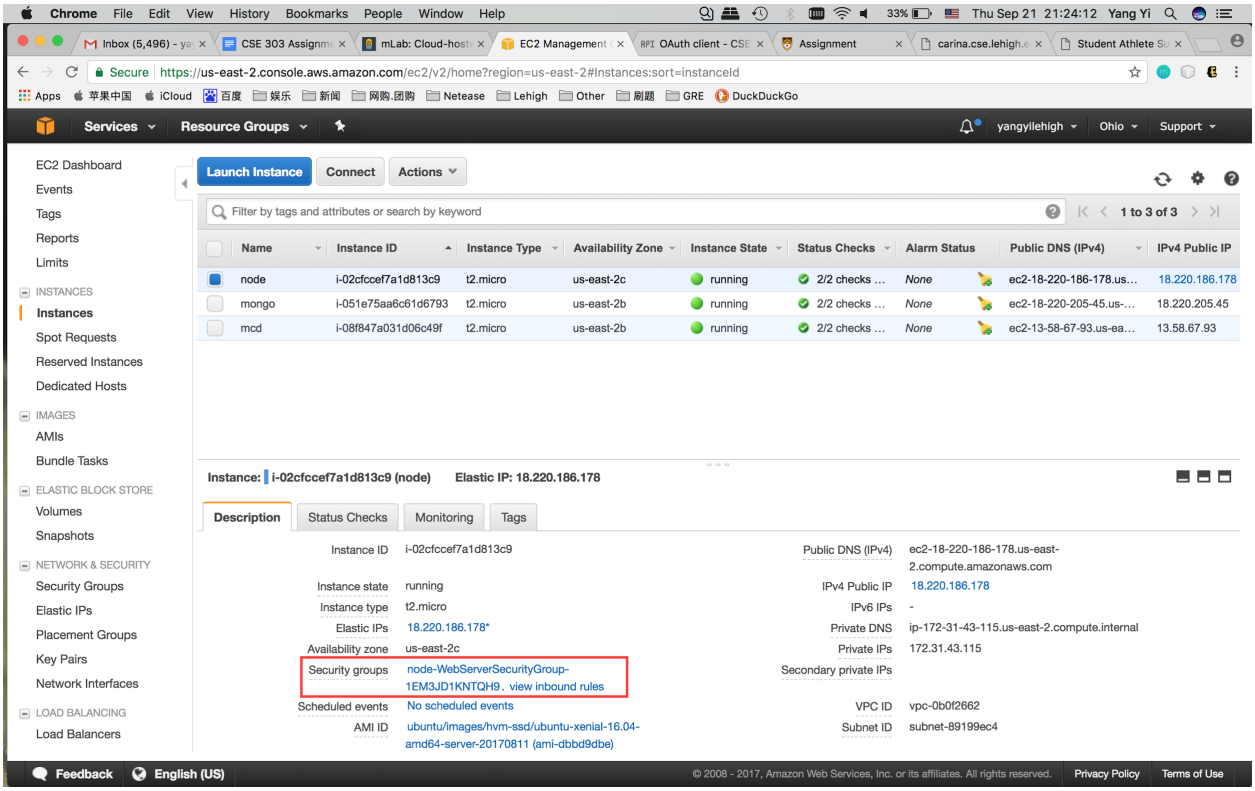
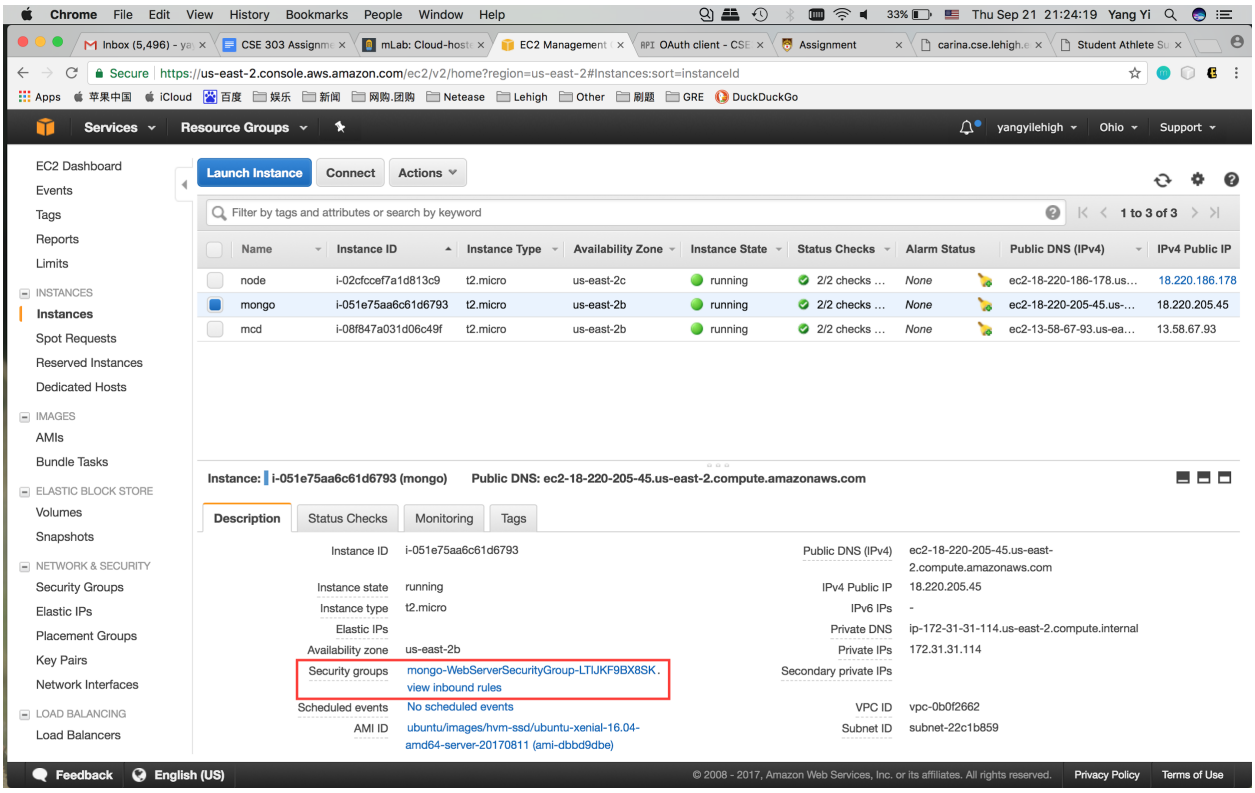

Launch Instance
Connect
Actions
Filter by tags and attributes or search by keyword
1 to 3 of 3
Alarm Status
Public DNS (IPv4)
IPv4 Public IP
IPv6 IPs
Key Name
Monitoring
Launch Time
Security Groups
None ec2-18-220-186-178.us... 18.220.186.178 - node disabled September 19, 2017 at 8:18:... node-WebServer...
None ec2-18-220-205-45.us-... 18.220.205.45 - mongo disabled September 19, 2017 at 8:23:... mongo-WebServe...
None ec2-13-58-67-93.us-ea... 13.58.67.93 - mcd disabled September 19, 2017 at 8:22:... mcd-WebServerS...
Select an instance above


Launch Instance
Connect
Actions
Filter by tags and attributes or search by keyword
1 to 3 of 3
Name
Instance ID
Instance Type
Availability Zone
Instance State
Status Checks
Alarm Status
Public DNS (IPv4)
IPv4 Public IP
node i-02cfccef7a1d813c9 t2.micro us-east-2c running 2/2 checks ... None ec2-18-220-186-178.us... 18.220.186.178
mongo i-051e75aa6c61d6793 t2.micro us-east-2b running 2/2 checks ... None ec2-18-220-205-45.us-... 18.220.205.45
mcd i-08f847a031d06c49f t2.micro us-east-2b running 2/2 checks ... None ec2-13-58-67-93.us-ea... 13.58.67.93
Instance: i-02cfccef7a1d813c9 (node) Elastic IP: 18.220.186.178
Description
Status Checks
Monitoring
Tags
Instance ID i-02cfccef7a1d813c9
Instance state running
Instance type t2.micro
Elastic IPs 18.220.186.178*
Availability zone us-east-2c
Security groups node-WebServerSecurityGroup-1EM3JD1KNTQH9. view inbound rules
Scheduled events No scheduled events
AMI ID ubuntu/images/hvm-ssd/ubuntu-xenial-16.04-amd64-server-20170811 (ami-dbbd9dbe)
Public DNS (IPv4) ec2-18-220-186-178.us-east-2.compute.amazonaws.com
IPv4 Public IP 18.220.186.178
IPv6 IPs -
Private DNS ip-172-31-43-115.us-east-2.compute.internal
Private IPs 172.31.43.115
Secondary private IPs
VPC ID vpc-0b0f2662
Subnet ID subnet-89199ec4


Launch Instance
Connect
Actions
Filter by tags and attributes or search by keyword
1 to 3 of 3
Name
Instance ID
Instance Type
Availability Zone
Instance State
Status Checks
Alarm Status
Public DNS (IPv4)
IPv4 Public IP
node i-02cfccef7a1d813c9 t2.micro us-east-2c running 2/2 checks ... None ec2-18-220-186-178.us... 18.220.186.178
mongo i-051e75aa6c61d6793 t2.micro us-east-2b running 2/2 checks ... None ec2-18-220-205-45.us-... 18.220.205.45
mcd i-08f847a031d06c49f t2.micro us-east-2b running 2/2 checks ... None ec2-13-58-67-93.us-ea... 13.58.67.93
Instance: i-051e75aa6c61d6793 (mongo) Public DNS: ec2-18-220-205-45.us-east-2.compute.amazonaws.com
Description
Status Checks
Monitoring
Tags
Instance ID i-051e75aa6c61d6793
Instance state running
Instance type t2.micro
Elastic IPs
Availability zone us-east-2b
Security groups mongo-WebServerSecurityGroup-LTIJKF9BX8SK. view inbound rules
Scheduled events No scheduled events
AMI ID ubuntu/images/hvm-ssd/ubuntu-xenial-16.04-amd64-server-20170811 (ami-dbbd9dbe)
Public DNS (IPv4) ec2-18-220-205-45.us-east-2.compute.amazonaws.com
IPv4 Public IP 18.220.205.45
IPv6 IPs -
Private DNS ip-172-31-31-114.us-east-2.compute.internal
Private IPs 172.31.31.114
Secondary private IPs
VPC ID vpc-0b0f2662
Subnet ID subnet-22c1b859
Feedback
English (US)
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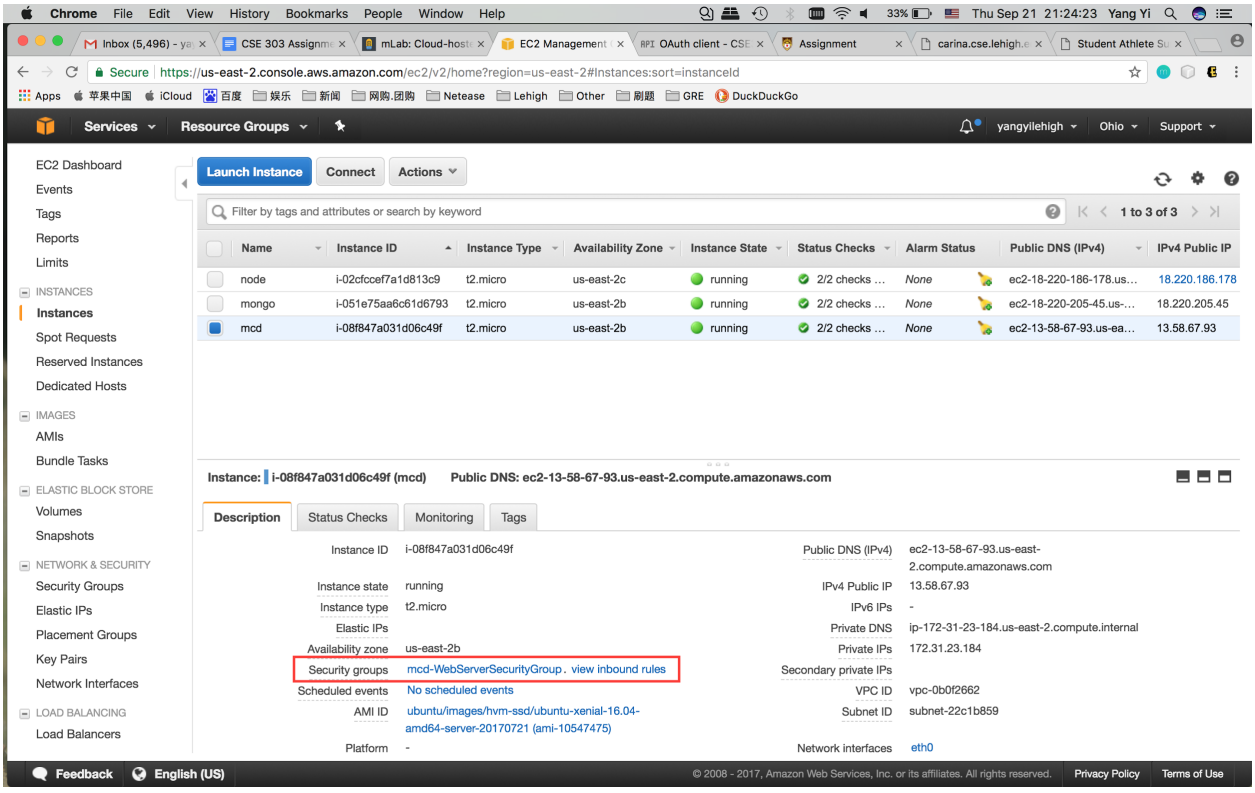
Launch Instance
Connect
Actions
Filter by tags and attributes or search by keyword
1 to 3 of 3
Name
Instance ID
Instance Type
Availability Zone
Instance State
Status Checks
Alarm Status
Public DNS (IPv4)
IPv4 Public IP
node i-02cfccef7a1d813c9 t2.micro us-east-2c running 2/2 checks ... None ec2-18-220-186-178.us... 18.220.186.178
mongo i-051e75aa6c61d6793 t2.micro us-east-2b running 2/2 checks ... None ec2-18-220-205-45.us-... 18.220.205.45
mcd i-08f847a031d06c49f t2.micro us-east-2b running 2/2 checks ... None ec2-13-58-67-93.us-ea... 13.58.67.93
Instance: i-08f847a031d06c49f (mcd) Public DNS: ec2-13-58-67-93.us-east-2.compute.amazonaws.com
Description
Status Checks
Monitoring
Tags
Instance ID i-08f847a031d06c49f
Instance state running
Instance type t2.micro
Elastic IPs
Availability zone us-east-2b
Security groups mcd-WebServerSecurityGroup. view inbound rules
Scheduled events No scheduled events
AMI ID ubuntu/images/hvm-ssd/ubuntu-xenial-16.04-amd64-server-20170721 (ami-10547475)
Platform -
Public DNS (IPv4) ec2-13-58-67-93.us-east-2.compute.amazonaws.com
IPv4 Public IP 13.58.67.93
IPv6 IPs -
Private DNS ip-172-31-23-184.us-east-2.compute.internal
Private IPs 172.31.23.184
Secondary private IPs
VPC ID vpc-0b0f2662
Subnet ID subnet-22c1b859
Network interfaces eth0
Feedback
English (US)
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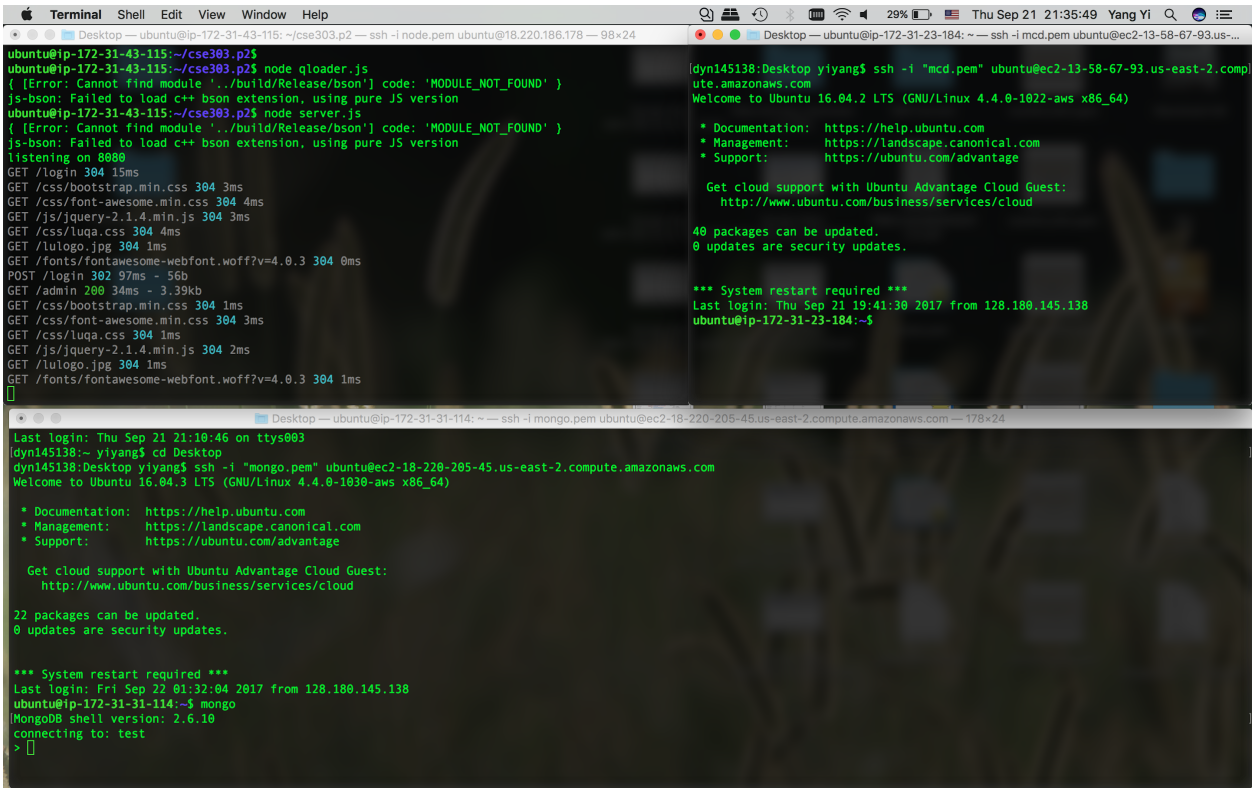
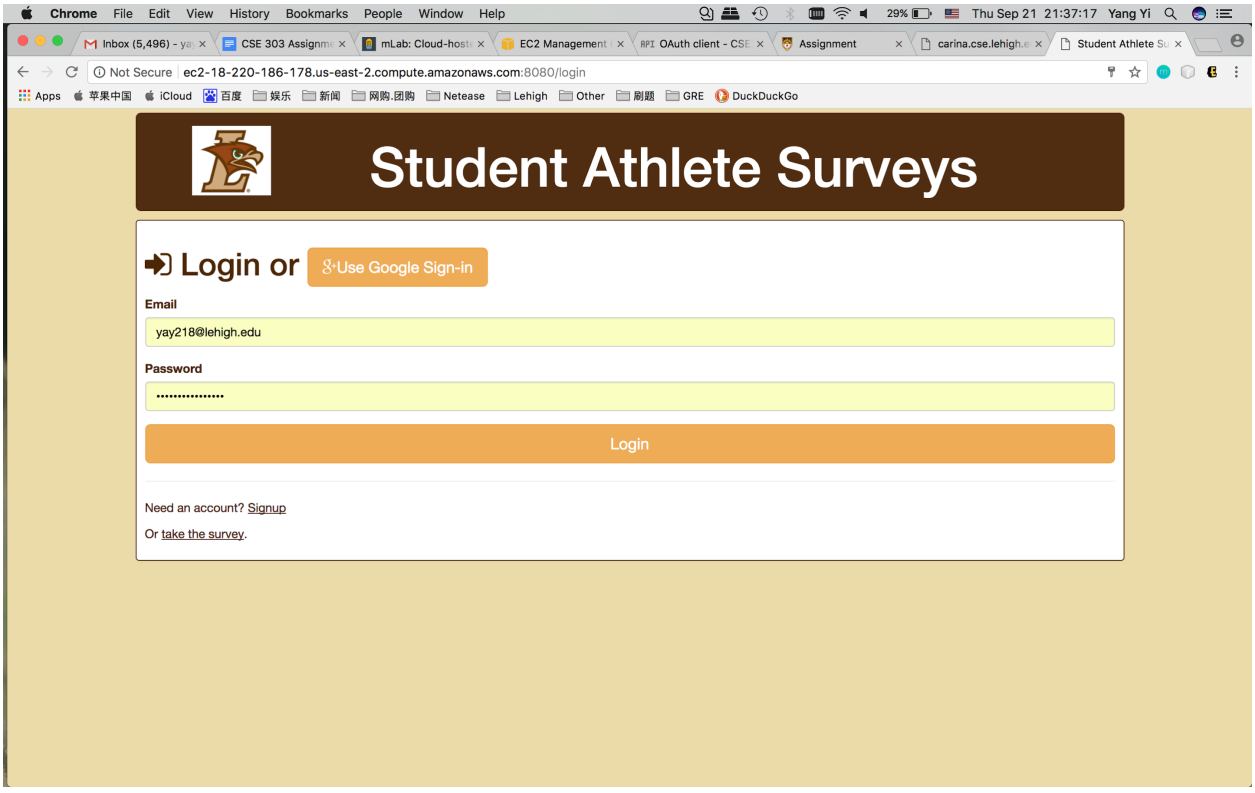
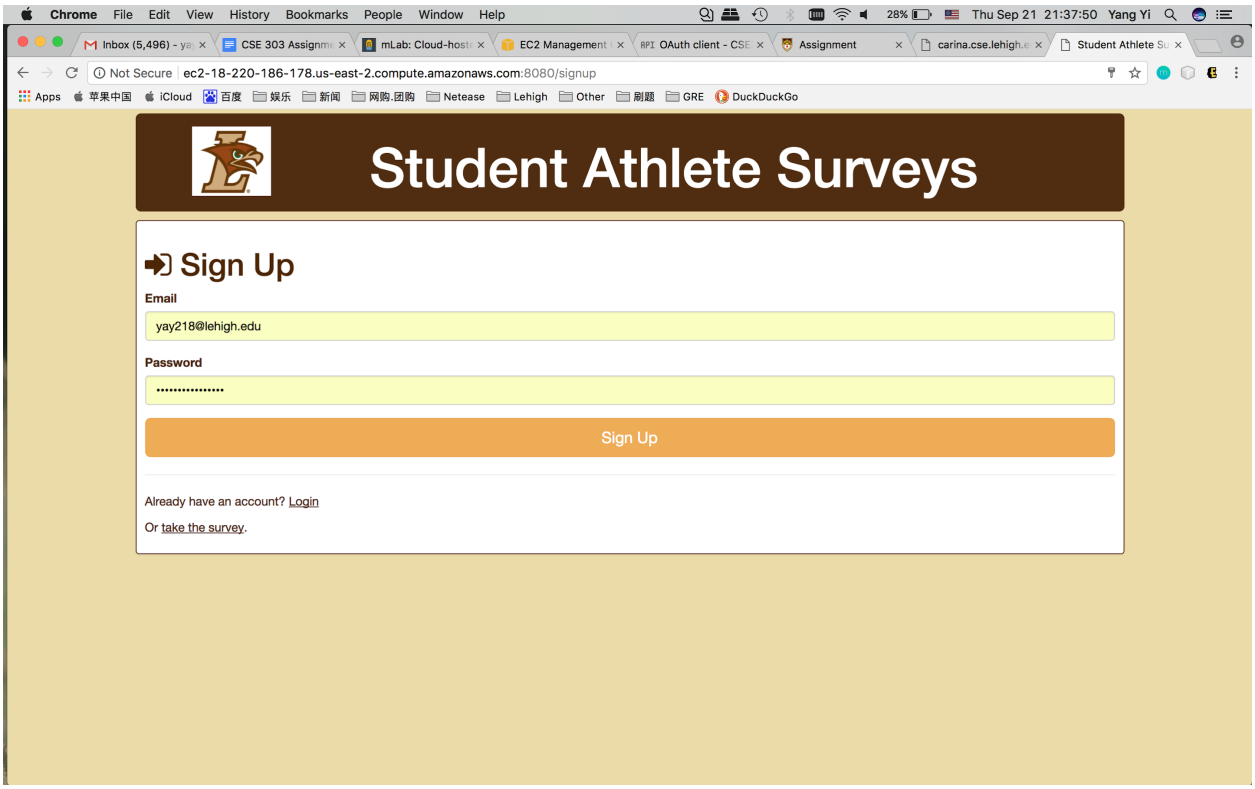
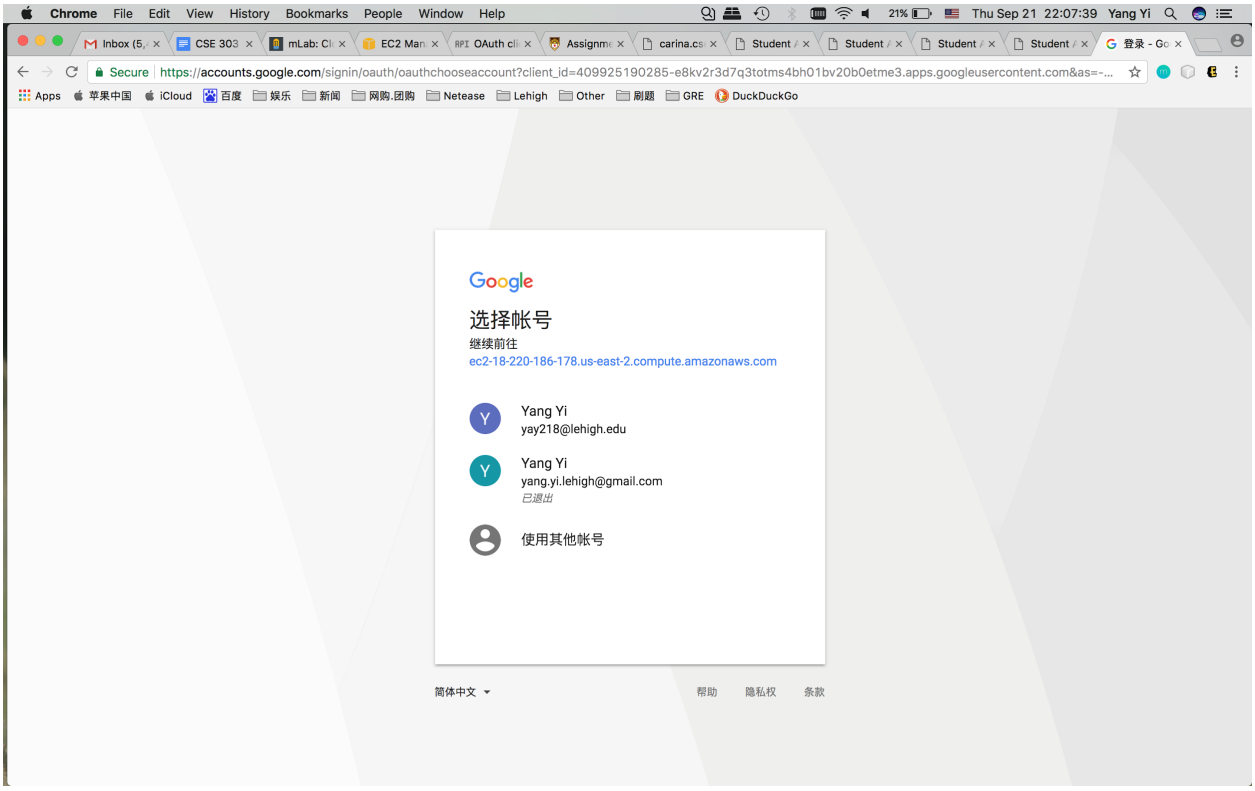
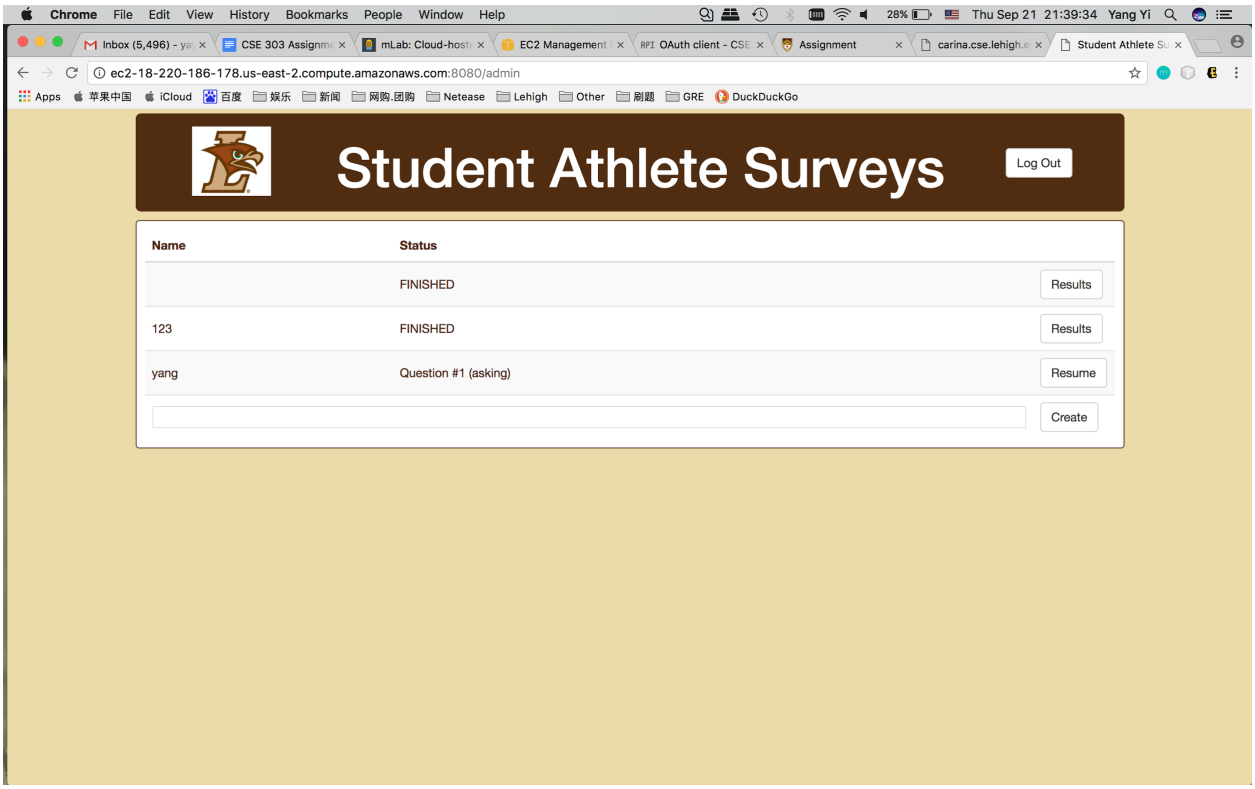
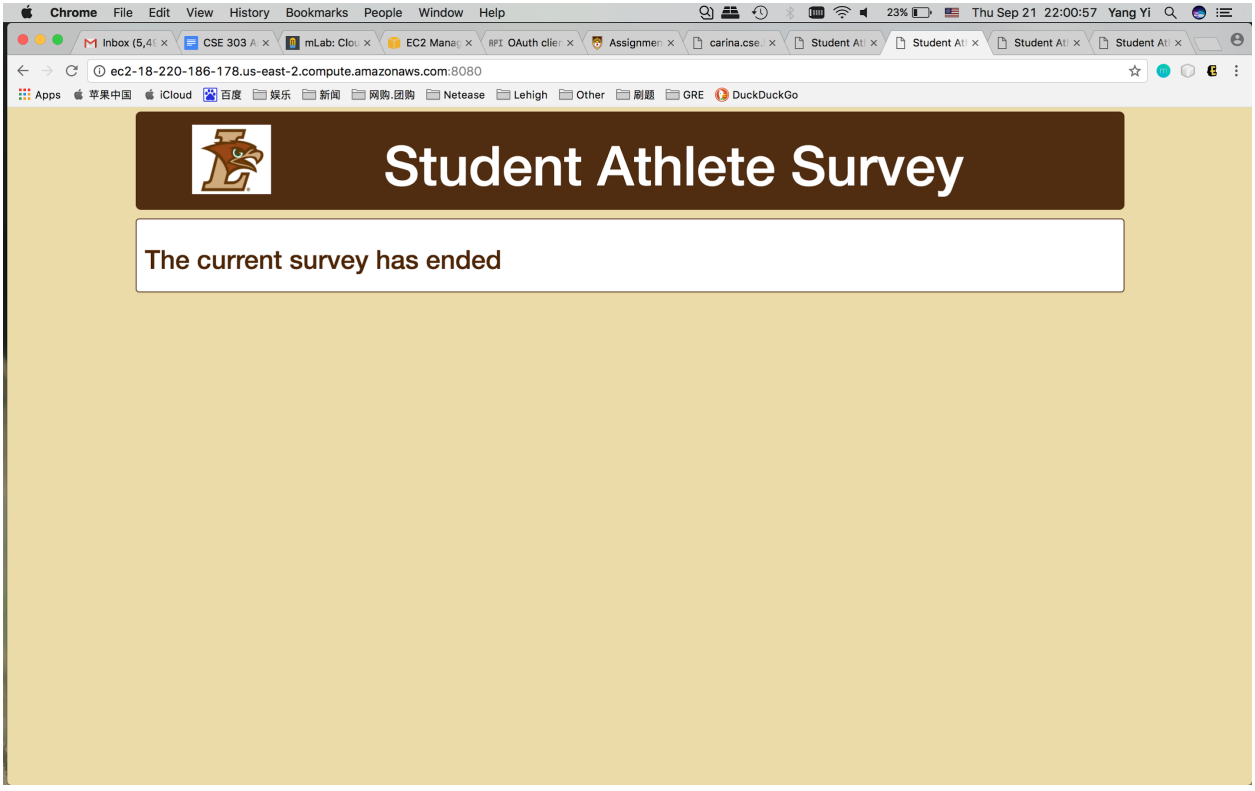

Terminal Shell Edit View Window Help
Thu Sep 21 21:35:49 Yang Yi
Desktop — ubuntu@ip-172-31-43-115: ~/cse303.p2 — ssh -i node.pem ubuntu@18.220.186.178 — 98×24
ubuntu@ip-172-31-43-115:~/cse303.p2$
ubuntu@ip-172-31-43-115:~/cse303.p2$ node qloader.js
{ [Error: Cannot find module '../build/Release/bson'] code: 'MODULE_NOT_FOUND' }
js-bson: Failed to load c++ bson extension, using pure JS version
ubuntu@ip-172-31-43-115:~/cse303.p2$ node server.js
{ [Error: Cannot find module '../build/Release/bson'] code: 'MODULE_NOT_FOUND' }
js-bson: Failed to load c++ bson extension, using pure JS version
listening on 8080
GET /login 304 15ms
GET /css/bootstrap.min.css 304 3ms
GET /css/font-awesome.min.css 304 4ms
GET /js/jquery-2.1.4.min.js 304 3ms
GET /css/luqa.css 304 4ms
GET /lulogo.jpg 304 1ms
GET /fonts/fontawesome-webfont.woff?v=4.0.3 304 0ms
POST /login 302 97ms - 56b
GET /admin 200 34ms - 3.39kb
GET /css/bootstrap.min.css 304 1ms
GET /css/font-awesome.min.css 304 3ms
GET /css/luqa.css 304 1ms
GET /js/jquery-2.1.4.min.js 304 2ms
GET /lulogo.jpg 304 1ms
GET /fonts/fontawesome-webfont.woff?v=4.0.3 304 1ms
Desktop — ubuntu@ip-172-31-23-184: ~ — ssh -i mcd.pem ubuntu@ec2-13-58-67-93.us-...
[dyn145138:Desktop yiyang$ ssh -i "mcd.pem" ubuntu@ec2-13-58-67-93.us-east-2.comp
ute.amazonaws.com
Welcome to Ubuntu 16.04.2 LTS (GNU/Linux 4.4.0-1022-aws x86_64)
* Documentation: https://help.ubuntu.com
* Management: https://landscape.canonical.com
* Support: https://ubuntu.com/advantage
Get cloud support with Ubuntu Advantage Cloud Guest:
http://www.ubuntu.com/business/services/cloud
40 packages can be updated.
0 updates are security updates.
*** System restart required ***
Last login: Thu Sep 21 19:41:30 2017 from 128.180.145.138
ubuntu@ip-172-31-23-184:~$
Desktop — ubuntu@ip-172-31-31-114: ~ — ssh -i mongo.pem ubuntu@ec2-18-220-205-45.us-east-2.compute.amazonaws.com — 178×24
Last login: Thu Sep 21 21:10:46 on ttys003
[dyn145138:~ yiyang$ cd Desktop
dyn145138:Desktop yiyang$ ssh -i "mongo.pem" ubuntu@ec2-18-220-205-45.us-east-2.compute.amazonaws.com
Welcome to Ubuntu 16.04.3 LTS (GNU/Linux 4.4.0-1030-aws x86_64)
* Documentation: https://help.ubuntu.com
* Management: https://landscape.canonical.com
* Support: https://ubuntu.com/advantage
Get cloud support with Ubuntu Advantage Cloud Guest:
http://www.ubuntu.com/business/services/cloud
22 packages can be updated.
0 updates are security updates.
*** System restart required ***
Last login: Fri Sep 22 01:32:04 2017 from 128.180.145.138
ubuntu@ip-172-31-31-114:~$ mongo
MongoDB shell version: 2.6.10
connecting to: test
>

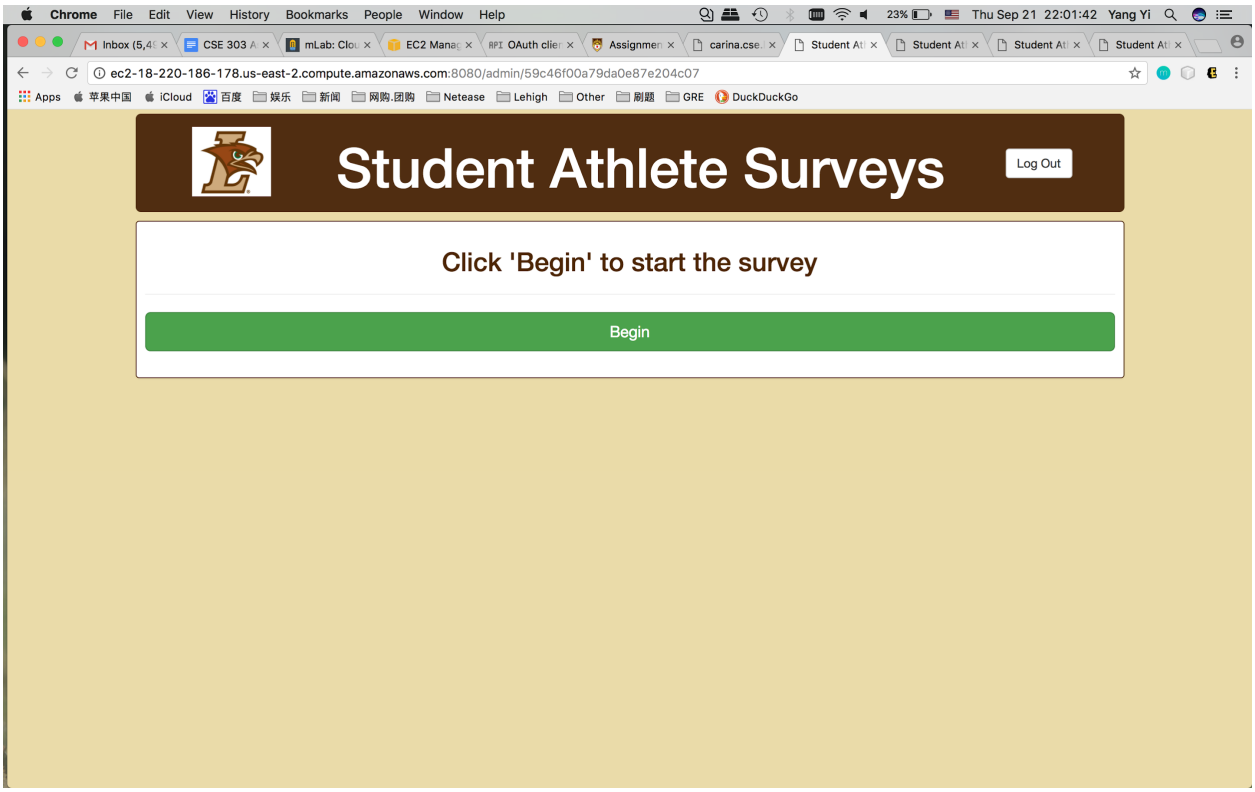

Chrome File Edit View History Bookmarks People Window Help
Thu Sep 21 21:37:17 Yang Yi
Not Secure ec2-18-220-186-178.us-east-2.compute.amazonaws.com:8080/login
Student Athlete Surveys
Login or
Use Google Sign-in
Email
yay218@lehigh.edu
Password
Login
Need an account? Signup
Or take the survey.

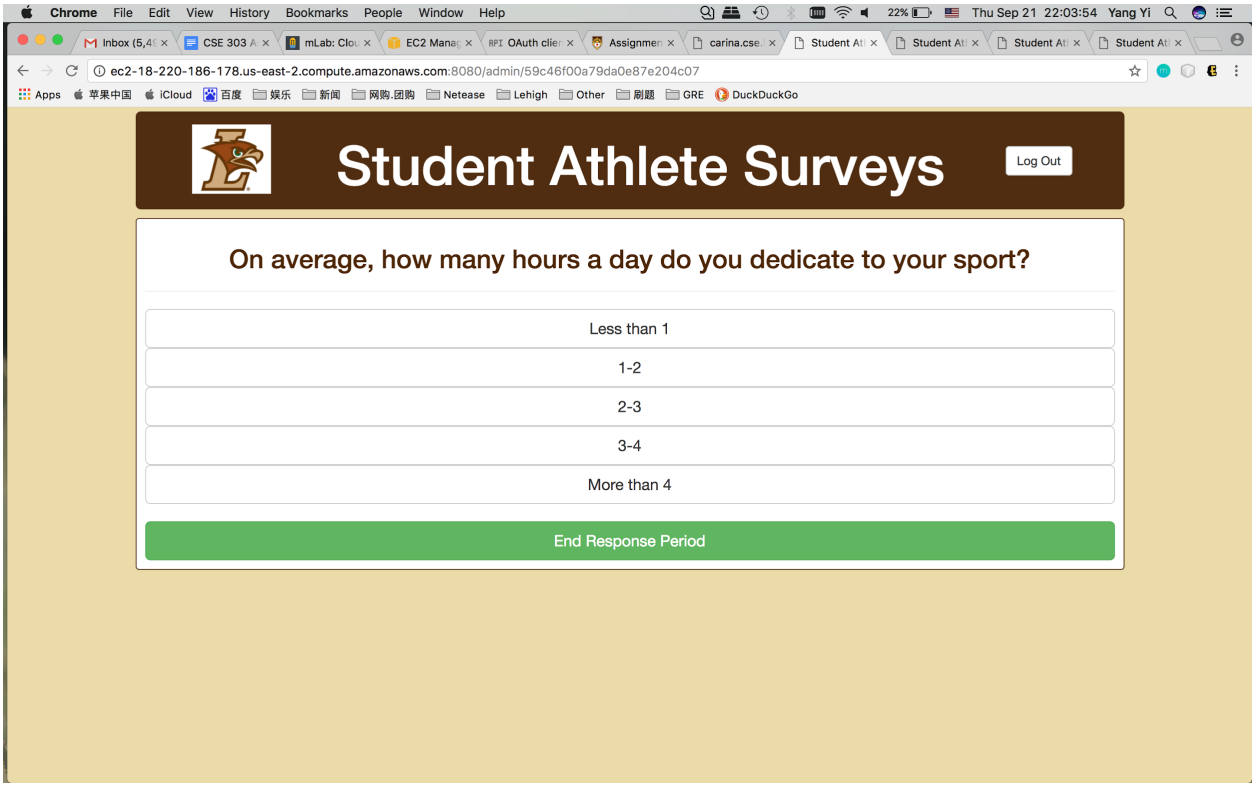

Chrome File Edit View History Bookmarks People Window Help
Thu Sep 21 21:37:50 Yang Yi
Not Secure ec2-18-220-186-178.us-east-2.compute.amazonaws.com:8080/signup
Student Athlete Surveys
Sign Up
Email
yay218@lehigh.edu
Password
Sign Up
Already have an account? Login
Or take the survey.

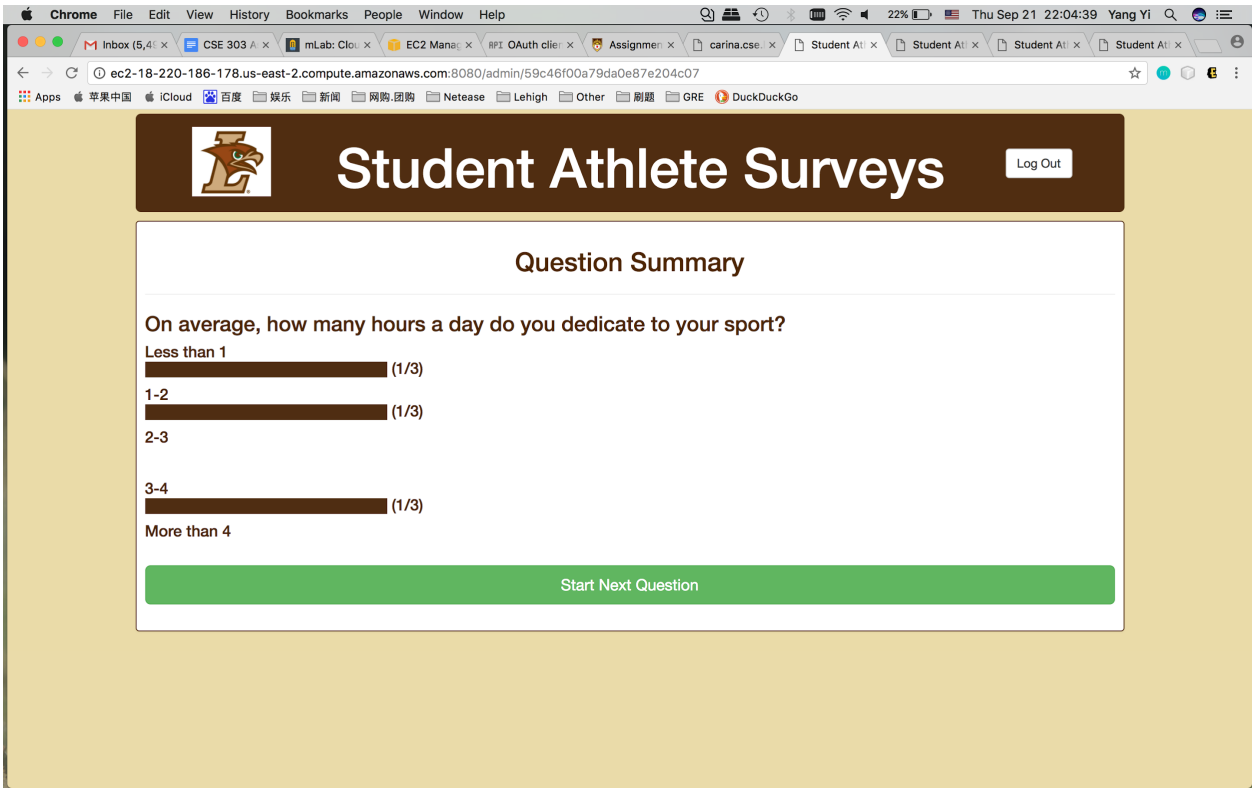

Chrome File Edit View History Bookmarks People Window Help
Thu Sep 21 22:07:39 Yang Yi
Secure https://accounts.google.com/signin/oauth/oauthchooseaccount?client_id=409925190285-e8kv2r3d7q3totms4bh01bv20b0etme3.apps.googleusercontent.com&as=-...
Google
选择帐号
继续前往
ec2-18-220-186-178.us-east-2.compute.amazonaws.com
Yang Yi
yay218@lehigh.edu
Yang Yi
yang.yi.lehigh@gmail.com
已退出
使用其他帐号
简体中文
帮助
隐私权
条款

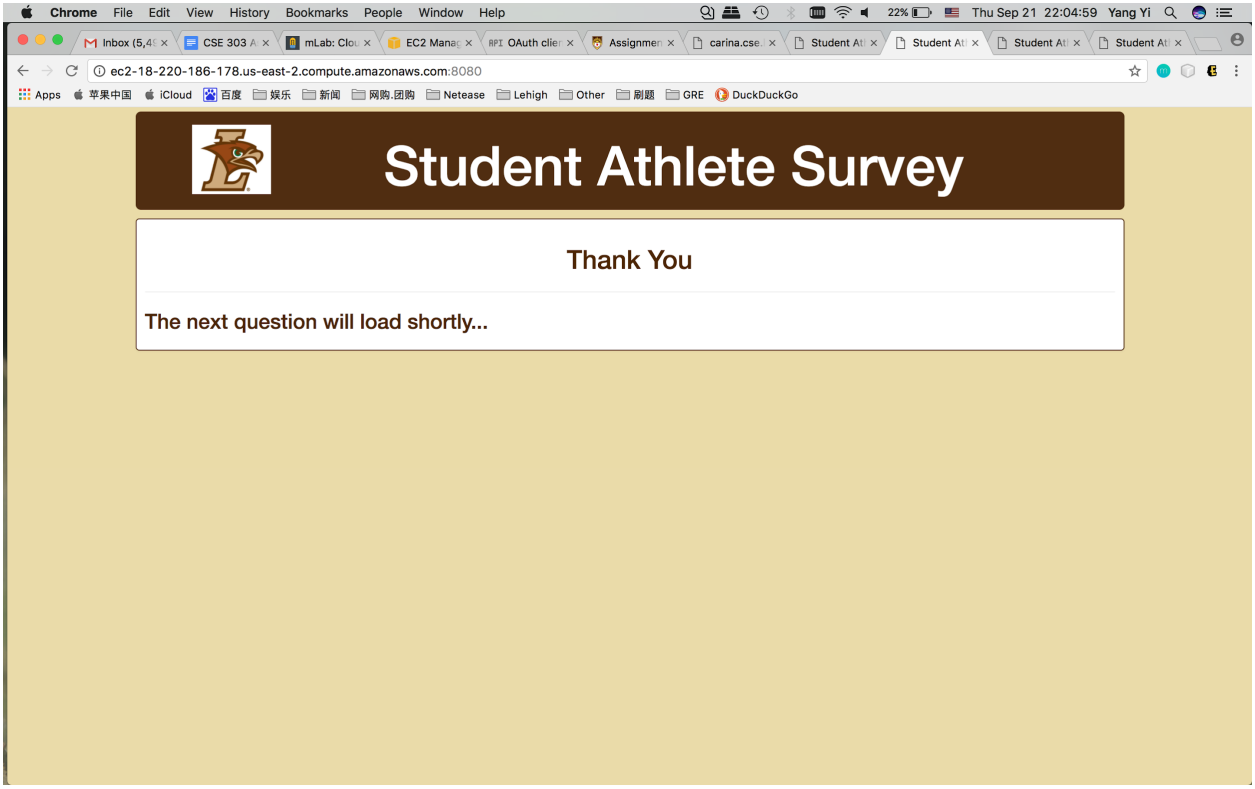

Chrome File Edit View History Bookmarks People Window Help
Thu Sep 21 21:39:34 Yang Yi
ec2-18-220-186-178.us-east-2.compute.amazonaws.com:8080/admin
Student Athlete Surveys
Log Out
Name
Status
FINISHED
Results
123
FINISHED
Results
yang
Question #1 (asking)
Resume
Create

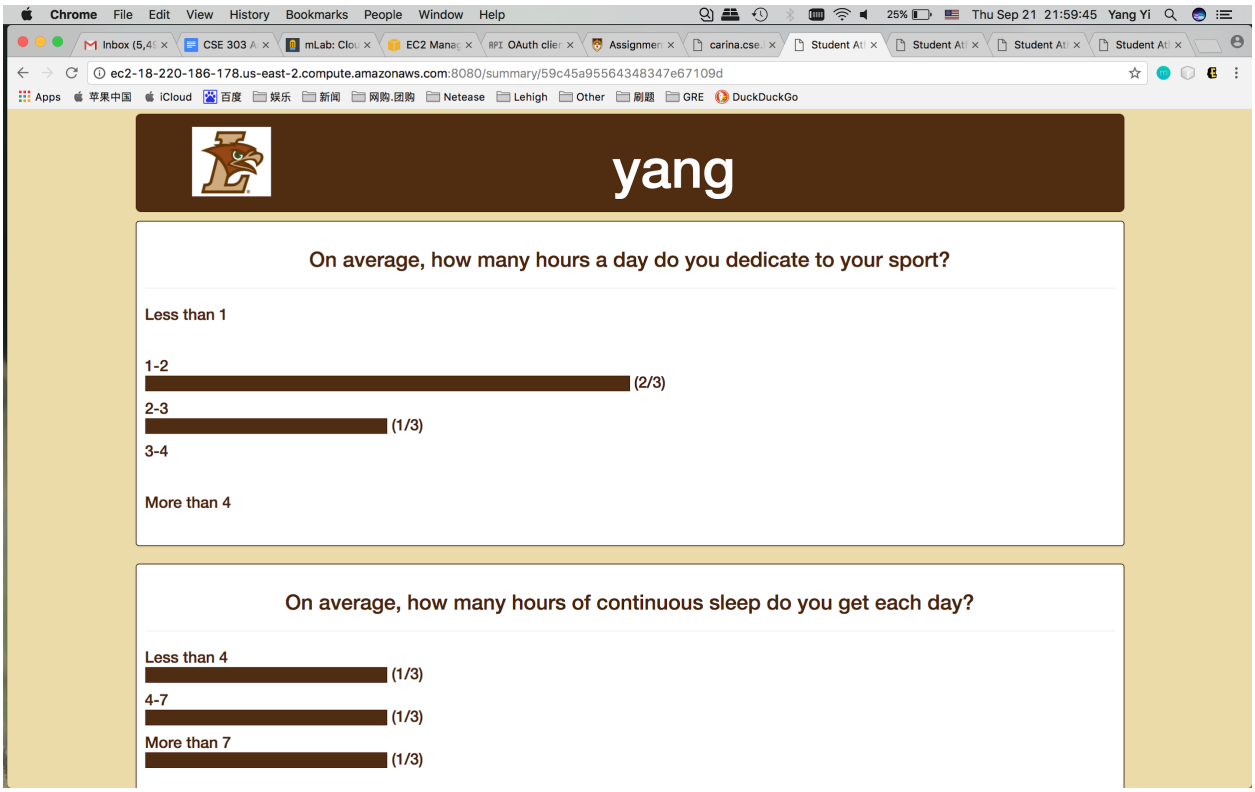

Chrome File Edit View History Bookmarks People Window Help
Thu Sep 21 22:00:57 Yang Yi
ec2-18-220-186-178.us-east-2.compute.amazonaws.com:8080
Student Athlete Survey
The current survey has ended

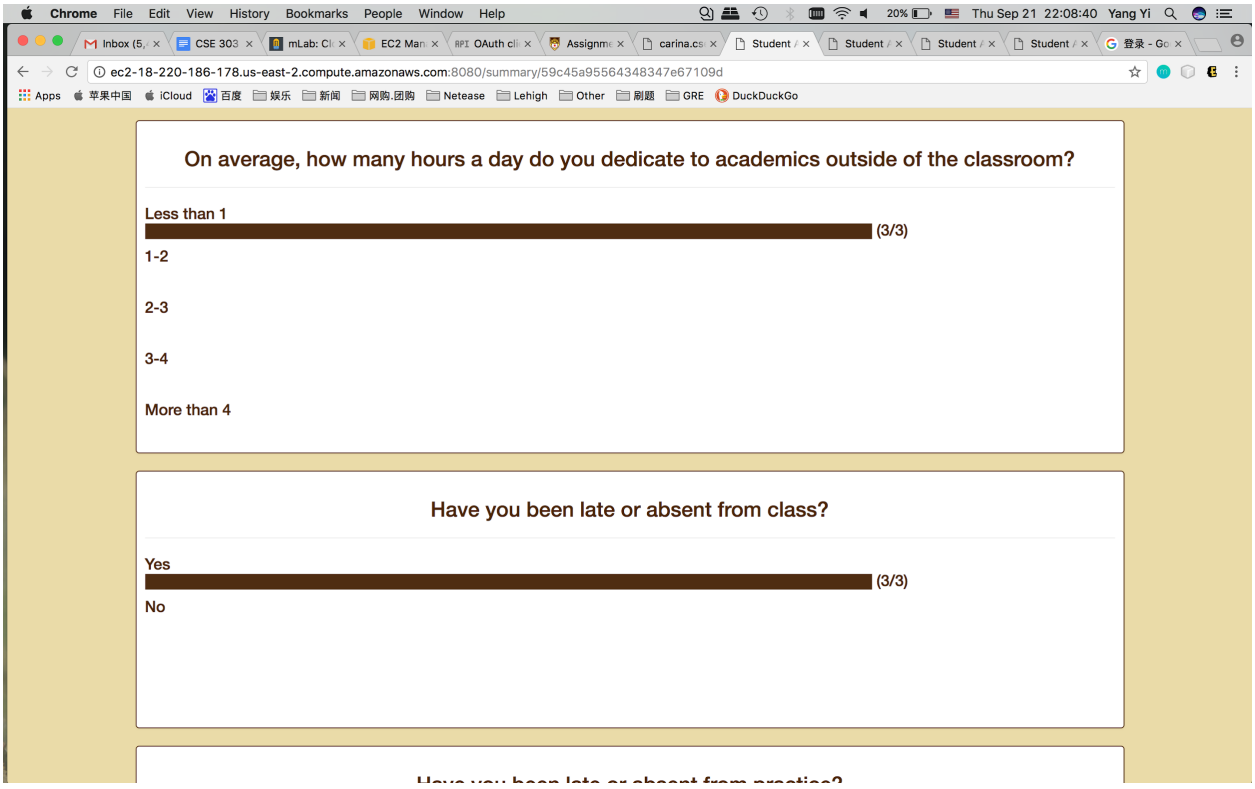

Chrome File Edit View History Bookmarks People Window Help
Thu Sep 21 22:01:42 Yang Yi
ec2-18-220-186-178.us-east-2.compute.amazonaws.com:8080/admin/59c46f00a79da0e87e204c07
Student Athlete Surveys
Log Out
Click 'Begin' to start the survey
Begin

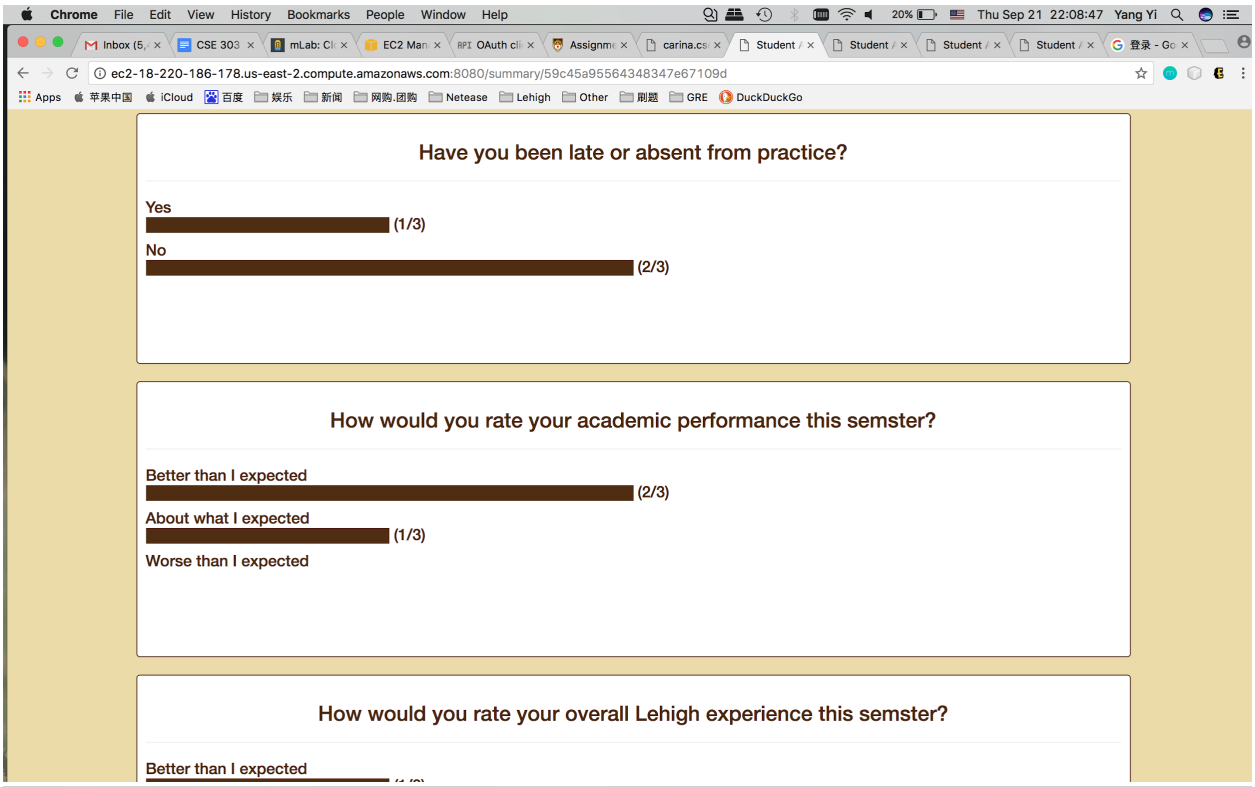

Chrome File Edit View History Bookmarks People Window Help
Thu Sep 21 22:03:54 Yang Yi
ec2-18-220-186-178.us-east-2.compute.amazonaws.com:8080/admin/59c46f00a79da0e87e204c07
Student Athlete Surveys
Log Out
On average, how many hours a day do you dedicate to your sport?
Less than 1
1-2
2-3
3-4
More than 4
End Response Period

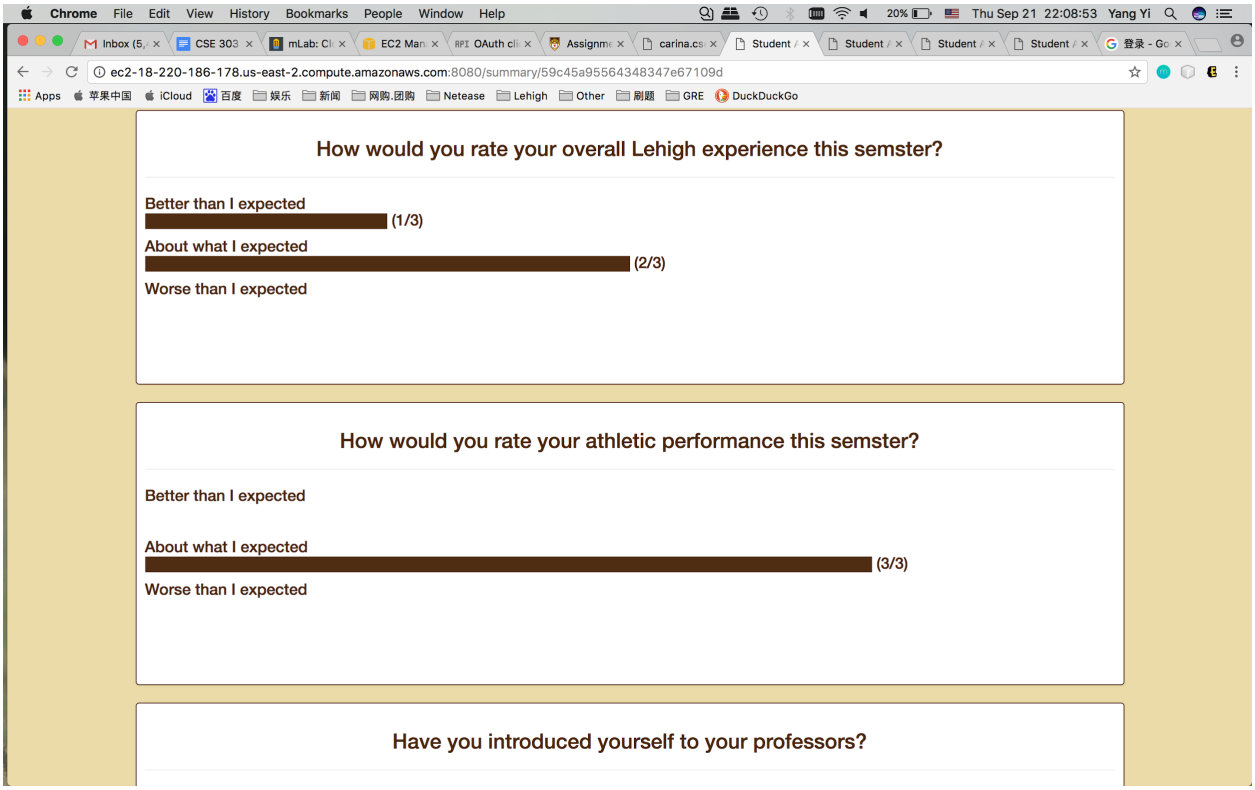

Chrome File Edit View History Bookmarks People Window Help
Thu Sep 21 22:04:39 Yang Yi
ec2-18-220-186-178.us-east-2.compute.amazonaws.com:8080/admin/59c46f00a79da0e87e204c07
Student Athlete Surveys
Log Out
Question Summary
On average, how many hours a day do you dedicate to your sport?
Less than 1
(1/3)
1-2
(1/3)
2-3
3-4
(1/3)
More than 4
Start Next Question


Chrome File Edit View History Bookmarks People Window Help
Thu Sep 21 22:04:59 Yang Yi
ec2-18-220-186-178.us-east-2.compute.amazonaws.com:8080
Student Athlete Survey
Thank You
The next question will load shortly...


Chrome File Edit View History Bookmarks People Window Help
Thu Sep 21 21:59:45 Yang Yi
ec2-18-220-186-178.us-east-2.compute.amazonaws.com:8080/summary/59c45a95564348347e67109d
yang
On average, how many hours a day do you dedicate to your sport?
Less than 1
1-2
(2/3)
2-3
(1/3)
3-4
More than 4
On average, how many hours of continuous sleep do you get each day?
Less than 4
(1/3)
4-7
(1/3)
More than 7
(1/3)


Chrome File Edit View History Bookmarks People Window Help
Thu Sep 21 22:08:40 Yang Yi
ec2-18-220-186-178.us-east-2.compute.amazonaws.com:8080/summary/59c45a95564348347e67109d
On average, how many hours a day do you dedicate to academics outside of the classroom?
Less than 1
(3/3)
1-2
2-3
3-4
More than 4
Have you been late or absent from class?
Yes
(3/3)
No


Chrome File Edit View History Bookmarks People Window Help
Thu Sep 21 22:08:47 Yang Yi
ec2-18-220-186-178.us-east-2.compute.amazonaws.com:8080/summary/59c45a95564348347e67109d
Have you been late or absent from practice?
Yes
(1/3)
No
(2/3)
How would you rate your academic performance this semster?
Better than I expected
(2/3)
About what I expected
(1/3)
Worse than I expected
How would you rate your overall Lehigh experience this semster?
Better than I expected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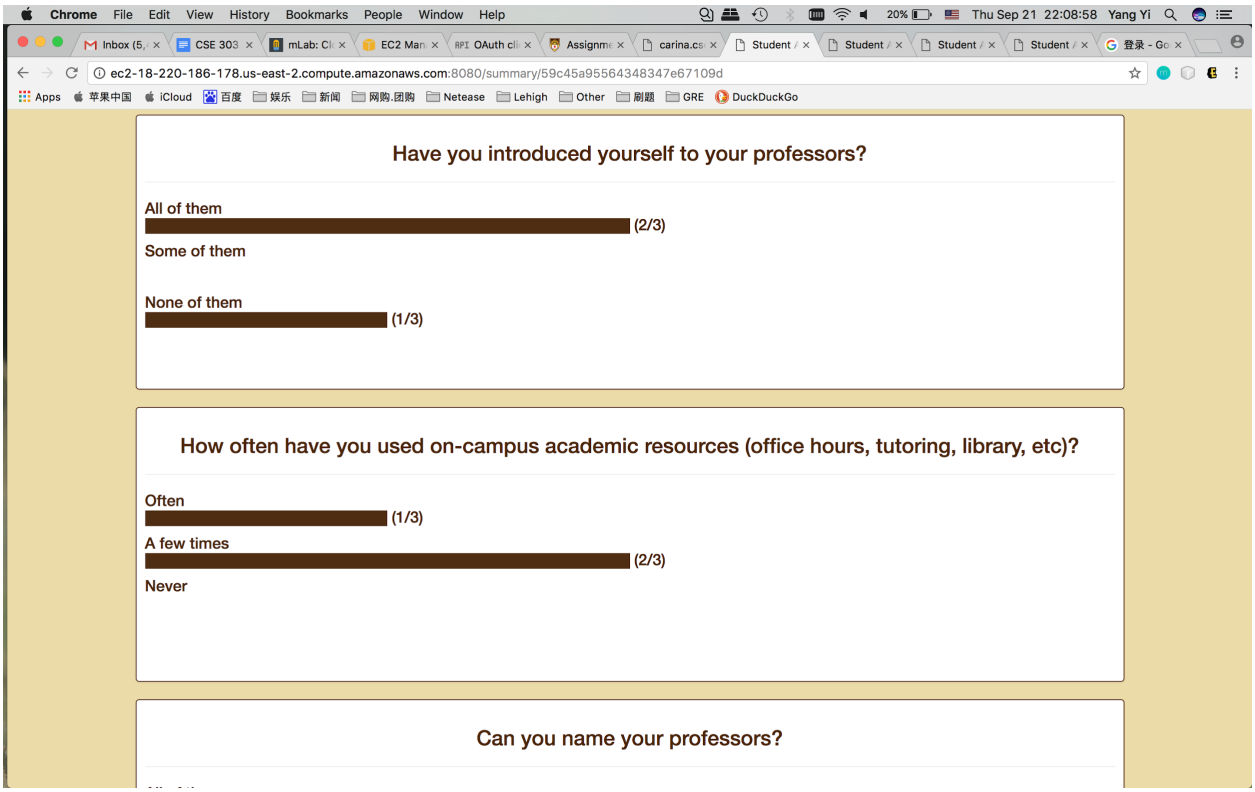
Thu Sep 21 22:08:53 Yang Yi
ec2-18-220-186-178.us-east-2.compute.amazonaws.com:8080/summary/59c45a95564348347e67109d
How would you rate your overall Lehigh experience this semster?
Better than I expected
(1/3)
About what I expected
(2/3)
Worse than I expected
How would you rate your athletic performance this semster?
Better than I expected
About what I expected
(3/3)
Worse than I expected
Have you introduced yourself to your professors?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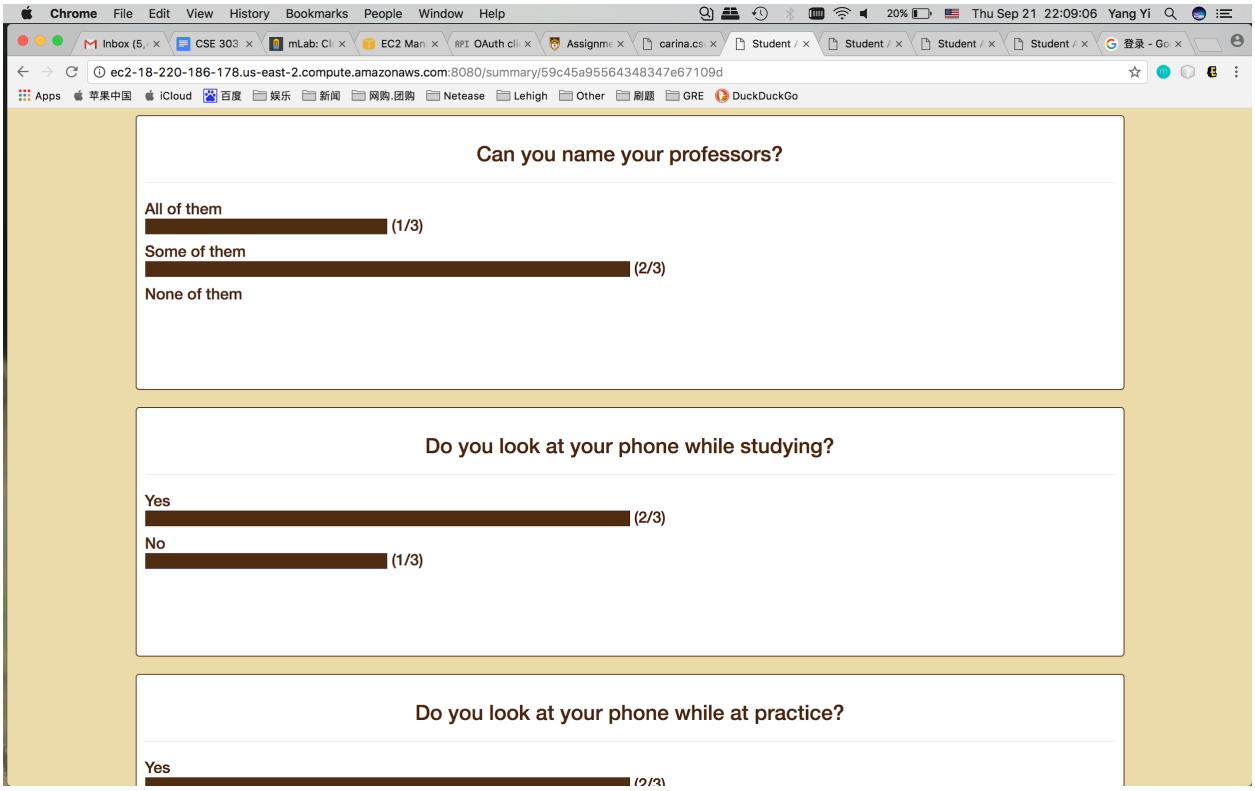
Thu Sep 21 22:08:58 Yang Yi
ec2-18-220-186-178.us-east-2.compute.amazonaws.com:8080/summary/59c45a95564348347e67109d
Have you introduced yourself to your professors?
All of them
(2/3)
Some of them
None of them
(1/3)
How often have you used on-campus academic resources (office hours, tutoring, library, etc)?
Often
(1/3)
A few times
(2/3)
Never
Can you name your professors?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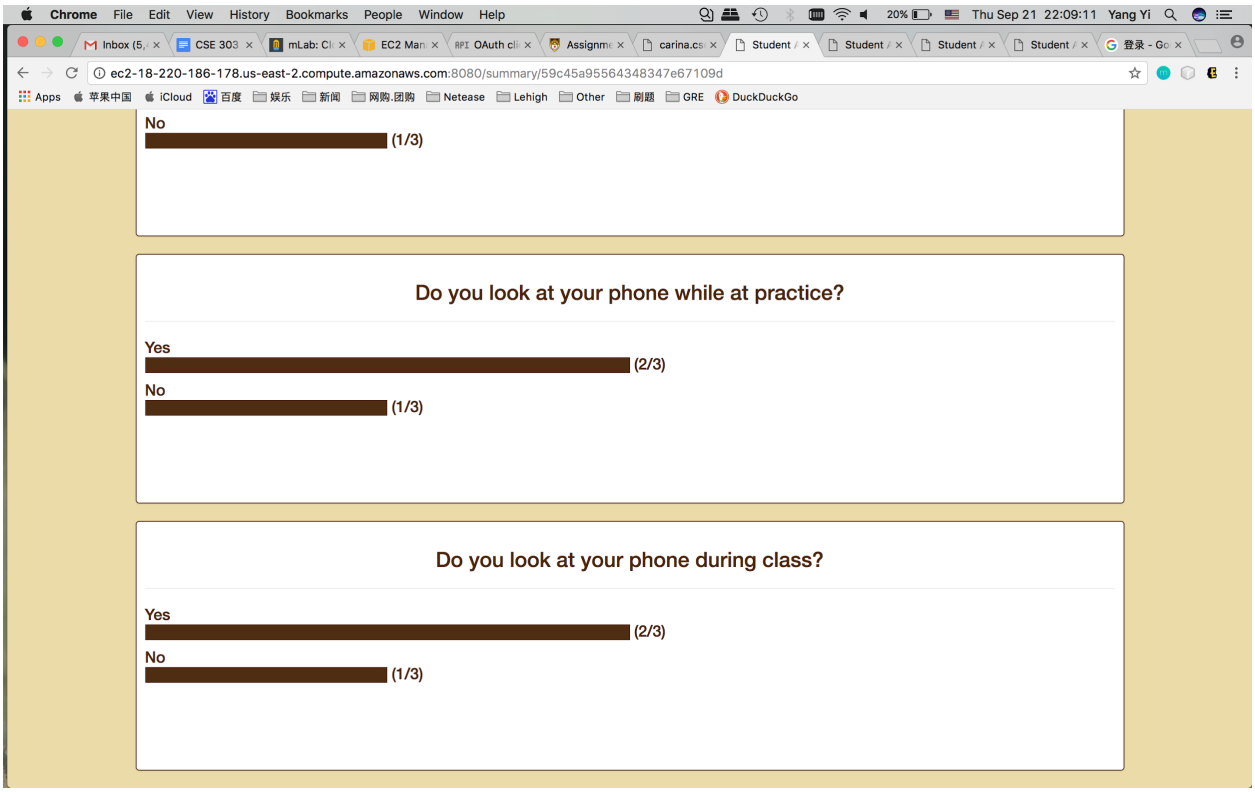
Thu Sep 21 22:09:06 Yang Yi
ec2-18-220-186-178.us-east-2.compute.amazonaws.com:8080/summary/59c45a95564348347e67109d
Can you name your professors?
All of them
(1/3)
Some of them
(2/3)
None of them
Do you look at your phone while studying?
Yes
(2/3)
No
(1/3)
Do you look at your phone while at practice?
Yes



1 - mlab.com provides SaaS (Software as a Service), in the form of MongoDB hosting. What is one benefit of using mlab? What is one drawback, relative to running your own MongDB server? (Note: your answers to the two parts of this question cannot be derivable from each other. For example, if your answer to the first is "SaaS has more X", then your answer to the second cannot be "IaaS has less X".)

SaaS generally allows for a more user-friendly implementation of software such as MongoDB. Websites such as mlab.com provide a simplistic user interface that allows for easy implementation and deployment. In using such a service, one gains access to the reliability, security, and stability that can be offered by a platform backed by diverse resources and connections, along with a substantial user base. Such a user base can be useful when questions arise, as the probability of someone else having experience with a given issue is significant. On the flipside, because mlab.com users are not necessarily getting into the nitty gritty of self-implementation as much as the people who are using MongoDB on their own, they may be unintentionally missing out on or overlooking powerful features of MongoDB in their attempts to utilize the SaaS platform to its full potential.

2 - Read about Eventual Consistency. Is Eventual Consistency a problem for this application? If so, why? If not, what conditions could lead to Eventual Consistency becoming a problem?

Eventual Consistency is not an issue for this application because information is only stored in one database, specifically, the mongoDB database set up through mLab. However, if the app eventually became too large to be supported by a single database of this type, then Eventual

Consistency could become an issue because information would have to be passed between the different databases, and this can sometimes take time.
Resouce Used: http://www.oracle.com/technetwork/consistency-explained-1659908.pdf

3 - Choose one factor from the 12-factor app that is handled well by our app, describe the factor, and describe why it is done well by our code.
Factor #2, "Dependencies," is handled well by the app. This factor pertains to how dependencies are used in the project, specifically, how they are documented and separated from each other. The three major dependencies in our app are used on three distinct servers, and each server is named descriptively and appropriately, adhering to the standards of the second factor.
Resource Used: https://12factor.net/

4 - Choose one factor from the 12-factor app that is handled badly by our app, describe the factor, and describe why it is done badly by our code.
Factor #9, "Disposability," is not handled particularly well. This factor pertains to how swiftly and smoothly the app functions, and this app could definitely run more quickly. As suggested by Question 7 below, improvements could be made to help with this issue. However, increasing the speed of an app is usually an ongoing process, so this is not the biggest of deals when compared to other factors that the app employs well.
Resource Used: https://12factor.net/

5 - There is a concurrency bug in our code, where it's possible to respond to a "closed" question. In our architecture (Node, Mongo), is this bug solvable? Is it really a problem?
Yes, this bug is solvable. We could double check if the question is not accepting the answer before we submit the answer or make the later submitted answers invalid. I don't think it is really a problem since this is only a survey and we need as more answers as possible to improve the result accuracy. So we could still use those answers submitted after the question is "closed" to our survey results.

6 - There is another bug, where the anonymity of survey takers means that someone could take the survey more than once. How would you solve this without violating anonymity? Is it possible?
We could solve this problem by recording the IP of the devices which respondents do the survey, and each IP could only do one time for the survey. IP addresses can be traced to a computer but not a person, so this does not violate anonymity. If we see multiple responses for the survey with the same IP address, it may be that a single person is responding to the survey multiple times, so we may get rid of other survey results for that respondent.

7 - Study the code that interacts with Memcached. Remarkably, we can use memcached to cache more than just data, e.g., the results of expensive computations. Propose additional caching that could be employed to speed up this application.
Caching anything helps with the speed of an application because it takes time and energy to retrieve information repeatedly, and these resources could be used elsewhere. In this case,

Memcached could be used to keep track of how user answers affect aggregate statistics so that the database could be updated more effectively.

8 - Heroku is a popular PaaS. Review the Heroku website and tutorials, and suggest technical reasons why PaaS on Heroku would be inferior to VMs on AWS for this app.
By using the VMs on AWS, we are able to automatically scale the web application based on the particular needs and defined conditions. AWS has adaptive load balancing spreads out the incoming app traffic across instances automatically. It also has various deployment options for us to choose. AWS offer IaaS, which could give us components we need in order to build thing on top of it. Moreover, we have the control over the file system in AWS, and we can easily upgrade hardware requirements according to our needs.
Resource Used: https://da-14.com/blog/aws-vs-heroku-cloud-platform-comparison

9 - Suggest technical reasons why PaaS on Heroku would be superior to VMs on AWS for this app.
Heroku is easy to use and its web interface is fairly intuitive. This app is a minimum viable product that we need to deploy and test, and we could use one command to deploy on Heroku (the deployments is very quick). Heroku has built-in tools and architecture, and limited control over architecture while designing app. We want to start an app right away, without much customization of the architecture. AWS is big and complex, but our app is a fairly simple one, so PaaS on Heroku would be superior to VMs on AWS.
Resource Used: https://da-14.com/blog/aws-vs-heroku-cloud-platform-comparison