Math Tools Course End Survey

Questions Responses 8

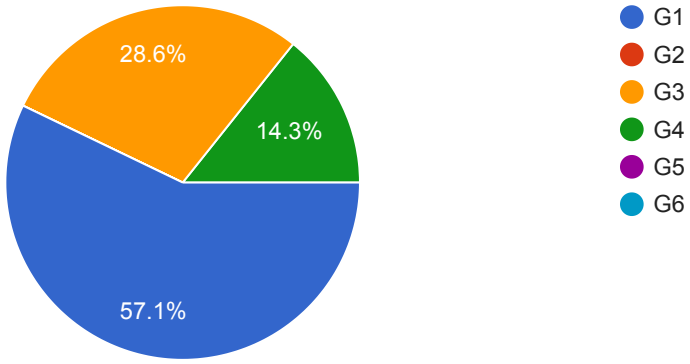
8 responses

Accepting responses

Summary Question Individual

What is your G-year?

7 responses



What was your math experience before taking this course?

8 responses

I completed a math minor in undergrad which included courses in linear algebra and differential equations in an engineering context.

Calculus

College algebra, and calculus

calc II freshman year of college was the last math class ive taken

A semester of Calculus first year of college + a very basic Stats course third year of college

Linear Algebra, Differential EQNs for engineering

I had taken linear algebra, multivariable calculus, and bayesian stats before, but a lot of concepts didn't really stick the first time around.

I took Calculus six years ago

What did you want to or expect to get out of this course? How did that match or deviate from what you actually got out of the course?

7 responses

I expected a refresher on math I already had, and then examples of how it can be applied in neuroscience. It basically matched what was taught.

I expected the class to spend more time teaching us basic mathematical principles that are used for analysis and modeling of circuits. For the most part, the course met this expectations however, I felt that finishing the schedule was prioritized over spending time on making sure the fundamentals were understood.

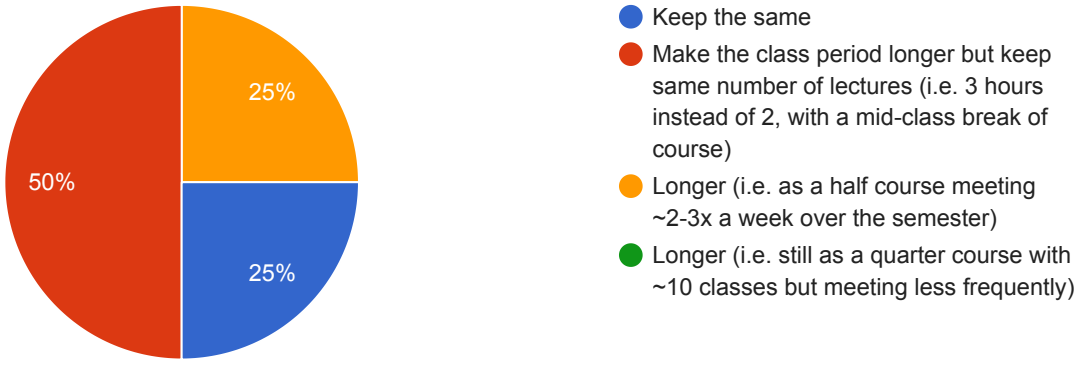
linear algebra concepts, more detail about PCA, thoughtful approaches to using information theory

I was hoping to get some understanding of how to mathematically analyze neuro data. Sort of like how to get an intuition about some common techniques and when they're applicable. We've actually covered some modeling and theoretical applications. I initially did not expect that but found it quite useful and interesting.

review of fundamental math needed to understand computational/theoretical neuroscience, learning how mathematical concepts are applied

Would you like the course (as in, the number of classes) to be longer? Shorter?

8 responses



Following the previous question, do you think J-Term is an appropriate time period to conduct this course in? Any other thoughts about reformatting?

8 responses

Yes. I think the course would be better if it were a semester long because you could teach more, but J-term is a better fit for most people's schedules I think.

I would not mind this course being longer than a J-term. I would rather have more time going over basics of differential equations and probability.

J-term!

6 weeks

Yes. I think it's really nice to have this condensed math. Personally, I feel like a couple of months of math would be overwhelming for me.

Yes. Because it is a short term, people would not mind being little intensive (long classes).

J-term works really well. It's a good preview of the mathematical concepts that we'll see in nb215.

I think so, especially for G1s, it seems very helpful for the spring semester core course

What was the biggest takeaway(s) or concepts that you left this class with?

8 responses

What is PCA

An understanding of PCA.

Eigen vectors!

what do computational neuroscientists do?

Not sure if I completely understand those even now, but a breakdown of what PCA is and an introduction of information theory was really cool.

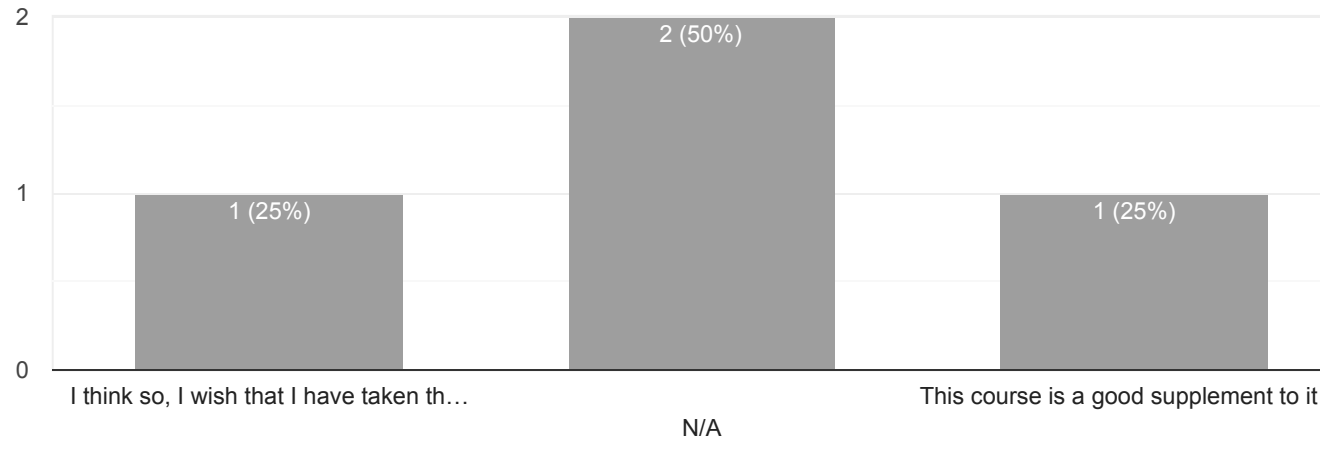
How PCA ans SVD works. Understanding, prior, posterior, and likelihood for neuroscience experiments.

I think I learned the most new information in the generalized linear models unit. It also helped to be able to discuss PCA in more detail, especially in how folks apply it for data analysis these days. The matlab simulations were especially helpful in solidifying the concepts.

Linear algebra is the core of a lot of the fancy computations we usually heard about

If you took Rick Born's "Thinking about Data" course beforehand, was this course a good supplement to it? What did you gain that was different?

4 responses



Do you have opinions on the amount of homework given? Did you like that it was directly after every session? Were they too long? Too easy?

7 responses

The homework was good. Maybe some optional supplemental practice problems would be helpful.

I like that they were directly after ever session. However, I think they should of been better planed and released on time, giving us proper time to complete them.

good

Definitely liked that there were after each class. None of them were too long, really. I must admit I liked Lucy's homeworks best. I think Alex's HW on information theory was good in theory, but I found myself completely lost and not knowing what to do when I was doing it. I think the problem was that the main chunk on entropy and information was introduced kind of in a rush towards the end of the lecture. If I had more time to digest the HW would've been more helpful. John's HW was a complete mystery to me :(

Yes. It was good. Not too long. Not too short.

I think it was good that hw was given after every session. I just wish the length was more consistent - sometimes it would be very short, sometimes very long. Some assignments were easy, but you could add some bonus questions (that would be discussed in class) to make some hw assignments harder for those who like the challenge.

Did you make use of the lecture notes after class? If so, were they helpful/clearly written? How could they have been improved?

8 responses

I only used them once because I missed class and they were clear enough that I felt I had a good grasp on what had been taught

The lecture notes were very helpful, I think they could be improved by adding more supplementary videos and foundational papers.

very helpful

yes

Wasn't referring to them too often. My general impression was that if a lecture was ~clear than so were the lecture notes.

Yes. The notes were great!

I think the lecture notes were fantastic, very clearly written. I didn't make use of all of them but they were good, especially when I had lingering questions. I liked how the notes were very consistent with the lectures.

What did you think about the amount of interaction in the course? Could we have been more interactive? If so, in what way?

8 responses

The interaction was the right level

The level of interaction was fine for me.

good level, maybe like having an office hour option would be nice

good

I think it was great. You guys were very helpful and willing to adjust your explanations according to people's questions.

I thought it was very interactive as it is.

It could have been more interactive, but I think the class dynamic was already great. I think John's presence was also helpful, as he would help give different explanations, which helped our understanding.

I think it's a good amount of interaction

How was the balance between depth and breadth of topics? Would you have wanted to go deeper into certain topics (more derivations) if we had more time?

7 responses

With more time I would choose breadth

I would of liked to gone deeper into most of the topics. I would of liked to learn more about Information Theory and SVD.

real data analysis with matlab in class

I was quite satisfied with the depth. At a certain point, more derivations don't really add to understanding or to ability to apply. For me, at least.

I thought it was a good balance.

Some topics I definitely would have liked to go deeper - particularly nonlinear dynamics and bayesian stats and the glms, especially with paper discussions and application examples.

I think it's good. I just wished to be able to try more applications.

Were you satisfied with the presentation of material with basic concepts first and application later, or would you have preferred a preface on the applicability upfront?

7 responses

Basic concepts first

I would of liked a preface to the applicability upfront.

applicability upfront

I don't have a strong opinion about that. Maybe it would be nice to give some kind of bait. Like just show some papers/figures where people do some cool math so we can appreciate how useful it can be and then we would be more motivated to learn how to do it.

I thought it was good to have concepts first. I think application could wait until we build up enough concepts to really fully understand the application steps.

The basic concepts first and application later works well.

Yes

Who might you suggest to take this course?

8 responses

anyone

Graduate students coming from a molecular/non-mathematical background who want to learn more about systems neuroscience, but does not have the foundation.

G4 and below

anyone interested in learning how math is applied in computational neuroscience

Anyone who appreciates that math tools are essential for their field and yet doesn't feel comfortable using them or even reading about them.

any Gs who are doing "experimental" neuroscience, who wants to learn more about computational techniques and math behind them.

G1s and whoever is interested, or who wants to build up a better mathematical understanding of stats.

Make it longer

Other general comments?

1 response

thank you for organizing this course. you are both great teachers!

Topical Feedback

Topic 1: Basics of Vectors and Matrices (Alex) - (1) Was this topic presented clearly? If not, how could it's presentation have been improved? (2) What was most confusing about this topic, if anything? (3) What confusions (if any) do you still have about this topic?

5 responses

In general (for all linear algebra) I felt the way it was taught was very different from how I learned it in undergrad. I think this was mostly because you were trying to build intuition (and were successful in this respect) while the undergrad course was just teaching an ability to solve a problem. I think the downfall of taking the intuition approach (or maybe because of time constraints) was that sometimes details were skipped (ex. cross product is different from dot product) and it seemed a little out of order. It was ok for me because I already knew where the math was headed but I think some of my classmates with less experience were hung up by this. In the future I would try and have a very very basics of linear algebra day, potentially without any consideration to what applications will be taught later in the course, so that students have a stronger foundation.

I though this topic was explained clearly, I felt I had a good understanding of it.

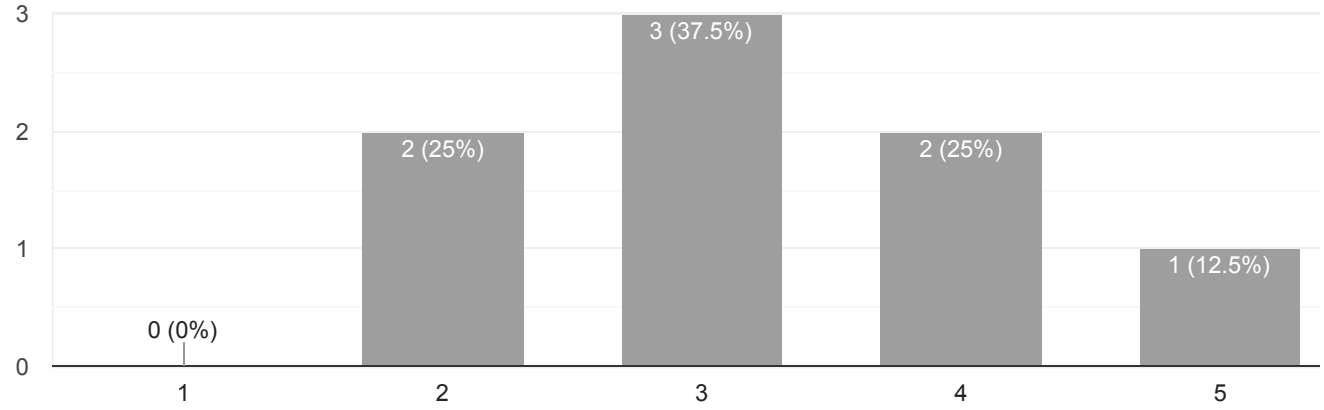
this section was done well

yes

Yes

Topic 1: How new was this topic to you?

8 responses



Topic 1: If you had previous experience, did you learn anything new? If so, what?

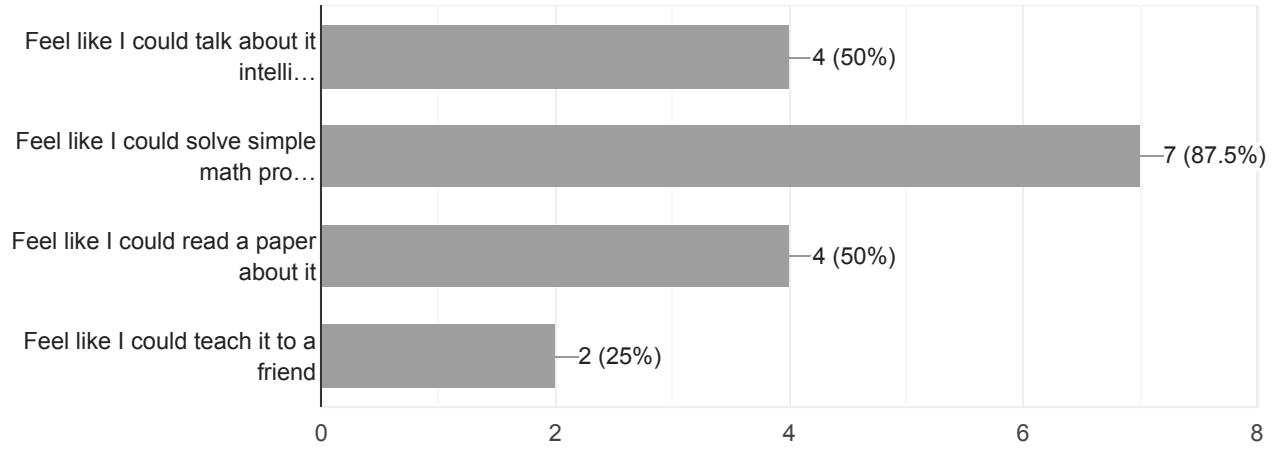
2 responses

It was a good refreshed that was needed.

Yes, I can better understand matrix operations now

Topic 1: How comfortable do you now feel about this topic?

8 responses



Topic 2: Eigenvalues and Eigenvectors (Lucy) - (1) Was this topic presented clearly? If not, how could it's presentation have been improved? (2) What was most confusing about this topic, if anything? (3) What confusions (if any) do you still have about this topic?

3 responses

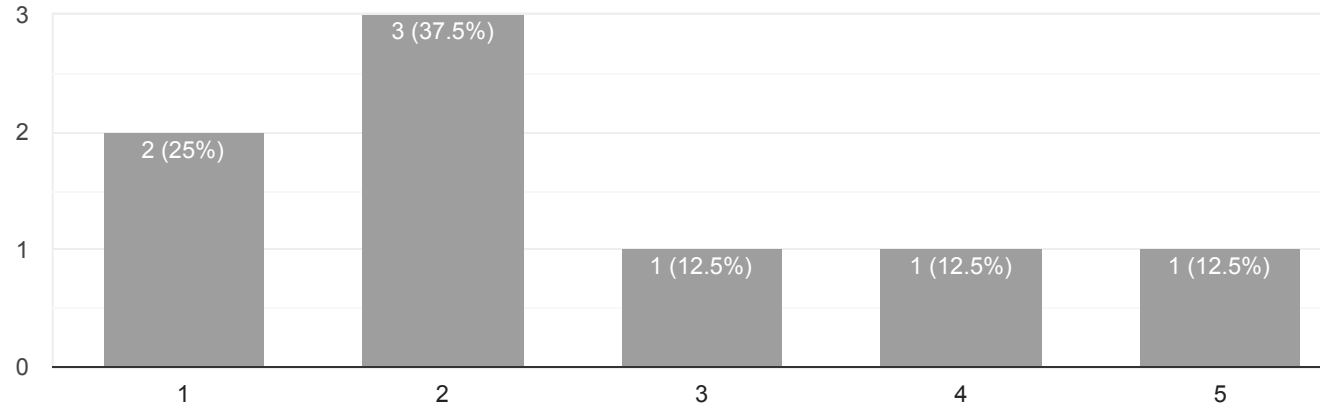
I think I have a somewhat OK understanding of Eigenvalues and Eigenvectors. These were terms that I heard of, but have no real experience with. Although I feel like I can solve basic problems involving them yet I never fully gained a conceptual understanding.

yes

Yes

Topic 2: How new was this topic to you?

8 responses



Topic 2: If you had previous experience, did you learn anything new? If so, what?

4 responses

The visual understanding

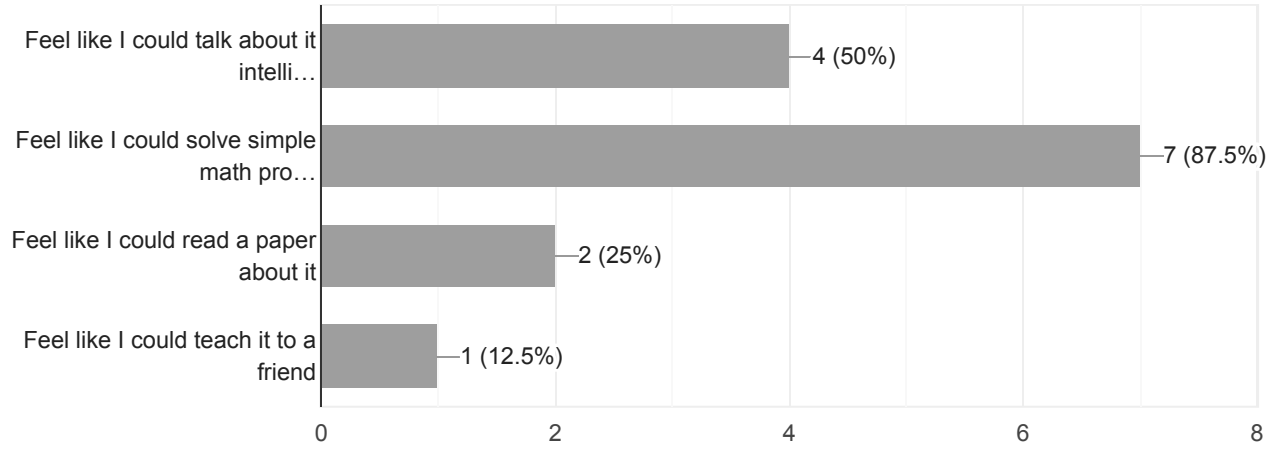
Mostly everything I learned was new.

I had heard of eigenvectors

Clearer understanding of matrix transformation

Topic 2: How comfortable do you now feel about this topic?

8 responses



Topic 3: Dimensionality Reduction - SVD and PCA (Lucy) - (1) Was this topic presented clearly? If not, how could it's presentation have been improved? (2) What was most confusing about this topic, if anything? (3) What confusions (if any) do you still have about this topic?

3 responses

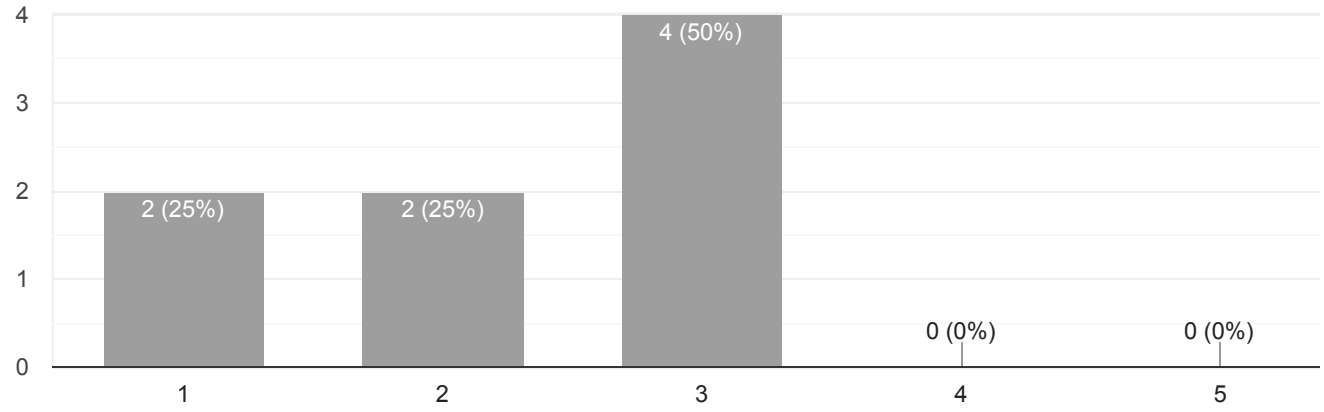
I felt like this topic was presented very well however I would of like to spend a few more lectures working on problems related to it.

One of those things where I feel like more time would be useful. Just absorbing the concept, trying to visualize what exactly it means.

Yes

Topic 3: How new was this topic to you?

8 responses



Topic 3: If you had previous experience, did you learn anything new? If so, what?

3 responses

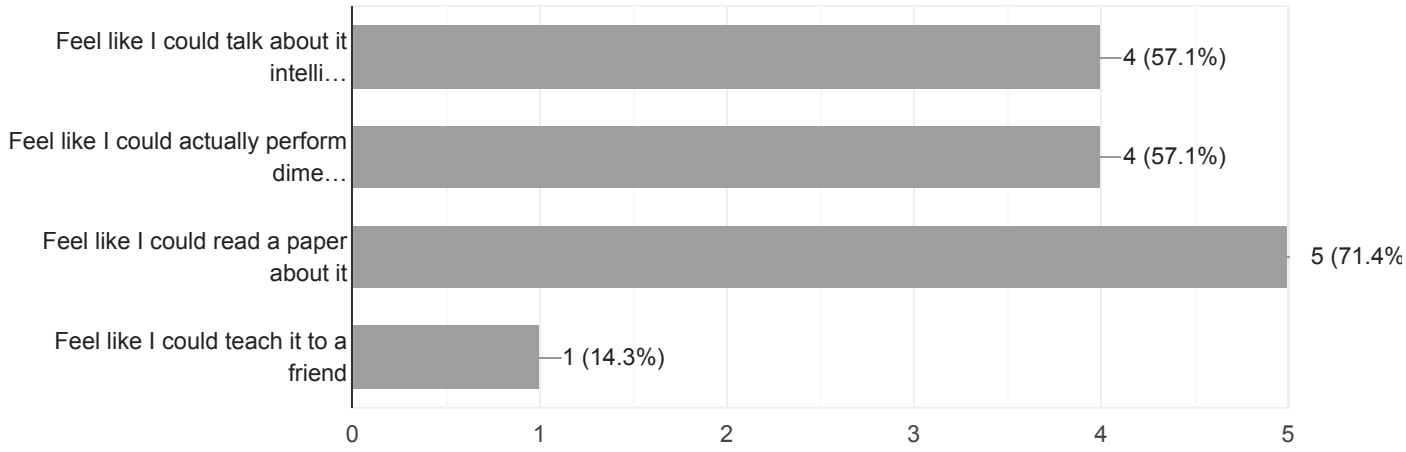
The relationship between SVD and PCA was new to me

I leaned what the different principle components means, and how they're found.

PCA inherently reduces noise in data

Topic 3: How comfortable do you now feel about this topic?

7 responses



Topic 4: Basic Probability and Information Theory (Alex) - (1) Was this topic presented clearly? If not, how could it's presentation have been improved? (2) What was most confusing about this topic, if anything? (3) What confusions (if any) do you still have about this topic?

3 responses

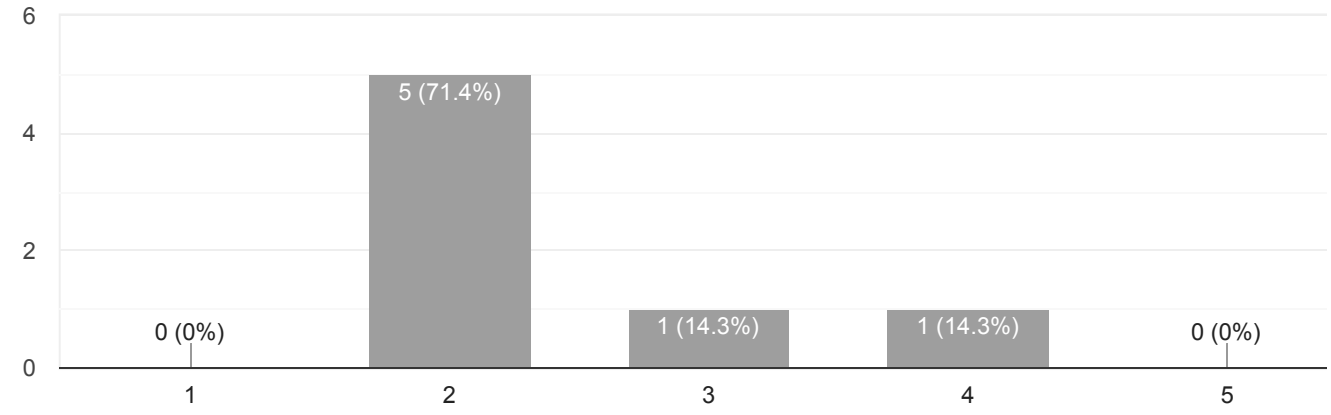
The basic probability was taught well, however I think the most confusing part about these lectures was the symbols and terminology used made things very confusing at times. Since a lot of the topics we learned were new to me, I felt the pace of the class should of been a lot slower.

I wish we spent more time on that topic. We spent too much time talking about sunny/rainy days and then just ran over abstract information and entropy.

Yes

Topic 4: How new was this topic to you?

7 responses



Topic 4: If you had previous experience, did you learn anything new? If so, what?

4 responses

I only heard of information theory.

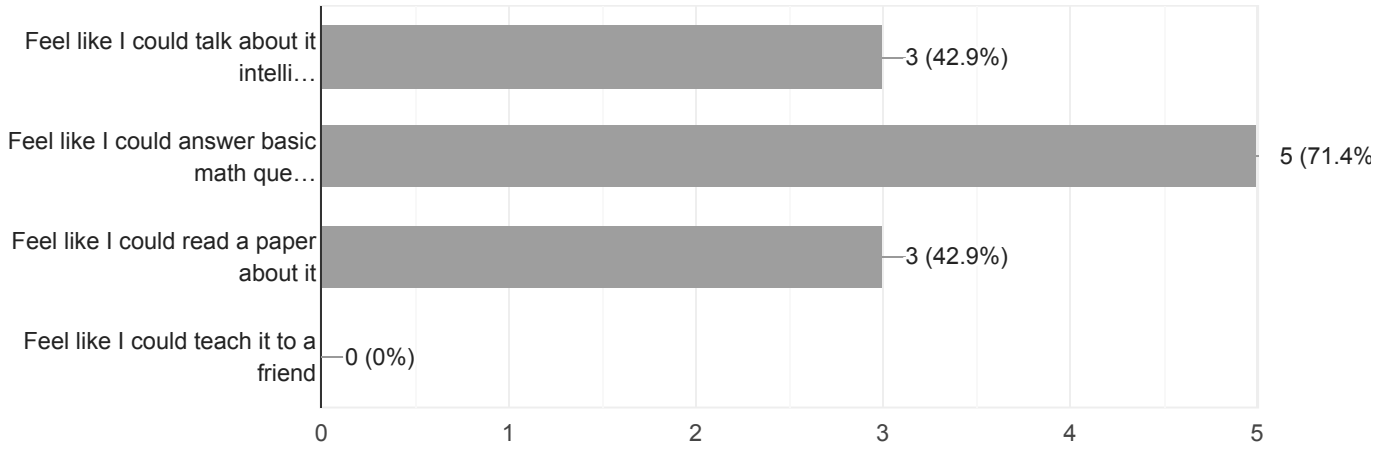
Rachel's lecture in 215

All the info theory stuff was new for me.

I better understood bayer's theory and how to apply it

Topic 4: How comfortable do you now feel about this topic?

7 responses



Topic 5: Dynamical Systems and Differential Equations (John) - (1) Was this topic presented clearly? If not, how could it's presentation have been improved? (2) What was most confusing about this topic, if anything? (3) What confusions (if any) do you still have about this topic?

6 responses

this was probably my favorite lecture (but dynamical systems was a big reason I took the course)

I was not at this class.

too fast

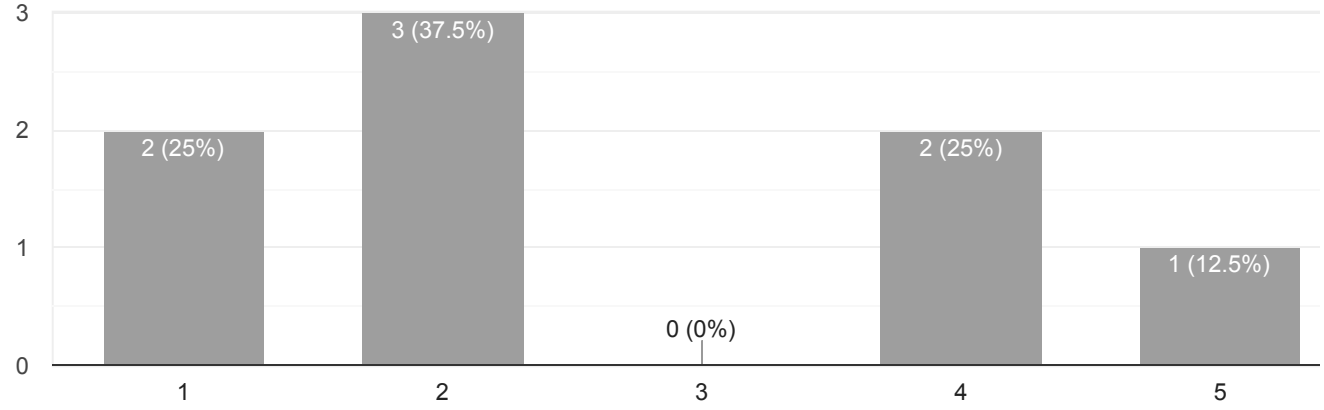
This was so(!) confusing. Way to fast to even ask questions. I think I have a very basic grasp on this after John's lecture, but it would've been so much better if it was slower.

John went quite fast on this topic. I think we all could have gotten more out of it if he went slower.

It went a little bit too fast

Topic 5: How new was this topic to you?

8 responses



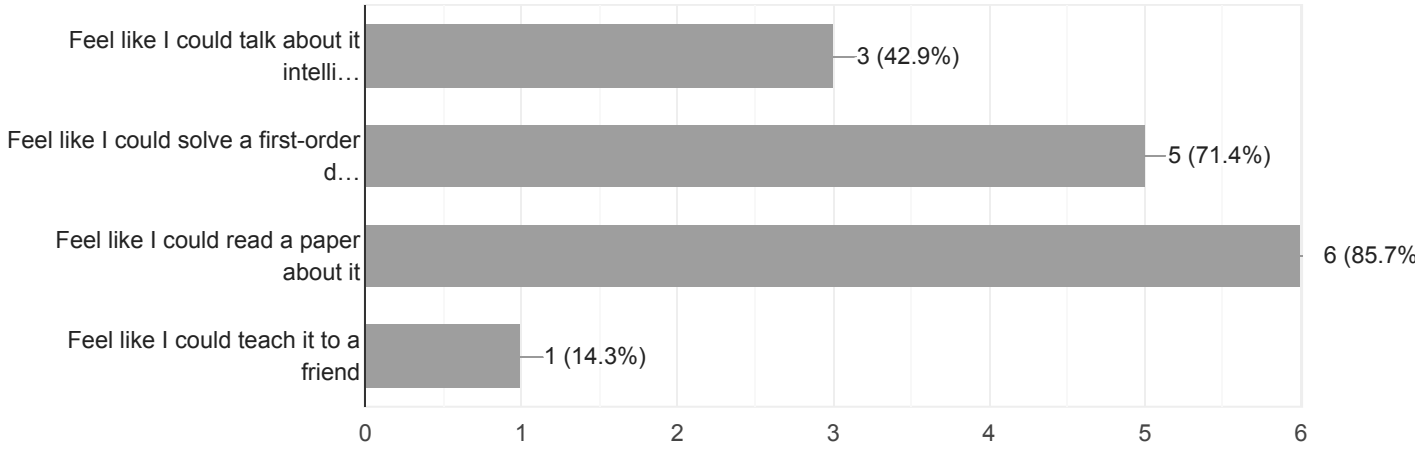
Topic 5: If you had previous experience, did you learn anything new? If so, what?

1 response

N/A

Topic 5: How comfortable do you now feel about this topic?

7 responses



Topic 6: Application of Dynamics - Attractor Models (Alex) - (1) Was this topic presented clearly? If not, how could it's presentation have been improved? (2) What was most confusing about this topic, if anything? (3) What confusions (if any) do you still have about this topic?

4 responses

This was great

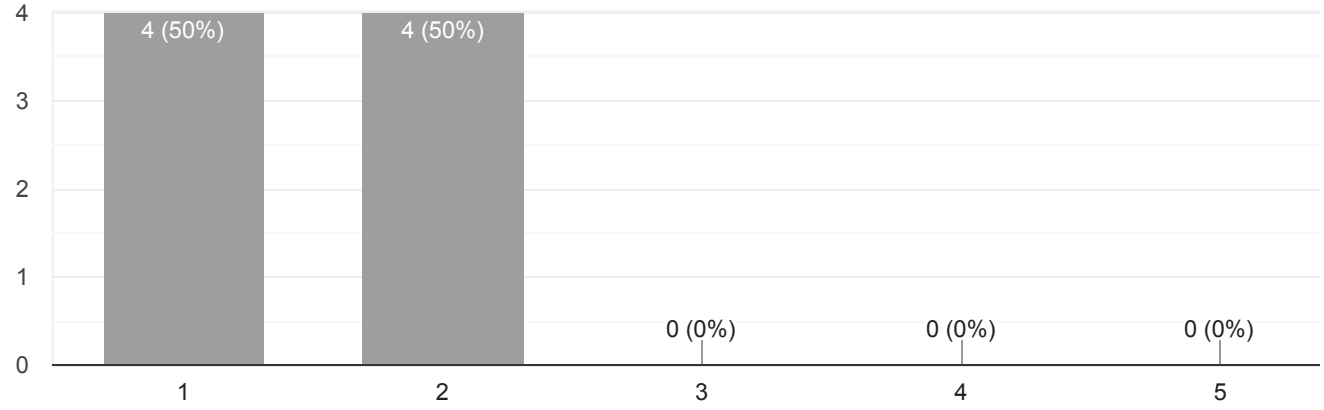
yes

This was actually sort of clear.

Yes

Topic 6: How new was this topic to you?

8 responses



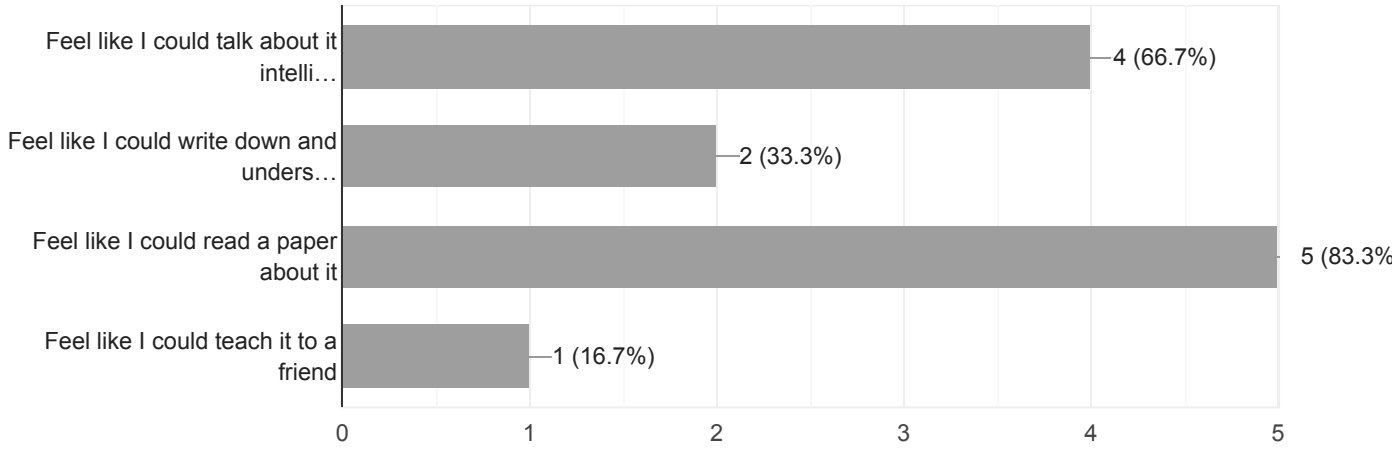
Topic 6: If you had previous experience, did you learn anything new? If so, what?

1 response

215

Topic 6: How comfortable do you now feel about this topic?

6 responses



Topic 7: Estimation and Inference - Encoding and Decoding (Lucy) - (1) Was this topic presented clearly? If not, how could it's presentation have been improved? (2) What was most confusing about this topic, if anything? (3) What confusions (if any) do you still have about this topic?

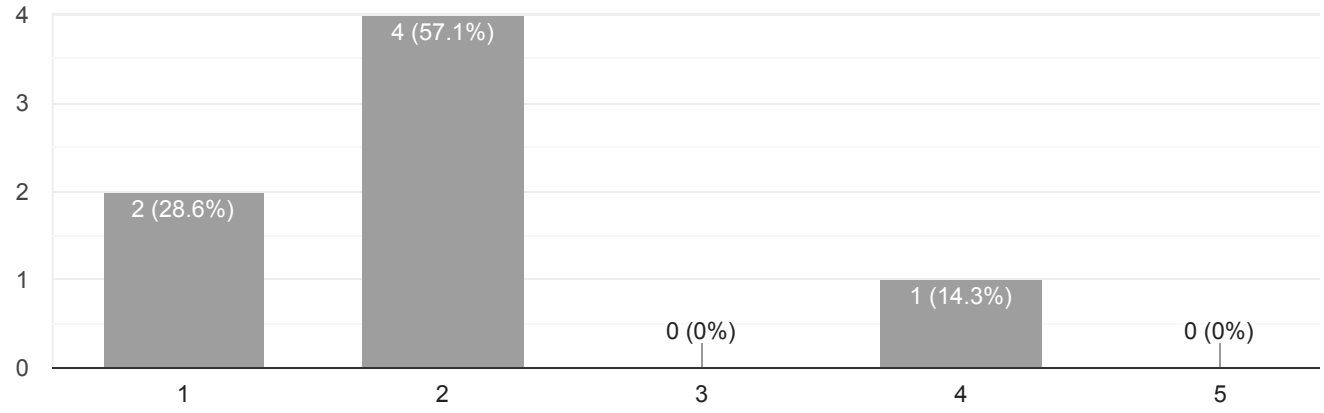
2 responses

Some of the terminology still trips me up, but I appreciate that Lucy slowed down on things that could be confusing for us.

Yes

Topic 7: How new was this topic to you?

7 responses



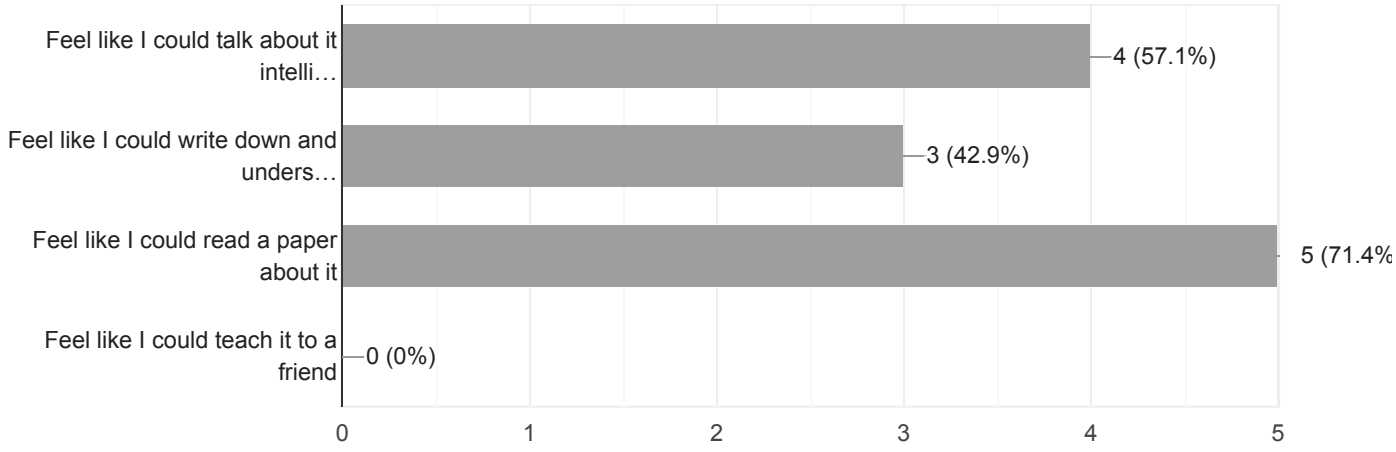
Topic 7: If you had previous experience, did you learn anything new? If so, what?

0 responses

No responses yet for this question.

Topic 7: How comfortable do you now feel about this topic?

7 responses



Topic 8: Generalized Linear Models (Lucy) - (1) Was this topic presented clearly? If not, how could it's presentation have been improved? (2) What was most confusing about this topic, if anything? (3) What confusions (if any) do you still have about this topic?

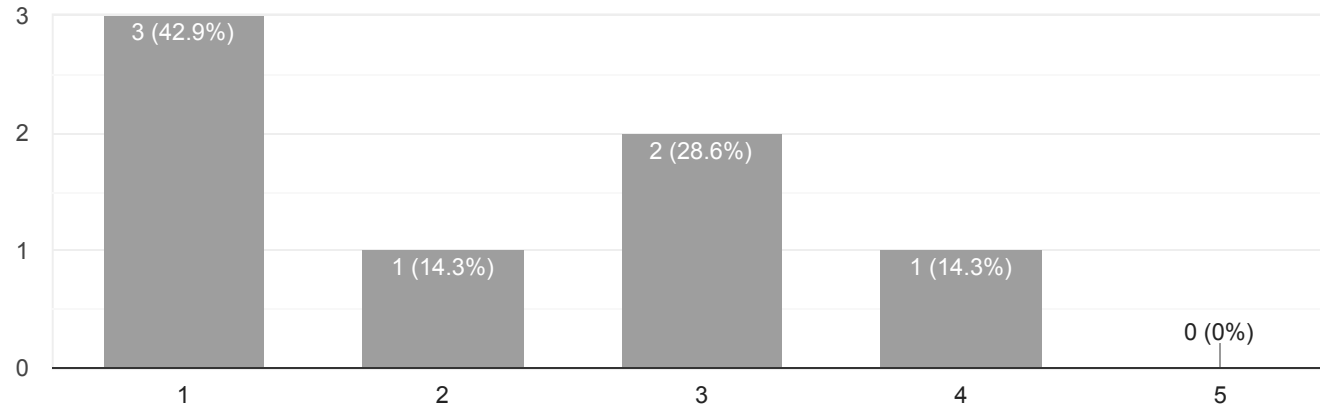
2 responses

More examples could have helped?

Yes

Topic 8: How new was this topic to you?

7 responses



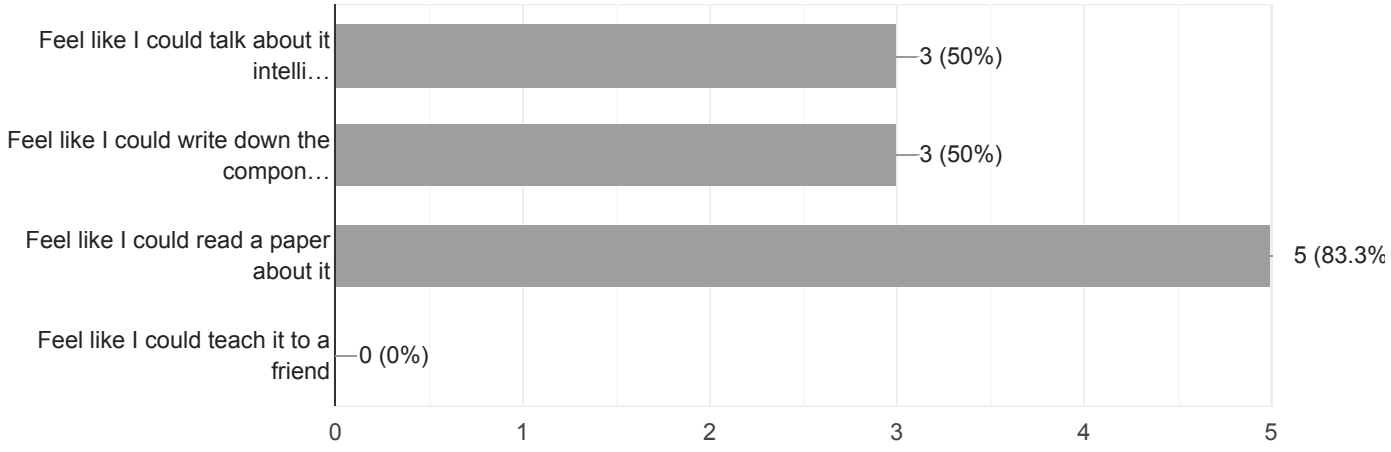
Topic 8: If you had previous experience, did you learn anything new? If so, what?

0 responses

No responses yet for this question.

Topic 8: How comfortable do you now feel about this topic?

6 responses



How did you feel about the order of topics presented? Do you think a different order would have been more intuitive/flowed better?

5 responses

The order seemed right

I think the order of the classes was fine.

Eigenvectors were great. Dimensionality reduction was a little less clear but still pretty good. Info theory was really good, although not at the initial presentation. Encoding/decoding was similarly good, but it's a little harder for me to comprehend. That last paper and the stuff we learned are sort of disconnected in my head. Diff.eq was incredibly confusing.

the only thing I could think of is move topic 7 to follow topic 4

I think it works good for mw

What topic(s) did you feel like was the most clearly presented? Which did you feel were the least clearly presented?

2 responses

eigenvectors, PCA and SVD were most clear, encoding/decoding and GLMs were least clear

I think PCA was mostly clearly presented, and I think more time could of gone into understanding Eigenvectors.

How helpful were the problem sets in solidifying the material? Could they have been improved in any way to help more? Is there any concept you wish you could have had more practice on?

3 responses

I wish I could have had more practice on all of it but honestly would have been stressed if there was a ton of outside work

They were nice. I wish I could practice on John's stuff. Still not entirely sure what that would be. Would be nice to have a little more practice on encoding/decoding and GLMs. It sort of felt like our discussion was very helpful to people who did it before, had some idea of what's what and had some more or less defined questions. Without that experience, I feel like it's sort of still up in the air for me.

Problem sets were good. Probably also include some helpful readings and videos to support the lectures.

Are there any topics that were not covered that you would have liked to see?

1 response

I think it would be really cool if you could discuss some common/well-known models - hodgkin-huxley, connor stevens, etc. and oscillatory activity in the context of nonlinear dynamics or conductance based models. Also, the Poisson process is quite important for modeling, so I think it would be worth discussing that in further detail.

Instructor Evaluations

Do you have any general comments and/or criticisms about Lucy's teaching style? Any way she could improve?

6 responses

The visual representations are really helpful for a good chunk of the time, especially because they brought something new to this course that I haven't seen in other courses, but not always, and having a way to explain the concepts not visually is also important.

I felt at time Lucy was a bit too worried about finishing the lecture on time than making sure we carefully went over the topic. Other than that I enjoyed he dedication for wanted us to understand things intuitively and clear passion of the subject.

Really liked it. Always very helpful. Sometimes she would get confused which confused us, but that's fine, especially for the first round.

great

Great job engaging the class. Some issues with mistakes on the board/some misunderstandings but I think she knows what I'm referring to here. I appreciate the slow pace, because it felt more thorough. The visual presentation in the linear algebra stuff was difficult - maybe try to show the video first next time, then discuss anything that was confusing/questions.

Do you have any general comments and/or criticisms about Alex's teaching style? Any way he could improve?

6 responses

Sometimes I felt like what he thought we knew and what I actually knew didn't match (he overestimated baseline knowledge).

Alex clearly has a very i- depth understanding about the topics we went over, which I felt at times lead him to state or write something in a "matter of fact" way, when others may need more time processing what was said. That being said I always enjoyed Alex's lectures, I though he did a very good job introducing each topic he taught.

Also really liked it. The only thing is that Alex seemed to be very comfortable with math notation and doing simple operations in his head. Sometimes I couldn't keep up with the lecture not because he was explaining things poorly, but just because I missed a step or didn't know how to interpret the symbols (like some of the more complicated uses of sum).

great

Good job in presenting all the math theory. Sometimes it felt some topics didn't link together super well, but he covered a lot of topics in depth.

Do you have any general comments and/or criticisms about John's teaching style? Any way he could improve?

7 responses

When you are solving a differential equation write a new line for each step rather than erase/editing the same line.

John is great but he needs to slow down his lecturing.

doesn't pause when he solves problems together so can feel lost easily

I'm sorry, but I found John's lectures way to fast to follow. Even though there are notes, it would be nice to understand something during the lecture. John gives great real life examples, but it's very hard to connect them to something you didn't get.

great

Definitely slow down. Less is more sometimes - we probably could gotten more out of the lecture if we had covered less, but in more depth. Also to not erase things he just wrote on the board - even if we aren't hand writing the notes, we still need to look at things for a little longer to help it sink in.

It's kinda too fast and would be better if we can have some primers or readings before the class

Any additional comments/feedback about our material/teaching styles, etc?

2 responses

I thought the class was awesome!

You could quiz the class with examples - you could do these just by asking the class more questions to assess understanding. Or do multiple choice question in polls online, but sometimes technology can be finicky. Overall, great job. I really appreciated all the work you guys put into this course, and how you all paid a lot of attention to detail and really took our feedback very seriously and tried your best to be very in tune with the class and what we needed, etc.

What did you learn?

In your own words, what is an eigenvector? What is an eigenvalue?

5 responses

An eigenvector describes a path the data is headed towards and the eigenvalue describes how fast it will get there

vector that does not get knocked off span when undergoing linear transformation

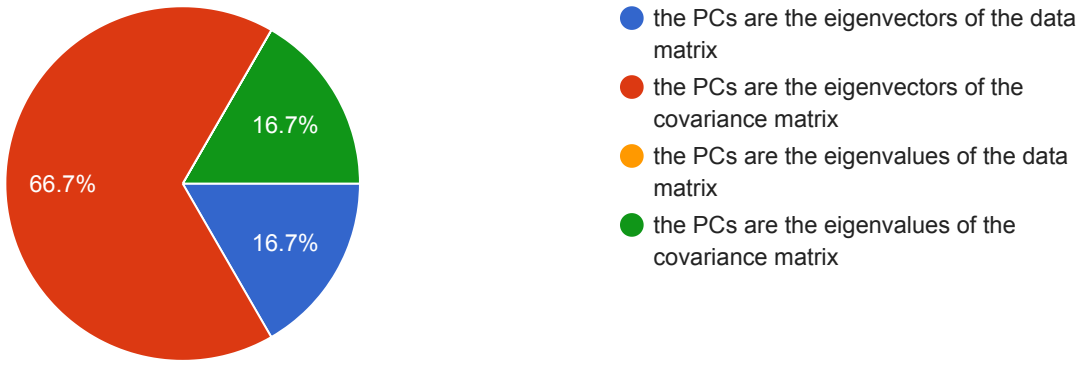
Eigenvector is a vector that is not rotated by a linear transformation. It's only stretched or shrunken by the corresponding eigenvalue.

dot product of matrix A and eigenvector gives a scaled version of eigenvector. eigen value is the scale.

An eigenvector is a vector that stays on it's span during matrix transformation and an eigenvalue is the factor that the eigenvector was stretched or shrinked by after the transformation.

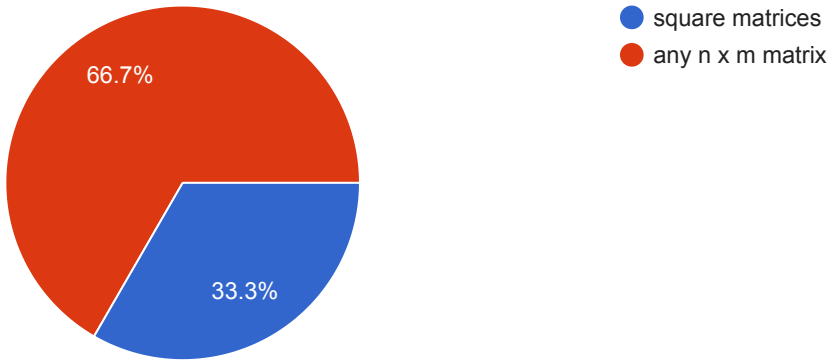
What are the PCs in PCA as related to eigenvalues and eigenvectors?

6 responses



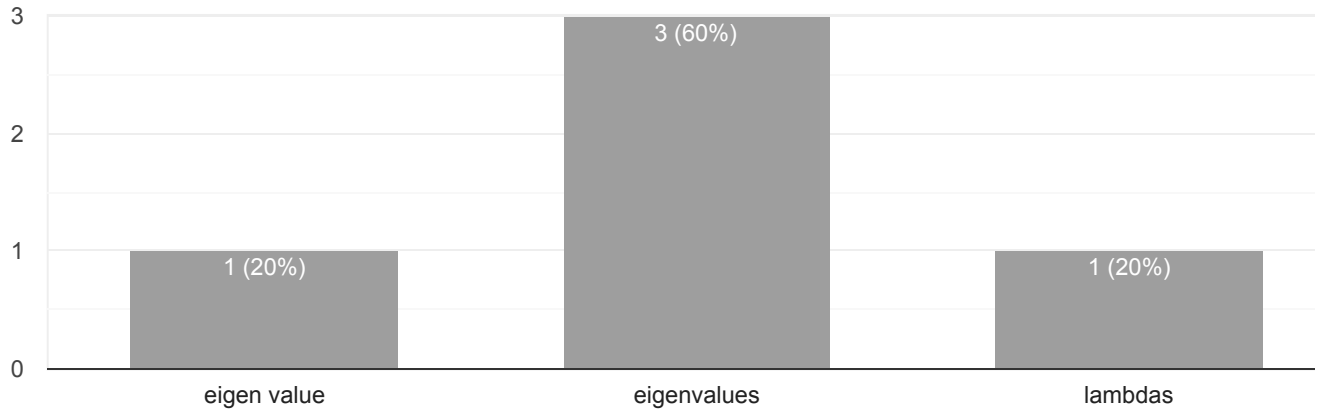
The SVD can be applied to

6 responses



The singular values of the data matrix are exactly the square root of the _____ of the covariance matrix, thus relating the SVD to PCA!

5 responses



What does it mean for a message Y to contain information about a random variable X?

5 responses

Y reduces our uncertainty about what X is

It means that knowing Y reduces uncertainty about X

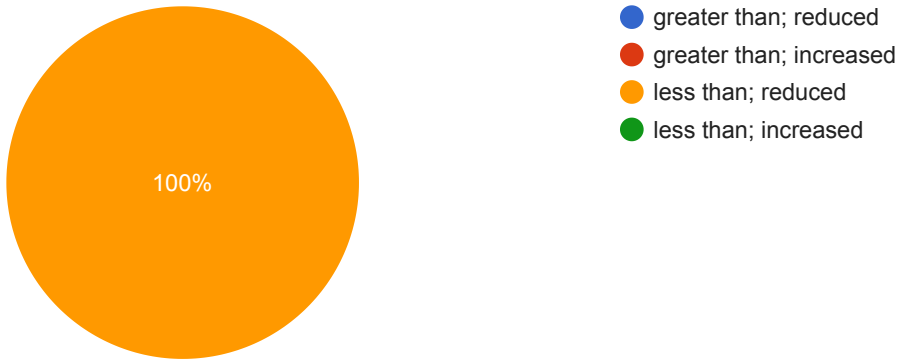
Given Y, uncertainty regarding X is reduced.

message Y is a function of X

Uncertainty about X is decreased when knowing Y?

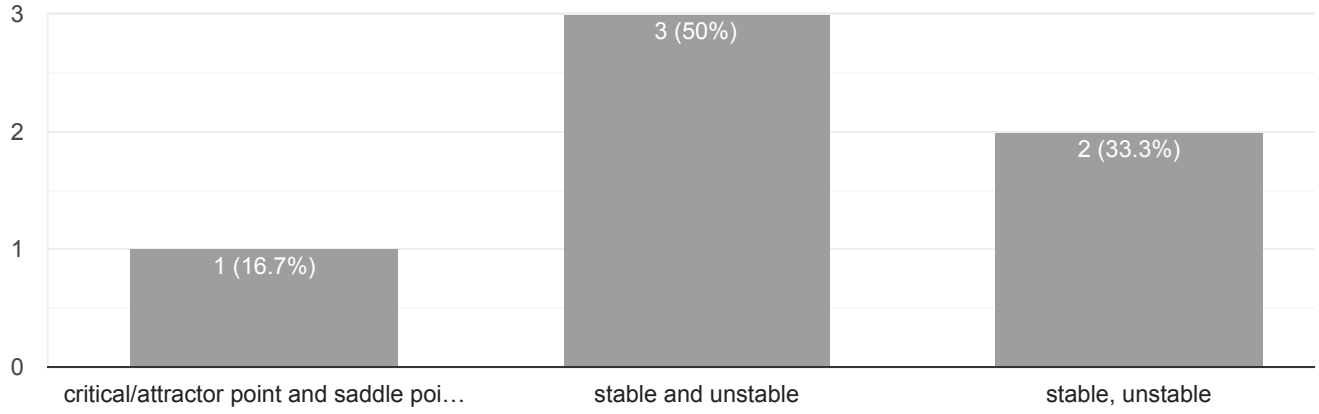
Conditional entropy H(Y|X) is always _____ than total entropy H(X). This means that uncertainty is always _____ when Y carries information about X.

6 responses



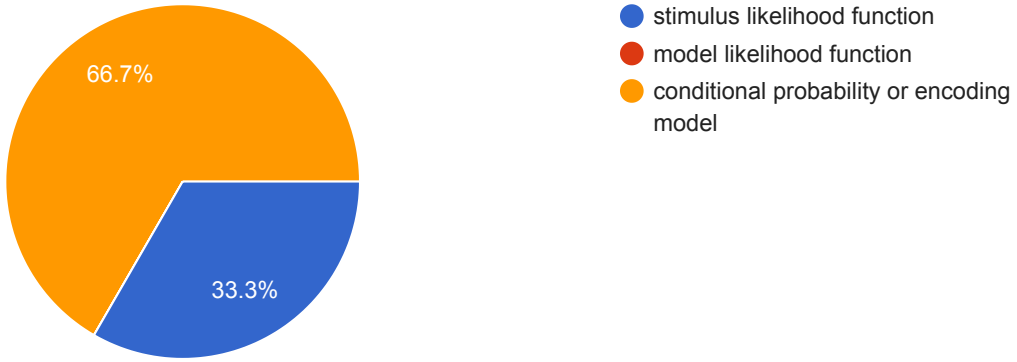
There are 2 kinds of fixed points: _____ points and _____ points. One of them describes dynamics that flows into the fixed point, the other describes dynamics that diverge from the fixed point.

6 responses



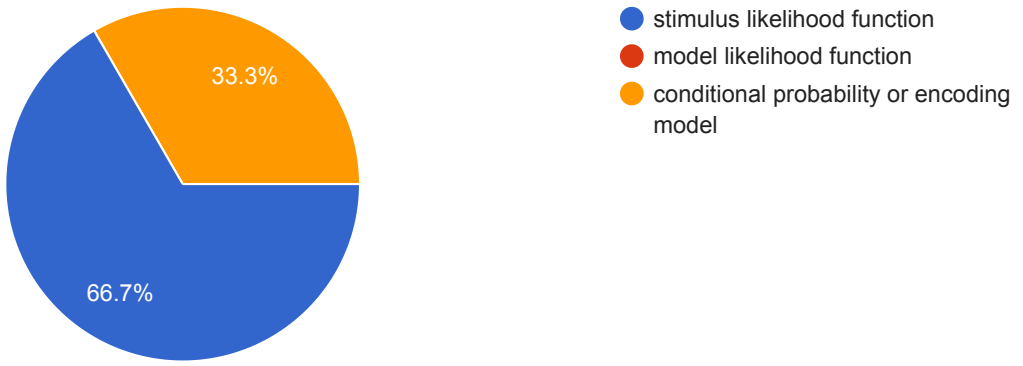
The distribution p(y|x,theta) can be understood as a function of y, x, and theta. What is it called as a function of y?

6 responses



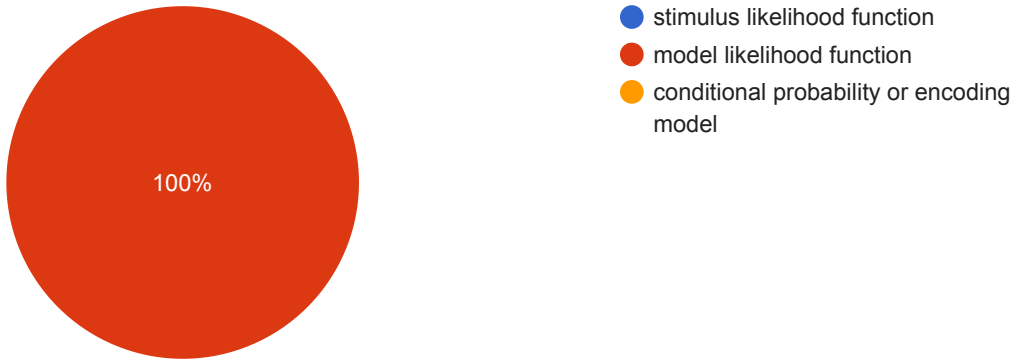
The distribution p(y|x,theta) can be understood as a function of y, x, and theta. What is it called as a function of x?

6 responses



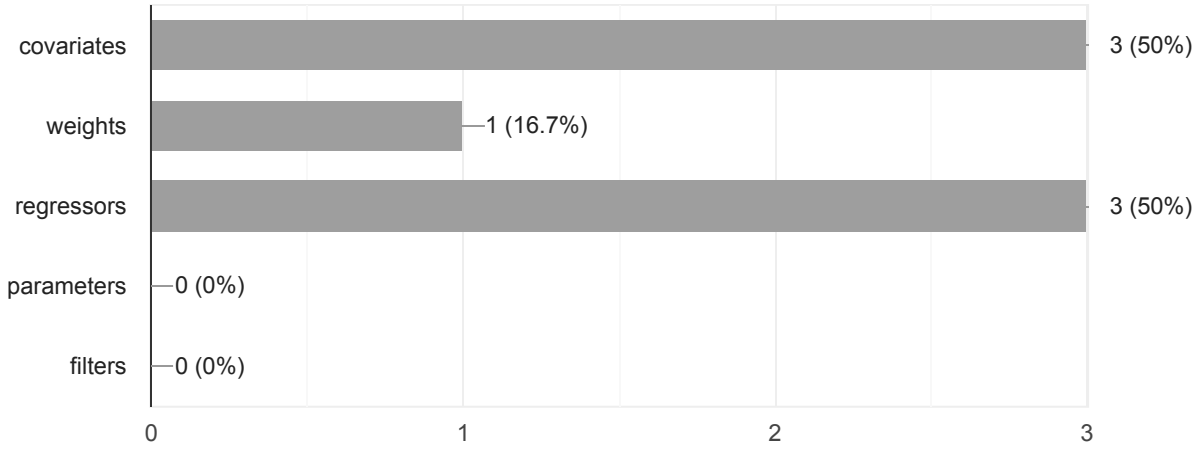
The distribution p(y|x,theta) can be understood as a function of y, x, and theta. What is it called as a function of theta?

6 responses



In GLMs, the X's in the design matrix are called....

6 responses



In GLMs, the k's that you want to find are called....

6 responses