17 responses

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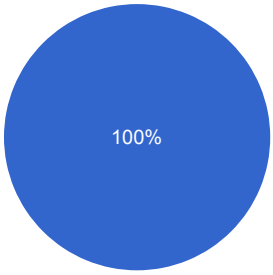
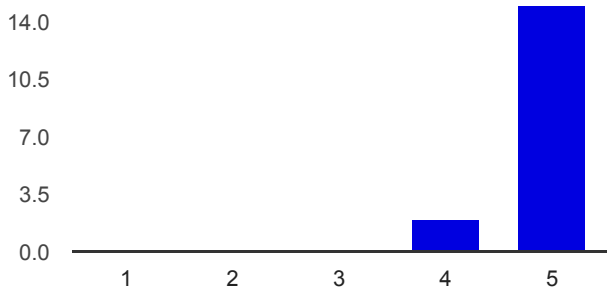
Summary

Parameter Estimation is Awesome



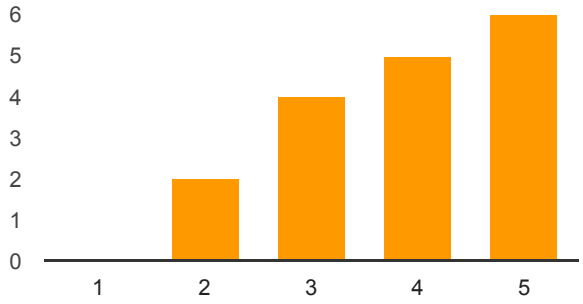
True	**17**	100%
False	**0**	0%
What is Parameter Estimation?	**0**	0%

How likely are you to use PEST/PEST++ in the future?



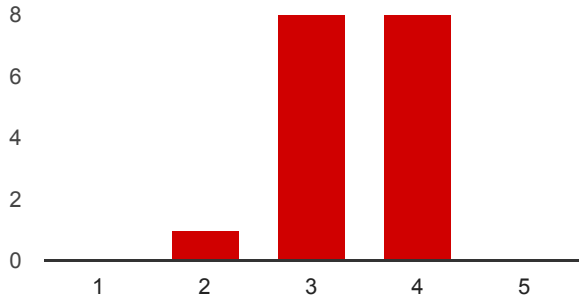
unlikely: 1	**0**	0%
2	**0**	0%
3	**0**	0%
4	**2**	11.8%
very likely: 5	**15**	88.2%

Given a couple of hours how comfortable would you feel hooking up an existing model to PEST++?



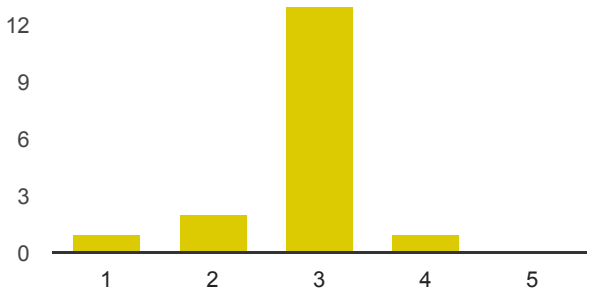
uncomfortable:	1	**0**	0%
	2	**2**	11.8%
	3	**4**	23.5%
	4	**5**	29.4%
totally dialed - let's do it!:	5	**6**	35.3%

What balance would you like between theory and applications?

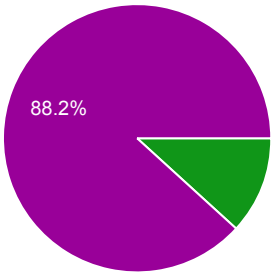


more theory(depth) :	1	**0**	0%
	2	**1**	5.9%
	3	**8**	47.1%
	4	**8**	47.1%
more applications (breadth):	5	**0**	0%

How was the mix of lectures and activities?

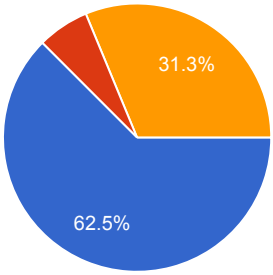


In your opinion, how many days should be allotted for this class?



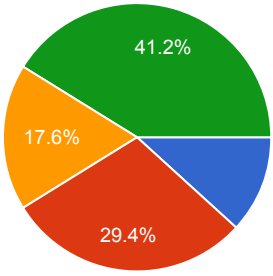
1 day	**0**	0%
2 days	**0**	0%
3 days	**0**	0%
4 days	**2**	11.8%
5 days	**15**	88.2%

Would you think it better to split into a basic and advanced class?



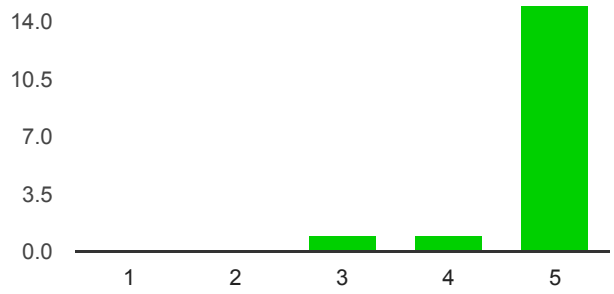
Yes, each could be 3 days separated by a few months	**10**	62.5%
Yes, a mix of virtual (3 days) and in-person (3 days)	**1**	6.3%
No way - keep it all as one	**5**	31.3%

Would you have attended and found useful a Webex presentation (an hour or so) in the weeks prior to the class?



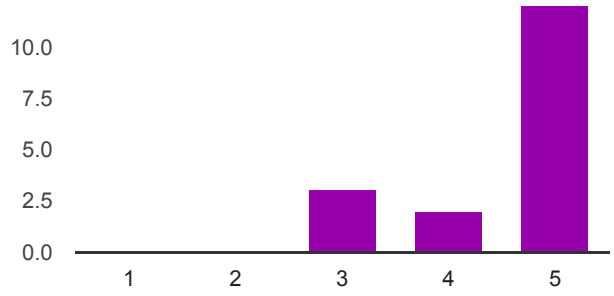
Yes, one focused on installing the required software	**2**	11.8%
Yes, one introducing the main topics of the course	**5**	29.4%
Yes, one of each	**3**	17.6%
No, it was fine to hit the ground running on day 1	**7**	41.2%

How likely would you be to recommend this class to a colleague?



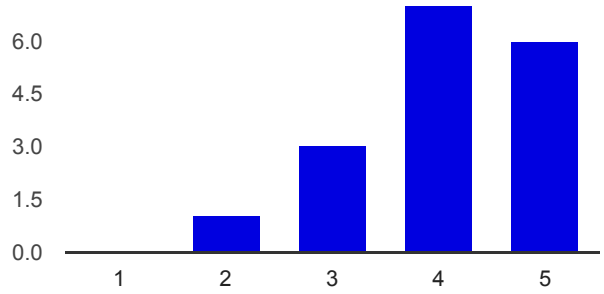
absolutely not: 1	**0**	0%
2	**0**	0%
3	**1**	5.9%
4	**1**	5.9%
very likely: 5	**15**	88.2%

Please indicate your level of satisfaction with the class location and hotel.



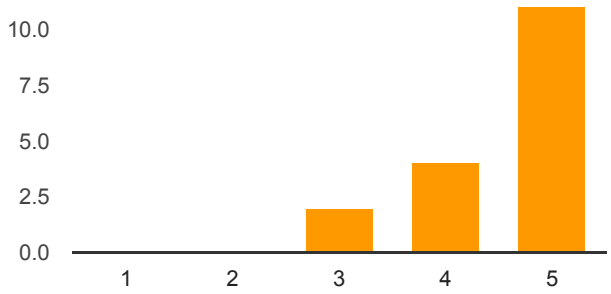
it was terrible: 1	**0**	0%
2	**0**	0%
3	**3**	17.6%
4	**2**	11.8%
it was great: 5	**12**	70.6%

Please indicate your level of satisfaction with the classroom.



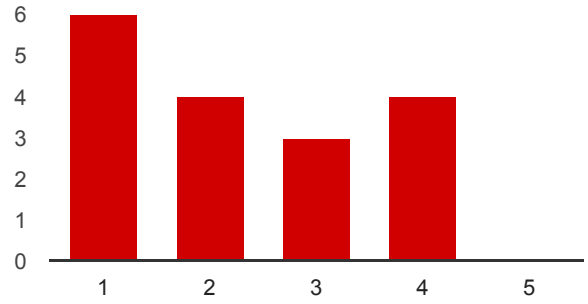
it was terrible:	1	**0**	0%
	2	**1**	5.9%
	3	**3**	17.6%
	4	**7**	41.2%
it was great:	5	**6**	35.3%

Please indicate your level of satisfaction with class internet availability.



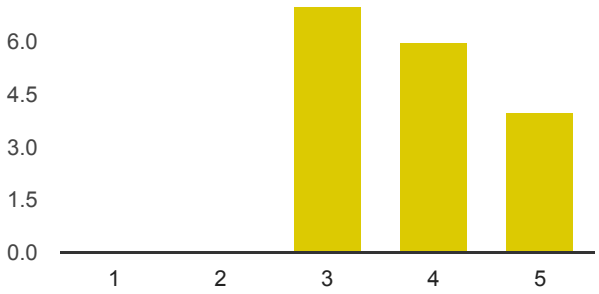
it was terrible:	1	**0**	0%
	2	**0**	0%
	3	**2**	11.8%
	4	**4**	23.5%
it was great:	5	**11**	64.7%

How confident were you using PEST/PEST++ *prior* to the class?



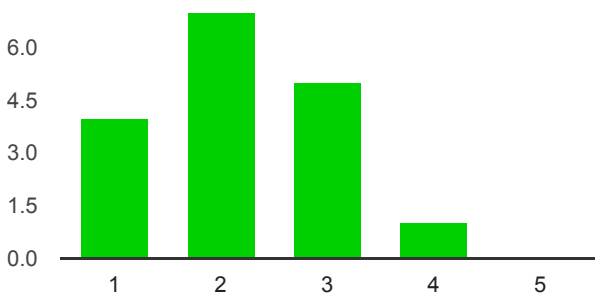
very confident: 5	**0**	0%

How confident are you with PEST/PEST++ now *after* the class?



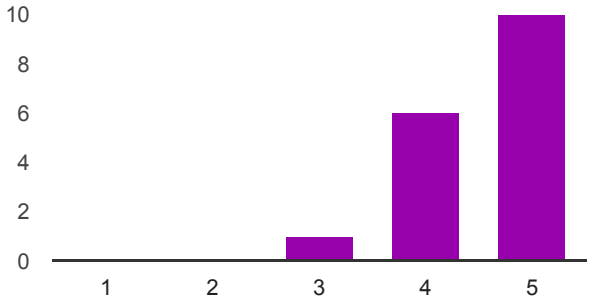
not confident: 1	**0**	0%
2	**0**	0%
3	**7**	41.2%
4	**6**	35.3%
very confident: 5	**4**	23.5%

How much experience did you have with uncertainty analysis before the class?



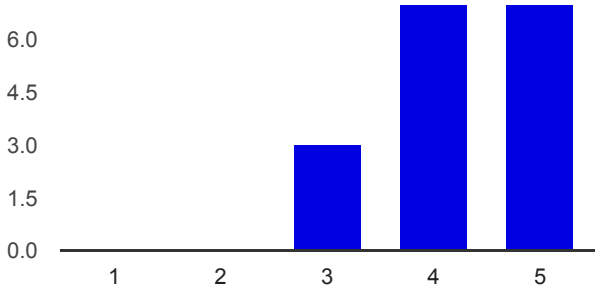
None: 1	**4**	23.5%
2	**7**	41.2%
3	**5**	29.4%
4	**1**	5.9%
Tons: 5	**0**	0%

How likely are you to incorporate PEST++ into your work?



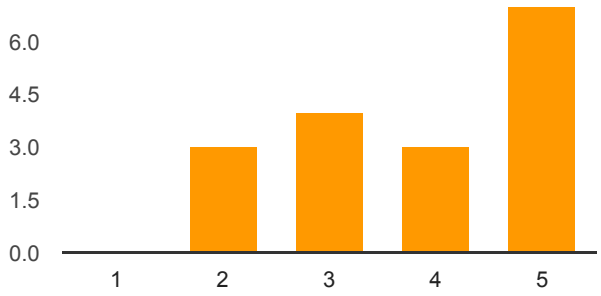
not at all: 1	**0**	0%
2	**0**	0%
3	**1**	5.9%
4	**6**	35.3%
totally: 5	**10**	58.8%

How likely are you to use FOSM in your work?

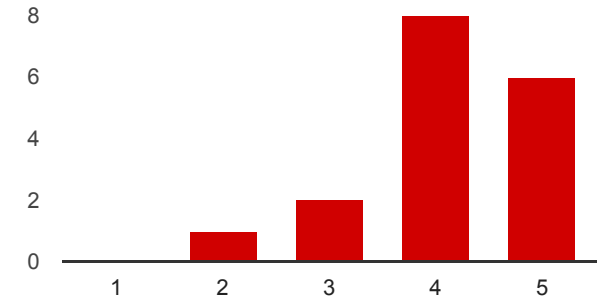


not at all: 1	**0**	0%
2	**0**	0%
3	**3**	17.6%
4	**7**	41.2%
totally: 5	**7**	41.2%

How likely are you to incorporate Monte Carlo into your work?



How likely are you to incorporate future data worth analysis into your work?



not at all: 1	**0**	0%
2	**1**	5.9%
3	**2**	11.8%
4	**8**	47.1%
totally: 5	**6**	35.3%

Are there any topics/lectures you recommend we drop from the class?

n/a

No, I thought that material was well thought out and presented

great - i really did learn a lot and enforced concepts

I wasn't super interested in the history of parameter estimation but I'm really biased because I hated every single history class I've ever taken in my entire life.

I think all needed to be covered and it makes for a logical progression

No.

Given my level of comfort with PEST, I could have used less time manually going through the control file. This could potentially be resolved by the intro / advanced split that you refer to above.

not really, maybe less of the history if you need to cut corners, but i also see a LOT of value in what we used to do and why that doesn't cut it anymore.. so there is value in including that in the story.

No, everything was relevant

Are there any topics you wish we would have covered?

More basic concepts of modeling terminology

Maybe some time spent on how to best adapt (or how to approach adapting) the notebook code for a different or more complex model

Perhaps a bit more time spent on parameterization would have been nice, as this plays a large part in the success or failure of the calibration process. Maybe cover some example good and bad PP/zone examples and general guidelines on parameterization.

could be interesting to see 'true' information from freyberg input to the model post-dataworth analysis - help verify/enforce the method? perhaps examples where groups of obs are used to evaluate dataworth? - a synthetic model is good for teaching, but tough to envision how a handful of params and obs should be scaled up and summarized in a model report that may involve tens of thousands of obs and several thousand parameters.

Null Space Monte Carlo fo sho

one session fitting parameter estimation and uncertainty analysis into the flow of an entire modeling project

I really can't--all the components were covered logically--defining parameters, sensitivities/diagnostics, calibration, evaluation, and uncertainty

No.

I would have liked a little more timing outlining the features of both pyEmu and PEST++ and how you all use them in your work.

NSMC

No

Do you have any needs for future software development?

since i haven't used pest yet i'm am really not sure?

Not far enough into the modeling process to say definitively, but likely yes

easily searchable documentation for pyemu (like flopy)? obviously a ton in there - how do you learn about what is available?

I'd like to see PEST++ add the Pareto feature of PEST

Not at the moment. Some resource that fully defines all of the capabilities available in PyEmu would be useful, but that's a big job

No, but I look forward to the continued development of Pest++ tools

maybe.. but most likely will continue to explore what is out there currently

Not now

Do you have computational resource needs (e.g. need a facility to run on an array)?

yes, when i start using it i would have computational needs.

potentially yes

definitely interested in flocking. how do we get rolling...

Depends on how busy our cluster is.

We have windows clusters and I hate them. Why is it so hard to convince our center to use Linux?

Will be looking into Condor in the future

I do, probably within 2 months

Yes, but I think our project has this worked out with Mike and Randy.

Not at the moment, but I expect to in the next year or two.

got one. :)

Currently WAWSC has an agreement with NVWSC to use their array. But, it would be great to have access to a national network of arrays, as discussed in the class.

Do you think you or your office will need future individualized training?

No

i will probably have some trouble or questions when i start using it, but i don't think our ofc would need training.

yes, we are in the early stages of developing a few models and when it comes time to calibrate we may need additional training to address our problems

Most likely. We have a need to train employees on MODFLOW input file creation, and the use of SWB, SFR, etc.

not sure - only 2-3 of us in gw modeling - but definitely want to send people to the next offering of the class.

Maybe

Not for calibration with PEST or PEST++. I do think it would help to have a day or half day dedicated to the importance of uncertainty analysis. No technical implementation details, just an introduction to why we should be incorporating these into our budgets and reports. Also to justify the additional time we might need during the calibration process.

Very possible

No, but a few colleagues should take this class and I'll tell them that

Uncertain. Perhaps direct assistance on some aspects/topics.

likely, yes. But since Jeremy sits in my office I get that for free. HA!

Yes

Your input is extremely valuable to us. Please take a few minutes to tell us your overall impression of the class. Suggestions for improvement would be greatly appreciated.

For a novice, I really enjoyed the class and making connections with other USGS scientists to collaborate on projects in the future. I thought the instructors were well informed and played to the masses despite various skill levels. I would recommend any class that incorporates calculus as the method behind the madness.

The class was well structured and I enjoyed the mix of theory and applied use of pest. The python notebook format was great for learning both. The location was convent and the classroom setup was great. Thanks for all of your hard work making this class a success.

I found this class the be excellent, and one of the best I have attended in the last several years. My only recommendation--which appears to already be discussed--is to break the class into two distinct sessions, so things can proceed a bit slower in each session. Overall, I had a great time.

Class was great! I have limited background to go on but feel like I walked away with the big picture and enough tools (so many Python notebooks!) to be dangerous. Some of the matrix math was a little foggy for me -- it's been a while. Since these concepts are pretty important, it would have been nice to have a list of terms before the class to freshen up on. I think that would have made the class a little smoother for me, but it did not prevent me from getting a lot out of the class. It was great!

great class. thank you all. one thought - if the class is broken into two, 3 day parts - for the first class - could use monday morning for travel/afternoon for python installation/background issues. then have tues-thurs for class - (but include teaser information for advanced class). covering SVD was great (and while it's very simple to include in PST file - it is comforting to know what is happening behind the scenes) - friday morning felt a little rushed on this, so if it fell into a second 3-day course, could give it more time.

I thought it was very enlightening. I now understand that parameterizing as much as and can and include as much data as possible leads to reduced forecast uncertainty, which is the end goal. Also the data worth seemed very valuable.

Highlights: - Parameter identifiability is very useful metric to investigate on top of composite sensitivities - Every time Jeremey says ‘slick’ - Having YAMR built in to PEST++ to easily spawn multiple workers - Randy’s smooth-jazz-radio-dj-voice is actually quite euphonic - Building up simple examples piece-by-piece is very easy to follow and great for exploring different possible parameterizations - Mike’s enthusiasm for the nerdy details - Thank you for putting in the time to make all the python notebooks for us. They are very useful. - That picture of Hilbert in the hat Lowlights (sarcasm intended): - Every python error caused me to die a little bit - When Mike gets too amped and loses the ability to speak English - Never enough donuts - Y’all let me ask too many questions. I should have been muzzled after the 20th Here are some suggestions to consider for the next class. I’m aware many of these may have been too difficult and/or time consuming to have for this first class. This is a massive brain dump so take it all with a grain of salt. Organization: - Now that a course order has been somewhat established, a chronological folder structure would help. - I am very disorganized myself and it would be great to see an example of a calibration directory structure that has consistent file naming conventions with a master readme file that explains with which each file type is associated. Also some tips on best practices for managing all the different folders with different model versions and calibrations. It’s too easy for me to get lost in my own mess of files and folders and forget which files are current and relevant. - Does it make sense to have copies of the executables in every folder? I know they are small in size but shouldn’t they just sit in one directory higher on our computer and every script/notebook just reference the same path? - A separate directory for the folders with images and presentations. I’ve already been scouring the activities folder for these materials. Links/Additional Resources: - A set of links to ancillary information on special topics would be helpful to those who need a refresher or want a primer on something new. - Maybe a guide or powerpoint for presenting the important topics to the modelers in our respective centers. Some sort of synthesis of important class topics to cover with those who couldn’t attend. Chat Forum: - Some sort of forum—one with organized topics or threads that can be maintained easily—for

discussion during and after the class would be nice. This way we can ask questions to the whole group as we think of them. Also, this gives us an avenue to help each other without the need for the instructors, since some of us have a better grasp on some topics already. I, for example, would be happy to help answer someone's questions related to PEST's control file, template file, or instruction file. It would be great to share our progress (presumed) with each other as we implement PE and UA into our projects. Python Notebook Improvements: - More comments to describe what is happening in each cell. This was generally done very well and in many cases, I could have just added comments for myself. A helpful reminder could be given to the class as a whole to add comments to these as we go along as a favor to our future selves who will be revisiting them later. I've gone through several of them today and I already forget what we were trying to accomplish with the code in some cells. - Always add axes labels and legends. Too often I go back to these notebooks and have to decipher what the figures are showing me. Also good to see examples of how this is done in python for those of us who are matplotlib-challenged. - Is there a way to print these notebooks to a PDF or have some offline version available for reference so we can view them without having to activate a python environment and run Jupyter? To correct or not to correct: - The zonation error is a good mistake to keep in for teaching purposes. Especially where there is accidentally an active cell within an inactive zone. We can easily make these mistakes so practice identifying them and seeing the resulting consequences is always useful. - I suggest using a version of the Freyberg dataset with more noise next time. Showing an example of model overfit would then be a little easier. - Double check that all dependencies are imported for each notebook. There were quite a few of these errors that hinder the smoothness of the presentations. THANK YOU!!!

Overall it was everything I dreamed it would be. Feeling inspired to learn more on my own and incorporate it into my ongoing projects. I realize there was not time to fully explain Baysian/FOSM/etc - adding some links to websites/books in the reference section would be much appreciated

My overall impression was that you guys had already taught this class several times before. The instructors passion and enthusiasm was clearly evident. I'm sure there could be areas for improvement--always is--but I really can't think of any. Maybe one master notebook might be an improvement with simpler data organization, but the complexity of the supporting data structure might make that intractable--not sure. Great job, guys!

The class content and presentation was excellent, and the impressive effort, commitment, availability, and enthusiasm of the instructors was very much appreciated. The mix between lectures and activities was good. The heavy emphasis on APPLIED parameter estimation was the right choice and the source of most of the value of the class. That said, the instructors explained the theory and mathematics of parameter estimation as well as I have ever seen it done. The computer/software setup and downloads probably were as well thought-out and smoothly executed as possible, but my inexperience with Python was a limitation at times. I would suggest making available a detailed syllabus and (more importantly) a reading list (and perhaps an extensive one) well in advance of the class meeting. I probably could have figured out my own, but didn't think to this explicitly ahead of time, even though I was familiar with some of the literature. The Python notebooks were an excellent tool for the class, but I would appreciate much more extensive documentation of the steps and tasks presented in the notebooks. I would also appreciate the availability of associated PowerPoint lecture materials. Class organization was

very good, especially considering this was the first offering of the class, but even more documentation and organization/structure would be useful. I'm sure much more will be developed as the class evolves.

It would be nice to hear more about specific projects that the instructors have worked on where the tools and approaches that were advocated in this course were used; such as FOSM, data worth analysis, and objective functions with many different observation types and expert knowledge. Also examples of how the approaches were sold and presented to collaborators. This was a wonderful course and I enjoyed every minute of it. I look forward to the advanced version.

AMAZING. YUGE. Honestly, the class was the BEST I've taken at USGS. Perfect mix of historical context and current issues, old and new, 20% theory, 80% application of theory and lots of discussion of what ifs and explanations of potential problems and lessons learned. Very energetic lectures; kept students engaged, dynamic presentations. Thank you Jeremy Mike and Randy! P.S. No Portland in Feb next time. P.S.S. I equally like the 3 day courses split with a few months in between in person with the webex + in person class options.

The class was terrific, and I am telling people that it is a must-have class for all USGS groundwater modelers. Even if a formal uncertainty analysis is not done, the calibration methods alone are valuable. It's important to teach modelers good calibration methods (e.g.; weighting, SVD, pilot-point mechanics); then uncertainty is the next step, which is not too onerous if the calibration is set up well. Maybe you should call the class "Model calibration PLUS uncertainty" to put the emphasis on the calibration part. The only thing I had trouble with was running the python scripts, which gave me a lot of errors. But it's not a bid deal as long as the instructors can help me when I need to apply them to my projects. Maybe the next version of the notebooks will be a little smoother.

Number of daily responses