Topic 2: Second Order Optimization (Groups 10 and 12)	
Positive Feedback:	**Room for Improvement:**
Group 10 provided a good background detail to the basis of non-linear equations, including: â€¢how they should be solved through the use of nonlinear least squares â€¢the reasons for difficulty in finding a suitable solution method â€¢the benefit that function convexity provides in aiming to find the function minimum (including through the use of a Hessian matrix) The developed code demonstrated the problems that arise in using the Newton algorithm (in terms of non-solution with divergence and column dependency). The benefit of the Levenberg-Marquardt methodology in terms of using the â€˜trust parameterâ€™ to control iteration size was also well explained. Finally, an impressive example was provided in terms of the power of this last algorithm in fitting a relationship to a random data set. With the use of the inbuilt Julia functions, Group 12 have developed code that is able to demonstrate a much wider set of examples compared to Group 10. They have set out their code structure well via dedicated functions to demonstrate the working behind each of the three algorithms. This includes good use of commenting within the function code itself for additional explanation. In terms of then using each of the algorithms, Example 3 was particularly helpful in demonstrating how the issue with non-	The presentation by Group 10 ran for 30% over the allocated time allowance. Given the complexity of the material to be discussed, it is appreciated that it would have been difficult to limit discussion. However, simplifying presentation of the background theory may have been possible, especially given that much of the detail had been repeated in the one-page project summary. Without the use of inbuilt functions (compared to Group 12), Group 10 has less flexibility in the use of their developed code. For the function that has been analysed in the examples, it would appear that the associated Jacobian matrix has had to be directly included rather than being able to be calculated by the code itself. If it had been possible, it would have been good if Group 12 could have developed one of their algorithms from a greater â€˜first principlesâ€™ basis, rather than fully relying on inbuilt computation capability (for â€˜gradientâ€™, â€˜hessianâ€™ and â€˜jacobianâ€™ functions). A direct comparison of output using this â€˜first principlesâ€™ route vs the inbuilt function could have been then made to demonstrate alignment. However, based on this quick review, it is unclear whether this would have been realistic to carry out in the project scope from a coding complexity perspective.
video1:Code is clear enough and explanation is easy to understand video2: background music is really good.	video1: more detailed application should be given. video2: giving more deeper explanations for code.
Group 10: The explanation started from ground level which is helpful to anyone to understand what second order optimization problem is. They clearly explained how to approach the problem using the newtonâ€™s algorithm. The concepts were explained clearly. They covered a lot of ground and explained convexity, newtonâ€™s algorithm and Levenberg -Marquardt Algorithm. Group 12: They picked up video from explanation of the optimization problem. But explained each step of the algorithms clearly. Best part was to show the working of the algorithms with an example each. That helped understanding the problem statement and the concept behind the algorithms more clearly.	Group 10: As group 12 did, If all the concepts were explained with an example problem, it would help understand the whole thing clearly. Algorithms could be explained a bit more using images and visualizations so that itâ€™d be easier to understand what the algorithms are trying to do. Group 12: Explaining the problem statement would help understand what weâ€™re trying to achieve here. Similar to Group 10, if the images and visualizations were incorporated along with the example problems, it would really help understand how the optimization is working.

The group10 has good visualization. The group12 has clear results and the comparison with different methods. Both of them have clear explanation.	The group 10 can add some function to compare time or steps with different methods to tell audience the differences. The group 12 can make some plots, which is good to presentation.
The formation of group 12 is more clear. The statistical analysis is fine. The group 10 really did in-depth numeric analysis on Levenberg-Marquardt Method which make me understand more about the mathematical concern of learning rate.	The group 12 could plot figure on their numeric result which make it easier to understand their code. No comments on the disadvantage of the group 10.
Group 10: their video has more details, but they look more like reading Julia. In their summary, The focus is very prominent. This gives the reader a better understanding of what they want to say. Group 12ï¼šThe video has background music, so it doesn't look boring. It's very good. The words are clear, and the speed is not fast enough to understand what the speaker said	Group 10: In the videoï¼Œ you can add your own insights and add some frustration when you talk. I think the summary is good,It would be better if you could give an introduction at the beginning. Group 12: I think their video and summary have a little less content. It still can't describe in detail how to explain this topic, it requires more content to explain the subject, just simply introduces several methods, but we don't know where the advantages of Second Order Optimization is.
### Group 10 - Good introduction to the topic at the start of the video - Data-fitting examples and plots. ### Group 12	### Group 10 Summary: Try to use diagrams where possible ### Group 12 - Display script outputs as visuals / plots, particularly with showing the residuals in the data-fitting parts of the video - The music is pretty distracting. Prefer to hear what you have to say than the music.
Group 10: notebook is well-organised and ask us questions which can have my attention on they problem and solve it. they have a good data fitting problem to help to explain their project well. Group 12: the music is good and I feel like it can take away the pain. there are comments in the code part and easy to read the code. They also have both easy and hard examples for us.	Group 10: maybe they can have comments on their codes so we can understand it more easily. Group 12: in the summary, maybe group 12 can have more numerical analysis rather than just explain by words.

For group 10, they give a brief summary in their video first, and give some examples when explaining the definition. They also give a very detailed explanation of their code and their mouse always shows where has been talked. For group12, their summary has a good layout help readers to understand. Their video has background music, and has comment of their code. They also give very detailed explanation and is easy to follow.	For group 10, the second person may speaks too fast, so it is a little bit hard to follow and it will be better if the video can be shorter. For group 12, the only one I want to mention maybe they can turn down the volume of the background music so that audience can focus on the video content.
In the presentation of group 10, difficulties of solving nonlinear least squares problems are listed. That explain why following algorithms are applied. Group 12 has a clear introduction to the project.	The group 10 did a perfect work, the only thing I would suggest is the presentation video can be more streamlined The principle of Levenberg-Marquardt Algorithm could be introduced more detailed in the summery of group 12.
The project of group 10 illustrated a lot about basic mathematical theories including non-linear equation, convexity, Newton Algorithm and evenberg-Marquardt Algorithm, which are clearly logical and explicit. Their work is well-done so that I can understand quickily and easily. The project of group 12 have the same clear stucture as group 10. However, the video of group12 can be improved through adding more explanation of important theories.	Group 10 should try to apply some cases to clear explain levenberg-Marquardt Algorithm and Newton Algorithm.Codes also need more comments. It would be better if group Group 12 can expand some basic explanations of mathematical theories.
Group 10: The knowledge points are organized and summarized, especially some details (such as the difference between linear and nonlinear equations, why we should pay attention to the convexity of functions, etc.), which are easy for beginners to understand. Group12: Clear hierarchy, prominent focus, knowledge points are very clear. It is easy to have a general understanding of Second Order optimization by combining summary and video.	Group 10: The description of important knowledge points is not clear enough. And when demonstrating the applications of Second Order optimization, they might be able to write specific equations before the code, which is not intuitive. Group12ï¼š Maybe some graphical content can be added to make it easier for readers to understand the Second Order optimization.

Feedback to group 10: As for the good aspects, you explained the algorithm in the jupyter file in detail. Besides, you made a good summary, I got a preliminary understanding of the algorithm in reading your summary. In addition, you used code to draw a lot of diagrams to explain the algorithm. This is worthy of praise. Feedback to group 12: As for the good aspect, you added a lot of comments to your code. Itâ€™s good, as I can understand your code more clearly and easily.	Feedback to group 10: As for the place needs to be improved, I think itâ€™s better to add some comments to your code. Then I can understand your code more clearly. In addition, you just show the Newton Method and Levenberg-Marquardt method. I think you can also show the Gauss Newton method. Feedback to group 12: Firstly, I think you can choose to explain the algorithm in detail by putting more detailed formulas in your jupyter file. Secondly, I recommend you to eliminate the background music, as it interferes with my listening to you. Thirdly, the difference between Newton Method and Gauss-Newton Method could be a place which can be explained further.
Group 10 compare different algorithms and list shortages and strength. The way of group 12 present video is more relax; it does not like to take a lesson.	Group 10 has good content but sometimes speak too fast. Group 12 can provide graphs to be evidence.
Group 10 introduced two kinds of second-order optimization methods. They explained the reason for using second-order optimization clearly and give a good example. This example is very complete, even including the step of data fitting. Group 12 added the background music to their video. They introduced three methods, one more than another group.	Group 10 would be better if they compare the first optimization with second-order optimization. Group 12 started with the Newton algorithm in the video, so I don't think the videos are complete enough. Also, BGM is louder than the speaker's voice, so I can't hear it clearly.
Group 10: The logic of summary is clear and comprehensive. They compare the advantages and disadvantages of different algorithms, and their relations. The explanation of video is clear, comments are good and helpful. Group 12: The summary is brief and focused, mainly talks about three algorithms of second order optimization. Itâ€™s good to have the background music in video. The comments are detailed and helpful.	Group 10: Maybe more comments between lines will make code easier to understand. Group 12: Maybe more introduction on Gauss-Newton Method and Levenberg â€“ Marquardt Method will be better and how they relate to each other.

Group 10: The video content is simple and clear. Doing a good job of explaining the basic concept of the non-linear least square problem and the importance of the convex function. When introducing Gauss-Newton method and Levenberg-Marquardt algorithm, they give examples by using these two to find local minimum of the same function, which can be easy for me to the compare the difference in the results obtained from these two measures. Group 12: At the beginning of the video, they help me review the Jacobian matrix and Hessian matrix, which I think is pretty kind. Besides, in order to tell us the limitation of Gauss-Newton Method they try to use this method to obtain the local minimum of a function, but the result is not available. Moreover, they are very careful when introducing the Gauss-Newton method.	Group 10: The only problem that they have is that their summary doesnâ€™t cover the application of the topic. Group 12: They also didnâ€™t mention application-related content, and if they can give the plots of results could be better.
Feedback to group 10: For the summary, the summary is very detailed. The context is very consistent and understandable for reader. For video, clear logic, full content, graphs, comments, formula in Julia make the algorithm more natural to understand. The great point is that you used a line chart to visually display the process of Newton method, making it easier for readers to understand. Feedback to group 12: For the summary, the summary is very concise. The context is very consistent, making it easier for readers to understand the second order optimization. For video, clear logic, full content, comments, formula in Julia make the algorithm more natural to understand. Other than that, you compared the outcome of different algorithm which let us see the advantages and disadvantages of the different method more intuitively. During your presentation, you also play a BGM which is attractive.	Feedback to group 10: You missed Gauss-Newton method in both your summary and Julia. Other than that, there are too many trivial basic concepts in both your summary and Julia, which should be compressed. You also need to control the presentation time. Feedback to group 12: In the summary, you passed the part of explaining how to fit the data by using these three methods. In the Julia, I can see you successfully fit the data but you donâ€™t have any formula to explain it which need to be pay attention to. In addition, it is a great idea to add the BGM, but it slightly covered your voice. You need to control the balance between BGM and your voice.

In group 10, they introduced what is a non-linear equation and a set of non-linear equation, where they got a rule about the optimal condition which is necessary but not sufficient condition and values satisfying the condition may not be a solution. They also got some shortcomings: the basic Newton algorithm can diverge and the iterations terminate if the derivative matrix is not invertible. So they used another algorithm called Levenberr-Marquardt Algorithm which can remove the above drawbacks. In group 12, they introduced the advantages of second order methods with some examples: 1. A full step jumps directly to the minimum of the local squared approx. 2. Often this is already a good heuristic. 3. More efficient on solving non-linear problems such as solving root, minimizer and least square	To group 10, they used more than 7 minutes in video, so i think they can compressed into 6 minutes. To group 12, i have no idea to give suggestions.
