In this document, I describe certain aspects that in my opinion are helpful for giving a good scientific talk, for example a talk at a conference or in a (student) seminar. What I describe are by no means objective truths, but rather my personal viewpoints on the topic. Also, I do not claim that this document covers everything that is important for giving a good scientific presentations. My own scientific area is theoretical computer science but I would imagine that several aspects apply also to talks in other scientific disciplines and to presentations in general. Any comment or feedback is appreciated, you can reach me via andreas.wiese@tum.de.

1 Beginning of the talk

The beginning of the talk is very important. This is the moment when you get the attention and the interest of the audience... or you don’t. If you don’t then it is unlikely that you will get it later during your presentation, as harsh as this may sound. There are many possibilities for what you can do in order to get the attention of your listeners:

- **State a quote** related to your topic. A colleague of mine once started his presentation with the quote by Thomas Jefferson “Never put off till tomorrow what you can do today.” And then he said that he will show in his talk that Thomas Jefferson was wrong. He definitely had the attention of the audience after that.

  ![Image of Thomas Jefferson with the quote](image)

- **Ask a question** to your audience. I once started a talk asking the audience “Who of you likes home improvement?” and then connected home improvement to the topic that I was talking about later. In general, I think that anything that makes you audience do something (think about a specific question, raise their hand, etc.) is helpful.

- **Latest news.** If there is anything in the news that has happened recently and that is related to your topic, go ahead and mention it. For example, some years ago a colleague of mine started his
presentation talking about the Mars rover that had been launched to space recently and he connected his topic with the mission of the Mars rover. In general, I think that it is good if you can relate your topic to something that your audience already knows.

• If you feel like it, you can tell a personal story. This does not need to be anything private or secret, it is totally enough if it is something about you as a person (while we scientists love science, we are also humans, and humans care about other humans). For example, I once started a talk telling the audience that I am from Berlin and that I was a kid when the Berlin wall fell, and related the topic of my talk to the Berlin wall.

• Use different kinds of media. For example, you can play a short movie, play a piece of music, or just show an interesting photo. In one of my talks I played the music of Game Boy Tetris to the audience and then related the game to my topic. In general, I think that you will get the attention of your audience if you do something that people do not see typically in other talks.

• Tell something funny. It is not necessary that you are a stand-up comedian or that you are the greatest story-teller. If you make your audience at least smile a bit then you already achieved a lot. Remember that they do not expect anything funny or anything that is entertaining as such. If you give them more than they expected (and practically they do not expect anything) then this is already a plus. For example, in the talk with the Tetris music, I later said that there are some similarities of Tetris and the topic of my talk, e.g., both are NP-hard. However, there are also differences: for example, in Tetris there is this wonderful music by the composer Nikolay Nekrasov, while in my talk there is no music and you have to listen to me.

• Title slide. I believe that almost all scientific talk I have seen started with the title slide, showing the title of the talk/paper and the names of the authors. When you start your talk with this slide, in my experience there is a temptation to start the talk by turning towards your slide (looking away from the audience!) and saying the title or the names of the co-authors out loud. I think that it is important to keep eye contact with the audience, in particular at the very beginning. So therefore, I would recommend to resist this temptation and remember your first sentences by heart if you cannot see your slides when you look to the audience.

• Title slide II. I find that you definitely need to state the names of your co-authors on a slide and say their names. However, I think that it is not necessary that this slide needs to be the first slide in your presentation. Instead, you can as well do one of the things listed above, maybe introduce your topic a bit, and only after that put the “title” slide. In particular, at that point your audience might have a much better chance to understand your title (in particular if the title of your talk/paper is hard to understand for non-experts, which in my opinion is the case for most paper titles).

• First sentences. Make sure that already the first sentence of your talk starts with something interesting. Just omit sentences like “In this talk I will speak about problem X.” etc. and instead start immediately with your actual content. If you watch TED talks, you will see that essentially always already in the first sentence the speaker starts straight away with what she/he wants to say. I think that it is fine if only after a few sentences you give credit to your co-authors and say the title of your talk/paper out loud. In any case, I recommend you to avoid starting your presentation with phrases like “This is joint work with my co-authors X and Y” (in my experience a large fraction of talks at conferences start with that sentence).

• First sentences II. As mentioned above, feel free to just remember your first few sentences by heart. Before your talk you might be nervous and if you start well into your presentation, this will give you confidence and make you feel comfortable during your talk (and your audience will see and like that).

Once you have the attention of your audience, you want to introduce and motivate your topic (which in theoretical computer science if often a problem that you worked on). Make sure that you spend a lot of
time on the motivation of your presented results and how they fit in in the scientific literature. Chances are that you worked for a long time on that topic, that it is totally clear to you what had been known before about it, and why it is interesting. In my experience, topics/problems become more interesting the more you know about them, and chance are that your audience knows your topic much less than you (and probably has never worked on it). Also, your audience might appreciate to learn not just the results of your paper, but also the general state of the art in that area.

2 Main part of talk

Now that you have the attention of your audience and motivated your topic, you want to speak about the core content of your presentation. In many scientific talks, here you talk about one or more new results. Here are some things to pay attention to when you do that.

- **Tell a story** in the sense that there is some logical order that connects your slides and what you say. It is a very good sign if you can connect two consecutive slides with the words “but” or “therefore”. An example for such connections is “Once, there was the evil Darth Vader who wanted to control the universe. Therefore, he wanted to built a death star that can destroy entire planets. But there was also the Rebel Alliance that heard about these plans and wanted to prevent them ...”

- **Structuring** your presentation. When you prepare your presentation, make sure that you first plan its structure and only then make your slides. In this way, you make sure that you get a nice story for your presentation before you invest a lot of time into making your actual slides. For example, you can take post-it notes, one for each slide, and write on each of them the topic or possibly a sketch of its content. Then you can reorder them easily, add a slide if necessary etc. Another way is to create the file of your presentation and write a topic on each slide (but nothing else).

- **Big picture first**, details later. First make sure that your audience first understands your topic/paper on a high level, only then go into details. In many papers the sections after the introduction are structured in a linear way. However, for your talk it is probably better to start with a broad overview and only then go into details. Also note that some people in the audience will get lost at some point during your talk (I think that it is impossible to avoid that). It is good for you if they understand at least the high level idea of what you are talking about.

- **Make sure that you convey** the intuition behind why things are as you claim, but do not get lost in details. Sometimes it is hard to identify this intuition and select the right points. In a talk of about 20min (which is a typical length of a conference talk) do not give mathematical proofs, at best give some high level ideas. In a talk of around 45min (the typical length of a seminar talk) you may want to give a mathematical proof or two, but also here it is preferable that you focus on the intuition why a certain proof works, rather than the mathematical details and calculations. Note that it is hard to pay attention for 45min if the content is very dense and your audience probably sees your content for the very first time during your talk.

- **Keep notation** as sparse as possible. There is some notation that is standard in the respective field, e.g., $V$ for vertices or $E$ for edges of a graph, and it is ok if you just use it. Avoid other notation as much as you can. A rule of thumb is to define at most one bit notation in a 20min talk, and maybe two in a 45min talk. When you do this, say explicitly out loud what your notation means, e.g., “For the rest of this talk I will denote by $U$ the capacity of each input edge.”

- **No outline.** In my personal opinion, for a 20min talk you do not need to give an outline; your story should speak for itself. When you show an outline early in your talk, there is a good chance (or rather say risk) that it will include terminology that you have not introduced yet. In that case, this information is useless for your audience and I find that then you should rather skip it in order not to confuse people. Also, 20min are so short for a talk that there is only a small change that people will
get lost because they are missing an outline. If you give a (long) talk of about 45 min, you might want to introduce an outline at a suitable moment during your presentation. In particular, when you show your outline, every single term on it should be clear to your audience. But again, if your story is good, I think that you can as well omit it.

- On your last slide repeat the main message of your talk. You should have 1-2 points that are clearly your main messages (having one is better than two). If you have too many “main messages” and they all seem equally important to you, this is a sign that you might want to focus your talk better. I think that if you manage to get one message across to your audience such that they will remember it, then you achieved already a lot. This is particularly true in the context of a conference during which the attendees listen to many talks during the conference.

- There are many talks on whose respective last slide it says something like “Thank you for your attention”. I personally think that it is nice to say this, but I would not write it on the slide itself. The more you write on the (last) slide, the more people get distracted from your main message, which is what you want to get across (rather than the fact that you thank them for their attention).

3 Slide design

When you design your slides, a general rule is that you want to make sure that you are in the center of attention and not your slides. You have your slides in order to help you getting your points across, but they are not the presenter (you are!). Whatever you put on your slides, let it be text or pictures: your audience will read it/look at it, and this will take a bit of their attention, which they will not give to you. Therefore, make sure that your slides contain only things that actually help you to illustrate the points of your presentation.

- Do not write completes sentences on your slides. If you really want to have a full sentence on a slide (e.g., because it is a quote of somebody) then read it out loud for your audience. For all other whole sentences: condense them, e.g., change “We obtain an improved approximation factor of 3” to “Improved approximation factor of 3” etc.

- Put as few text as possible. Your audience will read everything that is on your slides and therefore pay less attention to what you say. Try to avoid that. If you are not sure whether you should something as text on your slide, probably it is better to omit it and just say it.

- Use graphics instead of text. The advantage of graphical elements is that people can parse them much faster than text. Thus, they will have more time to pay attention to what you say (which is what you want). You can replace a lot of text by graphics, probably more than you think at first. Take the following slide.
Knapsack problem

- set of items $I$
- knapsack of size $B$
- each item $i \in I$
  - size $a_i$
  - profit $p_i$
- goal: select subset $I' \subseteq I$ with $\sum_{i \in I'} a_i \leq B$
- maximize $\sum_{i \in I'} p_i$

The text on this slide is relatively sparse, but still you can make the same statement with much less text like this.

In particular, this version of the slide does not use notation (like $I$, $B$, $a_i$, $p_i$, etc.), but simply shows the same information graphically. There are certain things that you need to say in order to explain them, but these are things that you should say anyway.

- **Do not put** the current date on your slide. For your talk it is completely irrelevant if it is April 25 or April 26, so do not write this (not even on your title slide).

- **Do not put** the venue, e.g., “European Symposium on Algorithms 2022” or “ESA 2022”. Your audience already knows which conference they are attending, they do not need your slide for this. If you want to remember for yourself where you gave this talk, you can still add a slide that is hidden, i.e., not part of your presentation. Or include the name of the venue in your file name, e.g., “ESA2022-my-talk.pptx”.

- **Avoid corporate design elements** if you can. Some organisations require you to put their logo or other design elements on each slide. If you can avoid this, you should definitely omit these elements.
In my opinion, corporate logos mainly serve marketing aims of the organisation, but they do not help you to make your presentation better (on the contrary, they make your presentation worse).

- **Slide numbers** are useful to have on your slides if you ask other people for feedback after your talk. Then they can say something like “On slide 12 I have the following comment... “. Other than that, they are not useful in my opinion. Your audience will not understand you better because they know that you show them right now slide number 12 etc. Do not use a slide numbering of the form “slide 12/18” etc. People will not understand you better because they know that you have 18 slides in total. They might rather see in this a progress bar (“Great, only 6 slides between me and the coffee break.”). There are some layouts for e.g. Latex Beamer that indicate visually how many slides there are left. Avoid them for the same reason.

- If you use Latex beamer, disable the navigation bar on the bottom right with which you can go to the next chapter etc. I have seen many talks with Latex Beamer but I have essentially never seen anybody using them. On the other hand, they take up space, might overlap with figures etc. so better disable them. The command for this is `\setbeamertemplate{navigation symbols}{}`.

- Some people put they name in the footer of every slide. This can be good for you so that people remember your name better. For the presentation itself, in my opinion it does not help since it is one more item on the slide that can distract your audience. So you need to weigh what is more important for you.

- Regarding the font size, my personal rule is that I always use a font size of at least 18, but a larger font size if possible. If you present in a very large room, font size 18 can be already quite small. Also, you might not know before your presentation how good the projector is, what its resolution is, etc. Since you should not have too much text on your slide anyway, you should have enough space to make your text large.

- **Omit the slide title** if you can. This may sound odd to you, given that naturally one may think that every slide should have a title. Also, when you add a new slide in a program like PowerPoint it kind of tells you to add a title, so the natural thing to do seems to indeed add a title.

In my opinion, many slides do not need a title since they serve their purpose also very well without a title. On the other hand, your audience will read the title when it is there and thus pay less attention to you. So feel free to omit the title if you want.

- When you use colors, use colors that can be distinguished easily. When your slides are projected, the colors can look quite different than on your screen (depending on the projector). Also, when you give a talk at a conference etc. you might have little control over the color settings of the projector. So it should not be important that people can distinguish light red from dark red when they see your slides. Use instead colors with stark contrast like plain red, yellow, green, blue, etc.
• **Test for your slides**: if you can give your slides to somebody and this person could understand from your slides what you want to say on each slide (also known as PowerPoint karaoke ;-)), then there is still too much text on your slides. Better get rid of some of the text then.

• **Program to use**: there are different programs out there to create your presentation, e.g., PowerPoint, Keynote, Latex beamer, etc. All of them have their advantages and disadvantages. I cannot give you a recommendation which software to use, since this depends a lot on your preferences, operating system etc.. Keep in mind however that with each software certain things are easier and certain things are harder. For example, with a program like PowerPoint it is quite easy to add many figures on your slides while it is harder to put formulae and mathematical notation nicely. For a software like Latex Beamer it is quite the opposite. I think that when you prepare your presentation, there is a temptation to do more of the things that are easy with your program, and less of the others. So when you use, e.g., Latex beamer, avoid the temptation to put lots of formulae and heavy notation (because it is easy and looks nice), but remember to put many figures.

4 **Delivering your presentation**

Suppose now that you prepared your slides very nicely. What is left to do is to actually deliver your presentation. Here are some points to pay attention to when you do this.

• **Practice your talk a lot.** How much depends on how experienced you are with giving presentations and how important the talk is for you. If you do not have a lot of experience yet, you should definitely practice your talk several times in full length. Check how much time you need to give the full talk.

• **Ask friend/fellow student/colleague for feedback.** In this way you can figure out what is not clear for your audience and where you need to improve your talk. Also, ask them to stop the time that you need. You might realize that you need more or less time when you give your talk in front of an audience than if you practice the talk just for yourself.

• **Have fun.** If you enjoy giving your talk and talking about your topic, then this will activate your audience and they will be more likely to listen to you. After all, you want to make your audience excited about your topic, so the first step is to be excited about it yourself. When you talk about your own research results, this often comes naturally because you, e.g., like your work and you are proud of it. When you speak about something that you are less excited about first, try to motivate yourself and look for reasons why you want to speak about it (rather than because you have to in order to pass the seminar course or because your boss said so).

• Whatever you do, make sure that you **respect your time limit.** At conferences you typically have a strict time limit, and you should obey this no matter what. In the worst case, skip parts of your talk if you see that you are running out of time. In particular, make sure that you have enough time to repeat your main message at the end of your talk again, so that you get this point across well. At seminars and similar venues, there might not be a strict time limit. However, people in the audience typically do not like it if you take more of their time than you are supposed to. So be respectful to other people’s time.

• **Use a remote presenter.** In this way you are much more flexible and you can interact with your audience in a much better way. If you don’t have one yourself, feel free to ask the person in charge of the seminar whether they can lend you a remote presenter (often they can).

• **Keep eye contact with your audience.** You want your audience to pay attention to you, so it is important that you also pay attention to them. If you do not look at them, chances are that they will not look at you either and at some point think of something else.
• **Change your position in the room** from time to time. In particular if you give a longer talk (like 45min), it can be a good idea to walk, e.g., from the left side of the projected picture to the right and back. Don’t worry if you block the slides for a few seconds. It can happen easily that you focus on the people in the audience that sit close to where you stand, so when you change your position you will give your attention to other people. It can happen that there are people in the audience that are particularly important for you. Make sure that you give attention to them.

• **Be open for questions.** It is good for you if somebody asks you a question during your talk because then most likely also other people have the same question. If something is unclear to you audience, there is a good chance that they will not understand what you will say on the next slides. So it is good that they ask. If you know that you have clearly enough time, it can be a good idea to encourage people at the very beginning to ask questions and ask explicitly for questions at certain important points (e.g., when you defined a problem that you will talk about). When you ask for questions, wait a bit because people might not ask a question immediately but only after a few seconds. If somebody asks a question, it is good to thank the person for the question, and to say it if you find the question particularly interesting or smart.

• **Do not** use a laser pointer to point to parts of your slides. Typically, the point of the laser pointer will shake a lot because it is impossible to hold the laser pointer completely stable in your hand, and even more so if you are nervous. Sometimes you know before your talk that you will point at something on your slide. Then you can simply put an arrow there.

• **Make content** of your slides appear **click by click**. In particular if you have many objects on your slide, in this way you can help your audience find the part of the slide that you talk about, e.g., make text or figures appear only when you refer to them. I personally do not see the point of having part of the slide grayed out at the beginning and make it appear later (LaTeX Beamer has such a feature). In my opinion, there is a good chance that people will try to read that part before you want them to do it and they will invest more effort for this because that part is hard to read (in gray).

• **Do not** use **fancy animations**. Programs like PowerPoint allow you to make animations like moving objects that change their color while they move or text that appears letter by letter. Do not use this, it will just take away attention from your audience, and they will not understand you any better because of this.

• In particular if you give a long presentation (e.g., 45min) it is natural that the attention of your audience will drop over time. Therefore, it can be a good idea to do something in the middle of your talk to get people's attention back. For this, you can do something similar to what you did at the very beginning of the talk. Avoid to say something that suggests that people stopped paying attention, e.g., “In case that you are already sleeping, now is a good time to get back because now in the second part of my talk I will speak about something completely unrelated.” (I have really heard people saying something like this in actual presentations.)

5 **Conclusion**

I think that it can make a big difference whether you give a good presentation or not, for you and for your audience. Therefore, I think that it is good if you invest the time to make a good presentation. As with many things, the more often you give a presentation, the better you will become at it, and then many things will go automatic for you.

I hope that the points above are useful for you and that you have fun preparing and giving your next talk!