The Imperial Mathematics DRP Handbook

Shen

October 15, 2025

Welcome to the DRP Handbook! We created this document to try and provide some initial support for students taking part in a DRP group. We've collated some advice for both group members and group leaders to ensure everyone can get the best out of the programme, and enjoy engaging with exciting topics in Mathematics. We wish you the best DRP experience! If you would like to suggest additional pieces of advice to put in this document, or revisions, please mail to *rohan.shenoy22@imperial.ac.uk*.

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Best wishes,
Shen

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1 Introduction

For more info, please see our site !

1.1 DRP Overview

Why we started the programme

This is a great opportunity for fun learning collaboration with your peers in our lovely department! The programme is a place to match students with like-minded interests to learn new topics together as a group, getting used to learning and researching topics collaboratively.

Studying Mathematics, I used to always try and solve problems on my own. But as a fresher, I soon found that my new friends at Imperial had each grown up with a very different version of Mathematics to the one I knew, and that actually exposure to all these new perspectives was very quickly enriching my overall understanding about all the new concepts, far beyond anything I could achieve on my own. That this was the proper way to learn and research Mathematics. In this way, I'm constantly reflecting on advice from my first lecture at Imperial:

'We're often told that great minds think alike, but I disagree, I think that actually great minds don't think alike and that's why we're able to progress at all.'

This is the ethos cementing the DRP - our Mathematics department here at Imperial is one of the most supportive, diverse and encouraging places for an undergraduate - we want to celebrate that! Our goal is to provide an environment for collaborative Mathematics to thrive.

How it works

Based on your interests, we'll match you with other like-minded students in the department to work on a reading project together. Each group is assigned a group leader (typically an older student) to guide discussions, structuring the group learning and conversation. Groups typically meet up weekly to discuss ideas and material together, sharing the learning experience. There'll be regular catch-ups with other DRP groups to see what everyone's getting up to, as well as a special end of term Colloquium for each group to present everything they've learnt!

Previous projects

We have really had a range of topics covered by different DRP groups - just a few examples of past group reading projects:

- Introduction to Category Theory and extensions

- A study of Morse Homology

- Introduction to stochastic processes and applications in the sciences

- Optimisation techniques for problems in the physical sciences

- Gradient descent for various machine learning problems

- Introduction to Harmonic analysis and Fourier theory Topological analysis for Quantum mechanics

1.2 Key Contacts

DRP Co-Chairs

- Rohan Shenoy: rohan.shenoy22@imperial.ac.uk

  Structuring the DRP, outreach and overseeing all DRP groups

- David Ye: david.ye23@imperial.ac.uk

  Group matching, organising all DRP events and advice sessions

Department contacts

- Sai Nathan: sai.nathan@imperial.ac.uk

  Undergraduate Liaison Officer (helping DRP organisation and communication)

- Ahmed Aynan: a.aynan@imperial.ac.uk

  Student Experience Administrator (helping DRP events)

- Olivia Adu-Bofour: o.adu-bofour@imperial.ac.uk

  Student Experience Administrator (helping DRP events)

Event organisers

- Karthikeya Kakarlapudi: karthik.kakarlapudi23@imperial.ac.uk

  Colloquium organiser (helping DRP colloquium event)

- Matthew Oswald: matthew.oswald25@imperial.ac.uk

  DRP Newsletter and feedback

Note: Rather than contacting the department separately about organising sessions and events **please message us first so we can arrange things centrally**.

1.3 Provisional Timeline (T1)

- 15/10/25: Group leader meetup + advice session
- 22/10/25: Group leader project proposal deadline
- 22/10/25: In person info session + Q&A
- 29/10/25: DRP Launch + first group sessions
- 10/11/25: Week of Group Leader Catchup 1
- 19/11/25: Midterm social
- 24/11/25: Week of Group Leader Catchup 2
- 03/12/25: End of term colloquium
- 10/12/25: Group reviews

2 For group members

2.1 Getting the best out of the programme

The DRP can be structured in many forms, as we'll allude to below. Each of the different types of structures lend themselves to different learning environments, and different interactions. But our overarching goal for the different DRP groups is the same - *collaborative learning*.

What we're looking for is enthusiasm for the topic and really, this goes without saying :) if you're this far down the page, I probably didn't need to mention that As we try to emphasise, the heart of the DRP is student collaboration. The programme is not competitive at all -the DRP is for anyone who wants to enjoy a more collaborative side to extracurricular learning, whatever "level" you feel you are at. Within a group, there's always going to be a slight range of background and experiences in a topic, but that's the reality of learning and research. Working out the best way to work together is part of the process - don't worry, the DRP team and the group leaders are there to help the group move forward as one.

What we have found from previous groups is that those which had regular, in person meetings were the ones who made the most progress, and were able to develop most effectively. As we keep emphasising, what makes the DRP different to a completely independent learning task is the opportunity to discuss what you're working on with others doing the same. Whether you are working on a codebase, working through book chapters or problems, meeting up to discuss at least once a week is what we would ask for.

Try to ask yourself, what can you learn from each and every person in the group? The benefits of diversity show best when a changed or added perspective enriches your understanding - we'd encourage you to constantly reflect on that throughout.

2.2 Programme Expectations

Commitment

Being part of a large DRP group is a *significant time commitment*. First and foremost, you should prioritise your course, and the standard curriculum. Forming strong foundations in those topics will certainly improve your ability to take part in a DRP group, rather than hinder at all time-wise.

The group leaders are all working incredibly hard to ensure that the group can move cohesively - honouring that with honesty with regard to your availability and commitment to the group would go a long way. Additionally, do help the group leader out too! Be that with suggestions about how the group could be structured, or directions for future study, we really encourage having those conversations with your group leader (and of course the other members) to see how you can all thrive. So turn up, have fun in the sessions and engage with the opportunity to discuss with others - not doing so means you're no better off than trying to learn on your own outside the programme.

Outside the in-person sessions, try and work out how much time you realistically have to work on DRP related things. For example if the group is going to meet next week to discuss chapter 6 of Rudin, do you really have time to read all of it by then? The group leaders are doing their best to make plans (plans they submit to us the DRP co-organisers for review!) to ensure the timeline is manageable and the reading is enriching given that time. Once again, do your best to honour that effort from the group leader by being honest with how much time you have, and putting in your all to get those tasks done each week.

Learning within a group

There is a skill to group learning, particularly in Mathematics - I for one didn't appreciate the extent of that until second year and even now I'm still finding out the best ways to go about it for me. Reaping the benefits of the group experience will elevate your learning as explained above. From my own experience, being open and really trying to follow what another person says, as though you're assuming only their viewpoint, is something very helpful. Give people space to speak, to write on the board, to contribute, and always be polite - all basic things but they go a very very long way.

Now there might be times where you feel the pacing is not quite right for you. Maybe the group is going too slow for your liking, given you have some experience in the field - in this case I cannot express how valuable it is to then try to explain your views on the material. In trying to find the right description, you will probably test your understanding in a way which could actually develop it further. On the contrary, if you're feeling that the group materials are moving too fast, mention it to the group - you *belong* here and we want the best for you. Asking for clarification is a really valuable thing, not just for you, but the group too to test the overall understanding. We encourage you to speak up if you find difficultly in understanding something - do reach out if you're worried about how to go about that, we can talk it over.

Reflection

Finally, really try to reflect on what you would like out of the programme in a bigger picture sense. Why did you sign up to the DRP in the first place? Is there something specific you would like to learn? Did you want to meet people who share your interests? Do consider what you would like to get out of the DRP, and how we the committee as well as your group leader can help with that. If you ever feel things are a bit much, reach out! Your group leader is there to help manage the balance between different group member experiences, as is the DRP committee too! We'll try and check in at regular intervals and at all the checkpoints given in section 1.3.

3 For group leaders

Firstly, if you have volunteered to be a DRP group leader, we'd like to thank you very very much. It is certainly a commitment that'll need a lot of time and care, but if done right, will hopefully prove to be a very rewarding experience. There is an incredibly informative site here called the DRP Network which has been created between many US Unis running a DRP - would seriously recommend a read[1]! As always, if you have any questions, do reach out to us (you should've been added to the group chat too - asking questions there like we do on EdStem will be really helpful!).

3.1 DRP admin

Timeline

We've given a rough timeline for the first term DRP above in section 1.3, and this should give an indication of how long you have for different things. We *strongly* advise regular, in-person[2] meetings with at least a weekly (if not more frequent) rate. This is so that you and the other group members can navigate the topics and deal with issues at a faster rate, and communicate that much more effectively. Bear in mind throughout that you're going to have to balance the DRP with your studies and social life - the timeline provided should give an idea of various checkpoints.

Room booking

This is still being sorted out ad hoc. The best advice for now [Oct 25] is that you should contact

- Maths room bookings
  mathsroombooking@imperial.ac.uk

- Ahmed cc'ed
  a.aynan@imperial.ac.uk

- Myself cc'ed
  rohan.shenoy22@imperial.ac.uk

making sure to put DRP somewhere in the subject title. All year groups are curriculum free on Wednesday afternoons - this has often been a good time for DRP group meetups in the past with a lot more rooms being free. A list of good rooms for ad hoc meetings in Huxley includes

- 139 (6p office)

- 340 + 341/342 if free (Classrooms)

- 410 + 411 (Classrooms) + MLC

- 503 (Classroom, blackboard)

- 658 (Classroom) + 6m42 (Classroom) + 711 (Classroom)

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[1]Our format differs a bit from the general one there, as we're encouraging a group rather than 1:1 mentorship and learning. However, a lot of the advice there is very useful even with our modified structure.

[2]There are some special cases where some group members with health conditions are not able to meet in-person - we will be in contact with appropriate group leaders about managing such arrangements with a larger group

though availability is not guaranteed. There are good, often free areas with desks and whiteboards in Blackett upper levels, Chemistry Level 5/6 and the Sherfield Building (SALC Level 5).

3.2   Structuring your group

The following section is based off advice given by various academics in a session last year, as well as various individual conversations with other academics too. We would like to especially thank Sam Brzezicki, Marie-Amélie Lawn, Ionna Papatsouma and Michele Zordan for their valuable input.

There are a variety of structures which we imagine might be possible. First and foremost, you as the group leader have the freedom to choose how you run the group. Are you *teaching* material you already know? Or are you learning alongside? This will probably make for the biggest difference with how you choose to structure your DRP group. Below we provide some advice about the different considerations with structuring a group, and how you can maximise the productivity and enjoyability of each. In the next section, we'll indicate how you should summarise an initial plan for your reading group that we can review based on these things.

Indicating prerequisites

This is a crucial first step towards running a reading group - what is the *minimum baseline* of knowledge that someone would require to begin learning and discussing the topic you set out to cover together. Now, we are *not* saying that every group member needs to come into the DRP group with all of the prerequisites already, rather before you do begin going at full speed, perhaps spend at least a couple of intro sessions making sure you as the group leader understand each group member's background knowledge, and how you think that'll affect their learning. If a certain group member or a few members appear to have less background knowledge than you expected for example, take extra care to guide them to the correct resources throughout - if they are sufficiently motivated to keep up the pace, then they can try and work on those prerequisites in the background. However, you need to be careful to make sure they don't overdo it - in many cases, a general understanding rather than knowledge of each tiny detail may be sufficient for what they would like to learn (and if they ever feel otherwise, you can guide them to the right materials).

A really key thing here is to have a solid list of references to fall back on. These can be books, notes, papers, github repos or even videos in many cases; however, ensuring that there is something to refer to for prerequisites is really important. The type of resources you choose may depend on the materials or topics you would like to study, for example learning real analysis for the first time it is definitely useful to list Rudin as a reference; however, if you're learning about neural networks, perhaps a link to a Github repository or 3B1Bs introductory videos may be more appropriate. This is very basic advice which I'm sure all recognise, but important to remember - ask yourself what types of resources will be good for different things, and how blending prerequisite resources could suit different learning styles. This leads nicely onto the next section.

Picking resources

In many cases (particularly for more pure topics), we expect that groups may be reading book chapters and coming together to discuss them in detail and maybe have a go at problems. In other cases, maybe once initial understanding is there, perhaps groups can move onto reading papers within a given topic to see where research has developed over time. There is also good scope for

groups seeking a more practical project in creating a statistical/physical model and discussing. Below we provide a list of different types of resources and how they can be used.

- Textbooks

    - Well structured and designed specifically for learning materials from the ground up
    - Often very comprehensive and in most cases, self-contained
    - Usually include problems to actively engage with the material
    - Will often provide a discussion of the material as you go through it
    - Can be very dense and for a reading group, it might be better to glean information rather than dissecting each detail or avenue of discussion

- Lecture notes

    - Very similar to textbooks in nature
    - Often differ in specificity of the material
    - May contain problems and exercises to have a go at
    - Indicative prerequisites are often outlined

- Papers

    - Show the developments of different ideas often at a much higher level than textbooks
    - More recent papers can show the state of research in the area today and where the topic is moving
    - Can introduce many new and different ideas
    - Will in most cases not be self-contained, referencing other papers or even textbooks. This can be good or bad - this gives opportunity for further exploration but could also be a potential source of issue if the paper has not been properly reviewed.

- Github repositories

    - Can vary drastically in terms of quality but are often laid out well
    - Provide practical demonstrations of different topics (particularly for statistical methodology and data analysis)
    - Immediately interactive - particularly useful if linked to a research paper.

- Videos/Lecture series (Particularly YT)

    - Often provide a larger picture overview of a topic in a more tractable way
    - Less capacity for detail, but good for building an intuition for a topic
    - Can provide directions for learning once initial understanding is there

- Seminars (in person & online)

    - Provide a very high level overview of the topic and demonstrate current research areas
    - Chance to discuss with academics working in the field in person

Knowing how to blend these is really important. Below we provide an example of using different resources if the goal of the group is to discuss new papers on optimal transport for machine learning:

1. Provide an initial YT video (e.g. Rigollet's OT seminar) demonstrating the topic, the motivation and applications

2. Reference introductory materials from a standard text (e.g. An Invitation to Statistics in Wasserstein Space)

3. Ascertain prerequisites from measure theory lecture notes (e.g. PFR 24/25 ed. on RN thm)

4. Dive into papers on the topic (e.g. Manifold Learning in Wasserstein Space) *with reference to* the standard text/lecture notes if prerequisite issues arise

5. Explore some related practical implementations on Github (e.g. Tobar's IX group work on W-F distance for SGD).

Note. In finding resources to use, try to maintain a balance between security and flexibility. It is important to have a few good resources to fall back on, but be adaptable if the group begins to move in a different direction over time. If you ever feel that you are unsure what resources to use, you can always ask around. If you know of any profs in the area, do approach them to ask about good reference texts or recent papers which could be interesting. Additionally, asking the library team can be very helpful too. Unfortunately, David and I have very similar interests and so have ideas about resources for much of the same set of topics, but if you know other DRP group leaders working in a similar area, consider asking if they have any ideas what could be useful too.

Running Sessions

Looking to meet at regular intervals is good, and having a defined plan for the next session is really important. At the end of each session, outline where you plan to go next time, and what you expect from the group members before the next session. Now, different topics will lend themselves to different session styles; however, as with resources to keep higher engagement, we recommend a blend could work really well. Some ideas for how to go about running sessions are below:

- First and foremost, set *clear* goals between each session where possible . This is really important to maintain engagement with a programme off syllabus - if you treat the group like a classroom, it'll help members stay more engaged and more likely to dedicate time and effort to their learning.

- If everyone had the same task between sessions, ask a group member (or just the group leader) to try and summarise the material between the sessions. If different people were working on different things, consider trying a brief stand-up format where each person briefly summarises what they did over the break in a few short sentences before beginning the session.

- Go about asking people their different opinions on the material between sessions. I'd suggest a layered structure to this where you first start by going at a broad level what was covered, then dig through some onion layers as you continue on a more granular level

- Ask as soon as possible about different things people struggled with, and encourage other group members to help out when these questions arise. This is very similar to a tutorial format.

- During the session try and outline some key ideas to progress the learning. Most of the learning is actually take place outside the sessions, but the discussions in the sessions should shape that learning greatly.

- Session on session, try to vary things a little, for example one session could focus on understanding key result or model or data source, while other sessions could focus on solving exercises together, implementing a model or carrying out data analysis together.

- As different group members begin to become more and more confident expressing their ideas, encourage them to take on the 'group leader' role for the week trying to guide the session, explain what they've been up to, and present their thoughts in a certain way. This can be in the form of a presentation, a report or a model demonstration [3].

- Before the Colloquium event (as in 4.1), try helping some of the group members practise different things they would like to say.

3.3   Managing the group

There's going to be different things you will have to manage as a group leader, and a lot of it boils down to matching your expectations with the expectations of the group members. Ensuring honesty and understanding cement the collaboration within the group is key - encourage openness about how much each person understands, whether they are enjoying themselves and whether they have any directions they would like the group to explore. Below are a few considerations

- Think about how to monitor progress for different group members. This is easier if they're open and discussing their thoughts on the materials throughout. If someone is being a little more quiet, consider ways to encourage them to find their voice, be that gently during the session by asking for their perspective, or separately outside the sessions. In doing so, be careful of members unintentionally 'tricking you' into thinking they understand the discussion - many students may think it may embarrassing if they appear to not be keeping up, and so try to cover up any lack of understanding during sessions. This is *common*, and the group as a whole should do their best to encourage openness to ensure this does not happen, and no one gets left behind[4].

- Consider how much you expect out from the group members and what level you are pitching at. Participation in the DRP is completely voluntary, but it is difficult to get much out of a reading group if the members (or the group leader themself) is not investing sufficient time and care. Make expectations clear to the group members from the outset, and try to gently reiterate those expectations as you progress. It's very understandable that ambitious students may want to continue in the group even if they are struggling to balance study commitments and are suffering in the group as a result. If this is the case, try to ascertain whether you think the problem can be resolved, and talk to the committee about the situation.

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[3]One thing to be wary of though is that if you do opt for this method (which can be really good!), when it is not the turn of other members, that could discourage them from paying as much attention to that session - try to emphasise how important it is to keep consistency no matter if they are presenting or not.

[4]This is especially key for online sessions where it is more difficult to get a measure of understanding from the screen - if time permits, consider short individual meetings outside the group sessions to check up on everyone

- Try and maintain a balance between maintaining the pace of the group 'giving out answers'. By that, we mean that if a student is struggling with something, rather than giving them a quick answer and moving on, try and provide hints to see whether they can come up with a solution themselves. This is common advice to peer tutors in the department, and all group members will benefit from the experience. You have time outside the sessions to learn things individually - the session are there to go over doubts and problems.

- If different group members come into the group with different ideas and directions, that's great as the group will reap the benefits of diversity; however, it makes the communal learning process more difficult. It is good to encourage individual exploration, but try your best to keep the group as streamlined as possible. This is not only for your benefit, but providing a solid structure with a larger group will help everyone learn from each other a lot better. In doing so, feel comfortable in knowing when to pull in the reigns if you feel the group is going in different opposing directions - this is your group after all, and it's in the interest of the group members to try and look at the same things as much as possible for the discussions. Perhaps the only time you want to actively encourage different directions during the sessions rather than outside towards the end with a view to the colloquium event. If there really is a variety of things people would like to do, consider letting a different group member shape one or two sessions and rotate between (being sure to maintain interest from the other members!).

- Lastly, it's *okay* to say I don't know. This will be the case more so if you're learning alongside, but is also possible if you're teaching the group too. Your job is *not* to be encyclopaedic throughout, rather it's to *guide discussions* and ideas for the group to consider. Encourage other group members to respectfully voice their thoughts if they feel they can help out if you're unsure, that is perfectly fine and we should all welcome that without too much of a sense of hierarchy.

If you do ever feel that you're struggling with guiding the group in the direction you want, or you feel there are disruptive members within your group, reach out to us sooner rather than later - we're here to help.

3.4   Some general thoughts towards guiding group members

Here are a few comments from different professors which I have found particularly useful at different stages. I feel highlighting similar ideas to members of the reading group (and yourself even in using those ideas) could be very useful.

Focusing on narratives

From Marco Guaraco on maintaining narratives in Mathematics for learning and teaching ideas.

This I hope is useful not just for this class, but hopefully for other classes as well. Some of these are going to obvious to you, but hopefully some of these are going to be not so obvious, and then perhaps it's something you can incorporate into the way you are thinking. So remember when you are doing Mathematics, the thing you have to care the most about is creating a narrative to explain your point of view about a problem. So creating a proof is about creating a narrative that explains something, right? So in order to create narratives, we need to have a strong grasp of the story we

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tell, as well as the vocabulary to tell it. So it does matter that you can ask yourself all sorts of questions, so you can have a conversation about the story you wish to tell.

What is the idea?

Being an older student, hopefully you've had a lot of experience with reading and exploring Mathematics independently. Trying to describe best practice is difficult as it'll vary person to person, but some of the best advice I had ever gotten came from Pierre-François Rodriguez - it'd be great to remind your group members of similar I feel as it generalises beyond :

So let me say this first. If I asked you to read the proof in the notes, you would probably all read it and, you know, you're smart and you'll read it, and at some point you would understand it and you would nod your head, and then you'd be done with it. But you see, when you do Mathematics you should never do that. If you do what I said you know, you just read the proof, ideally you agree with it [unless there is a problem of course but then we talk about it], and at some point you agree with the proof. But then you see, when you read a proof, the person who wrote the proof [in that case me], lures you into following their argument. So you know, you agree this implies that, that implies that, that implies this, you get to the bottom of the proof, you agree it's a proof. But if I ask you an hour later to prove to me how this is done probably half of you will not remember what happened.

And what's the problem? The problem is not that you're stupid, it's that you didn't do what you should be doing. When you read a proof, you should always try to identify: what is the idea? So in most proofs, even if it's several pages long, when you have a proof there is typically one good idea. Possibly two. But very rarely more than that. And basically the whole argument is based around the whole idea and makes them rigorous. But when you read a proof in Mathematics [and that's something very important, I see too many students even much more advanced than you guys who somehow still don't quite manage to do this] you always have to be looking for the idea. And once you get the idea you will remember the proof because you will remember the idea and building the argument around it is going to be easy.

Technique

From Marco Guaraco on doing things in the right way when learning a topic for the first time.

Say, I don't know if you play a musical instrument, but if you play a musical instrument or you start playing a sport, and you have a bad technique, you can get away with a lot. But then there is a certain point when you cannot, go further, because you are stuck in a well. So then you have to relearn how to do the activity and that requires climbing outside of this well and continuing on properly. So it's hard.

Going at the right pace

From Davoud Cheraghi on pacing your learning appropriately to deeply understand something, neither rushing nor getting stuck.

So being successful in Analysis only depends on one factor, yes. It depends on how many gears you have, when you think. If you can go at a very slow pace, you will become very successful, yes.

If you really think step by step, then things are rarely difficult, but you should be able to think in this way - it is not easy to think slowly. And that is key, to think slowly.

Translating between intuition and definition

Again from Marco during Analysis I.

I just wrote these questions. The first says, 'Can I remember the definition' and this is literally writing down the definition. You know, 'can I remember, for every epsilon, there exists a delta such that . . . '. Or maybe, do I have a picture of this, so this another question I have or maybe even this is another answer to this question of definition - what does it mean in a soft kind of way. Both are important, and as I always emphasise, we are always in Mathematics jumping between these ways of talking about things which are less formal and more intuitive, to the proof, that is formal. We convert one into the other, and the mathematical practice happens in the intersection of these things.

3.5   Project proposal

We will be asking for each of the group leaders to submit a initial 'project proposal'. This is a lot more informal than it sounds - it's just for us to provide a second opinion on the structure of your reading group before you begin, so we can discuss together what is really good, what we can use from your proposal or other proposals to recommend to others, and what you might be able to change to elevate your group's experience. We have some other checkpoints too throughout the term as outlined in section 1.3, and this is really the first one to make sure you're on the right track - we appreciate the group might take a different direction over time. Below we outline how to structure your proposal[5]. **This should be added to the sharepoint David has sent out here** and titled **<shortcode>_DRP_proposal** . The following should be under different sections in the proposal:

1. Topic outline

   - A relatively brief, low level description of the topic\s you intend to cover during the term
   - This will help us see what everyone is up to, and might be used in group matching alongside the signup form (though we will try to consult you where possible).

2. Project goals

   - A short list of things you would like the group to have achieved by the end of the term in a few sentences each.
   - Try to include a range from achievable goals to stretch goals depending on how things go.

3. Resources

   - A list of resources (e.g. literature, repos, or videos) you can see yourself using throughout *with a short sentence or two on how you intend them.* If two are very similar (e.g. papers on a research area) feel free to group these where possible.

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[5]Note: if you have multiple DRP project ideas, share them all in the same document one under the other. Do try and focus on only a few though

- Try to also provide online links to the *main resources* you intend to use so we can review the types of materials you're using (e.g. GitHub repo, ArXiv link or YT video). Don't feel you have to do this for every resource, focus on the main ones.
- This will indicate whether the material is sufficient to go about the learning, whether you might actually be stretched thin, and whether you could consider a blend of different resources.

4. Indicative prerequisites

- The minimum level of things you expect group members to have done before starting at full pace.
- Once again, note that not having these prerequisites *should not exclude* anyone from the group if sufficiently motivated, rather it should provide something to fall back on if there are clear gaps in knowledge blocking the learning.

5. Possible checkpoints

- This does not have to include a list of dates, rather different things you can refer back to for goal setting.
- This can include things like chapters of a book, a list of papers to have understood, different models you've implemented, different analysis techniques you have tried etc.
- If possible, try to include prerequisites in the resources section, highlighting them so.

6. Possible concerns for the project

- A short list of places you think may be the source of struggle in progressing the group.
- The goal with including this is to recognise what parts of the project might become difficult ahead of time so we can discuss how to resolve them if they do indeed arise as issues
- This can include both mathematical material, or things related to group dynamic if you are uncertain

7. Further comments

- Anything else you would like us to know ahead of time
- This section can left blank or even omitted if you do not have any further comments.

Hopefully this should not be too much - short phrases, bullet points & informal language is perfectly fine (you know who's reading it at the end of the day!). As mentioned, we'll try to share good ideas from these with everyone if you give us permission, as well as provide ideas for how you might be able to modify the proposal ahead of time.

We would really appreciate it if you could try and get this in as soon as possible, preferably before the general deadline for DRP sign-ups. For term 1, 25/26, this is currently **Friday October 24th**. Make sure to let us know any queries about the proposal, if it is too much, or any other thoughts on what we could include.

4 Presentations

We thank the Stanford DRP organisers for their presentation guidelines. What follows is an adaptation of their work here.

4.1 Colloquium event

In previous years, we had an M1R poster type format where different group members had a half an hour slot to present their learning over the term in front of a whiteboard, poster or screen. The audience had freedom to visit different stalls over the period and talk to everyone about their different projects. While the format worked very well, we would like to build on it, and potentially arrange a larger event where participants have the opportunity to present in something more like a shortened Colloquium style before moving to the stall format - this could potentially run over multiple days too.

The colloquium event will be the last DRP event of the term, with as many groups attending as possible, as well as hopefully a lot of people who didn't take part in the DRP too. This is tentatively scheduled for the 2nd to last week of term, but is subject to change.

We would really appreciate if groups took the opportunity to practise or discuss ideas for these presentations at least a little to make sure participants can get the most out of the experience. We've found that many participants can find the prospect of presenting something at the boundary of their knowledge very daunting, particularly when presenting to students of all year groups and people they may have never seen before. The goal of these presentations is to give group members a wider opportunity to present and share their learning, and hopefully build some confidence in talking about the Mathematics they love - the DRP team, the group leaders and all group members are there to support and will you on after all! This is meant to be a low stress environment to share your achievements during the term - I'd really grab the opportunity with both hands!

The talks are capped on time, and there is definitely not enough time to present everything a DRP participant has gone over in a whole term - that's part of the challenge! Instead, participants should think of the presentations as a chance to talk about a small sample of the material they've worked on:

- Consider a narrative you want to illustrate

- Give some basic definitions

- Present one or two interesting examples/models

- Key results and motivations

- What aspects did you particularly enjoy

Prior to the presentations, we'll be asking each presenting group member for a short abstract just so that we can arrange timing suitably.

Please direct any questions about these final presentations to

- Karthik @ karthik.kakarlapudi23@imperial.ac.uk

- Shen @ rohan.shenoy22@imperial.ac.uk cc'ed

4.2   General Presentation advice

Here we present some standard advice about giving a colloquium talk in this format. However, I'd argue the advice also generalises to presenting in group sessions too - some things to bear in mind.

- Start with a quick outline of the talk, what the narrative is, and where the different chapters lie.

- If using slides, presentations, try to keep as uncluttered as possible primarily using them for diagrams and visualisations where possible.

- Don't rush into answering questions as they arise, take a moment or two to consider what it is that the audience member is asking.

- Consider your use of notes. Having some notes is definitely good, but don't be reliant to the extent of just reading off them.

- If writing on a blackboard/whiteboard, you'll probably have to write a lot larger than you first anticipate! Write things out in full where possible rather than short forms. And always begin writing in the top left to give yourself enough space!

- Don't assume knowledge from the audience - it's always better to build up knowledge from the ground up, as even if the audience is experienced it aligns them with your point of view.

- Try to relate what you are talking about to other mathematical objects that the audience might be familiar with or give some applications to relatable things.

- In general, be considerate of your audience, and remember that the purpose of a talk is for those listening to learn something.