

Applying to the US

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Overview

- **Disclaimer:** I am a pure maths student. I believe applied and pure applications are relatively similar, less sure about stats.
- This is the extended version of the talk I gave. It should be a superset of the talk. Main areas fleshed out are:
 - ▶ More specifics on each of the application materials in "Application Requirements".
 - ▶ More fleshing out on actions to take in "Timeline".

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Overview

Overview of a US PhD:

- Typical length: 5-6 years. 4 is rare.
- Funding: Essentially only funded offers exist, funding mostly comes from TA-ships (teaching assistant-ships). Pay is generally a little above cost of living. You will live but don't expect to save much.
- Prerequisite: Equivalent of a US Bachelor's, so AU Bachelor's + Honours. Most domestic applicants have a Bachelor's (Master's programs in maths are rare in US).

Structure

First 1-2 years:

- Main aim: Find an advisor and pass an oral exam.
- Coursework based. Commonly there are core requirements (grad level algebra, analysis, geom/top) or you are required to pass a comprehensive written exam.
- Many interesting deeper courses such as topics courses. Often one takes reading courses to trial advisors.
- Oral exam: Locked in a room with ~ 3 professors and quizzed. A pass indicates competency to start research with a nominated advisor.

Remaining years:

- Do research. Write a thesis. Pass defense.

Throughout:

- Most ($\sim 80\%$, depends) terms: TA. Nominal load is 20 hours/week. Varies in practice, I've heard people get away with about 12.

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Pros (in comparison to UK/EU/AU)

Advantages of US system:

- Flexibility:
 - ▶ You apply to a school, not a specific advisor.
 - ▶ No specific topic or advisor preference is required in advance. The vast majority of applicants have vague preferences only, many later switch.
 - ▶ You get to trial advisors.
- More comprehensive training: The US system ensures you are conversant in the main areas of mathematics.
In certain areas with deep background the extended length of training is especially valuable.
- You get extra time before going on the job market.

Cons (in comparison to UK/EU/AU)

Disadvantages of US system:

- Length: If you already know what you want to do the extra delay can be frustrating.
Similarly if you prefer research or dislike coursework.
In the span of a US PhD you might have already finished a EU/UK/AU PhD and postdoc.
- More compulsory teaching duties.

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Application Requirements

Nearly compulsory (in a typical year):

- GRE General Test: General skills test.
- GRE Mathematics Subject Test: Non-trivial test of undergrad material.
- Statement of Purpose: ≤ 2 pages on why you are applying and are a good candidate.
- Academic Transcript.
- CV: summary of relevant and good stuffs.
- ≥ 3 Letters of Recommendation: 3 references, generally professors, write candid letters of their opinions of you.

Sometimes required:

- List of courses taken: with descriptions.
- Diversity/Personal statement: how you will contribute to diversity.

GRE General Test

- Offered year-round. Easy to book. Costs \sim \$200 to take. \sim 4 hours total.
- Visit a testing lab where you do it on a computer, or at home with ProctorU.
- 3 parts: Verbal (Comprehension) / Mathematics (high school maths) / Analytical Writing (30 minutes, \sim 600 words).
- Practice: You get free practice tests upon booking and all writing prompts are online.
I did about 2 of each as practice.
- Importance: low. Aim for decent in V and M. You can retake.

GRE Mathematics Subject Test

- Offered 3 times/year max: Apr, Sep, Oct. See [dates](#). Multiple choice, 66 questions, 170 minutes.
- Registration opens around July 1st. Last year there was only a single opportunity in Sydney. Though it probably won't fill immediately, try to book asap. If it fills up you may have to fly interstate/NZ.
- Content: See [here](#). About:
 - ▶ 50%: Calculus, including basic ODEs and several variable.
 - ▶ 25%: Algebra, mostly linear algebra, some basic abstract algebra and number theory.
 - ▶ 25%: "Additional", all undergrad difficulty, possibilities: real analysis, discrete mathematics, topology, complex analysis, probability, geometry (Euclidean). Most of these will have at most 3 questions.
- Don't mistake "advanced"-ness for difficulty. There will always be difficult calculus questions.

GRE Mathematics Subject Test

Advice:

- Practice computations. Time yourself, there is significant time pressure.
- Many people find the actual test more difficult than the practice ones.

Practice resources:

- [Chicago bootcamp](#) contains a relatively comprehensive list of available resources and a guide. Read the guide first.
- [MathSub](#) has useful stuff too.
- The Princeton Review book (Cracking the GRE Mathematics Subject Test) is a good overview.

GRE Mathematics Subject Test

Test advice:

- Most people ($\gtrsim 90\%$) do not finish. You get 2.5 minutes per question, you will likely have to skip.
- The questions are in some kind of difficulty order, but still be willing to skip.
- Kind of fun. More akin to HSC / first year tests: a lot of calculation, not enough time, many questions have small tricks to speed them up.
- Importance (heresay): depends. Lower in applied and stats. I have heard > 80 -th percentile is good, > 90 -th percentile is excellent and beyond this it is not very important. Definitely not the end-all be-all.
- Scores take 3-4 weeks to get back. This means you will not have results from the September test before having to decide if you want to do the October test.

Statement of Purpose

- ≤ 2 pages convincing them why you want to do a PhD, what makes you qualified and why their institution.
- The literal prompt is not too important (though do read it). I used the same Statement of Purpose for all unis with some customization if you wish.
- Importance: depends. I have heard some professors say they virtually ignore it, others have said they use it to get a sense of the applicant. More important if you have unusual circumstances.

Statement of Purpose

A good basic structure:

- Why you want to do a PhD.
- Positive points in favour of your application: What have you done that you think signals you might succeed in a PhD?
- What you are interested in and future plans. For the US, this does not have to be super concrete.

Some advice:

- Write in formal prose with a neutral tone. E.g: refer to professors by Prof. LastName.
- Be direct. Don't be cliché. Keep it as factual as possible.
- If you have or had any unusual circumstances you can include a brief explanation. Keep it brief.
- You can customize for different places if it makes sense. However it is not strictly necessary.
- Leave time for someone to proofread. Preferably both by someone who is a decent writer and a mathematical advisor.

Statement of Purpose

Potentially useful links:

- [Collection of some actual prompts.](#)
- [Some actual statements: 1 2](#) (latter has some advice too).
- [Advice from some US professors:](#)
 - ▶ [Excellent long guide.](#)
 - ▶ [Perspective from admissions committee members. 2.](#)

Academic Transcript

- Scanned official transcripts covering all higher education you have done. Include the grading scale (usually on the back of the last page).
- Scan should be enough for applying.
2 places I applied to said they wanted official mailed copies but when I inquired they said scans suffices.

CV

Stay objective and brief. I included:

- Name, email, DOB.
- Summary of education attained.
- Academic awards and scholarships.
- Relevant competitions (if you have any).
- Papers and preprints (if you have any). Brief abstract of each, links if available.
- Research talks (if you have any). Brief context of each, I also uploaded my slides to GitHub and linked them.
- Courses. I put a comma separated list of grad level courses and my ranks/marks, as well as explanations of any project courses on my transcript.
- Seminars/reading programs attended (e.g: AMSI, reading courses, seminar series).
- TA experience (if you have any). Brief summary of each.
- Other relevant work experience/volunteering.
- Internships/Jobs.

Letters of Recommendation

- You pick ≥ 3 referees, usually academics, to write a candid opinion of you and why you should be admitted.
- Candid since they will be asked directly and you should never see your own letters. In each application you will be asked whether you would like to waive the right to see your letters. **Always** waive.
- Importance: high.

Letters of Recommendation

- A strong letter is one from someone who knows you well in a mathematical context, thinks positively of you and is willing to go into details.
- Select first for personal familiarity in a context most similar to mathematical research. Then eminence matters somewhat. Whether your referees have a connection with a specific university can also matter.
- When you request a letter, ask explicitly if they will write a strong letter. It is worth also asking which places they think you have a good shot of getting into.
- When requesting a letter you can mention some things you'd like in your letter. But don't be overbearing.
- If they accept send them any supporting material they might need (e.g: list of schools, other recommenders, CV, SoP, transcript).

List of Courses Taken

Sometimes required, sometimes optional. Most applications accept additional documents so you can usually attach it if you want to.

- Include: Course code, name, institution, description (1-2 sentence summary like in handbook), books/reference material used, lecturer, grade, rank (if available).
- Since different universities want different information I made mine in Latex with macros to easily hide fields.

Diversity Statement

Occasionally requested, I think always optionally.

- Write something if you naturally can but, personally, I wouldn't force it if you can't.

Other Sources of Funding

2 major sources:

- Fulbright Scholarship (for incoming international students to the US).
- Monash Scholarship (for outgoing international students from AU).
- Nice but rare and not critical.

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Rough Timeline

(dates included are latest possible. The earlier the better)

- Now: Start thinking about your strategy. What are you interested in, what schools, who might write your letters?
- July 1st- (*asap*): Book GRE Subject Mathematics test.
- September - October: Prepare for the GRE subject test. Sit the GRE general test.
- October (likely): Sit the GRE subject test.
- October - November: Catalogue requirements for each uni. Write and get feedback for your SoP. Request an academic transcript to be sent to you. Fill in as much as you can for each application.
- ≥ 2 , preferably ≥ 4 weeks before deadlines: Ask for letters.
- December - January: Apply. Most common due date is 15th December. Earliest I've seen is 1st December.
- January - April 15th: Receive decisions. Possibly schedule some visits and calls.

Now: Strategize

- Figure out what you are interested in and what your strengths are.
- What schools might you apply to?
 - ▶ General advice I've heard is to have 4 categories: dream/reach/match/safety and ~ 10 schools total, if feasible.
 - ▶ Each application will cost ~ 140 USD total (a few are much cheaper though).
 - ▶ A topic match isn't critical in the US. However, universities have strengths in different areas. Some universities are very strong in specific areas. These can make good match/safety options.
 - ▶ Create a spreadsheet, *make sure* you record deadlines correctly. Record any special info about the uni (e.g: is there a specific professor I'm really interested in).
- Who might write your letters?
 - ▶ You might still be able to improve them by making yourself more noticeable to a professor.
 - ▶ Probably your honours advisor should write a letter. Make sure they are aware of what you are working on on a regular basis.

December-January: Apply

- Start earlier than the deadline. You can not fill 10 applications in a day.
- To provide letters you enter your references' emails and a letter will be requested from them directly. *Always* waive your rights to see the letters.
- For universities requiring GREs you pay ETS to physically send the scores to each university. This costs 27 USD per university and takes about 5 business days.
- Some universities require supporting material (GREs + letters) by the application deadline, others have leniency. Record these.
- In the week after each application double check letters and GRE scores have been received. Follow up on letters if need be.

January-April 15th: Receive Decisions

- Decisions will trickle in during this period. For me the majority came in end of Jan - mid Feb.
- A few universities interview. I had 2, neither were technical.
- This period will likely be stressful. It was very stressful for me. Try not to beat yourself up too much over your results. Each university weighs applications in some different opaque way. There are many reasons you might not get an offer that are unrelated to your application. E.g:
 - ▶ Some universities have a quota on international students.
 - ▶ There may also be quotas on applicants in a subject area.
 - ▶ Some professors you are interested in might be planning to leave.

Applications are a crapshoot. I got rejected from some places I thought I had a much better chance at than the place I ended up accepting.

January-April 15th: Deciding

If you are in the fortunate position that you have multiple offers, some things to look out for:

- Talk to students at each university. Away from professors most students are willing to be candid about their experiences.
- You should have an idea who your potential supervisors are from each place. It is good to arrange chats with them. It is important to also talk to their students.
- Many places offer reimbursement for a visit and allow you to schedule your own visit dates. You can subsidize your flight costs by arranging multiple visits in one trip.