Hi all! This is a Google Doc where we will track readings and the schedule for the formal math reading group.

Papers

For now, **please find at least two relevant papers you're interested in and add them to the list below** (using the "suggest edit" functionality, which you'll have access to if you're in the class). We will do this on **August 26th,** so if you are unable to attend class, please do this on your own time. Listing a paper here is not a commitment, it is just a way of giving us a list of potential readings to choose from. Suggested can be new or old, and can even be book chapters or something similar. I'll start the list off with a few I find interesting.

> **Not sure where to find papers to suggest?** Here is a list I helped make for a National Academies AI for Math workshop that includes many resources, some of which are relevant to this class (note that the document has an AI focus while this class does not, though AI for formal math is one topic we may cover). Looking into the recent history of linked venues in that document (for example, CPP, ITP, JMM, and IPAM) may be a good start. Lecture notes, book chapters, tutorials, and slides are also welcome suggestions. Since this is a particularly niche intersection of topics, the occasional blog post or software artifact is also welcome. For example, you can probably find some good relevant posts in Terry Tao's blog, or you can also just dive into a particular part of Mathlib. Google Scholar is good for a general keyword search. Some of the survey papers linked to below may also be good sources of papers.

Lectures, Books, and Background Knowledge

- **Proof Assistant Books**
  - Software Foundations series
  - Certified Programming with Dependent Types (Rocq, 2013)
  - Concrete Semantics (Isabelle 2014)
  - Logic and Mechanized Reasoning (Lean, Jeremy Avigad, Marijn Heule and Wojciech Nawrocki, in progress)
  - Theorem Proving in Lean 4 (Lean, Jeremy Avigad, Leonardo de Moura, Soonho Kong and Sebastian Ullrich)
  - The Mechanics of Proof (Lean, Heather Macbeth, 2023).

    - How To Prove It With Lean (Lean, Daniel Velleman, 2023)
- **Formal Mathematic Background**
    - AMS Special Issue on Formal Proof (2008)
    - Mathematical Components book (Rocq, Mahboubi & Tassi, 2022)
    - Mathematics in Lean (Lean, Jeremy Avigad and Patrick Massot, in progress)
    - Mathematics and the Formal Turn (survey paper by Avigad)
    - Why formalize mathematics? (survey paper by Massot)
- **Tutorials**
    - Natural Number Game (Lean)
    - Lean Game Server (several games for learning Lean)
    - Homotopy Type Theory Game (Cubical Agda)
    - Isabelle/HOL tutorial
    - HOL4 tutorials and guidebooks
    - Lean for the Curious Mathematician workshop materials and recordings: 2020, 2022, 2023, 2024
    - Learning Lean community webpage
    - Terry Tao's Lean phrasebook
    - A publicly editable list of formalized concepts in Lean
    - List of Lean tactics
- **Course Materials**
    - Proof Automation by Talia Ringer
    - Formalising Mathematics by Kevin Buzzard
    - Software Foundations course at Penn
    - Programming language foundations in Agda by Philip Wadler
    - Lean for teaching stream on the Lean Zulip and courses webpage
    - Concrete Semantics by Nipkow and Klein
    - Introduction to Homotopy Type Theory by Egbert Rijke
    - HoTTEST summer school - homotopy type theory and formalization in Agda
- **Uncategorized**
    - Your stuff goes here

Research Papers

- **Proof Developments**
    - Formalizing colimits in Cat (Carneiro and Riehl, ITP 2025)
    - Formalising New Mathematics in Isabelle: Diagonal Ramsey (Paulson, ITP 2025)
    - Formal Proof—The Four-Color Theorem (Gonthier, AMS Notices 2008)
- **Uncategorized**
    - Your stuff goes here

Blog Posts, Opinion Pieces, and Personal Experiences

- **Uncategorized**
  - QED Manifesto (manifesto, 1994) (2014 follow-up)
  - Machine assisted proof, Tao
  - Formalising Mathematics – in Praxis; A Mathematician's First Experiences with Isabelle/HOL and the Why and How of Getting Started, Koutsoukou-Argyraki
  - Formalization and Automated Reasoning: A Personal and Historical Perspective, John Harrison, 2023
  - Proofs and Conversations, Talia Ringer, AMS Early Career Notice, 2024
  - Your stuff goes here

Schedule

This is where we will update the schedule based on chosen papers and presentation groups. We will carry out this process on **August 28th**. To get full credit for the course, everyone who is enrolled in the class officially must sign up to **co-lead at least 2 papers**, and to **co-assist at least 4 papers.** Folks who are auditing can also sign up to lead and assist if they feel like it, but are not required to.

Leaders must be ready to present a short summary (10-15 minute presentation) of the paper and drive the discussion; **assistants** must be committed to fully reading the paper and participating in the discussion. **Everyone else** is encouraged to read the paper, but can come and join the discussion even if they only have time to skim the abstract, introduction, and conclusion (please do at least this).

Date	Paper	Leaders	Assistants
Aug. 26th	N/A; we will spend this day finding papers to add to the list above. I will also introduce the reading group and format, and ask for thoughts. **Homework due Aug. 28th:** Skim abstracts for papers in the list above, think about which ones you might want to present. Write down any words (or phrases) from the abstracts you don't know, and stick them in a comment here.	Talia Ringer	N/A
Aug. 28th	N/A; we will spend this day forming groups and filling out this schedule. **Homework due Sep. 2nd:** (1) add yourself to the schedule to make sure you're **co-leading** at least **two**	Talia Ringer	N/A

	papers and **co-assisting** at least **four** papers (2) read the paper		
Sep. 2nd	**Background Mini-Lecture:** Motivations **More Coming Soon**	Talia Ringer	N/A
Sep. 4th	**Background Mini-Lecture:** Formal Proof **More Coming Soon**	Talia Ringer	N/A
Sep. 9th	**Coming Soon**		
Sep. 11th	**Coming Soon**		
Sep. 16th	No class; rest Talia will be away at a very relevant Mechanization & Mathematical Research workshop	N/A	N/A
Sep. 18th	No class; rest Talia will be away at a very relevant Mechanization & Mathematical Research workshop	N/A	N/A
Sep. 23rd	**Workshop Debrief**	Talia Ringer	N/A
Sep. 25th	**Coming Soon**		
Sep. 30th	**Coming Soon**		
Oct. 2nd	**Coming Soon**		
Oct. 7th	**Coming Soon**		
Oct. 9th	**Coming Soon**		
Oct. 14th	**Coming Soon**		
Oct. 16th	No class; rest Office hours in my office (Siebel 4218) during class time for anyone who wants to catch up on background or discuss material	N/A	N/A
Oct. 21st	**Background Mini-Lecture:**	Talia Ringer	N/A

	Coming Soon **More Coming Soon**		
Oct. 23rd	**Background Mini-Lecture: Coming Soon** **More Coming Soon**	Talia Ringer	N/A
Oct. 28th	**Coming Soon**		
Nov. 4th	**Coming Soon**		
Nov. 6th	**Coming Soon**		
Nov. 11th	**Coming Soon**		
Nov. 13th	**Coming Soon** **Homework Due Nov. 18th:** Write a paragraph research idea for the collaborative project and add it to the appropriate section of this document.		
Nov. 18th	**Coming Soon** **Homework Due Nov. 20th:** Read over other people's research ideas and think about the ones you like.		
Nov. 20th	**Coming Soon** **End of Class:** Vote on your three favorite research ideas. We will choose the one that the most people are interested in, and begin planning after fall break.		
Nov. 25th	No class; fall break	N/A	N/A
Nov. 27th	No class; fall break	N/A	N/A
Dec. 2nd	**Collaborative Project Planning**	Talia Ringer	Everyone
Dec. 4th	**Collaborative Project Part 1**	Talia Ringer	Everyone
Dec. 9th	**Collaborative Project Part 2**	Talia Ringer	Everyone

Collaborative Project

The last three days of class will center a formal-math-related collaborative project that we will all do together as a class. This could be everything from building a productivity tool to writing documentation to building a dataset to formalizing new mathematics. Each person will propose one idea for this project below. We will vote together as a class for our favorite, and then we will plan and work on it during the last three days of class. I will join and work on it with you!

Note that we only have a few days of class time to work on this; it is OK to think of this as more of a hackathon or rapid prototyping group project than something which must be polished. If we are happy with the direction the project takes, continuing the project beyond the semester (e.g., for eventual publication) may be possible for those who are interested.

If you cannot attend class during any of the project dates, please let me know ahead of time, and we will plan for asynchronous participation. If you are sick that week or absent for any other reason but do not know ahead of time, please do let me know, and I will accommodate.

Project Ideas

- Your ideas go here

Grading

Grading for this class is participation-based, with the following breakdown:

- Co-lead two papers: 40% (20% each)
- Co-assist four papers: 40% (10% each)
- Propose a research idea for the collaborative project: 5%
- Participate in the collaborative project: 15%

Auditing is welcome! Both officially and unofficially. Auditors are not required to do anything in particular, though they may also co-lead, co-assist, and help with the project should they wish.