

JEREMY R. MANNING, PH.D.

LAB MANUAL

CONTEXTUAL DYNAMICS LAB, DARTMOUTH COLLEGE



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Introduction

This lab manual is intended to provide a crash course in doing research in the Contextual Dynamics Lab. It describes your rights and responsibilities as a member of the lab. The manual also introduces our general research approach and lab policies.

WHO IS THIS LAB MANUAL FOR?

Every new lab member should read the latest version of this lab manual in detail and reference it later as needed. Periodically throughout the document, you will see margin notes with listed TASK items. Completing your read through entails: (a) reading the contents of the manual, (b) asking current lab members about any confusing aspects, and (c) completing the relevant TASK items. You will also see non-task NOTE items; these provide helpful tips and additional commentary on the nearby text.

This lab manual is meant to be a "living document." All lab members are welcome (and encouraged!) to submit edits that improve the content, clarity, and overall helpfulness of this document at any point throughout their tenure in the lab.

WHAT SHOULD YOU DO IF YOU DON'T UNDERSTAND SOMETHING?

If you don't understand something you read in this manual, it is important that you *ask another lab member for help*. Every member of the lab brings their own unique knowledge base, training, life experiences, and perspectives. Respecting and celebrating those differences drives the science we do. If you're new to the lab or new to a particular technique, you might feel like a newbie today—but chances are good that if you stick around for a bit someone else will be seeking your expert opinion before you know it. In addition to learning, there's another good reason for asking for help: if you don't understand something, there's a reasonable chance that you've discovered a mistake or a logical inconsistency!

WHY IS IT WORTH MY TIME TO READ THROUGH THE MANUAL?

Aside from pursuing your own curiosity, a major reason that you've

TASK: Upon reading through this lab manual for the first time, please make at least one edit. You could correct a typo, clarify something that's unclear, add a comment, etc. Also add (or comment on) an issue via the [GitHub issues page](#); you can use the existing issues to help decide what to focus on for own edits if you'd like. Importantly, be sure to fork the [GitHub repository](#), make your edits on your personal fork, and submit a pull request with your edits so that everyone can benefit.

TASK: If you haven't used \LaTeX before (i.e., the document formatting language in which this manual is written), you'll want to [download \$\LaTeX\$](#) and take a look at [this "quick start" tutorial](#).

TASK: When you are done reading this manual and carrying out all required tasks, please fill out the signature page, sign it (electronically), and email a PDF (of just the signature page) to contextualdynamics@gmail.com. **You are not an official lab member until you have completed all tasks in this manual and receipt of your signed and filled-out signature page is acknowledged by Jeremy or Paxton.**

decided to join an academic research lab is probably because you want to gain training or career-advancing experiences. This manual briefly summarizes the collective wisdom of past and present lab members in a way that we think will best allow you to achieve your objectives. *Learn from it, challenge it, and add to it.*

WHAT “ISN’T” THIS LAB MANUAL?

This lab manual is *not* intended to provide a comprehensive overview of everything you need to know to do your research projects. As described next, you may not even *know* what you need to know to do your projects! Nevertheless, you need somewhere to start, and this is that place.

We also maintain a repository of [lab tutorials](#) that provide guidance on specific tasks. If you are looking for help on a particular task (or understanding a particular concept) that isn’t covered by the existing set of tutorials, please consider contributing a tutorial of your own once you’ve figured things out!

If you encounter an error or problem you don’t know how to fix, try checking the [ask a question, answer a question](#) section, where we maintain a log of common problems lab members run into and solutions. If you don’t see a solution to your question there, consider adding the question so that you or someone else can later add the answer for future readers!

Bill of rights and responsibilities

As a member of the Contextual Dynamics Lab, you are entitled to certain rights, and you agree to take on certain responsibilities.

TASK: Read [this letter](#) about defining and characterizing boundaries between lab members and noticing unhealthy norms.

YOUR RIGHTS AS A LAB MEMBER

1. You are entitled to a safe work environment free from harassment, abuse, violence, and discrimination in any form.
2. You are entitled to be supported and respected by all lab members.
3. You are entitled to openly share your scientific ideas and constructive feedback with all lab members.
4. You are entitled to appropriate credit (e.g. authorship, acknowledgement, letter of recommendation) for your work and ideas.

YOUR RESPONSIBILITIES AS A LAB MEMBER

1. You agree to contribute to a safe work environment and to refrain from behaviors that harass, abuse, expose to violence, or discriminate.
2. You agree to support and respect all lab members, including yourself.
3. You agree to openly share your scientific ideas and constructive feedback with other lab members.
4. You agree to clearly communicate and document your contributions to each research project (e.g. through GitHub commits, reports, updates on Slack, etc.).
5. You agree to establish open lines of communication between yourself and other lab members, and to address concerns or issues promptly and directly with the relevant parties (to the extent that you feel safe doing so).
6. You agree to carry out your work with integrity and diligence, adhering to the highest possible standards of scientific excellence.

7. You agree to utilize lab resources (including equipment, money, time, etc.) responsibly and sustainably.
8. You agree to maintain a clean workspace free from clutter, including both personal spaces (e.g. desks) and shared areas (couch, sink, testing rooms, etc.).

RECOURSE

If you feel your rights as a lab member have been, or are in danger of being, violated, it is your duty to report those violations to a senior staff member (e.g. Jeremy, Department Chair, Deans, polices, Title IX coordinator, ombudsman, etc.). Similarly, if you notice others endangering others' rights, or neglecting their responsibilities, it is your duty to report those violations to a senior staff member.

Official lab practices and policies

Our lab's practices and policies are intended to provide a framework for *maximizing efficiency*. Achieving our peak efficiency as a lab means we are being as scientifically productive as possible, in terms of knowledge discovery (learning new stuff) and dissemination (papers, talks, conference presentations, publicly released datasets, software, etc.). It also means that our fellow lab members are achieving their training and career objectives. To achieve peak efficiency, we need to succeed on three fronts:

- **Communication.** We want to foster an environment where everyone feels comfortable contributing to the collective dialogue. Our lab meets regularly to discuss logistical (e.g. scheduling, financial, sociological) and technical issues. We also use a variety of software packages to synchronize and facilitate communication within our lab and between our lab and the broader scientific community.
- **Resource allocation.** Our lab resources (e.g. equipment, time, money, attention) are finite. We want to foster an environment where lab resources are used as efficiently as possible to achieve our collective goals. We also want to foster sustainable use of resources by regularly pursuing research funding opportunities.
- **Adaptability.** The whole point of *research* is that we don't already know the answers to the questions we're exploring or how to create the tools we're working on. That means that we won't necessarily be able to plan out everything in advance. We often need to be focused and efficient *without knowing the end goal!*

Your job as a contributing lab member is to help us to achieve our collective peak efficiency (as a lab) while also maximizing your own training and career potential. To do this, the Contextual Dynamics Lab practices **agile research**, as described in the next section.

DOING AGILE RESEARCH

The agile approach to research we use in the Contextual Dynamics Lab is inspired by the [Agile Movement](#) in the software development

world. The idea is to create learning, adaptable teams to work on very small bite-sized tasks. Specifically, project teams are designed to respond to unpredictability in research through incremental, iterative work “sprints.” Each sprint lasts approximately 1–2 weeks, and results in a demonstrable research product (e.g. a draft of a paper, a draft of a grant, a completed analysis or figure, a poster, a software tool, etc.).

This is different from traditional approaches that you may have encountered in other labs or work environments, where a research team might try to plan out every part of a project in advance in a series of small steps. We still try to break projects into tiny bite-sized chunks, but the key insight of the agile approach is that we only need to know what the *next* chunk is, rather than attempting to forecast out over an extended timeline. Although it’s often helpful to have a general (if vague) sense of where things are going, we never actually need to know where the project will ultimately end up. The goals and process are constantly evolving. Perhaps the best justification for this approach is that **the first day of a new research project is when you’re the most clueless about what you’ll find**. So how could that possibly be the ideal time to plan out the entire project?

Our [agile research manifesto](#) has three key tenets:

NOTE: Our adapted approach also draws inspiration from [this blog](#).

1. Value **individuals and interactions** over *processes and tools*. To be clear, processes and tools are important. But we must always keep the user or consumer in mind. In practice this means that a simpler (but potentially less comprehensive) tool or approach may be preferable in that it could be easier for a reader or user to make sense of.
2. Value **working, intuitive, tools and research products** over *comprehensive documentation*. Documentation is important! But if our research products are designed in an intuitive way, they can (in some sense) serve as their own documentation. An intuitive tool or research product with decent documentation is always preferable to a unintuitive tool or research product with comprehensive documentation.
3. Value **responding to change** over *following a plan*. Each new step of the research process brings new insights and potentially uncovers mistakes or inefficiencies. Those discoveries may imply that a new direction is better than a previously planned one. These are opportunities that should be leveraged and embraced as part of the scientific process.

While there is value to the *italicized* items, we value **bolded** items more. There are [twelve principles](#) we use to achieve these tenets:

1. Our highest priority is to benefit the research community through the early and continuous delivery of scientific outputs (ideas, presentations, papers, tutorials, tools, devices, etc.).
2. We welcome changing goals and requirements, even late in the process. Doing awesome science means keeping an open mind. Your original goals and plans may no longer apply as your project progresses. Your original hypotheses may be proven false. Your assumptions may be incompatible with your data. Learn from these challenges and grow with them. Avoid getting “stuck” by refusing to change, and allow your questions to follow where your data leads, rather than be constrained by your initial ideas.
3. We deliver research products frequently, from a couple of weeks to a couple of months, with a preference for shorter timescales. Before you have a concrete manifestation of your work (a figure, a statistic, a presentation, a paper draft, a dataset, a GitHub commit, etc.) you have nothing you can show the world for your efforts. Produce research products, even if they’re small and seemingly insignificant, as often as possible. You can always improve on an already produced research product.
4. The product itself (software, paper, poster, presentation, grant) is the primary measure of progress. Before you’ve incorporated your latest efforts into a shareable or communicable research product, it (effectively) doesn’t exist.
5. Continuous attention to technical excellence and good design enhances agility. Getting research products out regularly requires avoiding the temptation of aiming for perfection. Nevertheless, there are often several almost-as-efficient ways to accomplishing tasks that vary in their design quality. For example, consider whether the solution to a problem you’re working on might also apply to other similar problems in the lab (that you or others are working on or have discussed). Can you make your solution general enough to cover those cases? Or, after completing a draft of a research product, you will likely have some insights into alternative (potentially better) approaches. Can you tweak the product to leverage those insights?
6. Simplicity—the art of maximizing the amount of work not done—is essential. Keep in mind the scope of your task. What’s the minimum viable set of accomplishments that will allow you to complete that task? Get those done first and “release” your product (e.g. commit to GitHub, share via Slack, etc.). You can always define a new set of goals for your next task centered around extending your just-released research product. This will help to

avoid aimless drift, whereby you spend large amounts of time on tasks that are, in retrospect, tangential to the main scope of work.

7. Aim to get some amount of work done *every single day* on your project. Commit your changes to GitHub, or document your progress in Slack or a Google Doc. Maintain careful records and logs so that someone can pick up your work in the future (and that future someone might be you!). Remember that your greatest ally is your past self, but they'll never respond to email or Slack messages! Help "future you" maintain peak efficiency through slow and steady, well-documented work. (Note: don't spend *too* much time on documentation; e.g. GitHub commits are themselves often sufficient for documentation, since one can always compare different versions of a particular file.)
8. Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done. Each day, ask yourself: "am I motivated to do my best work on my project today?" If the answer is "no," try to understand why. Is it lack of resources? Lack of support? Distractions? Ambiguous goals or research directions? Talk to your fellow lab members and see how they'd approach the challenges you're facing.
9. The best architectures, requirements, and designs emerge from self-organizing teams. Have you been chatting with a fellow lab member and you're excited about what they're working on? Or do you have ideas for building on that work? Or has a new potential team project emerged from a spontaneous conversation? Think about how you can leverage these opportunities into research products that you're excited to work on!
10. The most effective and efficient method of conveying information within a research team is face-to-face conversation. We use the [CDL Google calendar](#) to coordinate formal meetings between lab members. You can also sign up for meetings with Jeremy via [You-CanBook.Me](#). We also use Slack to coordinate, share notes/data, etc., but the ideal form of communication in the lab is face-to-face (and it often involves a whiteboard).
11. Agile research is sustainable research. Researchers should be able to maintain a constant pace indefinitely. To be sure, we sometimes have crunch times where we absolutely must meet a deadline (e.g. a grant submission, project milestone, etc.). However, it is far more efficient to make steady progress over an extended timeframe than to fluctuate between periods of high and low productivity.

By distributing your workload you'll help yourself avoid burnout, preserve your mental and physical health, and allow yourself time to "step back" and think about the big picture (effectively getting stuff done between your work sessions!). Sustainable work habits also promote good communication and coordination between project team members.

12. At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly. At minimum, all active lab members need to reflect on their projects once each week in your *Weekly Snippet* (defined below). In addition, you should **schedule** a 30 minute meeting with Jeremy at the beginning and end of each term to discuss:

- What your goals are for the upcoming term (start-of-term meetings), or what you worked on over the prior term and how well you feel you met your goals (end-of-term meetings)
- Reflections on how things are going in the lab (you will report how things have been going from your perspective, and will receive feedback about how things have been going from Jeremy's perspective).
- Insights you've come to regarding how we can (for your project, as a lab, as a department, etc.) further optimize efficiency or otherwise improve our work environment.
- Any other issues, comments, questions, or concerns that you'd like to check in about.

PAPERS

Research papers are the primary research output of our lab. Publications are the "currency of academia," in that they are central to career advancement. With each allocation of lab resources (equipment, money, time) we should be asking ourselves how this contributes to a paper.

General procedure

All lab papers should be coordinated with Jeremy. A paper starts with a discussion of:

1. What the paper is going to be about
2. What the key results are
3. What the overall "story" is
4. The current status of various components of the project (e.g. data collection, analyses, figures, interpretation, literature review, etc.)

5. Who is a potential candidate for authorship on the paper

We draft papers in \LaTeX , either on GitHub or on [Overleaf](#) (an online platform that supports text editing and compiling PDFs in the browser). Progress should be shared regularly via Slack.

Authorship guidelines

The Contextual Dynamics Lab follows the [NIH Guidelines for Authorship](#) in considering whether your contribution to a project merits authorship on the paper. If you have made a non-trivial contribution to a project but did not meet the requirements for authorship, you will instead receive a citation in the acknowledgements section of the paper. In general, you likely meet the requirements for authorship if you contributed in any of the following ways:

1. Drafted the manuscript (this warrants first authorship)
2. Came up with the idea or made other substantial intellectual contributions that meaningfully shaped the trajectory of the project
3. Carried out an original experimental study (e.g. that you designed or implemented)
4. Carried out non-trivial data analyses (e.g. more complicated than t -tests)
5. Contributed novel tools or resources to the project that haven't been published yet.

You are unlikely to meet the requirements for authorship if your contributions were limited to the following:

1. Running experimental participants for an already-designed and coded-up study
2. Running trivial data analyses (e.g. t -tests or similar)
3. Getting trained by one of the other project members on a project-related task
4. Training another project member on a project-related task
5. Sharing already-published tools or resources.
6. Editing or commenting on a draft of the manuscript.

The final determination for who will be an author on each lab paper (and in what order) will be made by Jeremy, following open discussions with project team members.

TASK: review the [NIH Guidelines for Authorship](#).

NOTE: Conference posters and abstracts generally have substantially less stringent authorship requirements than formal papers. The general rule of thumb for posters is that all project team members should be co-authors.

MAKING MISTAKES

The work we do is complicated, and mistakes happen. When you notice a mistake (a bug, misinterpretation, mislabeling, or any other error), it is critical that you report the mistake immediately. Whereas mistakes are unavoidable in science, negative impacts can be minimized by fostering a workplace where reporting mistakes is celebrated and accepted as part of the natural course of getting things done. Mistakes are opportunities to learn and grow, and identifying or noticing mistakes should be celebrated as part of our growth as scientists. However, real harm can come from failing to report mistakes soon enough. There is a Chinese proverb that says “the best time to plant a tree was 20 years ago; the second best time is now.” Analogously, the best time to identify and correct a mistake may have been in the past– but the second best time is right now!

Example scenarios (not an exhaustive list):

1. You’ve shared a figure, statistic, or other result, and you’ve realized there’s a bug in your code.
2. You tried to collect some data and the experiment crashed or yielded corrupted data.
3. You’re re-reading a paper that you shared, and you notice a mistake or typo.
4. You made a plan with your project team and you realized it’s flawed in some way, or that there’s potentially a better solution or approach.
5. You released a software package and you’ve found a bug or error.

Appropriate actions for each of the above scenarios (this should happen immediately after you notice the mistake):

1. Double check, to the best of your ability, that the mistake is real. This may involve checking over code, rebooting a computer and restarting an experiment, re-reading reference text, etc.
2. Create a GitHub issue describing the problem. Provide information about how to reproduce the problem (if applicable), the expected behavior, and the observed behavior. Also provide any relevant system or environment information that may be necessary for reproducing the problem (e.g. details of the computing environment).
3. Coordinate over Slack with your project team to formulate an action plan.

4. Ask other lab members for help if the course of action isn't clear.
Also try Google and/or Stack Exchange.

If you think you might have caught a mistake but aren't sure, consult with another lab member! It never hurts to be safe!

PROJECT ROLES

Every project has four possible roles. You will play one or more of these roles on your project:

1. **Project Owner.** This is the person responsible for maximizing "return on investment" of the project effort. The project owner:
 - (a) Is responsible for project vision
 - (b) Constantly re-prioritizes the research backlog, adjusting any long-term expectations such as publication and release plans
 - (c) Acts as the final arbiter of requirements questions
 - (d) Accepts or rejects each project increment
 - (e) Decides whether to publish/ship the project
 - (f) Decides whether to continue development
 - (g) Considers interests of funding bodies (e.g. NIH, NSF, DARPA, private organizations) and the scientific community
 - (h) May contribute as a team member
 - (i) Has a leadership role
 - (j) Will usually be Jeremy
2. **Team Member.** Team members are responsible for carrying out the project work. Team members:
 - (a) Are cross-functional: includes members with development skills (write code or papers/grants), testing skills (e.g. data collection, test software, proofread papers/grants), and/or domain expertise (e.g. knowledge or interest in a relevant research area)
 - (b) Are self-organizing and self-managing without externally assigned roles
 - (c) Negotiate commitments with the Project Owner, one "sprint" at a time
 - (d) Have autonomy regarding how to reach commitments
 - (e) Are intensely collaborative
 - (f) Are (ideally) located in one team room (usually this will be the lab)

- (g) Are (ideally) committed to long-term, full-time lab membership
- (h) Are (ideally) focused on a single team/project at a time
- (i) Often act in various leadership roles

3. **Project Coordinator.** The Project Coordinator facilitates the agile research process both directly and indirectly. The Project Coordinator:

- (a) Help to resolve impediments
- (b) Create an environment conducive to team self-organization
- (c) Capture empirical data to adjust forecasts (e.g. weekly Slack reports summarizing progress)
- (d) Shield the team from external interference and distraction to keep it “in the zone”
- (e) Enforce timelines
- (f) Have no management authority over the team (anyone with authority over the team is by definition not its Project Coordinator)
- (g) Occasionally act in a leadership role
- (h) Will usually be the Lab Coordinator (Paxton)

4. **Collaborator.** Collaborators are not formally part of the project team and generally will not attend regular meetings as part of the team. Collaborators do not have a leadership role in the project. They may carry out one or more of the following roles:

- (a) Provide data or share equipment
- (b) Provide occasional consulting services
- (c) Provide occasional feedback on project results
- (d) Carry out minor analyses
- (e) Proofread documents
- (f) Help with administrative tasks such as scheduling
- (g) Help with information technology tasks such as computer maintenance

NOTE: A project may never be held up by a collaborator. If the collaborator fails to provide a promised service, the project team must adapt. If the collaborator fails to meet a non-critical deadline, the project will proceed without that component of the project. Involvement as a collaborator is fluid.

By definition, collaborators play a minor role in the project, and they are not responsible for managing any aspect of the project. They may become Team Members if their involvement increases. Generally collaborators will be included in a paper’s acknowledgment section, but collaborators are not normally co-authors.

MEETINGS

Effective lab communication requires forums for communicating. As described below, we use [Slack](#) to facilitate non-in-person communications, but Slack cannot replace in-person meetings. In fact, our approach is set up to encourage in-person interactions as often as possible—ideally several times a week for group projects. We'll have the following regularly scheduled meetings:

1. **Lab meeting.** We will have, as a lab, a regular weekly 1.5 hour meeting on **Wednesdays at 12:00pm**. The precise format of this meeting varies from week to week according to lab needs and interests. Attendees: all active lab members.
2. **Project meetings.** Several of our collaborative projects involve regular coordination with external lab members. These are organized on an *ad hoc* basis for each project. Attendees: all project team members, and any other interested active lab members.
3. **Hackathons.** We occasionally organize hackathon style events whereby spontaneously organized groups work towards one or more very short term projects or goals. These are scheduled on an *ad hoc* basis. Attendees: all interested lab members, any interested member of the Dartmouth community, external collaborators.
4. **Beginning-of-term and end-of-term meetings.** At the start or end of each term, you should schedule a 30 minute meeting slot with Jeremy to discuss your research plans, progress, goals, etc. It is your responsibility to sign up for a slot via [YouCanBook.Me](#).
5. **Department talks and colloquia.** Each week the Department of Psychological and Brain Sciences invites internal and external researchers to present on a wide variety of research topics. You are encouraged to attend any that seem interesting. Attendees: all interested lab and non-lab Dartmouth community members.
6. **Howdy weekly snippets.** Each week (via Slack), all paid employees must fill out a “weekly snippet” with brief answers to the following questions:
 - (a) What did you work on last week?
 - (b) What do you plan to work on this upcoming week?
 - (c) What is impeding your progress?
 - (d) Do you want to set up a meeting with Jeremy? (If so, a link is provided to schedule a meeting via [YouCanBook.Me](#).)

Whereas weekly snippets are required for all paid employees, they are optional for all other lab members. To be added to the weekly

TASK: If you are a senior lab member (lab manager, grad student, or postdoctoral researcher), discuss with Jeremy at the beginning of each term one thing that you can present at a lab meeting. Junior lab members (undergraduates) are not obligated to present at lab meetings, but may schedule a time to do so upon request by coordinating with Jeremy. **Exception:** if you are presenting your work outside of the lab, and if it is the first time you are presenting that project, you *must* do a practice talk for the lab (regardless of whether you are a junior or senior lab member).

NOTE: Each term, you'll sign up for a beginning-of-term and end-of-term meeting time with Jeremy via [YouCanBook.Me](#).

NOTE: Department talks and colloquia are listed on the [PBS Department Events](#) calendar.

TASK: If you are a paid lab employee, or if you would like to submit weekly snippets, email Jeremy to get added to the Howdy script.

snippet schedule, email Jeremy. Being added to the weekly snippet schedules means that you will receive a link via the “Howdy” survey bot (through Slack) each Monday at 9am. Your answers are then compiled into reports that I receive each Wednesday at 10am. If you are an unpaid employee but are likely to request a letter of recommendation, weekly snippets are a good way for me to maintain a detailed sense of what you are working on from week to week and how you are progressing over time. (Virtual) attendees: all paid lab members and any other lab members who want to participate.

GETTING STARTED IN THE LAB

The very first thing you need to do is to get set up the following platforms, which will enable you to interact with the rest of the lab, download and use the lab’s software packages, and accomplish various necessary administrative tasks:

1. **Slack.** This is where almost all not-in-person lab communications take place. It provides an interface for asking questions, storing notes, and sharing ideas.
2. **Trello.** This is used to manage all projects and tasks. It provides a way of tracking progress and impediments to progress.
3. **GitHub.** This is used to manage all code, papers, grants, presentations, and posters. In other words, anything where it’d be useful to track multiple versions, anything that we might ultimately want to release to the public, and/or anything that multiple lab members will be collaborating on. Each project has one or more GitHub repositories.
4. **1Password.** This platform is used by senior lab members to manage secure notes and passwords (e.g. shared software licenses, card numbers and chart strings, etc.).
5. **Lab website.** We use the lab website to distribute research materials, describe ongoing work, and provide information about our work.

Once you’ve created those accounts, you can ask any questions through Slack (use the [#general channel](#) or the channel specific your project). Depending on your role in the lab, you may be added on Slack as a single-channel guest (access to only one channel) or a full member (access to all lab channels). This generally depends on how long you’ve been in the lab and/or how many projects you are expecting to interface with. If you feel you don’t have the appropriate account type, please communicate your concerns to Jeremy.

TASK: Create (free) Google, Trello, and GitHub accounts. Send your addresses and/or usernames to Paxton(cc’ing Jeremy) so that you can be added to the lab groups. Also send your preferred email address so that you can be added to the lab Slack account.

TASK: If you’ve never used Trello before, you may find it useful to work through this [Trello tutorial](#).

TASK: If you’ve never used GitHub (Git) before, please work through these [GitHub Tutorials](#). You may also find it useful to refer to this [Git cheatsheet](#) and this [Git workflow](#) sheet when using Git/GitHub at first.

TASK: If you are a senior lab member, request a 1Password invite from Jeremy.

TASK: Submit a photograph (of yourself or some other picture or image that you want to represent you) and brief 2-3 sentence biography to Paxton so that you can be added to the [people page](#) on the website. Alternatively, if you do not wish to be included on the website, send a note to Paxton expressing that you do not want to be added to the website.

MISCELLANEOUS ADMINISTRATA

You can pick up a lab key from Michelle Powers (Moore Hall administrative office) by [emailing her](#) and cc'ing Jeremy. You will need to pay a \$5 deposit, which will be returned to you when you return your key at the end of your tenure in the lab. If you are the last one in the lab for the day, please be sure to lock the door when you leave.

STARTING A NEW PROJECT

Our lab uses a number of project management tools and policies to promote continuity across projects and lab members. First, make sure that your project doesn't already exist (generally this involves asking Jeremy).

The general steps to starting a project are:

1. Create a Slack channel or decide on existing channel appropriate for project use.
2. Coordinate with Jeremy to set up a [GitHub for Slack](#) integration between your project and channel by sending a link to the GitHub repo in the project's Slack channel with a note asking to set up a Slack integration.
3. If your project involves testing human participants, verify with Jeremy that your project is covered under an existing active IRB protocol, and that you are listed on the protocol. (A list of active IRB protocols appears at the end of this lab manual.) Depending on the protocol, you may need to complete one or more online training courses to become certified to run your experiment. If no existing protocol is appropriate for your study, discuss with Jeremy whether it would be more appropriate to create a new protocol or submit an amendment for an existing protocol.
4. Create an initial set of short-term action items for kicking off your project and post them to your project's Slack channel.

NOTE: If you create a new Slack channel for your project, invite Jeremy, Paxton, and other team members to join.

JOINING A PROJECT

To join a project, simply subscribe to the project's Slack channel and GitHub repository. All project communications should either be summarized on Slack or occur through Slack, whenever possible. This keeps notes searchable and visible to all team members (except direct messages, which are useful for private communications between one or more team members).

Note that, as a general rule, you should focus the majority of your efforts on one project at a time. This doesn't mean you need to do the same thing every day (each project has many components and, as

described above, the focus of lab projects will change over time), but it gives some sense of how you should be allocating your work time.

If you are a part-time employee of the lab, prior experience has shown that you will be able to make a meaningful contribution to a single project at a time. If you are a full-time employee, you may choose to devote some of your time to a secondary project (with the understanding that you will always prioritize your primary project). If you want to change which project is your primary project, or if you want to divide your time across multiple projects, you should coordinate this with Jeremy, Paxton, and your team members.

SCHEDULING

Our lab's scheduling practices and policies are intended to facilitate lab member interactions between ourselves, our collaborators, and our experimental participants. There are three basic tools the lab uses to organize and schedule events:

- **Google Calendar:**

- We use the **main lab calendar** to keep track of lab-wide events including lab meetings, conferences, and activities.
- We use the **CDL resources calendar** to coordinate the use of shared rooms and equipment, such as testing rooms, our EEG systems, eye-tracker, hospital equipment, software licenses, etc.
- We use the **out-of-lab calendar** to keep track of known absences (e.g. illness, travel, holidays, etc.).
- We use the **CDL class schedule calendar** to keep track of course schedules of grad students and undergraduates.
- We use the **DHMC meetings calendar** to keep track of important events and meetings at DHMC.
- We use the **PBS department events calendar** to keep track of talks and events happening in the department.
- You may also choose to create project-specific Google Calendars, inviting project team members. When you add an event (in any lab calendar), it is important to include the following information as a comment (this does not apply to “out-of-lab” events):
 - * Key contact names and contact information (email or phone)
 - * Physical address (where the event will take place)
 - * A brief description of the event and/or other relevant information
 - * Attach any relevant documents via Google Docs

TASK: email Paxton to request invites to each of the calendars below—the download links in the lab manual are read-only!

TASK: If you are a graduate or undergraduate student, please add your schedule to the CDL class schedule calendar at the beginning of each term.

- [Doodle](#), [When2Meet](#), and [YouCanBook.Me](#). We use Doodle and When2Meet to converge on mutually good meeting times that fit (as well as possible) with everyone's busy schedules. Doodle is most useful for selecting a date from a large number of options, and When2Meet is most useful for selecting a specific time on a relatively small number of dates. YouCanBook.Me is used to sign up for meeting slots with Jeremy. You can book a meeting in a free slot through YouCanBook.Me at any time if you would like to meet with Jeremy.

Attendance policy

In general, we expect full time employees to be in the lab during “standard” working hours—roughly between 9 AM and 5 PM. The precise range of hours you work is less important to us than putting in an effort to help form a cohesive lab culture where lab members can interact in person to share ideas, leverage expertise, solve problems, etc. Therefore, even if you end up deciding to shift your hours, we'd like you to make a strong effort to be physically present in the lab between 1 and 4 pm (prior arrangements notwithstanding; e.g. if you have a long commute and we've agreed that you won't come in every day, or if you need to occasionally schedule an appointment during the 1–4 pm window). Similarly, if you are a part time employee, we'd like you to try to put in your in-the-lab hours during the 1–4 pm time window as often as possible.

The lab also abides by Dartmouth's standard paid time off policies for benefits-eligible (full-time, non-student) employees. If you are a salaried employee, you can find the official policy [here](#), and if you are an hourly employee, you can find the official policy [here](#). If you are a student employee, you are generally ineligible for paid time off (you can take time off, but you won't normally be paid for it).

If you know that you'll be unable to meet any of these general attendance guidelines, please coordinate with Jeremy to make appropriate arrangements. **With the above in mind, we abide by a “common sense” attendance policy that relies on an honor system.** If you cannot attend a lab event or meeting, your privacy will be respected: you do not (generally speaking) need to provide a reason for your absence (although you are honor bound not to abuse this system!) but you are expected to responsibly manage your schedule so that you get your work done and minimize inconvenience to others to the extent possible. The one exception is that if you seem to be abusing this system (e.g. as determined by your project owner, project coordinator, or fellow team members), you may be asked to provide additional information (in a way that does not invade your

TASK: If you are a (paid) hourly employee, you'll need to track your hours using the Kronos system. Paxton can help get you set up with that system.

privacy—and if you are worried that this policy is overly intrusive, please bring your concerns to Jeremy or Paxton). Here's the official lab attendance policy:

- It is your responsibility to provide notice, well in advance, to anyone your absence will affect (e.g. Jeremy, Paxton, people you're scheduled to meet with, etc.). The best way to do this is via email or Slack, along with adding your absence to the [out-of-lab calendar](#).
 - You are responsible for accounting for your planned absences when we discuss project schedules and goals. If you agree to take on work or to meet a deadline, you're responsible for it until you make alternative plans with your team!
 - Prolonged (more than 1 day, excluding weekends and lab-related absences) planned absences should be scheduled at least 1 week in advance, and ideally 2 weeks in advance.
 - Brief (one day) absences (excluding weekends, and lab-related absences) should be scheduled as far in advance as possible, but at least at the beginning of the week, emergencies notwithstanding.
- If you are feeling sick, *do not come into the lab*. We can arrange virtual meetings (if you are feeling well enough) or re-schedule as needed. Your recovery, and the health and safety of the lab, are the top priorities.
- If you need to be out of the lab for an unexpected non-illness-related emergency, simply give as much notice and information as possible.
- You are expected to attend all lab meetings and other regularly scheduled meetings that are directly relevant to your work in the lab.
- If you are scheduled to present at a conference (i.e. you submit an abstract and the abstract is accepted as a talk or poster), you are expected to attend the conference to present your work. In the extremely rare event that an emergency situation arises that would prevent you from presenting as scheduled, you are expected to make alternative arrangements (e.g. by arranging for a co-author to present in your place).
- You are strongly encouraged (but never required) to attend relevant journal clubs, PBS talks, DHMC meetings and talks, thesis defenses, and other relevant lab and/or Dartmouth-affiliated events. If you are overwhelmed with other work, have a conflicting

meeting, are running an experimental participant, or are out of the lab for other reasons, you do not need to provide a reason for your absence (unless you're presenting or are otherwise playing a key role).

Compensation and benefits

If you are a non-student full-time on-campus employee, it's likely that you're eligible for Dartmouth benefits, such as medical insurance, dental insurance, life insurance, etc. You can read more about the comprehensive benefits package [here](#).

Dartmouth also sponsors various health-benefits programs (for all members of the Dartmouth community). For example, you are likely eligible to get a free (or subsidized) fitness tracker, fitness equipment, race fees, gym membership, etc. You can also earn cash (up to \$400/year) for meeting your fitness goals. Go [here](#) to learn more or sign up for this program.

If you are a student employee, you may be paid or unpaid. In general, full-time student employees are paid and part-time student employees are unpaid until they have been a full-time employee for at least one term. Your precise level of compensation will depend on your position, how your work in the lab is funded, your prior research experience, etc. If you have comments, questions, or concerns about your compensation, please discuss them with Jeremy.

Interpersonal issues

If you are experiencing an interpersonal issue with another lab member or community member and are having trouble resolving it on your own (or feel unsafe resolving it on your own), please seek out assistance from Jeremy, Paxton, your Project Owner, your Project Coordinator, or one of the Dartmouth community resources described below as early as possible.

All lab members, regardless of position or status, are protected by (and must abide by) Dartmouth's human resources policies. This means behaving professionally and respectfully towards others (including, but not limited to, your fellow lab members). On (hopefully) rare occasions, despite your best efforts, you may find yourself in an interpersonal situation that you feel unable to resolve on your own. You have many resources at your disposal to help get you back on track.

The [Office of Human Resources](#) provides assistance and resources to all faculty, staff, retirees, and prospective employees. The [Student Employment Office](#) provides a similar suite of services to student employees. The [Dartmouth Ombuds Office](#) also provides confidential

and informal assistance in resolving concerns related to interpersonal issues. Please also see the [Ask a question, answer a question section on resources for resolving interpersonal issues](#).

LAB RESOURCES

As with most academic research labs, we (sadly!) must conduct our research within a limited research budget. In practice, the important thing is to communicate with Jeremy before you spend (or commit to spending) lab funds.

Generally, the lab's financial policy is the following: we will do whatever is possible to ensure you have the equipment and resources you *need* to do your best work. If you can adequately justify an expense and sufficient funds are available, then we will spend what it takes to get the job done. If you cannot justify an expense, or if the lab does not have sufficient funds, then we will need to get creative by figuring out how to get the job done anyway on a seemingly too-small budget. Usually we'll find ourselves somewhere in the middle of this continuum, which will help us to stretch our limited budget as far as possible while not making ourselves crazy or losing too much productivity in the process.

Some of our projects are intended to be self-funded and/or to support other projects (e.g. StockProphet). Any use of project-generated funds should be discussed with Jeremy.

Computers

All lab members need a computer to get their work done. We generally prefer to use Macs, as this maximizes compatibility across lab members. Depending on your expected role in the lab and the specifics of your project, the lab may provide a computer to you, or you may be expected to use your personal computer to complete your work. Any equipment purchased by the lab, including personal computers, is the official property of the Contextual Dynamics Lab and should be treated as such. All equipment must be returned to the lab when your association with the lab is complete.

In addition to personal computers, we also maintain a lab account on Dartmouth's [Discovery Supercomputing Cluster](#). In addition to having access to the compute nodes shared amongst the entire Dartmouth community, we have purchased several dedicated servers and a powerful head node that is shared with the [COSAN Lab](#) and the [Dartmouth Brain Imaging Lab](#). When you link your Discovery account with the lab, you will automatically have access to those additional computing resources. We use Discovery for our most computationally intensive work. [This link](#) contains instructions for

creating an account and accessing the Discovery cluster. Our suggested workflow is to do non-intensive computations and analyses on your personal desktop or laptop computer, and to offload more intensive analyses to Discovery. The lab's code repository includes [sample Python scripts](#) for running analyses on Discovery.

Other research equipment

Many research projects require specialized research equipment (e.g. for neuroimaging using fMRI, EEG, ECoG, etc.). Some of the necessary research equipment is owned by the Contextual Dynamics Lab, and other equipment is shared with other labs affiliated with PBS or DHMC. All equipment should be treated with care and respect. Any malfunctions should be reported immediately.

Travel policy

A major component of doing scientific research is communicating with other scientists. The Contextual Dynamics Lab regularly presents at several international scientific conferences. If you are presenting your work from the lab (i.e., you are the presenting author for a talk or poster), then your travel expenses and conference registration fees will be guaranteed by the lab, *under the assumption that you will also make reasonable efforts to seek out alternative sources of travel funding* (e.g. through PBS, other internal Dartmouth sources, applying for travel awards, using personal grants like NRSAs or NSF fellowships, etc.). You are also expected to keep costs low (e.g. fly economy class, seek out cheaper tickets, stay in reasonably priced hotels, share a room with other lab members, etc.). By the same token, we also want to be cognizant of your comfort and time, and it is not always necessary to use the cheapest option. More specific travel guidelines will be given on a per-conference or per-trip basis.

If you are not presenting your work (or if you're presenting non-lab work), but you are a senior lab member, then the lab may cover your travel expenses to a limited number of conferences each year. These should be discussed on a case-by-case basis with Jeremy.

If you are a junior lab member not presenting your work, the lab will generally not pay for you to attend conferences. However, if you are interested in attending a conference, and you aren't able to secure funding through non-lab sources, you should discuss your options with Jeremy.

NOTE: To obtain funding for a scientific conference, *prior to submitting your abstract*, you must (a) briefly describe or discuss how attending the conference fits in with your goals and/or plans, (b) provide confirm that you have applied for some form of external funding, and (c) provide an approximate travel budget, including all registration fees, tickets, meals, etc. Your budget should not include lab events (e.g. lab dinners), which are covered by a separate mechanism. Your budget must be approved by Jeremy prior to submitting an abstract in order for the lab to cover your expenses. (Your expenses will be covered up the agreed-upon amount, at which point you are responsible for making your travel plans accordingly, submitting receipts, etc.)

Making a poster

The preferred methods for creating posters are to use [LaTeX Beamer-Poster](#), Adobe Illustrator, or [Inkscape](#). The lab has several example poster templates on file, but these are not organized well yet. Your best bet is to ask Jeremy for an old poster and modify it. You can also create a file from scratch. Ensure that any images are either vector graphics, or bitmaps (.png, .jpeg, .tiff, etc.) at sufficiently high resolutions (at least 300 dpi).

Poster printing

There are two on-campus poster printers. One is in the Map Room of Baker Library. More information may be found [here](#). The Map Room printer should be used in most cases. It is important to schedule your printing time as far in advance as possible, particularly before conferences when many people will want to print. Advanced planning can help us avoid the additional costs associated with off-campus printers. The Department of Psychological and Brain Sciences covers conference poster printing costs for PBS labs and students (coordinate with Paxton to obtain the PBS Chart String for poster printing).

Publication costs

All costs related to lab publications will be fully covered by the lab. Paxton can help facilitate these payments.

Subject compensation

Most in-lab experimental subjects will be compensated via t-points. Coordinate with Paxton in order to receive a t-point allocation well in advance of the start of the term you wish to run participants.

Cash subject payments for lab research projects will in most cases be fully covered by the lab (see the NOTE). Subject payment guidelines are generally found in the IRB approval documentation relevant to your project. For Mechanical Turk experiments, a subject payments budget should be approved prior to beginning the experiment. Cash payments may be made via petty cash, which is managed by Paxton.

NOTE: If you commit to presenting a poster at a scientific conference, you agree to prepare a complete draft of your poster *at least two weeks in advance* of the conference, and to complete a final draft of your poster (that incorporates feedback from Jeremy) *at least one week in advance* of the conference. If you do not meet these deadlines, you may be required to withdraw your submission and/or cover any conference-related expenses that you incurred, at Jeremy's discretion.

NOTE: Be sure to coordinate with Jeremy regarding the funding source covering your poster printing cost prior to going to print your poster.

NOTE: In some cases, external funding sources may be available to cover cash subject payments (e.g. [undergraduate Honors Thesis Grants](#) or [Neukom Scholars grants](#)). Coordinate with Jeremy or Paxton to determine whether alternative funding sources are available for your project.

Ask a question, answer a question

This section contains a log of common issues and errors encountered by lab members, as well as some guidelines on where to seek help with issues that may arise in the lab. If you encounter an issue you don't know how to resolve right away, this is a good place to begin your efforts.

If you run into a tricky technical issue you think is likely to come up again, consider adding it to the log, and then adding the solution when you resolve it. Additionally, if you find yourself helping another lab member with a problem you encountered in the past, document the problem and its solution here for future lab members.

WHO TO GO TO WITH QUESTIONS

This section contains guidelines of where to direct questions related to technical and interpersonal issues that may arise, or any issues you encounter not already listed in the sections below. In general, resolving *technical* issues within the lab saves time, but there will inevitably be some we cannot resolve on our own. In general, interpersonal issues should be resolved in accordance with your comfort, but it is important to be aware of the below resources should you encounter a situation in which you want to use them.

Tech issues

- For issues related to our lab's fileserver, seek assistance from Jeremy.
- For issues with other lab-owned equipment (e.g. computers, research equipment, etc.) Paxton or the senior lab member actively using the equipment should be your first-sought resource.
- For issues with Dartmouth IT, [open a ticket](#) with the Information, Technology, and Consulting office, or contact [Andrew Knutsen](#).
- For issues related to the the Discovery computing cluster, contact [John Hudson](#).

Lab documents

- For questions about non-paper documents (e.g. receipts, consent forms, IRB protocols, the lab website, etc.), talk to Paxton.
- For questions on papers or posters, talk to Jeremy.

Lab policy

- If you have a question about the lab's policies, first try to find the answer in the [Lab Manual](#).
- If you feel your question is not adequately answered in the Lab Manual, post your question on Slack (or, if it's a private issue, talk to Jeremy).
- If you think your question is likely to be of general interest, update the lab manual to reflect the answer.

Specific methods

- If you have questions about specific methods related to a project, ask a senior lab member working on the project.
- It may also be helpful to check the [CDL tutorials](#) repo, and contact the author(s) or contributors of a related tutorial.
- You can also post your question in the [#computrons channel](#) on Slack.
- Remember, [Google](#) and [Stack Overflow](#) are your best friends! You'll rarely ever encounter a problem someone else hasn't faced before.
- For more general methods questions, talk to Paxton.
- If you still cannot find an answer to your question, talk to Jeremy.

Interpersonal issues

- Clear, direct communication is often the best way to address interpersonal issues. However, if you are having trouble resolving something (or feel uncomfortable doing so on your own) you should reach out to one of the following resources:
- Senior lab members (e.g. your immediate supervisor)
- Jeremy
- The [PBS department chair](#)

- The Undergraduate Deans Office or the Graduate and Professional Schools Deans Office
- Dartmouth's Office of Human Resources
- Dartmouth's Faculty/Employee Assistance Program
- Dartmouth's Title IX office (for concerns about sexual misconduct, harassment, or assault)
- Hanover Police (if criminal activity is involved)

COMPILED PROBLEMS AND SOLUTIONS

Testing rooms

This section contains common issues and errors encountered when running subjects in our testing rooms.

Git & GitHub

This section contains common errors encountered using Git locally or syncing with the lab's GitHub repositories.

Data analysis

This section contains common errors encountered with many of the analysis-related software packages frequently used by the lab

Computing cluster

This section contains common errors encountered submitting and running jobs on Dartmouth's computing cluster.

Other assorted issues

This section contains commonly encountered issues that don't fit well in any of the above sections. Over time, if multiple issues begin to accumulate here that seem related to a broad topic, feel free to create a new section and move the related issues there.

Internal Review Board (IRB) approvals

Experimental protocols and IRB approval forms are maintained and coordinated through **RAPPORT**. Typically this system is accessed directly by Jeremy or Paxton, but if you feel you need access to RAPPORT then let Jeremy know.

TASK: prior to running any non-lab-member participants in your study, you must coordinate with Paxton to verify that (a) your experiment has been approved by the IRB and (b) your name is specifically listed on the associated protocol.

LIST OF ACTIVE PROTOCOLS

1. **Efficient Learning (STUDY00029685)**. Used for all behavioral learning and memory experiments for participants run in the lab or via Amazon Mechanical Turk. The protocol also covers fitness-related studies (e.g. incorporating fitness tracker data and other on-body and remote biosensors including scalp EEG and eye-trackers, and/or performing physical tasks like riding on a stationary bicycle or running in place).
2. **fMRI Efficient Learning (STUDY00030020)**. Analog of the Efficient Learning protocol, but allows for fMRI data collection.
3. **Electrophysiological Localization of Human Brain Function (STUDY00012495)**. Hospital protocol used for studying electrocorticographic activity in epilepsy patients.
4. **Network dynamics in human epilepsy (STUDY00029400)**. Hospital protocol used for studying network dynamics inferred via electrocorticographic activity in epilepsy patients.

LIST OF INACTIVE PROTOCOLS

1. **EEG Efficient Learning (STUDY00029881)**. Analog of the Efficient Learning protocol, but allows for scalp EEG data collection. This protocol is redundant with the revised Efficiently Learning protocol, which now allows for scalp EEG data collection as well.

When you run an experimental participant, you must have them sign a consent form. After each day of testing (or more frequently), you should give all signed consent forms to Paxton. Consent forms are kept in a locked file cabinet in Jeremy's office.

All experimental data must be stored securely, as per IRB guidelines. All lab computers employ disk encryption and password protection. If you need to copy unpublished data onto a non-lab computer, you need to verify (by checking in with Jeremy) that your computer satisfies our data security requirements. *No personally identifiable data about our participants may ever be shared outside of the lab.*

Checklist and signature page

By signing below, I certify that I have completed the following tasks:

- ☐ I am proficient in \LaTeX , allowing me to edit and understand this lab manual's source code.
- ☐ I have submitted one or more edits to the lab manual by making a pull request to the [GitHub repository](#).
- ☐ I have read [Leah Somerville's commentary](#) on speaking out in toxic or abusive environments.
- ☐ I have reviewed the [NIH guidelines for authorship](#).
- ☐ I agree to set up a beginning-of-term or end-of-term meeting with Jeremy at least once per term.
- ☐ I am a paid lab member and have coordinated with Jeremy about getting added to the weekly snippets Howdy script, or I am an unpaid lab member.
- ☐ I have access to the following lab calendars: Contextual Dynamics Lab, Out of lab, CDL Resources, CDL class schedule (if applicable), DHMC Meetings (if applicable), and PBS department events.
- ☐ I have created a GitHub account and have been added to the appropriate lab GitHub group(s). If I am unfamiliar with Git, I have gone through the GitHub tutorials.
- ☐ I have created a Trello account and have been added to the appropriate lab Trello group(s).
- ☐ I have joined the lab's Slack account and agree to check it regularly (at least once per normal business day, excluding days I mark on the out-of-lab calendar).
- ☐ I have been added to the lab's 1password account if I am a senior lab member, or I have not been added because I am a junior lab member.

- ☐ I have submitted a photograph (of myself, or a representative scene or object) along with a brief (2-3 sentence), professionally worded biography, to be included on the lab website. Alternatively, I have coordinated with Paxton to indicate my preference to not be included on the lab website.
- ☐ I agree to regularly attend lab meetings (unless I have a course conflict and have informed Jeremy or Paxton).
- ☐ I am an unpaid or salaried employee, or I am an hourly employee and have gotten myself set up on Kronos to track my paid hours.
- ☐ I agree to abide by the lab's bill of rights and responsibilities, and to follow official lab practices and policies.
- ☐ I have carefully read through the entire lab manual, and I have checked off all of the above items to indicate that I have carried out the indicated tasks. and plan to complete those assigned.
- ☐ I will send a digital copy (PDF) of the final two pages of this manual, including checked-off list items, my digital signature, and today's date, to contextualdynamics@gmail.com.

Signature

Date