DR. RYAN STRAIGHT

MA{VR}X LAB MANUAL

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Preface

THIS IS A WORK IN PROGRESS! Until stated otherwise, the content of this book should be considered unofficial and in an active draft stage.

This manual was created using the **bookdown** package (Xie, 2021), which was built on top of R Markdown and **knitr** (Xie, 2015). The PDF uses the Tufte package (Xie et al., 2021).

The contents of this manual are heavily influenced by John Paul Minda and Emily Nielsen's *Lab Manual* (2018). The full collection of influences and inspiration can be found in the manual's GitHub repo.

Using this book

This manual is licensed under the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

It is available as a PDF, eBook, or via the web. We encourage you to use the **OSF** project to cite this particular document (Straight, 2021).

Structure

This manual should be considered a comprehensive living document aimed at presenting a unified understanding of how the lab works and what it should become.

Session Information

As this book is written using the `bookdown` package, here is the R session information from when the book was last compiled on 2022-01-04:

```
## R version 4.1.2 (2021-11-01)
## Platform: x86_64-w64-mingw32/x64 (64-bit)
## Running under: Windows 10 x64 (build 22000)
##
## Matrix products: default
##
## locale:
## [1] LC_COLLATE=English_United States.1252
## [2] LC_CTYPE=English_United States.1252
## [3] LC_MONETARY=English_United States.1252
## [4] LC_NUMERIC=C
## [5] LC_TIME=English_United States.1252
##
## attached base packages:
## [1] stats     graphics  grDevices utils     datasets  methods   base
##
## other attached packages:
## [1] tufte_0.11
##
## loaded via a namespace (and not attached):
##  [1] compiler_4.1.2  magrittr_2.0.1  fastmap_1.1.0   bookdown_0.24
##  [5] htmltools_0.5.2 tools_4.1.2     rstudioapi_0.13 yaml_2.2.1
##  [9] stringi_1.7.6   rmarkdown_2.11  knitr_1.37      stringr_1.4.0
## [13] digest_0.6.29   xfun_0.29       rlang_0.4.12    evaluate_0.14
```

Acknowledgements

Many thanks to the people who supported the idea of the lab, have donated their blood, sweat, and tears to get it off the ground, to the colleagues and collaborators that make it work, to those that came before, and to those still to come.

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Director, MA{VR}X Lab

Tucson, AZ

About the MA{VR}X Lab

The **M**ixed **A**ugmented **ViR**tual e**X**tended (Reality) Laboratory (referred to as the MAVRX Lab, pronounced *mavericks*, and stylized with curly brackets around {VR}) is space in which we drive innovation through alternative reality modalities and research. It came about in early 2021 as an entity, though its physical location had existed for some time. MA{VR}X Lab is intended as a collaborate effort, meant to be interdisciplinary and reside in a place of praxis and innovation.

It is our goal to apply this to bleeding-edge innovation in alternate reality spaces.

Figure 1: Official MAVRX Lab banner.

Identity

The lab's identity is determined by three basic concepts: its mission, vision, and values, but also of our dedication to praxis. Praxis as we refer to it can be defined as:

> the process by which a theory, lesson, or skill is enacted, embodied, or realized [and] the act of engaging, applying, exercising, realizing, or practicing ideas[1].

[1] Praxis (process)

Mission

The primary mission of the MA{VR}X Lab is to develop human-focused ideas through technology, transparency, and care, with a focus on extending our reality using technology and evidence-based methodology.

Vision

Manifested in the nexus of technology research, evidence-based pedagogy, and boundary-pushing ideas, the MA{VR}X Lab will act as a space for chances to be taken, brilliance to be realized, and people to come together.

Values

The MA{VR}X Lab's vision is one of transparency, openness, and optimism. At all possible times, we believe knowledge should be not just presented publicly but developed there, as well. We are humans. We make mistakes and we want to make them in public so others may learn. We make those on our way to create great things and help build a better future for everyone.

Code of Conduct

In addition to the University of Arizona Student Code of Conduct, the MA{VR} X Lab would like to emphasize that it is dedicated to providing a harassment-free experience for everyone, regardless of gender, gender identity and expression, age, sexual orientation, disability, physical appearance, body size, race, or religion (or lack thereof). We do not tolerate harassment of lab members in any form. Sexual language and imagery is generally not appropriate for any lab venue, including lab meetings, presentations, or discussions.[2]

[2] Adapted from Lab Code of Conduct — DIB Lab 1.0 documentation.

1
Roles and Expectations

For detailed information on those working within/for the lab, visit the MAVRX Lab's website[1].

The expectations and roles within the lab revolved around the openness that we strive for, so clarity and frankness are valuable. It is important to remember that the lab is a resource, and the main role within the lab–that of the director–is to assist others in the utilization of that resource[2].

Regardless of someone's role in the lab, there are expectations of professionalism, intellectual integrity, curiosity, and passion for praxis, the technology we explore, and the future we're creating.

1.1 *Everyone*

Each person in the lab should adhere to a shared set of expectations.

1.1.1 *Big Picture*

Generally, everyone should:

- Push the envelope of applied scientific discovery and personal excellence.
- Do work we are proud of individually and as a group.
- Double-check our work, and be at least a *little* obsessive.
- Be supportive–we're all in this together.
- Be independent when possible, ask for help when necessary.
- Communicate honestly, even when it's difficult.
- Share your knowledge. Mentorship takes many forms, but frequently involves looking out for those more junior.
- Work towards proficiency in research production and knowledge distribution (not to mention R!).
- Be patient, including with your PI. He will forget things you just talked about, and repeat some stories over and over. Organization

[1] If the content of the manual ever drifts into first-person, presume the speaking voice is the director.

[2] This section is largely adapted from the Peelle Lab Manual.

and comprehensive note-taking is a great solution to his absent-mindedness.

- Advocate for our own needs, including personal and career goals.
- Respect each other's strengths, weaknesses, differences, and beliefs.
- If you move something, put it back.
- **Charge all devices**.
- Keep everything awesome.

1.1.2 Smaller Picture

MA{VR}X Lab physical spaces are not *that* big (ironic, considering the infinite spaces and opportunities in extended reality), so please be thoughtful of others you're with and who will come later:

- Do not come to the lab if you are sick. Period. If you are sick, DM your faculty advisor or the director to let me know you won't be coming in. If appropriate, update your lab calendar to reflect the change.
- Be considerate with the thermostat. Everyone has different preferences, so we all need to learn to compromise. In B158, the air handler is also *very* loud, which may come into play if we are recording something.
- Do not leave food, drinks, or crumbs out in the lab. Please put food trash in another trash can (*not in the lab*!), especially late in the day or on Friday (so that food doesn't stay in the lab over the weekend).
- Lock the door if there is no one in the lab, even if you will only be gone for "a minute".
- Avoid wearing strong perfumes/colognes/et cetera in the lab (for the sake of your coworkers, lab visitors, and our participants).
- Keep the lab neat—especially in the back of B158 in the VR boundary. Items left unattended may be discarded, reclaimed, or recycled.
- Wear a mask until further notice.

1.2 Primary Investigator (Director)

The PI (here referred to as the Director) of the lab is responsible for the day-to-day administration of the physical, digital, and logistical spaces. While responsibilities may be delegated–and often are–the director is ultimately responsible for ensuring the lab is functional and productive.

Additionally, the director often serves in an advisory capacity for student research. This ranges from initial ideation to research project design to means of publication. That said, the director is not a "boss"

of the lab; instead, they provide guidance at all levels, from the lab's research trajectory and agenda as a whole to advising on a project-by-project basis.

In addition to the list above, the director will[3]:

- Have a vision of where the lab is going in the near and far terms.
- Care about your happiness, well-being, and academic success.
- Obtain–with the assistance of others, typically–funding to support the lab.
- Support you in your career development, including writing letters of recommendation, introducuing you to others in the field, assisting in travel, and promoting your work as often as possible.
- Support your personal growth by giving you flexibility and encouraging you to do things beyond just researching.
- Occasionally bring goodies.
- Make time to meet with you regularly, read through your lab-related manuscripts and research designs, and just generally chat.
- Fuss over your text and graphic design.

1.3   Faculty Research Fellows

While the lab does not have any *dedicated*[4] staff beyond the director, we do have a number of faculty, specifically, who engage with the lab regularly. They are expected to act as mentors and advisors, with an aim to be more-or-less director-like.

[4] Read: paid to be in the lab. While we do have a few univeristy staff "working" in the lab, they are *not* "the lab's." Their participation in the lab generally falls under "Other duties as assigned," and we cannot overstate our appreciation of their time and energy.

1.4   Graduate Research Fellows

We also do not, at time of publishing, have any graduate students working in the lab. That said, should we, they will be expected to:

- Know the literature related to their topic like the back of their hand.
- Seek out and apply for fellowships and awards (including travel awards, et cetera).
- Realize there are times for pulling all-nighters, and times for taking the headset off, leaving early, and spending time with loved ones.

1.5   Undergraduate Research Fellows

Usually works directly under a faculty member or graduate student. The faculty need not be a member of the lab, but the director or a Faculty Research Fellow should be in the loop at all times. Regardless of how undergraduate students are engaging with the lab, they should:

1. Be working on a particular project that has been discussed with the director and their faculty advisor.
2. Ask around to see if they can help with anything.
3. Spend time improving various lab-related skills (learning R or C#, studying Unity, et cetera).
4. Spend time writing a blog post, updating or adding sections to the lab manual, and the like.

Undergraduates will generally engage with the lab in one of the following capacities:

- Volunteering
- For-credit (independent study[5] or capstone[6])
- Lab Assistants (paid work)
- Honors[7]

1.5.1   Volunteering

Volunteering in the lab is generally formulated in a resources-for-time transaction. Students will be provided access to the lab's resources (computers, space, software, guidance, collaboration, et cetera) in return for helping the lab make progress toward its goal of research and knowledge production.

That said, student volunteers are still expected to have a regular and consistent presence in the lab, adhering to the expectations of "Everyone" above. Volunteering in the lab does *not* mean a student can come and go as they please or ghost on projects because they got busy! Volunteering is still a serious commitment.

1.5.2   For-Credit

Undergraduate research fellows engaging in a for-credit independent study or capstone should expect to end the semester in which they are receiving credit with an annotated bibliography of ~10 articles on the topic they've been studying and making a 15-20 minute presentation at a lab meeting sometime during the semester. This is the *minimum* requirement that is for the lab; depending on how you've enrolled, you may have additional requirements.

1.5.3   Lab Assistants

Some students will be paid to "work in the lab," which could be anything from assisting in faculty research to lab maintenance to doing market research. While undergraduate research fellows may also be lab assistants, an overlap is not necessarily required or expected. These are generally funded by particular grants and thus will have specific project-related tasks and expectations.

[5] In the Applied Computing program, this is APCV 399, and can range from 1-3 credit hours

[6] In the Applied Computing program, this is APCV 498: Senior Capstone. You will generally take this in your final semester in the program.

[7] In the Applied Computing program, this is APCV 498H: Honors Thesis.

1.5.4   Honors

Honors Contracts and theses are relatively rare, so simply contact the director for more information on this.

2
Onboarding

Use this section as a step-by-step to get up to speed when you're new to the lab. This list is *not* suggested, but *required*!

1. Complete our Onboarding Survey and provide your profile info to to the director.
2. If you are paid by the university in any way, be sure to clarify your time reporting requirments with HR.
3. Join the lab's Discord.
4. Install the various software and sign up for the platforms we use in the lab:

   1. Git and GitHub (or Git Kraken; follow the Git chapter instructions to get your free education upgrade. Request to join the lab's GitHub organization: `https://github.com/mavrxlab/`
   2. Create accounts for OSF, Protocols.io, and Clustermarket
   3. Install R and RStudio on your machine.
   4. Install Zotero.
   5. Sign up for your Adobe Creative Cloud access.

5. CITI Program training

   1. Select `Log In Through My Organization`, search for `University of Arizona`, sign in with your NetID.
   2. Find the `Group 2: Social & Behavioral Research Investigators` course and complete it.
   3. Send a copy of your Completion Record to the director and copy your advisor.

6.

2.1 Baseline Reading List

While the lab covers a wide, wide range of research topics, we have established a reading list to provide everyone with the same basic foundation of knowledge. The exact topics listed below may not apply

to the precise topic you're interested in but you should still endeavor to read it all.[1] This list is ever-growing and if you wish to add to it, simply create a pull request.

These are meta-reads, basically, that focus on "doing" research and sharing the resultant knowledge.

[1] The "Ten Simple Rules" article list is gleaned from gzahn/Lab_Manual: Lab manual for Zahn Lab at UVU.

- Bourne, P. E. (2007). Ten Simple Rules for Making Good Oral Presentations.*PLoS Comput Biol, 3*(4), e77. `https://doi.org/10.1371/journal.pcbi.0030077`
- Bourne, P. E., & Chalupa, L. M. (2006). Ten Simple Rules for Getting Grants. *PLoS Comput Biol, 2*(2), e12. `https://doi.org/10.1371/journal.pcbi.0020012`
- Edmund Hart, Pauline Barmby, David LeBauer, François Michonneau, Sarah Mount, Patrick Mulrooney, … Jeffrey W Hollister. (2016). Ten simple rules for digital data storage. `https://doi.org/10.7287/peerj.preprints.1448v2`
- Erren, T. C., & Bourne, P. E. (2007). Ten Simple Rules for a Good Poster Presentation. *PLoS Comput Biol, 3*(5), e102. `https://doi.org/10.1371/journal.pcbi.0030102`
- Kording, K. P., & Mensh, B. (2016). Ten simple rules for structuring papers. BioRxiv, 088278. `https://doi.org/10.1101/088278`
- Rougier, N. P., Droettboom, M., & Bourne, P. E. (2014). Ten Simple Rules for Better Figures. *PLOS Computational Biology, 10*(9), e1003833. `https://doi.org/10.1371/journal.pcbi.1003833`
- Vicens, Q., & Bourne, P. E. (2007). Ten Simple Rules for a Successful Collaboration. *PLoS Comput Biol, 3*(3), e44. `https://doi.org/10.1371/journal.pcbi.0030044`
- Weinberger, C. J., Evans, J. A., & Allesina, S. (2015). Ten Simple (Empirical) Rules for Writing Science. *PLoS Comput Biol, 11*(4), e1004205. `https://doi.org/10.1371/journal.pcbi.1004205`

3

Labs and Physical Spaces

The MA{VR}X Lab has two official physical spaces: one on the Sierra Vista campus and one on the Yuma campus (contact Dr. Saldana for information on this space).

3.1 Sierra Vista

The MA{VR}X Lab's main location is room B158 on the University of Arizona Sierra Vista campus[1]. It is part of the College of Applied Science and Technology (CAST).

[1] Formerly UA South, the college was established in 2019 by the Arizona Board of Regents.

Figure 3.1: Sierra Vista campus

1140 N. Colombo Avenue
Sierra Vista, AZ 85635
(520) 458-8278

3.1.1   Hours

Generally speaking, the director is in the lab on Mondays. Given that the lab focuses on extended reality, much of the work can be done virtually unless the hardware in the room is specifically needed. Other hours throughout the week are determined by those employed by, volunteering, or researching in the lab.

3.2   Yuma

(Info on the Yuma location coming soon!)

Figure 3.2: Yuma campus

7875 E. 24th St. Ste. #7
Yuma, AZ 85365
(928) 782-1914

3.3   Other Locations

Plans to expand into other locations like Chandler are in the works.

4
Communications

Ways we communicate and collaborate in the lab.

4.1 Email

The lab has its own email address: `MAVRX-Lab@arizona.edu` used for external communication. The director monitors this.

4.2 Discord

For virtually all lab-related chatting, announcements, and so on, we have a lab Discord server.

4.3 Social Media

The lab's social media presence is generally restricted to Twitter and YouTube. Research assistants are welcome to tweet relevant content from the lab's account. The director can help you set this up. Content ideas for YouTube should be discussed at length with the director, as this also requires getting other administrative bodies involved.

4.4 Webpage

We maintain a `blogdown` website for the lab at `https://mavrxlab.org`. This is where we share news items, project updates, upcoming talks, publication notifications, and so on. Specifically, Rmarkdown is used for this as it allows for native inclusion of data analyses and plain-text content creation. This book, for example, is a `bookdown` publication, also created using Rmarkdown.

5

Meetings

We have meetings. We hold them via Zoom. We may hold them in Teamflow or Spatial.

5.1 Types and frequency

- Researchers actively working: **bi-weekly** (begins second Tuesday of semester)

  - Briefly update the lab on whatever they are working on.
  - This is also an opportunity for practice talks, elevator pitches for new project ideas, so on.

- Assistants/workers: **bi-weekly** (begins first Tuesday of semester)

  - Check-ins.

- Faculty Research Fellows: **as needed**

  - This may be monthly, generally, but depends on the projects at the time.

If you fall into one of these categories and have not received an invite to the meetings, please contact the director.

5.2 Notes/Minutes

Notes and minutes from meetings[1] will–again, when appropriately public-facing–will be kept in the lab's OSF ecosystem.

Template for meeting notes in markdown. This is also found in the meeting-notes repo, along with instructions on how to add/update/correct meeting notes:

```
# YYYY-MM-DD HH:MM

- Lead:
- Note Taker:
```

[1] Meeting minutes template based on the core-notes/template.md at master · emberjs/core-notes

Attendees

Add yourself to the list if you attend and check the box!

Core Team

- [ ] Ryan Straight (RS)
- [ ] Diana Saldana (DS)
- [ ] Tony Vega (TV)
- [ ] Tyler Rhea (TR)
- [ ] Juan Carlos Alcala (JCA)
- [ ] Ariella Valencia (AV)

Guests

- [] Your name here (INITIALS)

Weekly review

- (General notes on weekly review here.)

Topics

<!-- If you would like to add a topic to the agenda please add
your name to the appropriate list above and add a suggestion to
the PR using the following format: -->

<!-- ### Your topic (INITIALS, expected duration in minutes) -->

<!-- ### Your topic (INITIALS, expected duration in minutes) -->

<!-- ### Your topic (INITIALS, expected duration in minutes) -->

<!-- ### Your topic (INITIALS, expected duration in minutes) -->

<!-- ### Your topic (INITIALS, expected duration in minutes) -->

<!-- ### Your topic (INITIALS, expected duration in minutes) -->

Any Questions?

Questions, comments or concerns? Submit a comment or PR for this
set of notes after they're published.

6
Practices and Protocols

We deal with disparate technologies, fields, and methodologies. Having clear and available policies, practices, and protocols is absolutely essential.

6.1 Documentation and Manuscripts

6.1.1 File Formats

Along with the 7.1 we strive for when disseminating work via the lab, open formats should also be used when possible.

Documents: markdown (Rmarkdown) or RTF
Audio: FLAC - Free Lossless Audio Codec or OGG (Ogg Vorbis)
Images: JPEG-2000 or TIFF
Video: MP4 or MKV (H.264 or H.265 encoded)

While the University of Arizona provides free access to the entire Adobe Creative Cloud to anyone in its ecosystem, which the lab primarily uses, we also encourage the knowledge and use of free, open source software (FOSS) as an optional alternative:

- HandBrake: Open Source Video Transcoder
- GIMP - GNU Image Manipulation Program
- ardour - the digital audio workstation

6.1.2 Documenting and Record Keeping

Projects should be housed in the lab's OSF project but the actual work done in these projects–writing, code, et cetera–should typically go in a GitHub repository within the lab's organization, especially student-driven projects. You may find that faculty-driven content may reside elsewhere but should still be linked within an OSF project. That repository can then be linked to the OSF sub-project.

Having a well-written and organized `README` file in your repository is absolutely essential. To conform with UA Research Data Repository

Policies (and to have a consistent organization), you should at least start with the README_template.txt they provide. You are also encouraged to maintain a step-by-step process that describes your project environment, how to run any cleaning scripts (if applicable), and how to reproduce the manuscript/slide deck/et cetera. The 2014 Software in Research survey readme is a good example of this.

Likewise, when describing commits in GitHub or describing updates in OSF, please don't skimp. Commits are cheap and the next person that reads what you left will thank you.[1]

Note that you don't just have to be coding applications to use GitHub! Use it for slide decks, papers, websites, and all sorts of things (like this lab manual, for example!).

6.1.3   Filenames

We believe in standardizing as much as we can in order for consistency and clarity. Filenames should be chosen using the three considerations delimited by Jenny Bryan's "How to name files". They should have the following qualities:

1. Machine readable
2. Human readable
3. Plays well with default ordering

You'll want to name your files like `YYYY_MM_DD-Project_name-Sub_identifier-Slug.ext` or some such[2]

6.2   Lab Safety

As virtual reality has a tendency to cause dizziness, motion sickness, and so on, the lab has a variety of health-related safety plans and protocols in place.

6.2.1   Motion Sickness

Should someone become motion sick when in virtual reality, the following steps should be taken:

1. Immediately stop the experience by standing still and removing the headset.
2. Stare at one location as far away as you can.
3. Take deep breaths.
4. Sit down and rest.

Should someone vomit during VR: (see lab guidance in the room for now)

There is always cold water available in the minifridge in the Sierra Vista lab and suckers are in one of the drawers by the storage cabinet.

---

[1] Use GitHub's `Release` function to keep track of substantive updates to a project by keeping track of release notes and next steps. This will also help spin up a new collaborator should someone join your project.

[2] I prefer to use an underscore in place of a space and a dash as the separator of terms, concepts, and so on. This way allows you to Ctrl-Arrow through filenames and only stop at each portion rather than every word. -Dr S.

6.3   Reserving Lab Equipment

Reserving or checking out lab equipment should be done via our online lab inventory management system, Bookkit by Clustermarket. This system is invite-only, so let the director know if you don't have access. Everyone needs to make a reservation in the system as a means for tracking what equipment is being used to what extent. Please keep in mind that lab equipment does need to be sterilized and recharged between uses and equipment that *is* checked out should be returned in the same fashion (with the exception of the rechargeable batteries; the lab will take care of those upon receipt).

6.4   Requesting Lab Services

It's possible, also using Bookkit, for lab services to be requested by outside entities. Some services like 3D scanning of a property using a Matterport camera requires a certain amount of training. Other services, like providing assistance with software, can be done by those with the expertise necessary. Remember to let the director know if you have a particular skill that you'd like to offer as a service through the lab. (Know Unity? Perfect. Proficient with Adobe Aero? Awesome. These are great services to offer.)

7

Dissemination of Lab Products

We create things. This is how they get shared with the world.

7.1   Openness

Firstly, we endeavor to do as much work as possible in public to encourage transparency, honesty, and to support open science.

7.1.1   FAIR Principles

We strive to adhere to FAIR Principles, meaning we aim to develop and provide digital assets that are **F**indable, **A**ccessible, **I**nteroperable, and **R**eusable using the FAIRification Framework:

1. Metadata for Machines (M4M)
2. FAIR Implementation Profile (FIP)
3. FAIR Data Points (FDP) & FAIR Digital Objects (FDO)

7.1.2   Open Science Framework

In this vein, this book is open source and our projects are, when feasible, registered and tracked using the Open Science Framework supported by the Data Cooperative through the University Libraries at the University of Arizona. The OSF "is a research collaboration platform that is freely available to all researchers. It allows for the management and sharing of research projects at all stages of research."

Through the OSF and field-specific preprint servers (i.e., SocArXiv, EdArXiv, et cetera), all publications that can legally be provided publicly via these services will be.

Research fellows–faculty and student, alike–should create OSF profiles to allow for transparent and clear attribution.
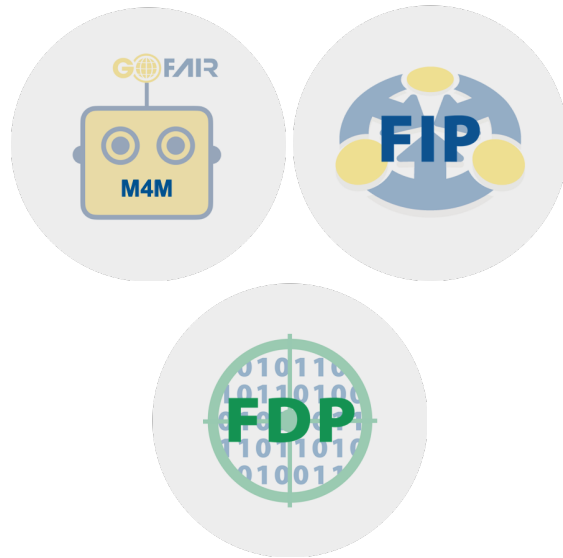
7.1.3   ReData

When applicable, we store data using the The University of Arizona Research Data Repository (ReDATA) repository, also provided by the Data Cooperative, which

> ...serves as the institutional repository for non-traditional scholarly outputs resulting from research activities by University of Arizona researchers. Depositing research materials (datasets, code, images, videos, etc.) associated with published articles and/or completed grants and research projects into ReDATA helps UA researchers ensure compliance with funder and journal data sharing policies as well as University data retention policies.

Given the nature of the work done in the MA{VR}X Lab, some content (large video recordings, for example) may be stored elsewhere. Links to data will regardless be linked within OSF projects.

7.2   Writing

- Markdown (specifically, Rmarkdown)
- `papaja`
- Zotero
- Obsidian (for your notes)
    - Use the Zotero -> Zotfile -> mdnotes -> Obsidian -> Rmarkdown pathway for an incredibly powerful and collaborative workflow.

The importance of writing about your ideas and work cannot be overstated. Take it seriously, do it often, and get others involved.

7.3   Publishing

The MA{VR}X Lab is, at heart, a research entity devoted to *applied* research. This is, of course, not to say we aren't interested in or willing to support purely theoretical or exploratory research, especially when it is conceptualized as leading to concrete applications.

7.3.1   Conferences

You are encouraged to present research at conferences. The lab has a small budget to assist in students' research presentation.

This is a list of conferences that those affiliated with the lab have attended, presented at, helped organize, or simply encourage knowing more about:

(List of conferences goes here!)

7.3.2   Newsletter

The lab also has a newsletter, `MetaMeta`, that goes out weekly.

7.4   Authorship

To transparently and fairly maintain a record of contributions, the lab follows the CRediT - Contributor Roles Taxonomy. These roles are as follows:

- Conceptualization
- Data curation
- Formal Analysis
- Funding acquisition
- Investigation
- Methodology
- Project administration
- Resources
- Software
- Supervision
- Validation
- Visualization
- Writing – original draft
- Writing – review & editing

Including a spreadsheet in your project directory that keeps track of who is fulfilling which role is required. Note that some roles may not be applicable (a student working on a self-directed project likely could ignore the *Funding acquisition* role, for example).

7.4.1   Contribution

What counts as a contribution? Keep in mind that the CRediT taxonomy above is not a checklist insofar as it is not binary; making some punctuation changes in a manuscript, while technically "editing," does not necessarily qualify you for the *Writing - review & editing* role. You should consider contributions to be *substantive* and *meaningful.*

To be considered an author on a publication, you should have:

- designed one or more experiment,
- wrote the initial draft for a major section,
- wrote the entire paper, and/or
- designed and carried out the analyses.

This is not to say that not having been involved to this degree means your work goes unappreciated or unacknowledged. For example, to receive named recognition in the author note or acknowledgements section, depending on the type of publication, you might have:

- helped to carry out data collection,
- created a table or figure,
- created or cleaned a data set,
- engaged in media wrangling and editing, and/or
- helped edit or proofread the manuscript.

7.4.2   Author Order[1]

Author order is not arbitrary, nor is it necessarily simply a descending list based on effort, at least the first and last author positions, specifically. That is, when involving student researchers, the *first* author typically goes to the student that wrote the majority of the paper, while the *last* author is the faculty research advisor, principle investigator, or the lab director (if they provided guidance).

Note that there is typically also a *corresponding author*, who is essentially the point-of-contact for the work. They are the shepherd for that particular project and are in charge of correspondence. This is typically the first or last author.

Within the MA{VR}X Lab, there are generally four kinds of publication authorship considerations:

1. If the director or a faculty research fellow designed the experiment/project and was responsible for most of the authoring, they will be first and corresponding author.
2. If a student researcher assisted in *some* the research (by carrying out some of the experimentation, for example) under the supervision of the director or a faculty research fellow but the student was

[1] This policy is, like much of this document, heavily influenced by Minda and Nielsen (2018) to the extent that drawing attention to it again is warranted.

not responsible for the research design and/or writing most of the paper, the same applies from #1.

3. If a student researcher was primarily/entirely responsible for designing and conducting research, and wrote most of the paper, all under the supervision of the director or a faculty research fellow, the student researcher will be first author and the director or faculty research fellow will be last and corresponding author.

4. Authorship with graduate students is usually decided on a one-by-one project basis. Discuss this with your supervisor.

Generally speaking, if lab resources are being utilized, the director should have at least some advisory role in the publications or products and will likely default to last author.

A

Step-by-Step Project Lifecycle

This is a step-by-step instruction on how to begin a project from scratch. This is, as the rest of the manual, a living document. Coincidentally, this same basic process can be used for class projects or papers by following just the relevant steps. The basic checklist goes like this:

1. Pitch your idea to the director (and, if you're a student researcher, your faculty research advisor) and do groundwork
2. Create your project in OSF
3. Create CRediT list of planned contributors and add them in the project
4. Submit for IRB approval with faculty research advisor (optional, depending on the type of study)
5. Pre-register (with sign-off from faculty research advisor)
6. Data Depositing

A.1 Pitch Your Idea

This is actually two steps and, if related to a class project, is very straightforward:

1. Have an "elevator pitch," being able to describe what you want to study, why, and what you hypothesize you'll find in three sentences. Pitch this (to the director or, if you're a student researcher, to your faculty research advisor).
2. With initial approval of the concept, you need to then go on to provide the groundwork for the study: a literature review, research question(s), and so on. This creates the basis for the next stages like the IRB and pre-registration (remember, the IRB even requires a basic literature review and your study will absolutely need it, so best to begin early).

This is very likely exploratory at this stage and *that is just fine.* You may even flip back and forth between steps 1 and 2 as you delve

deeper into the topic. Again, *perfectly normal* and expected. This is what research is all about.

A.2   Create Your Project

- Create a Project from a Template – OSF Guides

For consistency within the lab's organization, you'll be creating your project from a template. At this point, you'll want to pre-register your study. Remember, your *project* is a living, breathing thing that can be edited at will. *Registrations* are a little different, which we'll come to shortly.

You can also choose a description for your project at this point and a license. It's important to remember that data itself cannot be copyrighted but a database and the analysis of that data can. The University of Arizona's Data Repository License Matrix provides a few suggestions (though these are specifically for data deposited in ReDATA, they're best practices):

1. Data: Creative Commons — CC0 1.0 Universal (public domain; no copyright)
2. Documents & Media: Creative Commons — Attribution 4.0 International — CC BY 4.0
3. Code/Software: MIT License

At this point, you'll also want to have watched the OSF tutorial videos to orient yourself to how the platform works and why we use it.

A.3   CRediT List & Project Contributors

As mentioned in the authoring section, you'll want to employ the CRediT taxonomy to transparently identify who is responsible for doing what within the lifecycle of your research study. If it's a solo study, your list may be very basic and simply identify your faculty research advisor or the director with "Supervision," leaving the rest blank and, by default, assigned to you. A more complex project will require more roles. These should be identified in good faith as they are planned; they are not contracts. Include this list, either as a spreadsheet or a link (to a Google Sheet, for example) in your project (if you used the lab's template, you'll already have this).

Make sure to include these folks in the *Contributors* list in your project.

A.4   IRB Approval (optional, depending on project)

If your project, generally speaking, involves humans other than yourself (a meta-study, for example, or one using existing data does not require this), you will likely need to get approval from the Institutional Research Board (IRB) and have had done the required training through the Human Subjects Protection Program (HSPP).

> University of Arizona students/residents who act as PIs are held to the same ethical and regulatory standards as faculty PIs. They are expected to follow all University policies and processes regarding human research.
>
> It is at the College and/or Department's discretion whether a student or resident can serve as a PI. If a student (whether undergraduate or graduate) or a resident is serving as the PI, then a University advisor must be listed on the Verification of Human Subjects Training Form (VOTF) and have current training. The advisor does not need to be the student's academic advisor or dissertation/thesis committee member, but must have an academic appointment at the University of Arizona. Advisors must sign off on the human research application and will be copied on all correspondence regarding the student's human research project.[1]

[1] Conducting Human Subjects Research | UArizona Research, Innovation & Impact

One fringe benefit of needing to go through the IRB process is, having done this, your pre-registration content is almost entirely completed. Still, you'll need to get IRB approval *prior* to making your plan public.

A.5   Pre-registration

Pre-registration is, more or less, a transparent plan of action and justification. See OSF Registries | ADHD and Hyperfocus for a good example of what this looks like. You don't *have* to have all the answers, all the exact specifics, but you should endeavor to provide the information you *do* have and explain why you can't or won't provide the others. Why pre-register, though?

> The main goal of preregistering one's research is to make it easier for readers (and yourself) to distinguish between what the you set out to do (confirmation) and what was discovered along the way (exploration).[2]

[2] Preregistration: A Plan, Not a Prison

It also has the benefit of establishing precisely what you intended and expect to find, precluding *p*-hacking[3]. That said, remember that pre-registration is a *plan* and, as such, may become outdated or obsolete when things change unexpectedly. Preferably, if things do change, you should simply create a new pre-registration in the same project and either withdraw the previous one or simply reference the original

[3] P-Hacking – Statistical Bullshit

now out-of-date pre-registration the new one. The time at which you
do this is important[4].

Here's a very important aspect of registering a project:

> A registration on OSF creates a frozen, time-stamped version of a
> project that cannot be edited or deleted. The original project can still
> be edited, while the registered version cannot. You might create a
> registration to capture a snapshot of your project at certain points in
> time – such as right before data collection begins, when you submit a
> manuscript for peer review, or upon completion of a project.

Technically, you *can* update a pre-registration within a particular
set of circumstances[5]. Presume that the research design you're plan-
ning on using is the one you *will* use. Registration updates are for
situations outside the researcher's control that are necessary to the
project's completion. The logistical changes necessitated by COVID-
19 would be one example of this. You should also consider creating
a pre-data-collection registration *and* a pre-data-analysis registration
to capture any changes or alterations you'll be requiring prior to data
analysis.

How To Properly Preregister A Study - Data Colada

- Choose the right pre-registration template: Select a Registration
  Template – OSF Guides (it is very likely you will choose one of the
  following)

  1. OSF | Qualitative Preregistration Template.docx
  2. OSF | Preregistration for Qualitative Research Template.docx
     (Kern & Skrede Gleditsch, 2017)
  3. OSF | Pre-Registration in Social Psychology (van 't Veer &
     Giner-Sorolla, 2016) Pre-Registration.docx
  4. OSF | AsPredicted registration.docx[6]
  5. OSF | Replication Recipe (Brandt et al., 2013) Pre-Registration.docx

It's understandable that undergraduate researchers, especially, may
feel hesitant to pre-register their work given they're still learning not
just the content they're researching but *how to* research. This is ac-
tually a great reason to go through the open science framework: that
willingness to demonstrate growth, transparency, and a dedication to
the process can be tremendously impressive.

A.6   Depositing Data

Your collected data may be easy to handle, as in the case of a small
pilot survey, or it may take up tremendous space, as in the case of
videos of interviews, large metadata collections, scraping, et cetera.
Using the ReDATA platform requires the inclusion of a README

[4] Preregistration: A Plan, Not a Prison

[5] Introduction to Updating – OSF Guides

[6] This is a good one to choose as it is very open and is what is included in the lab's project template. -RS

helps that data to be found. Of course, you should always follow legal requirements for what kinds of information can be made available (this will be spelled out very clearly in the IRB if you are dealing with personally identifiable data).

Regardless, check with your faculty research advisor or the director to see which platform/repository is most appropriate for your particular kind of data.

B
GitHub

You may not be familiar with GitHub. This is intended to provide guidance in this regard.

(TBD)

C

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