Research Kick-Off Pack

08 March 2021 15:30

Hi there! This notebook aims to offer a helping hand in getting started with your MSc project! It aims to introduce several concepts that are usually assumed you already know. And you might already know all of this, in which case, awesome! The hope is that you find something useful here to take away and use in your project, even if this is just some inspiration.

The notebook is structured in several pages, and you are more than welcome to add more or restructure things as you like them. It contains:

- Project management tools, to be used and/or adapted to your needs: log book, meeting notes, project backlog templates
- Writing guide, specifically aimed at research papers / project reports
    - Critical Literature Review
    - Other writing tools
- Some basic information for getting started with…
    - Java, with particular applications in Game AI
    - Github and version control
    - IntelliJ / PyCharm (IDEs for Java/Python)
    - Latex/Overleaf for report writing
- Support page with links to various useful resources - please check it out!

An assortment of other useful links

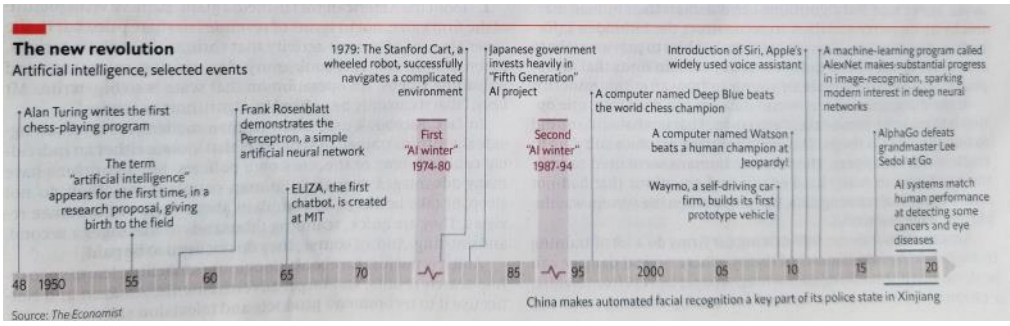
- QMUL Game AI group website: http://gameai.eecs.qmul.ac.uk
- QMUL Game AI group calendar: https://calendar.google.com/calendar?cid=MXI5bjNwaTAwaWIydm5tM2RlZ3Nzb3Z2czBAZ3JvdXAuY2FsZW5kYXIuZ29vZ2xlLmNvbQ (we can also add you to the mailing list if you'd like to take part in our weekly meetings and seminars, contact your supervisor in this case)

- QMUL How to research: https://qmplus.qmul.ac.uk/pluginfile.php/2363262/mod_resource/content/2/How%20to%20Research%20Guide.pdf
- QMUL Guidance for writing lab reports: https://qmplus.qmul.ac.uk/pluginfile.php/2363244/mod_resource/content/1/Guidance_for_Writing_Lab_Reports.pdf
- QMUL academic skills resources: https://www.qmul.ac.uk/library/academic-skills/
- QMUL Harvard referencing: https://qmplus.qmul.ac.uk/pluginfile.php/2363246/mod_resource/content/1/Harvard%20Referencing%20-%20Imperial.pdf

- EECS IT for new students: http://support.eecs.qmul.ac.uk/faq/newcomers/
- Install Office: https://www.its.qmul.ac.uk/support/self-help/software/free-and-discounted-software/office365-proplus/

- Game AI conferences: https://docs.google.com/spreadsheets/d/1ySqFUBdchv_e6Dc9vt_8DrbfBtElIT01iimSdamdo00/edit?usp=sharing
- Game AI survey: https://gaigresearch.github.io/gameaisurvey
- Technical Games Research Groups World-Ranking: http://www.kmjn.org/game-rankings/
- Game Design talks: https://docs.google.com/spreadsheets/d/1oPvg0Um9ZdBBcsfKg4PSaMViVtU2SWW5tWZUbF_LjFc/edit#gid=0

- Things a scientist is supposed to know: https://github.com/philippbayer/Things-a-scientist-is-suppposed-to-know
- "Twenty things I wish I'd known when I started my PhD": https://www.nature.com/articles/d41586-018-07332-x?utm_source=fbk_nnc&utm_medium=social&utm_campaign=naturenews&sf201730242=1
- State-of-the-art script: https://huyenchip.com/2018/10/04/sotawhat.html
- Fuse: https://getfuse.io/
- Many tools for writing or others: https://tinytools.directory/



The new revolution

Artificial intelligence, selected events

Alan Turing writes the first chess-playing program
The term "artificial intelligence" appears for the first time, in a research proposal, giving birth to the field
Frank Rosenblatt demonstrates the Perceptron, a simple artificial neural network
ELIZA, the first chatbot, is created at MIT
First "AI winter" 1974-80
1979: The Stanford Cart, a wheeled robot, successfully navigates a complicated environment
Japanese government invests heavily in "Fifth Generation" AI project
Second "AI winter" 1987-94
A computer named Deep Blue beats the world chess champion
Introduction of Siri, Apple's widely used voice assistant
A computer named Watson beats a human champion at Jeopardy!
Waymo, a self-driving car firm, builds its first prototype vehicle
A machine-learning program called AlexNet makes substantial progress in image-recognition, sparking modern interest in deep neural networks
AlphaGo defeats grandmaster Lee Sedol at Go
AI systems match human performance at detecting some cancers and eye diseases
China makes automated facial recognition a key part of its police state in Xinjiang
48
1950
55
60
65
70
85
95
2000
05
10
15
20

Source: *The Economist*

Project Management

08 March 2021 15:30

Some tools suggested for managing your project.

Log Book

08 March 2021 12:50

Week: *(Monday date)*

Activities:

- Activity1
- Activity2

Notes:

- Note1
- Note2

Questions:

- ? Question1
- ? Question2

Meeting Notes

08 March 2021 12:50

Date:

Agenda:

□ Item1
□ Item2

Notes:

- Note1
- Note2

Actions/Tasks:

- Action1
- Action2

Project Backlog

08 March 2021 12:42

High Priority

□
□
□
□
□
□
□
□
□
□
□

Medium Priority

□
□
□
□
□
□
□
□
□
□
□

Low Priority

□
□
□
□
□
□
□
□
□
□
□

Writing Guide

08 March 2021 15:28

Common Feedback & General Tips

This document compiles some common feedback on reports and some general writing tips, to help you write better assignments/project reports. This is only a brief summary of some main points, if you want to read more on this, check out this guide for technical writing by Norman Fenton.

General Report Presentation

- **Templates**: Make use of the templates given (i.e. don't alter fonts, sizes, spacing etc.).
- **Structure**: Structure your report into sections (and sub-sections!), and the sections into paragraphs. A nicely structured report can more easily convey the quality of its contents. However, don't overdo it either - having only 1 short sentence in a sub-section, for example, is a sign that you've added too much structure.
- **Language**: This is a formal report, avoid colloquial or casual language.
- **Padding**: Quality over quantity! Avoid unnecessary repetition or padding of any sort (e.g. extra text, repetitive text, stating the obvious, long pieces of code, repetitive images etc.).
- **Workflow**: See Figure 1 for a diagram depicting workflow for research, which a report should reflect too.
- **Precision**: Be precise, specific in your language. For example, "The modifications made the agent better" versus "The modifications described in Section 5.2 increased the MCTS agent's average win rate on all game settings tested (see Section 6.1) by 10%" (hint: the second is better in a technical report).
- **Reader**: When writing a report, think of the reader. Write good text, watch out for grammatical errors and typos. If you can keep them entertained, they'll read until the end. In other words, don't be boring (see Figure 2). Don't write disjoint paragraphs, build a narrative.
- **Writing**: Start by noting down all ideas you have (bullet points are a great option at this point). Keeping notes as you do the research (development, experiments) is useful to be able to include small details or decisions you make that you may forget about by the end, when you have to do the formal write-up of the process.

Figures, tables, code

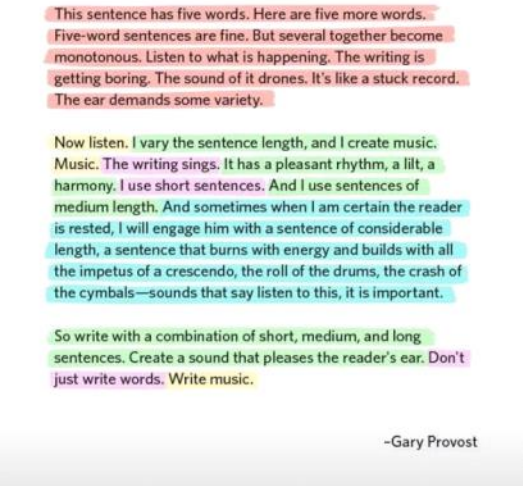
- **Captioning**: Any figures (images), tables and code snippets you include should be correctly labelled, captioned and referred to in text. For example, a plot of an AI agent's win rate could have the caption: *Figure 3. Average win rate of the A* agent over 10 runs.* Then, in your text you could mention: *The win rate of an A* agent was tested in several levels (see Figure 3) and we can observe that [...].* If you don't refer to them in text, the reader can assume they're not necessary for the understanding of the report and won't look at them.
- **Code snippets**: If you copy-paste your code from your agent to explain what it does, label it as "code snippet" and not pseudo-code. If you write pseudo-code instead, label it as such.
- **Margins**: Make sure all your figures, tables, code and other materials fit within the margins of the document (nothing should float outside of where the text blocks begin/end).

References

- **Peer-review**: Cite predominantly peer-reviewed papers, articles or books. Include external links or materials in footnotes if needed, references should not be just a link to an external website.
- **Critical review**: Review literature critically, mention how it relates to your work, identify gaps or issues with previous approaches etc.
- **Relevance**: Cite work that is relevant to the framework and methods you use. Make sure the references actually make sense. Don't add references just for the sake of increasing the number of cited works. However, reviewing *several* different works that use similar methods to what you use and/or similar environments is preferable.
- **Referencing style**: Make sure you consistently adhere to one (and only one) referencing style: IEEE, Chicago, Harvard, Vancouver, etc. These styles indicate the fields that should be included in a reference and their order, for each type of reference you cite (book, paper, article, etc.). For example, if you follow IEEE referencing style, check out their IEEE Reference Guide.
- **Claims**: Make sure to back up any claims you make with either evidence or references.
- **Placing**: Any references should be placed within sentences [1]. Don't include the citation in section headers, but in the text. If you talk about one piece of work in a paragraph, in most cases, only one reference either in the beginning or the end is needed (i.e. don't add the same reference after each sentence in a paragraph).
- **Finding literature**: If you don't know where to start looking for references, look up some key words in Google Scholar and read through paper abstracts to identify those possibly relevant to your topic. If that doesn't give you enough material, a common technique used in reviewing work is checking references on the relevant papers you've already found (i.e. those suggested to read in a module lecture notes / lab scripts), and find those papers cited which might be relevant (not all would be, depending on the angle of the work). Tracing through references could result in quite a large collection of literature, make sure to narrow it down to your selected topic. Another resource for this is **arXiv**, often containing state-of-the-art research, but use these articles sparingly as they are not peer-reviewed.

Content

- **Why**: Why are you doing this research? Just because it is an assignment is not an option (and doesn't need to be mentioned in your report either). Motivate your work and fit it within the larger research area (introduction, literature review, background). Make the reader understand why what you write is important, especially for the literature review. Let the reader understand where your work fits in the related works and how it fills possible gaps in the literature.
- **What**: Given your literature review and background information, *what* are you going to research? Describe the techniques involved in your research (background) and what's your specific contribution, your approach to answer the research question (methods).
- **How**: Describe how you are going to apply and test your approach (experimental setup), with sufficient details so that it can be repeated and replicated by external researchers.
- **What happened**: Present results, plots, tables, output data.
- **What does it mean?** Analyze the results, discuss why you may have gotten these specific results, and how does this relate to your initial motivation, does it answer your question? It's okay if it doesn't, and it's okay to make speculations as to why something may have happened (further investigation into this 'why' can be mentioned as future work).
- **Recap**: Always conclude a report with a brief summary of what the document describes (the what, the how, and the results discussions), and add notes for further studies that can be done based on the results obtained.

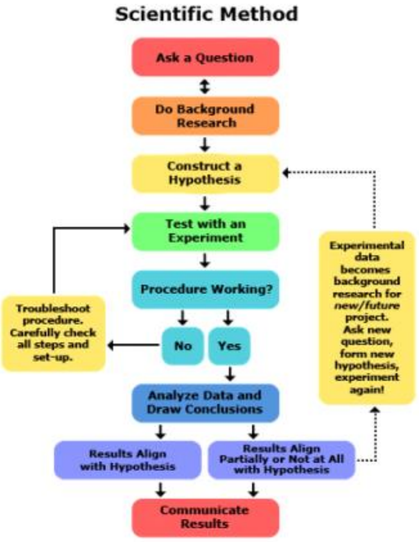


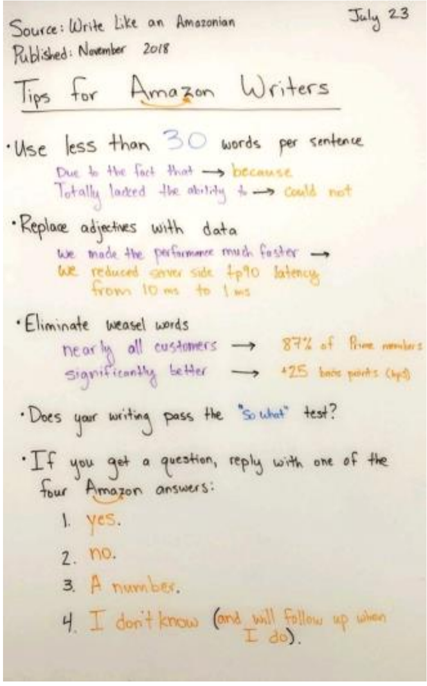
This sentence has five words. Here are five more words. Five-word sentences are fine. But several together become monotonous. Listen to what is happening. The writing is getting boring. The sound of it drones. It's like a stuck record. The ear demands some variety.

Now listen. I vary the sentence length, and I create music. Music. The writing sings. It has a pleasant rhythm, a lilt, a harmony. I use short sentences. And I use sentences of medium length. And sometimes when I am certain the reader is rested, I will engage him with a sentence of considerable length, a sentence that burns with energy and builds with all the impetus of a crescendo, the roll of the drums, the crash of the cymbals—sounds that say listen to this, it is important.

So write with a combination of short, medium, and long sentences. Create a sound that pleases the reader's ear. Don't just write words. Write music.

-Gary Provost


Scientific Method
Ask a Question
Do Background Research
Construct a Hypothesis
Test with an Experiment
Procedure Working?
No
Yes
Troubleshoot procedure. Carefully check all steps and set-up.
Analyze Data and Draw Conclusions
Results Align with Hypothesis
Results Align Partially or Not at All with Hypothesis
Communicate Results
Experimental data becomes background research for new/future project. Ask new question, form new hypothesis, experiment again!



Source: Write Like an Amazonian
Published: November 2018

July 23

Tips for Amazon Writers

- Use less than 30 words per sentence
  - Due to the fact that → because
  - Totally lacked the ability to → could not
- Replace adjectives with data
  - We made the performance much faster → We reduced server side tp90 latency from 10 ms to 1 ms
- Eliminate weasel words
  - nearly all customers → 87% of Prime members
  - significantly better → +25 basis points (bps)
- Does your writing pass the "So what" test?
- If you get a question, reply with one of the four Amazon answers:
  1. yes.
  2. no.
  3. A number.
  4. I don't know (and will follow up when I do).

Critical Literature Review

08 March 2021 12:44

Table of Contents

Finding papers to read and cite (Table of Contents)

The easiest way to get started is to head to Google Scholar and search for keywords related to your project:

1. Save and make notes of all papers you find that *seem* relevant based on their **title** and **abstract**.
2. Read the **introduction** and **conclusions** of this first list of papers, and eliminate those that are not actually relevant for you.
3. Look at the list of references in the papers collected and retrieve any other papers that seem relevant to your topic. Repeat the steps above for this new list of papers, and keep going until you have at least 20 papers that have some connection to your project.
4. Follow the steps below to read each paper in more detail, and make notes on each one.

Some other ways to find papers:

1. Search on Google for your topic, using the keyword "survey". Surveys are longer papers that act as stand-alone literature reviews on particular topics, and therefore act as a great source for your own literature reviews. Look through the works cited in the survey to find relevant papers.
2. Look for conferences where work related to your topic is usually published, e.g. IEEE CoG and search for proceedings for that conference. ACM and IEEE conference proceedings are easily accessible, but if you find a paper that is behind a paywall, try to search for its title in Google Scholar, or for its title and the "PDF" keyword in Google directly. Often, papers are published on the authors' websites or university archives and publicly available.
3. https://ieeexplore.ieee.org/Xplore/home.jsp (sign in with your QMUL login) / https://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=7782673, https://arxiv.org/, https://dblp.org/, https://dl.acm.org/

Critical Review (Table of Contents)

You may come across the term **critical** when asked to do a literature review, or when receiving comments or feedback on your literature review. This refers to assessing the contribution of the work read and its connection to your own work, instead of simply summarizing the approach in the cited paper.

For example:

- **Summary of work:**
  For example, approaches based on Hyper-Heuristics have been used in the General Video Game AI framework (GVGAI [2]) by Mendes et al. [11]. These approaches train the agent off-line to recognise the best strategy for the game at hand from a portfolio. When the agent has to play a new game, it uses the trained mechanism to select the best strategy depending on some of the game's features. Experiments have shown that these approaches are promising and are able to outperform agents based on standard algorithms.
  From: Raluca D. Gaina, Chiara F. Sironi, Mark H.M. Winands, Diego Perez-Liebana, Simon M. Lucas, "Self-Adaptive Rolling Horizon Evolutionary Algorithms for General Video Game Playing", in IEEE Conference on Games (CoG), 2020.
- **Critical review:**
  Some games adopt this concept and research on social, interactive characters in order to create more immersive experiences for their players. A great example here is Emily Short's game "Galatea" [9], which focuses on interactive storytelling. Emily Short writes about NPC conversation systems [10], showcasing different functionalities these can take. We are interested in the tutorial system most, although in our case it would be reversed: the humans would be giving the AI hints, and not the other way around, as in Matt Wigdahl's "Aotearoa" [11] or Santiago Ontanon's "SHRDLU" [12]. These characters, although becoming more and more impressive with the inclusion of memory, personality and adaptation to different players and play styles, they do exist only within the game. Our vision wishes to take this concept further and bring more presence into the real world to such characters.
  From: Raluca D. Gaina, Simon M. Lucas, Diego Perez-Liebana, "Project Thyia: A Forever Gameplayer", in IEEE Conference on Games (COG), pp. 1-8, 2019.

What does a critical review include? (Table of Contents)

- The main ideas or arguments in the book or article. Don't feel you have to mention everything: part of being an effective evaluator is being able to extract the most important ideas from a source.
- Your own evaluation of the article. Don't just accept the author's statements without question. Ask yourself questions such as: How effective is the author's argument? Is it clearly presented and explained? Is it biased in any way?
- The connection to your work and/or to other works included in the same section. (Although this connection can sometimes be simply implied instead of explicitly stated.)
- A critical review is not just a summary!

Reading an article for a critical review (Table of Contents)

1. Have a clear context in mind that you will place the work within, so that you can look for specifics related to your topic.
2. Read the title and abstract first, to form an idea of what the article will cover.
3. Take notes as you read of anything that is confusing or unclear. You'll have two main purposes in your reading:
    a. Understand the author's argument (what the author is trying to show, and the steps he or she takes to prove this argument).
    b. Evaluate the effectiveness of the author's argument.
4. Write down any questions you have (pay particular attention to questions that seem important, but that the author does not address).

Paper reviews (Table of Contents)

A good way to practice critically reviewing other works, instead of simply reading them to find out their methods/results, is to review papers. All articles published in journals or conferences undergo a review process, where several other scholars in the field read the paper and send back comments and feedback on the paper's presentation of the work, as well as the soundness of the work itself. This process is used to validate papers before they are published, making **peer-reviewed** articles more likely to contain accurate citable information than blog posts, arxiv.org articles etc.

Recommendation: when doing background reading for your project, record not only a summary, but also your own review of the paper (using the template provided or any other you prefer). This will help you in several ways:

- Reading the paper in more detail and questioning its soundness
- Understanding paper presentation techniques to use when writing up your own work
- Writing a critical literature review for your own work

Critical paper review template (Table of Contents)

Summary: briefly state what the paper is really about (may be different to what they say it is in the abstract/introduction).

Contributions: what are the claimed contributions of the paper? How significant/important are the claimed contributions? What are the actual contributions (if different)?
Support: how are these contributions supported? Is the support adequate? Correct? Is the evaluation adequate? Well-designed? Comment on the support for each claimed contribution and, if appropriate, on how the support could be improved.
Relevance to project: how is this article relevant to your project? Are you going to use some of the methods described, compare to results obtained? Did you find a flaw in the approach or experimental setup which you will address in your work? Is there something mentioned in the future work section which you can use to build upon? Do their discussion of results or particular statements inform your thinking/work?

Technical quality: is the paper technically sound? Does it adequately address the limitations of the results? Comment on how technical quality could be improved. Are the strengths/weaknesses and reasons for observed results explored systematically? Are algorithms, evaluation methodology, etc. described in sufficient detail? Could a reader replicate the work? Are the figures/tables sufficient?
Originality: are the claimed contributions novel? Does the paper place the work appropriately in the context of related research?
Clarity: comment on the writing, organization & exposition.

Detailed comments of major issues: if specific issues highlighted need to be explained in more detail, do so. Could refer to specific sections or sentences.
Minor changes: some changes (i.e. incorrect spelling or figure numbers) that would be easy to fix/don't have a major impact in the overall quality of the paper.

The template provided on the right is a typical journal review template, which usually go in much more depth than conference paper reviews. The "relevance to project" topic was added specific to your usage of this template (and not an aspect covered in regular reviews).

Literature Reviews (Table of Contents)

A literature review is a type of critical review in which you analyse and evaluate many sources on a specific topic. The purpose is to provide your reader with an overview of the research that has been done on your topic, and to evaluate the sources you are reviewing. Focus on the most important points relevant to your topic.

For each paper, summarise the work **and** evaluate the effectiveness of the authors' arguments **and** state the relevance to your own work. Point out areas where much research has been done, as well as areas where more research still needs to be done. It is also important to compare sources with each other, pointing out where they agree or disagree with one another.

Finally, draw conclusions from your findings, describing what the literature as a whole suggests about your topic. Take into consideration your evaluations of the relative effectiveness of the different authors' arguments. If there are important aspects of the topic that have not yet been fully researched, you might not be able to reach definite conclusions. If this is the case, you can discuss why more research is needed.

Further reading (Table of Contents)

- http://ormawa.kd-cibiru.upi.edu/wp-content/uploads/2019/01/critical-review-or-literature-review-handout.pdf
- https://sociology.fas.harvard.edu/files/sociology/files/literature_review.pdf
- https://researchguides.njit.edu/ld.php?content_id=32213382

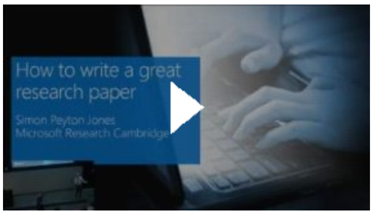
Other Writing Tools & Tips

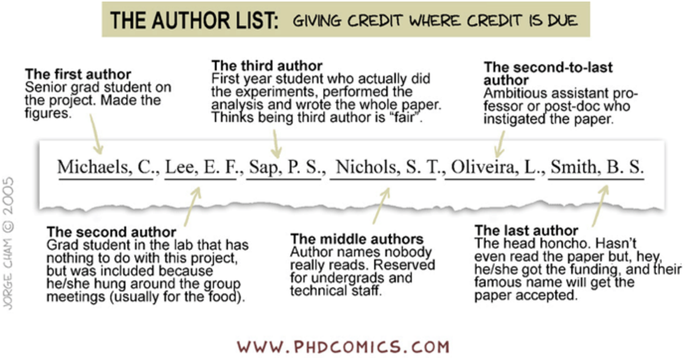
08 March 2021 12:44

- **Academic Toolkit** have some free resources available to help break down and design research or articles (in your case, the report): e.g. https://www.academic-toolkit.com/the-article-design-canvas/ (browse the other tools and search for the "download" buttons). This will help not only to get started with asking the right questions and finding the right content, but also to frame your thinking when doing research.
- **Voice dictation**: software such as MS Word (available for free with your QMUL account) or Google Docs feature dictation tools which allow you to speak your writing. This can speed up the process of getting ideas down on paper, which can be fixed up later.
- **How to write the introduction to a research paper**: https://docs.google.com/presentation/d/1PZj0Sev2yjDu9NNr96S_wwjKCgIDhGmLjW1vtQpDhlk/edit?usp=sharing
- **How to write a great research paper**: https://abhijeetkrishnan.me/how-to-write-a-great-research-paper/
  1. **Don't wait: write**
     Don't follow the typical research of process of idea > research > paper. Instead, do idea > paper > research. Let the process of writing the paper guide your research. Writing your ideas down crystallises them, forcing you to think more deeply about your idea, and revealing possibilities you did not consider. It also creates a shareable artifact that you can use to invite collaboration and critique.
  2. **Identify your key idea**
     Imagine your paper to be virus whose goal it is to infect the mind of your reader with *one* key idea. This idea should be something useful and re-usable that stays with the reader after they've finished reading your paper.
  3. **Tell a story**
     Imagine explaining your research to a friend at a whiteboard. You would probably explain the problem first, describe why it is interesting and unsolved, talk about your idea and how it works (with details and data), then compare it with other approaches. Remember that you start losing readers from the first page onwards, so keep your paper engaging.
  4. **Nail your contributions**
     Ensure you focus on your contributions in the 1st page - list them in bullet points and make them refutable. Use forward references to link to where you justify the contributions later in the paper.
  5. **Related work: later**
     Related work can act as a barrier between your idea and the reader's mind. It is better to include it at the end after you've already explained your idea simply. Use them earlier if they help explain your solution path better (e.g. if you're building off of prior work), but don't list them for the sake of adding alternative approaches or examples. Give credit freely (it is not a zero-sum game).
  6. **Put your readers first (examples)**
     Your problem is a labyrinth; in your research, you've encountered many dead-ends before hitting on the solution. You need to lead your readers comfortably to the solution. Address obvious objections your reader might have. Eschew technical-sounding prose since they will make your reader feel sleepy or stupid. A reader should be able to take something away from your paper even if they skip the details.
  7. **Listen to your readers**
     Get your paper read by as many friendly guinea pigs as possible. Explain carefully what you want (confusion is better feedback than spelling errors). Value the first time readers and make it easy for them to give you feedback. Reviews are gold dust; people are donating their time to write a review for you. Take criticism positively.

  From <https://abhijeetkrishnan.me/how-to-write-a-great-research-paper/>

  How to Write a Great Research Paper
  Microsoft Research


How to write a great research paper
Simon Peyton Jones
Microsoft Research Cambridge


THE AUTHOR LIST: GIVING CREDIT WHERE CREDIT IS DUE
The first author
Senior grad student on the project. Made the figures.
The third author
First year student who actually did the experiments, performed the analysis and wrote the whole paper. Thinks being third author is "fair".
The second-to-last author
Ambitious assistant professor or post-doc who instigated the paper.
Michaels, C., Lee, E. F., Sap, P. S., Nichols, S. T., Oliveira, L., Smith, B. S.
The second author
Grad student in the lab that has nothing to do with this project, but was included because he/she hung around the group meetings (usually for the food).
The middle authors
Author names nobody really reads. Reserved for undergrads and technical staff.
The last author
The head honcho. Hasn't even read the paper but, hey, he/she got the funding, and their famous name will get the paper accepted.
JORGE CHAM © 2005
WWW.PHDCOMICS.COM

Getting Started with…

08 March 2021 15:30

Some handy guides for various software and tools you may use during your project.

Java for Game AI

04 May 2021 14:28

A short course on Java for beginners, with a focus on its use for Game AI (though without explaining the corresponding AI concepts), assuming little to no previous programming experience.

java-lessons

The lessons walk you through programming a simple game in Java and writing AI that plays the game. Some of the examples and explanations reference the game Pommerman as implemented here: https://github.com/GAIGResearch/java-pommerman

Code solutions for most exercises can be found in a Github repository: https://github.com/rdgain/JavaClasses

Check the commit history for the intermediary state of the code: https://github.com/rdgain/JavaClasses/commits/main

E.g. https://github.com/rdgain/JavaClasses/commit/6a73a0fc71dad8b20326e12101509e5efaa793c6 is the code updated with the solution to Exercise 3.

Zip Contents:

- **1.pdf**: first lesson slides, basic Java (types, variables) and Object-Oriented Programming concepts.
- **2.pdf**: second lesson slides:
    - Methods
    - Classes, Inheritance and Interfaces
    - Java Coding
- **3.pdf**: third lesson slides:
    - Arrays, lists, queues and sets
    - Maps, Hash vs Tree
    - Trees and Graphs
    - Visualisation and Testing
- **Exercise 1-14**: exercises to follow in order, which appear in the slides but are also provided separately for easier reference. Some of these exercises reference other files in the zip files:
    - **mazeGraph.txt**: used in Exercise 12
    - **mazeGraphDraw** folder: explained in Exercise 12
    - **graphToGridDraw** folder: explained in Exercise 13
    - **Week 2 - OOP**: used in Exercise 1, with an example answer provided in *Week 2 - OOP - myExample*
- **MazeGameOOP-StepByStepProcess.pdf**: an alternative way of thinking about Object-Oriented problems.

Latex/Overleaf

08 March 2021 14:01

Table of Contents

Basic step-by step instructions: (Table of Contents)

1. Make an Overleaf account.
2. Open the dissertation template .zip file as a project.
3. Add a new **.bib** file to the project (any name would do, e.g. **references.bib**).
4. Edit the **.tex** file to remove extra information and add your project title and author name.
5. Add the following at the end of the file, just before the **\end{document}** command (to include the citing information in the **references.bib** file):
    \bibliographystyle{IEEEtran}
    \bibliography{IEEEabrv,references}
6. Share the Overleaf project with your supervisor.
7. Add the rest of the contents in your paper.

1. Make an Overleaf account (Table of Contents)

Head over to https://www.overleaf.com/ and register! Basic accounts are free (and you should go for this option).

What is Latex?

LaTeX (pronounced LAY-tek or LAH-tek) is a tool used to create professional-looking documents. It is based on the WYSIWYM (what you see is what you mean) idea, meaning you only have focus on the contents of your document and the computer will take care of the formatting. Instead of spacing out text on a page to control formatting, as with Microsoft Word or LibreOffice Writer, users can enter plain text and let LaTeX take care of the rest.

What is Overleaf?

Overleaf is an on-line LaTeX edition tool that allows you to create and compile LaTeX documents directly in your web browser and share them easily with collaborators.

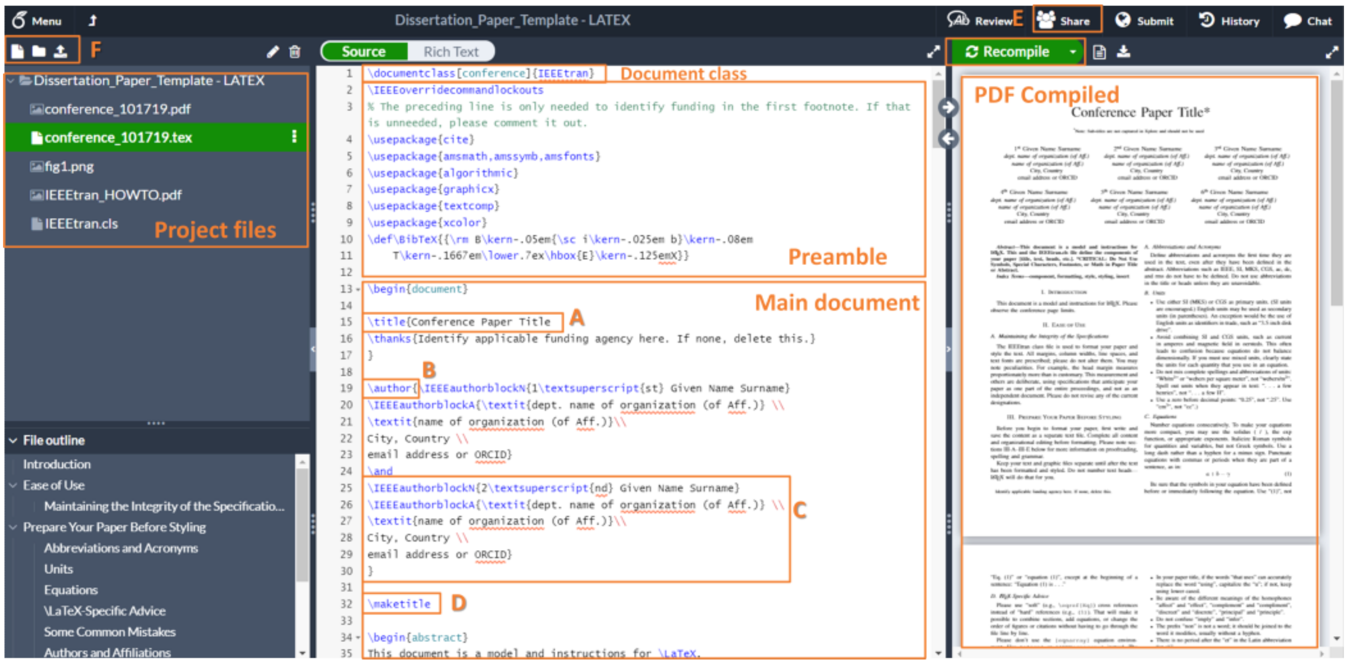
Basic Overleaf project

- **.tex** → Source file with Latex code. One file will be the main one being compiled for the project.
- **.bib** → Bibliography file, contains bibtex of one or several works to be cited in the paper.
- **.cls** → Style file, defines how the paper is formatted (think of **CSS** = **cls** vs **HTML** = **tex** if you're familiar with web development)
- **.png** / **.pdf** / others → Image files to be displayed in the project
- folders → Useful for grouping the different types of files together

2. Open the dissertation template .zip file as a project (Table of Contents)

Navigate to your home-page once logged in, click New Project → Upload Project and select the **.zip** file downloaded from QMPlus (https://qmplus.qmul.ac.uk/mod/resource/view.php?id=1495698)

After opening the file, you should have a view similar to this:



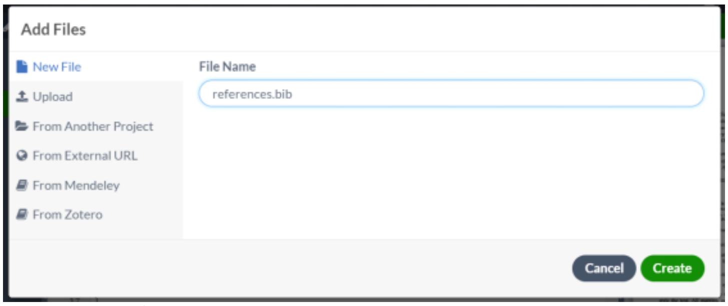
```
\documentclass[conference]{IEEEtran}
\IEEEoverridecommandlockouts
% The preceding line is only needed to identify funding in the first footnote. If that is unneeded, please comment it out.
\usepackage{cite}
\usepackage{amsmath,amssymb,amsfonts}
\usepackage{algorithmic}
\usepackage{graphicx}
\usepackage{textcomp}
\usepackage{xcolor}
\def\BibTeX{{\rm B\kern-.05em{\sc i\kern-.025em b}\kern-.08em
    T\kern-.1667em\lower.7ex\hbox{E}\kern-.125emX}}

\begin{document}

\title{Conference Paper Title
\thanks{Identify applicable funding agency here. If none, delete this.}
}

\author{\IEEEauthorblockN{1\textsuperscript{st} Given Name Surname}
\IEEEauthorblockA{\textit{dept. name of organization (of Aff.)} \\
\textit{name of organization (of Aff.)}\\
City, Country \\
email address or ORCID}
\and
\IEEEauthorblockN{2\textsuperscript{nd} Given Name Surname}
\IEEEauthorblockA{\textit{dept. name of organization (of Aff.)} \\
\textit{name of organization (of Aff.)}\\
City, Country \\
email address or ORCID}
}

\maketitle

\begin{abstract}
This document is a model and instructions for \LaTeX.
```

Figure 1: Main project view

You can compile this project by clicking the green "Recompile" button, and you should do so after you make changes to the document in order to see these changes reflected in the PDF displayed. There may be errors in compilation, which can be reviewed by clicking the log button next to the compile button.

3. Add a new .bib file to the project (Table of Contents)

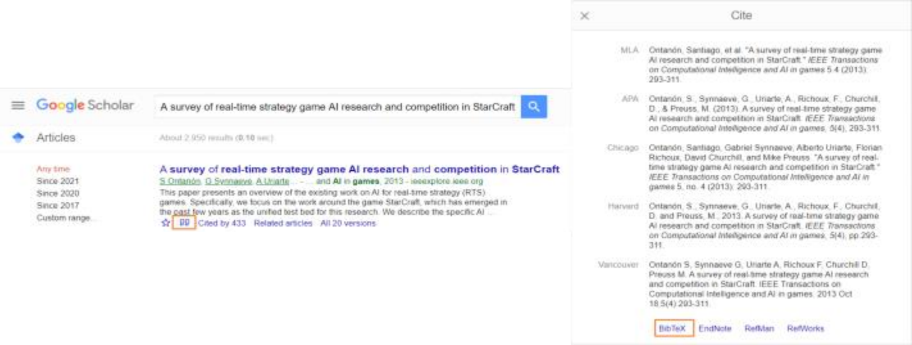
In Figure 1 above, the **F** letter highlights 3 buttons (from left to right): create a new file, create a new folder, or upload a file. Select the first button, input the name as "references.bib" and create it:



File Name: references.bib

Figure 2: Creating a file

You can then add BibTeX information from your papers in this new file. To obtain these you can use Google Scholar, clicking the "cite" symbol underneath a paper, and then selectin the BibTeX option:



A survey of real-time strategy game AI research and competition in StarCraft

About 2,950 results (0.10 sec)

A survey of real-time strategy game AI research and competition in StarCraft
S Ontañón, G Synnaeve, A Uriarte... - ... and AI in games, 2013 - ieeexplore.ieee.org
This paper presents an overview of the existing work on AI for real-time strategy (RTS) games. Specifically, we focus on the work around the game StarCraft, which has emerged in the past few years as the unified test bed for this research. We describe the specific AI ...

MLA: Ontañón, Santiago, et al. "A survey of real-time strategy game AI research and competition in StarCraft." *IEEE Transactions on Computational Intelligence and AI in games* 5.4 (2013): 293-311.

APA: Ontañón, S., Synnaeve, G., Uriarte, A., Richoux, F., Churchill, D., & Preuss, M. (2013). A survey of real-time strategy game AI research and competition in StarCraft. *IEEE Transactions on Computational Intelligence and AI in games*, 5(4), 293-311.

Chicago: Ontañón, Santiago, Gabriel Synnaeve, Alberto Uriarte, Florian Richoux, David Churchill, and Mike Preuss. "A survey of real-time strategy game AI research and competition in StarCraft." *IEEE Transactions on Computational Intelligence and AI in games* 5, no. 4 (2013): 293-311.

Harvard: Ontañón, S., Synnaeve, G., Uriarte, A., Richoux, F., Churchill, D. and Preuss, M., 2013. A survey of real-time strategy game AI research and competition in StarCraft. *IEEE Transactions on Computational Intelligence and AI in games*, 5(4), pp.293-311.

Vancouver: Ontañón S, Synnaeve G, Uriarte A, Richoux F, Churchill D, Preuss M. A survey of real-time strategy game AI research and competition in StarCraft. IEEE Transactions on Computational Intelligence and AI in games. 2013 Oct 18;5(4):293-311.

Figure 3: Obtaining citing BibTex information from Google Scholar

This will open a new browser tab with the code you need to copy into your .bib file, for example:

```
@article{ontanon2013survey,
  title={A survey of real-time strategy game AI research and competition in StarCraft},
  author={Ontan{\'o}n, Santiago and Synnaeve, Gabriel and Uriarte, Alberto and Richoux, Florian and Churchill, David and Preuss,
Mike},
  journal={IEEE Transactions on Computational Intelligence and AI in games},
  volume={5},
  number={4},
  pages={293--311},
  year={2013},
  publisher={IEEE}
}
```

Which can be cited in your paper using the **\cite{ontanon2013survey}** command.

4. Edit the .tex file to remove extra information and add your project title and author name (Table of Contents)

In your project files, find the main .tex file (named conference_101719.tex by default) and find the **\title{}** (**A** in Fig.1) and **\author{}** (**B** in Fig.1) commands. In the author command, several author blocks (**C** in Fig.1) can be specified, separated by the **\and** command.

Command **\maketitle** (**D** in Fig.1) makes sure all this information is displayed in the PDF of your paper.

6. Share the Overleaf project with your supervisor (Table of Contents)

Find the "Share" button (**E** in Fig.1) and either input the email address, or create a shareable link and email this yourself instead. Give editing writes for e.g. help with debugging LaTeX.

7. Add the rest of the contents in your paper (Table of Contents)

When you are ready to do so, add the rest of the contents. Some basic commands that will be helpful in structuring this:

- The abstract will go between the brackets of the **\abstract** command.
- **\section{Section name}** makes a section. Similarly, you can have subsections, or subsubsections, or paragraphs.
- **\label{Label name}** gives a label to a structure (e.g. to a section). You can then refer to this structure with the **\ref{Label name}** command, which will automatically retrieve the correct numbering even if you rearrange things.
- **\caption{Caption}** adds a caption to a figure, table etc.
- **\begin{itemize}** makes a bullet-point list, where each bullet point starts on a new line with command **\item**. The bullet-point list must be closed with command **\end{itemize}**. Similarly, you can have a numbered list (enumerate).
- **\begin{equation}** Eq… **\end{equation}** makes an equation. You can add math in-line between **$** symbols.
- Underscore (_) in a math block means subscript in latex, and ^ means superscript.
- You can force a new line with the \\ symbols.
- You can import extra packages with needed functionality by using the **\usepackage** command in the **Preamble** of the document.
- You can include code from other .tex files in your project with the **\input** command.

Further Reading (Table of Contents)

- https://www.overleaf.com/learn/latex/Learn_LaTeX_in_30_minutes

Github

08 March 2021 15:27

Why?

Version control is very important for any project you'll undertake. Keeping a history of your project developing not only allows you to *see* the progress you make and quantify it, but you can also *use* past milestones to your advantage. Has a new feature you just added broken the system? Revert back. Did you find a bug that you're not sure when it was introduced? Check the history. Do you have multiple options for implementing a feature? Do both in parallel "timelines" of the project and keep the one that works better.

There are many benefits to this concept that you'll slowly discover if you've not worked with version control before!

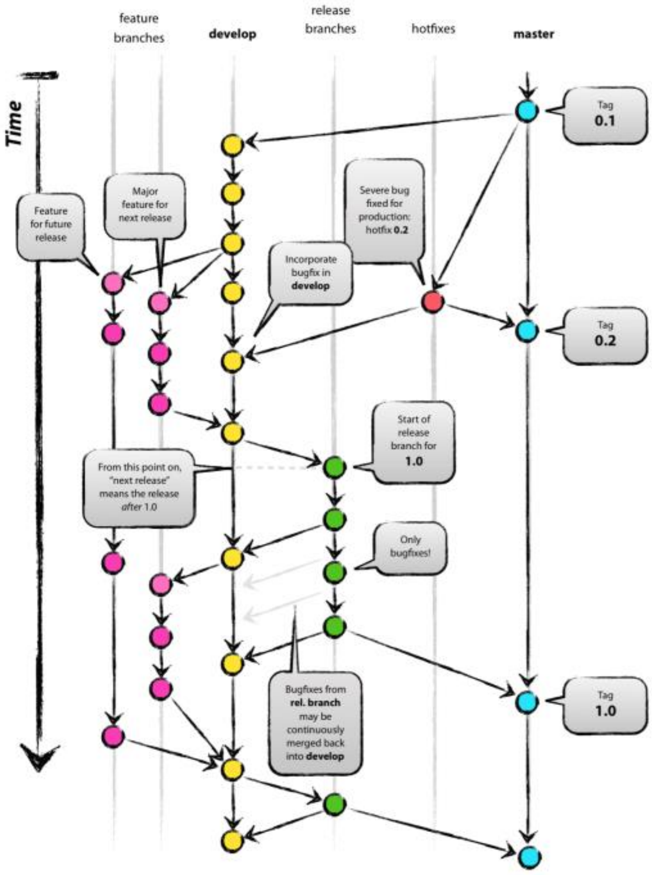
Github

Git and Github are an easy way to manage your project. Changes to different files can be grouped in named **commits** with a description, which are able to show the differences in the files changed for easy sanity checks. You can **push** these commits to update the code on the host server, and **pull** to update your local **clone** of the **repository** containing your project. You can develop multiple **branches** of your project in parallel, so you can test out different features without affecting any stable code you've already developed (and you can later **merge** these different branches into the **master** or main branch).

Github additionally includes further project management tools: you can create one or several **projects** associated with a repository, to keep track of tasks to-do / in-progress / done; you can add a **wiki** which documents the project across several easily navigable markdown pages. And you can create **pull requests** to manage the merging of branches, as well as **issues** for tasks that need to be done, bugs that need to be addressed etc.

Github accounts are free (with limited privileges), or you can request a Github Enterprise account to be created for you with your QMUL account: https://docs.hpc.qmul.ac.uk/intro/github-only-account/.

If you're unfamiliar with git and command line (or simply prefer a nicer interface), check out Github Desktop: https://desktop.github.com/



feature branches
develop
release branches
hotfixes
master
Time
Tag 0.1
Feature for future release
Major feature for next release
Severe bug fixed for production: hotfix 0.2
Incorporate bugfix in develop
Tag 0.2
Start of release branch for 1.0
From this point on, "next release" means the release after 1.0
Only bugfixes!
Bugfixes from rel. branch may be continuously merged back into develop
Tag 1.0

Recommended Workflow

1. Create a **fork** if you are working with an existing repository that you are not a collaborator in. This will create a copy of the repository which you own and can use the full tools with. If you are a collaborator in the project, simply **clone** the repository instead.
2. Create a **project** in your repository. Add all of your tasks as issues, and these issues to the project.
3. Make a new **branch** for each new feature you are planning to add.
4. Create a **pull request** and link it to an existing issue (if relevant). Add documentation, tasks, goals for the feature you're planning to add.
5. Push **commits** to your branches often - maybe not for every line changed in a file, but if you implement and test a concept that builds up to your feature, push it. It's easier to track things when everything is broken down into small chunks.
6. **Pull** before you start working, to make sure you have the latest changes: especially important if multiple people are working in the same branch. You want to avoid merge conflicts as much as possible.
7. Update your branch from the **master** every so often if there are new changes there.
8. Update the pull request with documentation where big changes are achieved / needed.
9. When your feature is ready, if you are working in a shared repository, ask others for a **review** of your code before merging.
10. **Merge** your branch, update the **project** (if not automatic). Repeat for the rest of the features!

Further Reading

Github official guide: https://guides.github.com/activities/hello-world/
Other tutorials: https://www.atlassian.com/git/tutorials/what-is-version-control

IntelliJ / PyCharm

08 March 2021 15:26

Official guides

https://www.jetbrains.com/help/idea/getting-started.html
https://www.jetbrains.com/help/pycharm/quick-start-guide.html

Download

- IntelliJ (Java): https://www.jetbrains.com/idea/download/
- PyCharm (Python): https://www.jetbrains.com/pycharm/download/

As a student, you can sign up for a student pack to get access to the Ultimate versions and other JetBrains software: https://www.jetbrains.com/community/education/#students

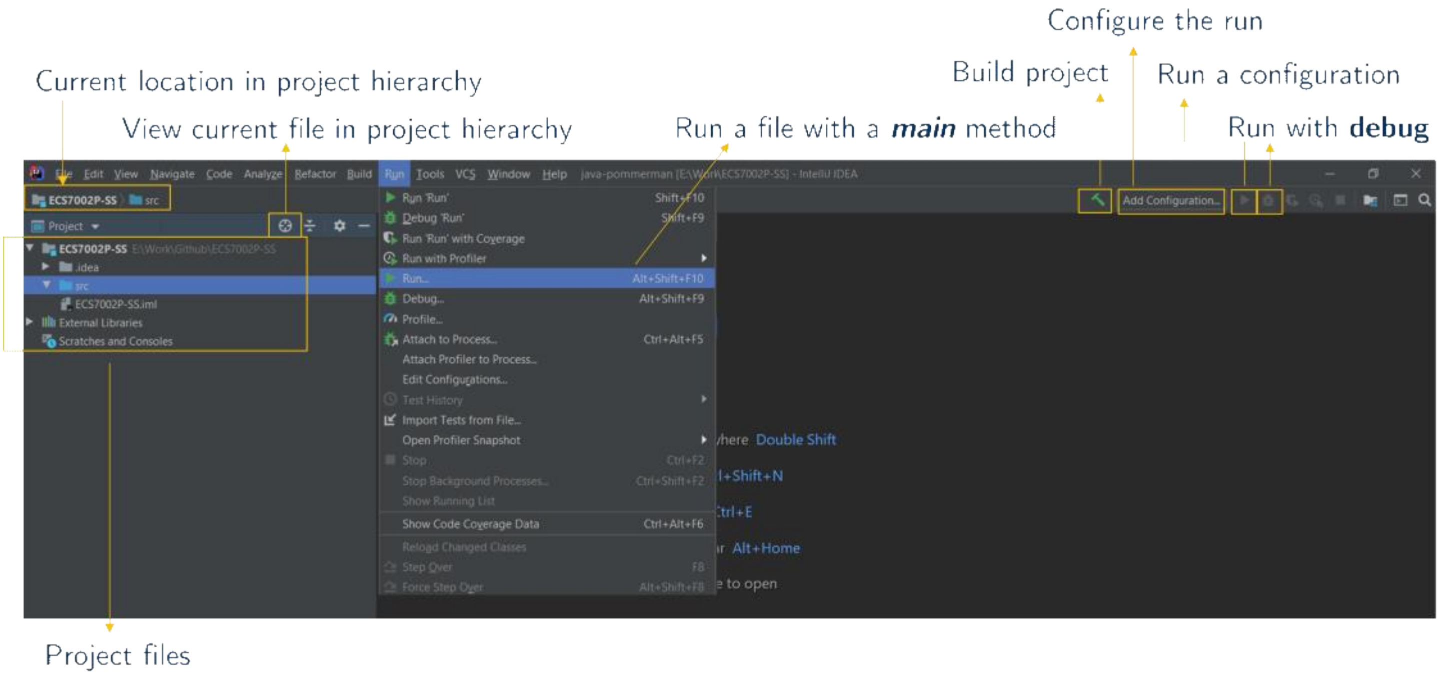
Why?

IntelliJ/PyCharm are very similar IDEs (integrated development environment) for Java and Python, respectively. They are currently the best options for either language (and both compatible with other languages as well), with all features you'll usually need available for free with the Community edition:

- Source code editing
- Build automation
- Debugging
- Java/Python compiler
- Highlights syntax for clarity
- Highlights syntax errors while writing code
- Makes useful suggestions for completing in-progress code
- Easy navigation through code

Interface

An overview of IntelliJ (PyCharm works in a very similar way):



Support Resources

08 March 2021 12:58

Your mental and physical health are important! Please remember to take care of yourself and to take breaks and time off when needed. Do contact your supervisor if you're experience any issues, and let them know if you do need time away - you don't need to give me a reason, but letting them know would avoid other issues.

Important note: you're not alone!

Some resources for you to check (good to go through even if you don't need them yet):

Queen Mary's Advice and Counselling Service

Queen Mary has a variety of services and links for student wellbeing.

Bell House 'Coping With Anxiety' Sessions

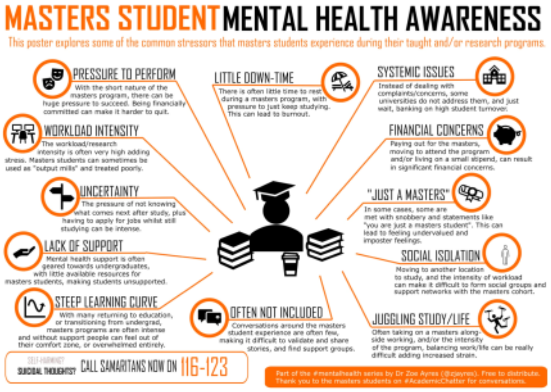
This is a series of online meetings aimed at 18-25 year-olds, held weekly and hosted by assistant psychologists.

Mind - Student Mental Health Resources

Mind is the UK's mental health charity, and this page lists helpful links and resources, in conjunction with Student Minds.

NHS Student Mental Health

Links to mental health resources within the NHS, including helping with understanding issues, and support.



MASTERS STUDENT MENTAL HEALTH AWARENESS

This poster explores some of the common stressors that masters students experience during their taught and/or research programs.

PRESSURE TO PERFORM
With the short nature of the masters program, there can be huge pressure to succeed. Being financially committed can make it harder to quit.

LITTLE DOWN-TIME
There is often little time to rest during a masters program, with pressure to just keep studying. This can lead to burnout.

SYSTEMIC ISSUES
Instead of dealing with complaints/concerns, some universities do not address them, and just wait, banking on high student turnover.

WORKLOAD INTENSITY
The workload/research intensity is often very high adding stress. Masters students can sometimes be used as "output mills" and treated poorly.

FINANCIAL CONCERNS
Paying out for the masters, moving to attend the program and/or living on a small stipend, can result in significant financial concerns.

UNCERTAINTY
The pressure of not knowing what comes next after study, plus having to apply for jobs whilst still studying can be intense.

"JUST A MASTERS"
In some cases, some are met with snobbery and statements like "you are just a masters student". This can lead to feeling undervalued and imposter feelings.

LACK OF SUPPORT
Mental health support is often geared towards undergraduates, with little available resources for masters students, making students unsupported.

SOCIAL ISOLATION
Moving to another location to study, and the intensity of workload can make it difficult to form social groups and support networks with the masters cohort.

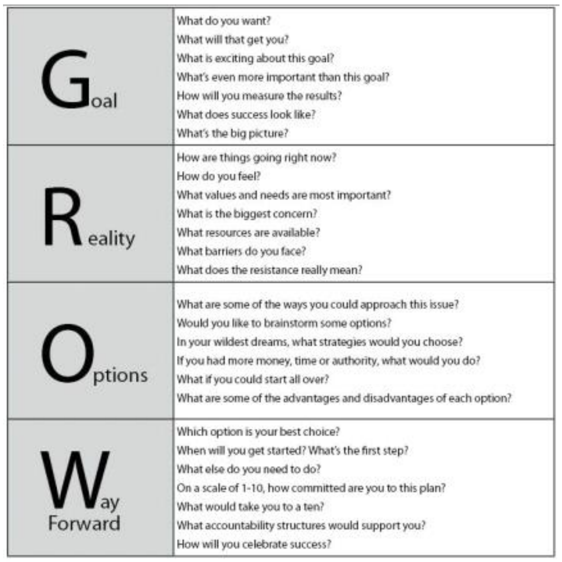
STEEP LEARNING CURVE
With many returning to education, or transitioning from undergrad, masters programs are often intense and without support people can feel out of their comfort zone, or overwhelmed entirely.

OFTEN NOT INCLUDED
Conversations around the masters student experience are often few, making it difficult to validate and share stories, and find support groups.

JUGGLING STUDY/LIFE
Often taking on a masters alongside working, and/or the intensity of the program, balancing work/life can be really difficult adding increased strain.

SELF-HARMING? SUICIDAL THOUGHTS? CALL SAMARITANS NOW ON 116-123

Part of the #mentalhealth series by Dr Zoe Ayres (@zjayres). Free to distribute. Thank you to the masters students on #AcademicChatter for conversations.



Goal	What do you want? What will that get you? What is exciting about this goal? What's even more important than this goal? How will you measure the results? What does success look like? What's the big picture?
Reality	How are things going right now? How do you feel? What values and needs are most important? What is the biggest concern? What resources are available? What barriers do you face? What does the resistance really mean?
Options	What are some of the ways you could approach this issue? Would you like to brainstorm some options? In your wildest dreams, what strategies would you choose? If you had more money, time or authority, what would you do? What if you could start all over? What are some of the advantages and disadvantages of each option?
Way Forward	Which option is your best choice? When will you get started? What's the first step? What else do you need to do? On a scale of 1-10, how committed are you to this plan? What would take you to a ten? What accountability structures would support you? How will you celebrate success?

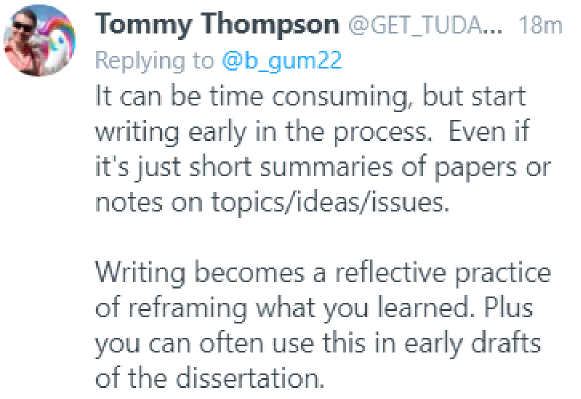
A word from Twitter

11 March 2021 11:30

I've asked Twitter to share some of their tips and tricks for getting started with research projects. Here are some great answers they've given!

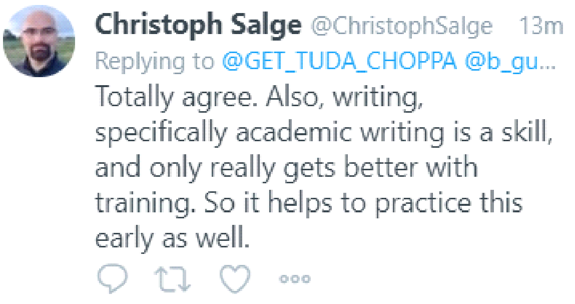
P.S.: Twitter is a great platform for finding out about new research, or for promoting your own work. Getting involved in the community early can be very advantageous, even if it's just to say hi, follow others in the domain you're interested in or post pictures or comments on your in-progress work!

Tweetdeck is a great tool for Twitter which helps organize your interests.

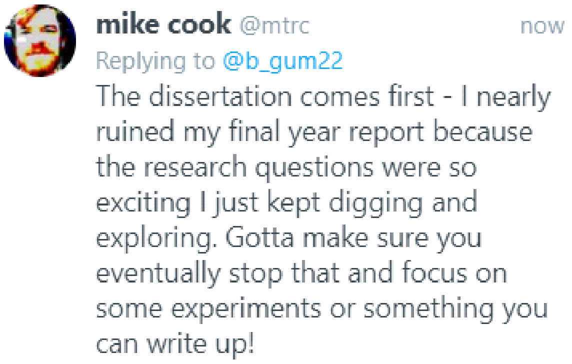


Tommy Thompson @GET_TUDA... 18m
Replying to @b_gum22
It can be time consuming, but start writing early in the process. Even if it's just short summaries of papers or notes on topics/ideas/issues.

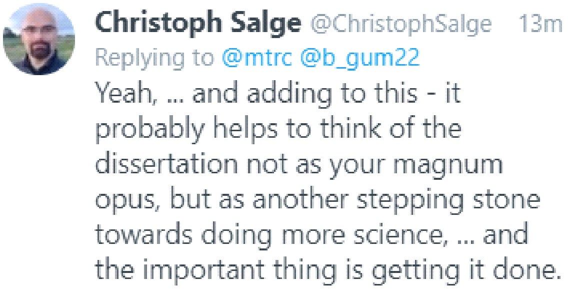
Writing becomes a reflective practice of reframing what you learned. Plus you can often use this in early drafts of the dissertation.



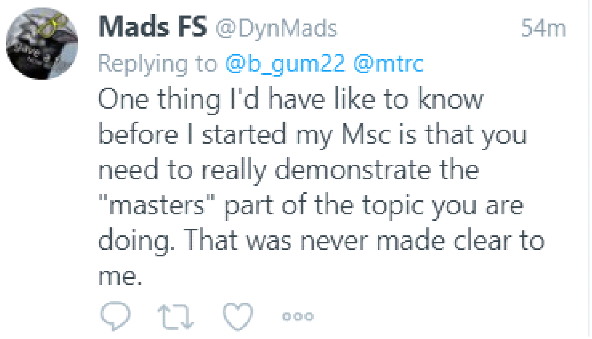
Christoph Salge @ChristophSalge 13m
Replying to @GET_TUDA_CHOPPA @b_gu...
Totally agree. Also, writing, specifically academic writing is a skill, and only really gets better with training. So it helps to practice this early as well.



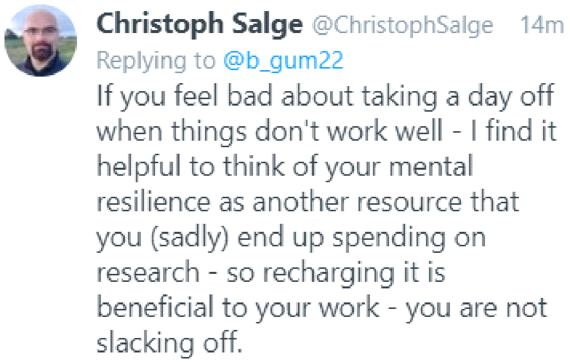
mike cook @mtrc now
Replying to @b_gum22
The dissertation comes first - I nearly ruined my final year report because the research questions were so exciting I just kept digging and exploring. Gotta make sure you eventually stop that and focus on some experiments or something you can write up!



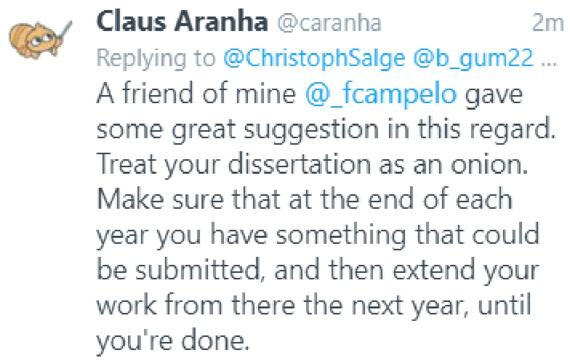
Christoph Salge @ChristophSalge 13m
Replying to @mtrc @b_gum22
Yeah, ... and adding to this - it probably helps to think of the dissertation not as your magnum opus, but as another stepping stone towards doing more science, ... and the important thing is getting it done.



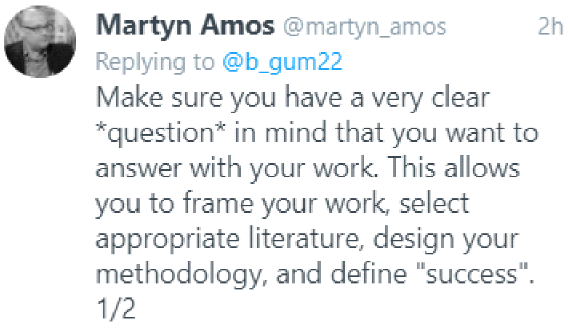
Mads FS @DynMads 54m
Replying to @b_gum22 @mtrc
One thing I'd have like to know before I started my Msc is that you need to really demonstrate the "masters" part of the topic you are doing. That was never made clear to me.



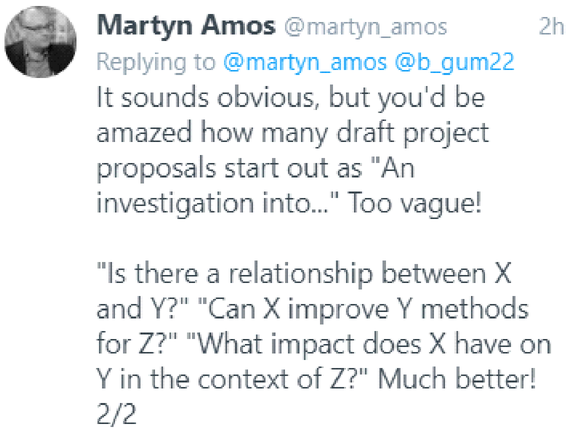
Christoph Salge @ChristophSalge 14m
Replying to @b_gum22
If you feel bad about taking a day off when things don't work well - I find it helpful to think of your mental resilience as another resource that you (sadly) end up spending on research - so recharging it is beneficial to your work - you are not slacking off.



Claus Aranha @caranha 2m
Replying to @ChristophSalge @b_gum22 ...
A friend of mine @_fcampelo gave some great suggestion in this regard. Treat your dissertation as an onion. Make sure that at the end of each year you have something that could be submitted, and then extend your work from there the next year, until you're done.

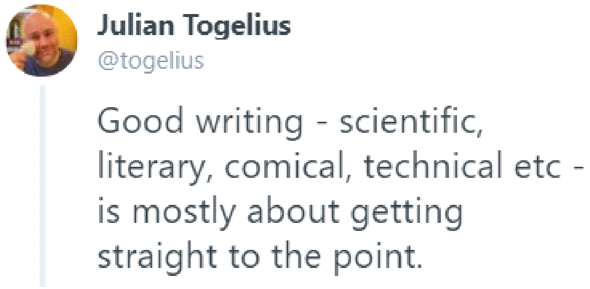


Martyn Amos @martyn_amos 2h
Replying to @b_gum22
Make sure you have a very clear *question* in mind that you want to answer with your work. This allows you to frame your work, select appropriate literature, design your methodology, and define "success". 1/2



Martyn Amos @martyn_amos 2h
Replying to @martyn_amos @b_gum22
It sounds obvious, but you'd be amazed how many draft project proposals start out as "An investigation into..." Too vague!

"Is there a relationship between X and Y?" "Can X improve Y methods for Z?" "What impact does X have on Y in the context of Z?" Much better! 2/2



Julian Togelius
@togelius

Good writing - scientific, literary, comical, technical etc - is mostly about getting straight to the point.