# Thesis Structure

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Dan Page kindly provided a LaTeX template for writing a thesis. The following structure is based on Dan's template with my own bits added in.

None of the chapters are currently fully complete but I have made a good start on Contextual Background, Technical Background and Project Execution. Chapters and sections marked with (TODO) have not been started yet.

I need to do some 'torture testing' on my algorithm and describe under what conditions it starts to fall down. I also still need to test on the SPHERE data which I will do this weekend.

## 1 Front Matter

### 1.1 Abstract

### 1.2 Supporting Technologies

### 1.3 Notation and Acronyms

### 1.4 Acknowledgements

## 2 Main Matter

### 2.1 Contextual Background

- A high-level description of the project context to motivate each aim and objective.
- Introduction to SPHERE: what it is, what the long term aims are, how the technology could help.
- What the problem is: "Within the SPHERE group there is an accelerometer..."
- Short description of the accelerometer.
- Short description of the RGB-D cameras.
- What the current solution is.
- High level objective of the project.
- A brief breakdown of the project (4 or 5 bullet points).
- Benefits if the project is successful.

## 2.2 Technical Background

- Proposed solution 1 - Synchronize two device clocks using algorithms such as Cristian's algorithm, Berkeley algorithm or NTP. Explain why these are no suitable (i.e. no network connectivity)
- Proposed solution 2 - Synchronise the signals along the time axis.
  - Cite some papers on how people have done this before.
  - Show I can derive acceleration from position: f(x) = position, f'(x) = velocity, f"(x) = acceleration.
  - How do you track a drift?
  - What does 'drift'/ 'temporal distortion' even mean?
  - Define types of temporal distortion we will be working with.
  - Introduce cross correlation and explain why it wont work 'out of the box'.
  - Introduce the idea of a sliding window cross correlation.

## 2.3 Project Execution

- Highlight best practice such as the fact I used version control, this blog.
- Talk about why I chose Python and SciPy.
- Description in chronological order of how the project started out: obtained clean SPHERE data, visualised it, did some processing, decided it was too noisy and complex.
- Decided to generate my own data.
- Describe my data generator, the features it has and why, different parameters users can change.
- Explain how this data made it easier to solve the task at hand.
- Describe the process from this synthetic data and the plots I used to eventually be successful in correcting for the different time drifts.
- Pseudo-code for the algorithm.
- Show the algorithm working for different time drifts on synthetic data.
- Show how the algorithm performs when I add temporal distortions to the clean SPHERE data (TO DO).

## 2.4 Critical Evaluation (TO DO)

- Describe exactly what can my algorithm do? (Show extreme cases of it working)
- Explain if it can it do more than/ less than/ exactly what we originally aimed for?
- Highlight the limitations of the algorithm and describe the conditions where it fails.
- Talk about assumptions I have made. (e.g. data is synchronised at t=0)
- Describe the parameters that a user can change and what they affect: window size, step size, length of signal to use.
- Evaluate how the algorithm works on the SPHERE data.
- Describe how it could be made better.

## 2.5 Conclusion and Further Work (TO DO)

- (Re)summarise the main contributions and achievements, summing up the content.
- Clearly state the current project status e.g. 'I have an algorithm which can correct for these types of drift which could help/ has helped us discover X about the SPHERE data'.
- Evaluate what has been achieved with respect to the initial aims and objectives e.g. 'I completed aim X outlined previously, the evidence for this is within Chapter Y'. Also include that I did not get as far as initially planned in fixing the accelerometer problem due to finding so many complications.
- Outline any open problems or future plans such as this algorithm could be used in SPHERE to reject false positive skeletons found by the RGB-D cameras etc.
- What I could have done given more time.