BIRMINGHAM CITY University

CMP6200
Individual Undergraduate Project
2024 - 2025

A2 - Literature Review and Methods

University Artifically Intelligent Assistant

Course: Computer & Data Science
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Student Number: 22133848
Supervisor Name: Dr. Atif Azad

Contents

Report Introduction

Draft notice

This is a very early draft of this literature review and will be subject to major change over the next month. I've marked sections that I've taken from the proposal, or ones that I'm currently uncertain of, with boxes similar to this one.

1.1 Aims and Objectives

Copied from proposal

These are still subject to change pending the grade from my proposal.

This project aims to aid new and existing students alike while they are attending university with helpful information about the university itself, such as university societies, locations/campuses, and policies through the medium of a digital chatbot companion to converse with. Its objectives are to:

- Develop a chatbot capable of accurately answering user queries related to university buildings, policies, and societies with a minimum 95% accuracy rate.
- Conduct a thorough literature review on the surrounding topics, namely AI, LLMs and NLP.
- Create effective documentation for all stages of development, highlighting challenges faced during the process.
- Manage time effectively to ensure all project milestones are met on a consistent and regular timeframe.
- Evaluate the effectiveness of an AI assistant on university student acclimatization.

1.2 Literature Search Methodology

My literature search will be performed using multiple reputable databases for academic papers, including:

- IEEE Xplore
- Scopus / Elsevier
- Google Scholar
- BCU Online Library

By using multiple different databases to source my information from, I can ensure that any potentially relevant literature will be found. Figure 1.1 depicts how in a search for 1685 articles about employee retention strategies and turnover, only 582 (25.7%) appeared in multiple databases (Wanyama, McQuaid, and Kittler, 2022), meaning that the remaining 74.3% of articles were exclusive to the single database in which they were found, emphasising the importance of searching multiple databases.

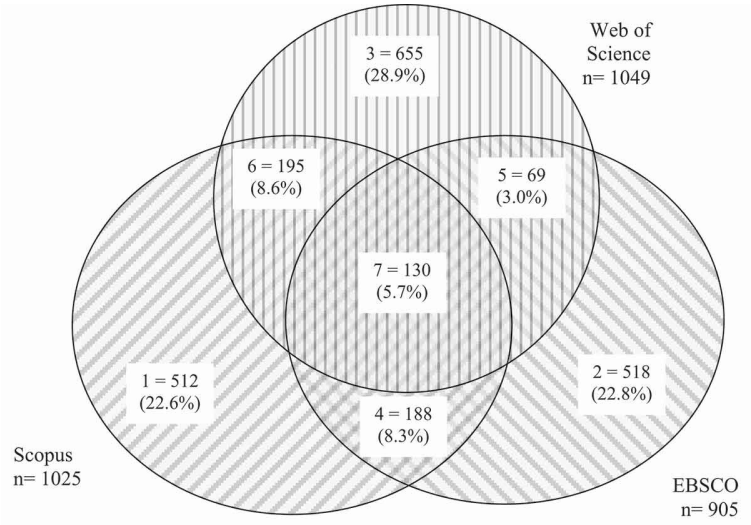

Figure 1.1: Distribution of searched articles across databases. (Wanyama, McQuaid, and Kittler, 2022)

All searches performed for recent literature will be on papers published during or after 2017, with a preference to more recent literature, due to the constantly evolving fields my project is based on. The search terms I will use to retrieve the data I will be studying are:

- Artifical Intelligence / AI
- Chatbots / Digital Assistants
- Natural Language Processing / NLP
- Large Language Models / LLMs

- User Experience / UX

By using these specific terms that are directly relevant to the core themes of my project, I will be ensuring that I only retrieve literature that will be of crucial use in its development.

Literature Review

2.1 Themes

To develop the artefact and conduct thorough background research on relevant literature to further my knowledge of the subject areas, key general themes of the project were identified. From these themes, further keywords to be used in the literature search were derived to ensure that retrieved literature is directly relevant to my research and development of the final artefact. Due to the constantly evolving fields the project focuses on, it will be necessary to limit the results to only those written in recent years (2018 earliest) as there are frequent new developments in the subject areas.

Theme	Description	Keywords
AI	A field of computing dedicated to allowing computers to simulate human learning by training them on large amounts of data so that they can recognise patterns to classify or predict unknown data. AI can only be as good as the data it is trained upon, and can develop biases if it is fed too much data of a certain type.	Generative AI, Human-Centred AI, AI Ethics, AI Bias
Chatbot Digital Assistant	Software that simulates a natural conversation between the computer and end user. Many chatbots, including the one I intend to develop, utilise recent developments such as Generative AI and natural language processing (NLP) to interpret and respond to user queries. (IBM, 2024c)	NLP, Microsoft Bot Framework, Watson Assistant, ChatGPT
Natural Language Processing	NLP refers to the use of machine learning to encode and process text to understand it in a similar way to humans, which can be used to allow direct two-way conversation between users and computers.	Tokenization, Sentiment analysis, Entity linking
LLM	Large Language Models are a type of AI dedicated to the recognition and generation of text. As suggested by their name, they are trained on enormous amounts of text data, which allows them to have active conversations with users. There are many different LLMs, and as their size and complexity increases, so too does the necessary processing power.	Retrieval augmented generation (RAG), Fine-tuning, Prompt engineering
User Experience (UX)	The end user's overall experience of using a system, such as its ease of use and whether it is enjoyable to use (Cambridge Dictionary, 2024). In the context of my project, it will refer to the user's ability to smoothly converse with the chatbot and how human-like it is.	Conversational design, usability, market research, human-computer interaction

2.2 Review of Literature

To-do for each theme

Past developments, developments over time to now, many sources (Example 3 uses 9). You need to reconsider your project's themes. RAG and fine-tuning LLMs are such key elements here that it could be worth having them as themes rather than keywords. Remember you can talk about your sub-points, like for LLMs you can branch into NLP. Consult week 6 A and B notes. **Zotero is an obscenely useful tool. It's somewhat poor at citing websites, but excellent for papers.**

2.2.1 Artificial Intelligence (AI)

Researchers have always wanted to harness the processing power of computers to act in a similar manner indistinguishable from that of humans, most notably from as long ago as 1950, where the question was posed 'Can machines think?' (Turing, 1950). Even now, AI is a constantly evolving field that is seeing bleeding-edge developments on a highly frequent basis, and more recently, is becoming instrumental in many people's work and private lives (Maedche et al., 2019). AI is used across many disciplines and for different purposes. For example, AI can be used to predict sales based on trends, or classify images to identify defective products in manufacturing. However, when developing a project that utilises AI, it is important that they are ethical and human-centred, which is known as Human-Centred AI (HCAI), and the actions they perform are explainable (XAI). In doing so, the focus shifts from the machine executing the algorithms, and instead to the user and their experience using the AI (Shneiderman, 2020). In his article, Shneiderman strongly advocates for the promotion of HCAI for the benefit of both companies and their users, and proposes a governance structure in the development of AI from the software engineering level to independent overseers to ensure privacy, accountability and fairness, shown in Figure **??**.

2.2.2 Chatbots / Digital assistants

I don't think I've got any papers relating to this yet.

2.2.3 Natural language processing (NLP)

Talk about (Vaswani et al., 2017) here. It's a key paper and was the foundation of GPT (I think)

2.2.4 Large language models

I don't think I've got any papers relating to this yet.

2.2.5 User experience

I don't think I've got any papers relating to this yet.

2.2.6 Theory

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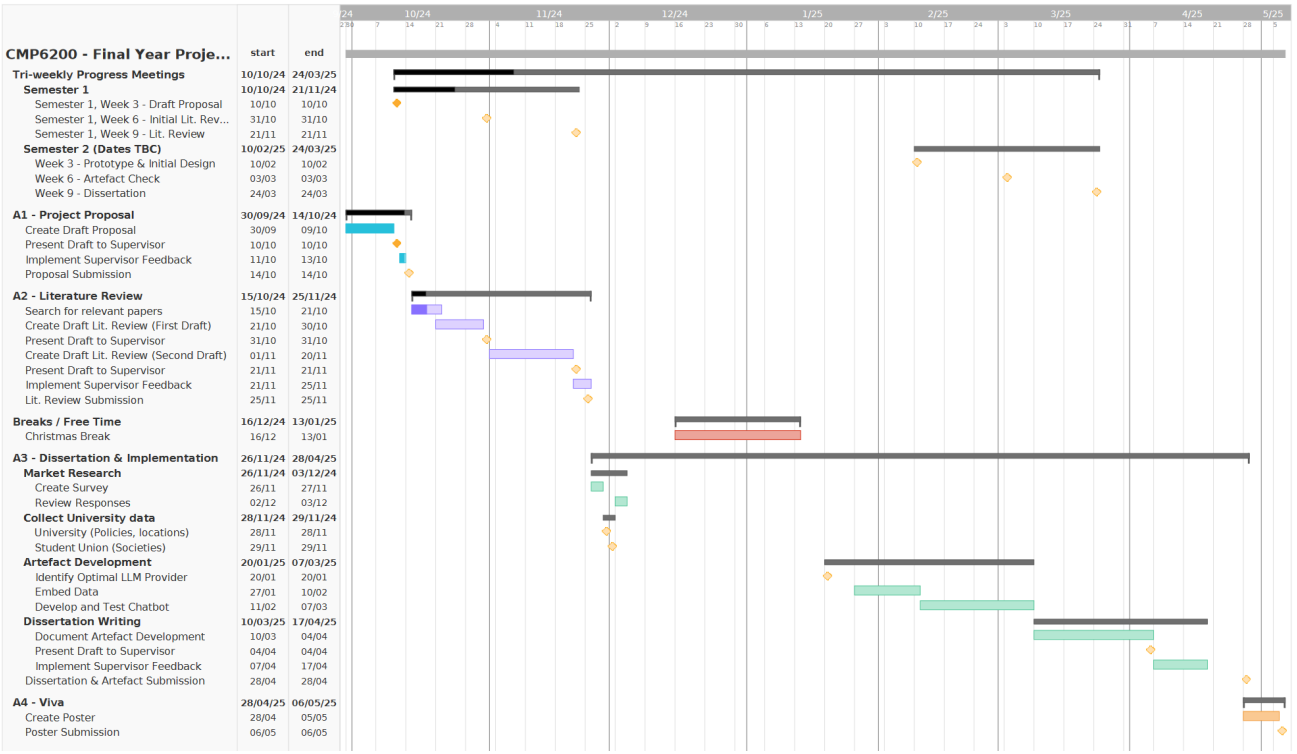
2.3 Summary

Appendix

Copied from proposal

This is still subject to change pending the grade from my proposal.

3.1 Gantt Chart



CMP6200 - Final Year Proje...	start	end
Tri-weekly Progress Meetings	**10/10/24**	**24/03/25**
Semester 1	**10/10/24**	**21/11/24**
Semester 1, Week 3 - Draft Proposal	10/10	10/10
Semester 1, Week 6 - Initial Lit. Rev...	31/10	31/10
Semester 1, Week 9 - Lit. Review	21/11	21/11
Semester 2 (Dates TBC)	**10/02/25**	**24/03/25**
Week 3 - Prototype & Initial Design	10/02	10/02
Week 6 - Artefact Check	03/03	03/03
Week 9 - Dissertation	24/03	24/03
A1 - Project Proposal	**30/09/24**	**14/10/24**
Create Draft Proposal	30/09	09/10
Present Draft to Supervisor	10/10	10/10
Implement Supervisor Feedback	11/10	13/10
Proposal Submission	14/10	14/10
A2 - Literature Review	**15/10/24**	**25/11/24**
Search for relevant papers	15/10	21/10
Create Draft Lit. Review (First Draft)	21/10	30/10
Present Draft to Supervisor	31/10	31/10
Create Draft Lit. Review (Second Draft)	01/11	20/11
Present Draft to Supervisor	21/11	21/11
Implement Supervisor Feedback	21/11	25/11
Lit. Review Submission	25/11	25/11
Breaks / Free Time	**16/12/24**	**13/01/25**
Christmas Break	16/12	13/01
A3 - Dissertation & Implementation	**26/11/24**	**28/04/25**
Market Research	**26/11/24**	**03/12/24**
Create Survey	26/11	27/11
Review Responses	02/12	03/12
Collect University data	**28/11/24**	**29/11/24**
University (Policies, locations)	28/11	28/11
Student Union (Societies)	29/11	29/11
Artefact Development	**20/01/25**	**07/03/25**
Identify Optimal LLM Provider	20/01	20/01
Embed Data	27/01	10/02
Develop and Test Chatbot	11/02	07/03
Dissertation Writing	**10/03/25**	**17/04/25**
Document Artefact Development	10/03	04/04
Present Draft to Supervisor	04/04	04/04
Implement Supervisor Feedback	07/04	17/04
Dissertation & Artefact Submission	28/04	28/04
A4 - Viva	**28/04/25**	**06/05/25**
Create Poster	28/04	05/05
Poster Submission	06/05	06/05

Figure 3.1: A conceptual Gantt chart of a development timeline.

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