

Example of topics for MSC Final Project

Below are the series of steps I tried to follow to settle on a final research project topic—assuming that I will not do a project based on the literature review submitted in Unit 7. The chosen topic affects the research proposal for the remaining module in Research Methods and Professional Practice.

1. Identify Computer Science Research Areas

Here, I had to source the research areas and topics from several international universities to get an idea of what academia is studying.

| RESEARCH AREA | TOPICS |
|---------------------------|---|
| ALGORITHMS AND COMPLEXITY | <ul style="list-style-type: none">• Algorithm design |
| ARTIFICIAL INTELLIGENCE | <ul style="list-style-type: none">• Cognition• Computer Vision• Conversational AI• Deep Learning• Enabling Mobile Users• Evolutionary computations• Explainable AI• Languages• Machine Learning• Neural Networks• NLP• Responsible AI• Robotics• Sentiment Analysis• Intelligent agents |
| AUDIO AND MULTIMEDIA | |
| BIG DATA | <ul style="list-style-type: none">• Visualisation |

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| | <ul style="list-style-type: none"> • Predictive analysis • Parallel data processing • Data anonymisation • Privacy and data protection |
| BIOINFORMATICS AND COMPUTATIONAL BIOLOGY | <ul style="list-style-type: none"> • Sequencing algorithms • Protein structures • Image analysis |
| CLOUD COMPUTING, EDGE COMPUTING AND FOG COMPUTING | |
| COMPUTER ARCHITECTURE AND HARDWARE | |
| COMPUTER VISION | <ul style="list-style-type: none"> • Content retrieval • Image and video search • Image understanding • Medical Imaging • Robot vision • Vehicle Environment Perception • Video analysis • Visual recognition • Object detection |
| COMPUTING EDUCATION | |
| CYBER SECURITY | <ul style="list-style-type: none"> • Biometrics • Computer security • Cryptography • Deepfake techniques • Intrusion Detection and Prevention • Malware Detection, Analysis and Mitigation • Privacy-preserving data mining • Software Reverse Engineering • Software security • Vulnerability Discovery • Wireless security • Wireless Sensor Network Security |

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| DATA SCIENCE | <ul style="list-style-type: none"> • Big data analytics • Data mining • Data clustering • Database management • Linked data • Semantic web • Data modelling • Metadata management |
| DATA STRUCTURES | |
| DATABASES | |
| DISTRIBUTED SYSTEMS | |
| GRAPHICS AND VISUALISATION | |
| HIGH PERFORMANCE COMPUTING | |
| HUMAN-COMPUTER INTERACTION | <ul style="list-style-type: none"> • Virtual Reality • Augmented Reality |
| INTELLIGENT ROBOTS | |
| INTERNET OF THINGS | <ul style="list-style-type: none"> • Security issues for IoT • Architectures • Adaptive networks • Device interoperability • Scalability issues • Privacy and trust issues • Integration with fog computing • Context and location awareness |
| MACHINE LEARNING | <ul style="list-style-type: none"> • Big Data • Deep Learning • Graphical models • Natural Language Processing • Pattern recognition • Reinforced learning • Speech recognition • Supervised learning |

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| MOBILE COMPUTING | <ul style="list-style-type: none"> • Mobile data management • Mobile image and video analytics • Sensing systems • Smartphones • Wireless networks |
| NATURAL LANGUAGE PROCESSING | <ul style="list-style-type: none"> • Questions • Text summarisation • Information extraction • Reading comprehension |
| NETWORKING | <ul style="list-style-type: none"> • Network protocols • Radio networks |
| OPERATING SYSTEMS | |
| PARALLEL COMPUTING | <ul style="list-style-type: none"> • Concurrency • Distributed parallel computing • Dynamic scheduling for large-scale distributed systems • Parallel architecture |
| PROGRAMMING LANGUAGES AND COMPILERS | <ul style="list-style-type: none"> • Compilers • Language concepts for database programming • Logic constraints |
| PROJECT MANAGEMENT | <ul style="list-style-type: none"> • Processes |
| ROBOTICS | <ul style="list-style-type: none"> • Personal assistive robots |
| SCIENTIFIC COMPUTING | <ul style="list-style-type: none"> • Algorithms • Domain-specific compilers • Numerical software • Performance modelling • Randomness |
| SECURITY AND PRIVACY | <ul style="list-style-type: none"> • Cryptography • Network security • Privacy-enhancing technology |

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| | <ul style="list-style-type: none"> • Program analysis and verification • System security • Technology policy |
| SOFTWARE ENGINEERING | <ul style="list-style-type: none"> • Processes • Design and Testing • Model-based design • Static and dynamic analysis |
| THEORETICAL COMPUTER SCIENCE | |

THINGIES

Cloud Computing Issues

- Performance
- Security and privacy
- Metadata management
- Massively parallel execution

2. Consider Topics and formulate basic Research Questions

Here I considered the various research areas and formulated a research question that I thought would be interesting to investigate in a final project. The questions in **bold** are those that I gravitated towards compared to the others.

| Research Area | Research questions |
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| AI | How to use current technology to filter fake news from actual news |
| AI | Virtual assistants in aiding dementia patients |
| Cloud | Are cloud providers well-positioned to support real-time, distributed healthcare professionals? |

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| Cloud | Cloud computing for Rural banking |
| Cloud | Component-based software design using cloud technologies |
| Computer Vision | Using computer vision to read lips: how machine learning can auto-caption video |
| Computer Vision | Using hand gestures to control cursor movements onscreen |
| Data Science | Search engines rankings |
| Data Science | Vehicle Tracking Using Driver Mobile Gps Tracking |
| Data Science | Web crawler for human body of knowledge |
| HCI | Progressive disclosure in user interfaces and their contribution to understandable and usable systems |
| IoT | Can wearable tech be used to log calories automatically? |
| IoT | Wearable tech to help healthy lifestyle choices |
| Machine learning | Climate change and machine modelling |
| Machine Learning | Extract data models in software code using machine learning |
| Machine Learning | Handwriting analysis as a predictor for degenerative diseases |
| Machine Learning | Human colour perception on smartphones for WSYWIG reproduction |
| Machine Learning | Identification of (industry) domain from source code models |
| Machine learning | Machine learning in software architecture |
| Machine learning | Machine learning to develop new programs automatically without developers |
| Machine learning | Machine learning to improve software quality (how?) |
| Machine Learning | Sentiment analysis of X in Y setting |
| Security | Encryption of data across network, internet, data streams |
| Security | Network port scanning for XXXX |
| Security | Non-interceptable authentication system for building access based on QR codes |
| Security | Private messaging platform using steganography |

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| Security | Sound-based authentication system between two or more mobile phones |
| Software Engineering | Health and safety risks to software engineers |
| Software Engineering | Identify high-risk software code areas |
| Software Engineering | Pervasiveness of repeated code structures across open-source projects |
| Software Engineering | Software code specification mining |
| Software Engineering | The high cost of development: what can be done to reduce development costs and deliver high quality? |
| Software Engineering | The impact of open-source software product use in large organisations |
| Software Engineering | What impact do environmental factors play in delivering quality software products? |
| Software Engineering | What impact does software engineering play in climate change? |
| X | Augmented reality to achieve X for Y group of people (such as the disabled, children, adults, disabled) |
| X | Automated task list using bank transactions and GPS data |
| X | How accurate are the latest fitness trackers? |
| X | Uncanny valley in AI and voice reproduction |
| X | Using medical device like blood sugar, heart rate, breathing to detect/predict health condition X |
| | Can knowledge graphs and semantic web realise the philosophy of right-data-at-the-right-time-to-the-right-people? |
| | Using computer vision to extract UML models |
| | Using AI to reduce or minimize model element connector line-crossings |

3. Identify challenging areas

1. Artificial Intelligence
2. Machine Learning
3. Computer vision
4. Security

4. Identify areas of no interest/avoid

1. Water/land/resource management
2. Face recognition
3. Self-driving cars
4. Any that require human participants apart from myself
5. People voting systems
6. Anything to do with government, politics, banking
7. Anything with which I have zero experience in my career
8. Network infrastructure such as 5G or mobile
9. Topics focused on security

5. Considerations for selecting a topic

- It is important to focus on *what I have access to right now*. Better to work on a final project that I have access to software and hardware as opposed to trying to deliver a convoluted and involved project.
- I can use an observation/quantitative approach on result sets.
- I can use a qualitative/survey/questionnaire approach to get direct analysis.
- I am not expected to contribute any ground-breaking ideas or work. I merely use literature, ideas, experiments that have been performed previously and add to them in new ways or approach them from a unique perspective.