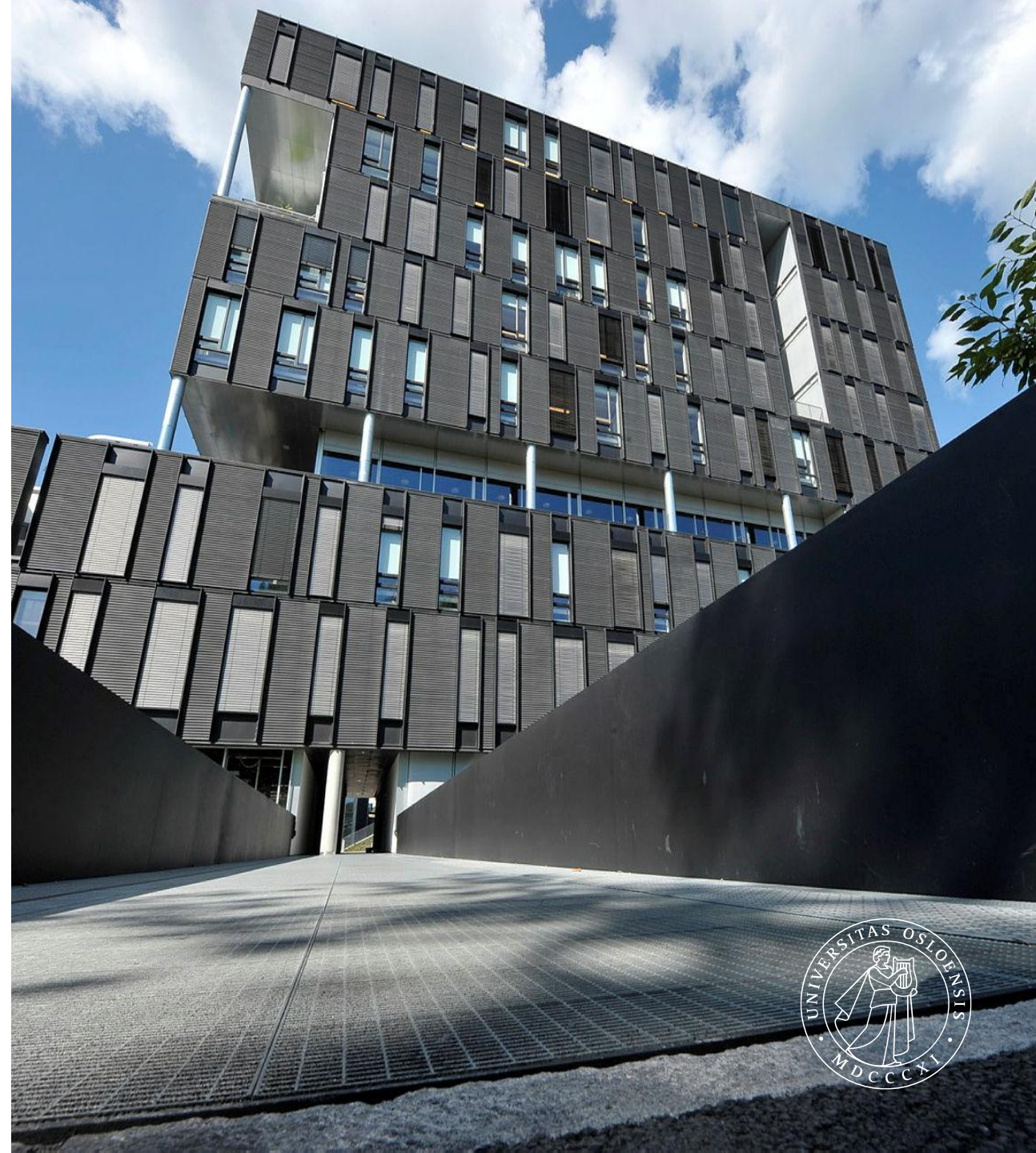


UNIVERSITY OF OSLO

Writing seminar for informatics

9th & 10th of April 2026





David Burke

MPhil English
Leader of Academic
Writing Centre



Matthew Good

PhD in Innovation and
Entrepreneurship
Leader of Digital
Scholarship Centre
Matthew.good@ub.uio.no



Andri Spilker

PhD in Astrophysics
Subject responsible for
physics & informatics at
the science library
andri.spilker@ub.uio.no

Master seminars to help you through your masters

Writing seminar (TODAY):

- Academic writing
- Structure and readers
- Writing as a process
- Start finding papers
- Correct citations
- AI in writing

Master seminar fall:

- More on finding and reading scientific literature
- Writing and citing
- Data management
- Planning your master project

Master seminar final (spring):

- How is your masters grade set?
- Final writing tips
- Ultimate checklist for delivering your master
- Presenting your master: how to give a great scientific presentation

You can influence what happens in upcoming seminars!

Plan for today

09:00-09:15 Coffee, tea & snacks

09:15-10:00 Academic writing

David Burke

10:15-11:00 Writing as a process

David Burke

11:15-12:00 References & AI

Andri & Matthew

Check in



<https://www.menti.com/alixg936j95k>

Agenda

- 1) “Academic” writing
- 2) Writing as process

What is academic writing?

Imagine that you enter a parlour. You come late. When you arrive, others have long preceded you, and they are engaged in a heated discussion, a discussion too heated for them to pause and tell you exactly what it is about. In fact, the discussion had already begun long before any of them got there, so that no one present is qualified to retrace for you all the steps that had gone before.

You listen for a while, until you decide that you have caught the tenor of the argument; then you put in your oar. Someone answers; you answer him; another comes to your defence; another aligns himself against you, to either the embarrassment or gratification of your opponent, depending upon the quality of your ally's assistance.

However, the discussion is interminable. The hour grows late, you must depart. And you do depart, with the discussion still vigorously in progress. (110-11)

Burke, Kenneth, *The Philosophy of Literary Form*, 1941

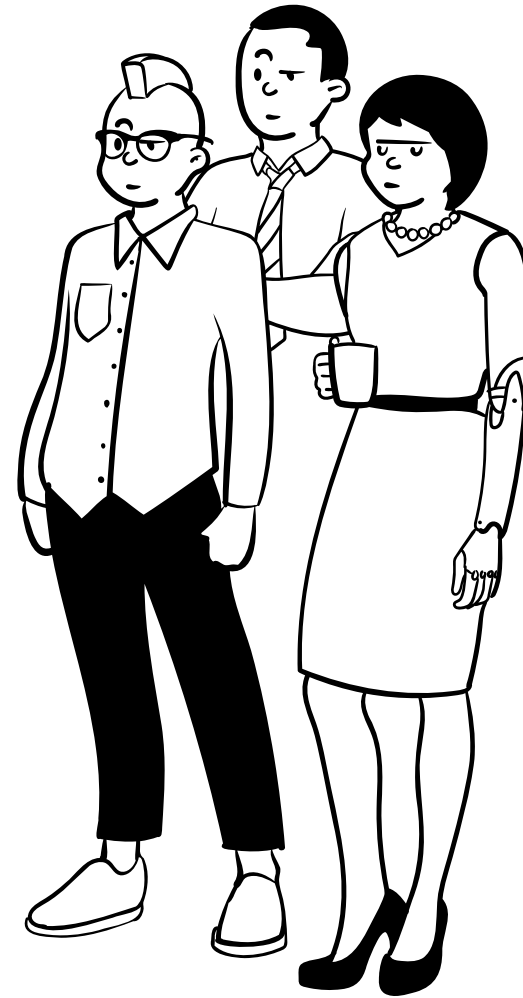
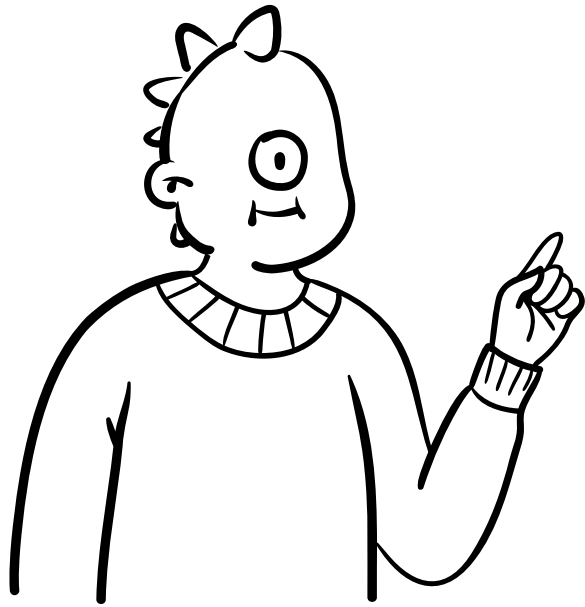
Academic writing...

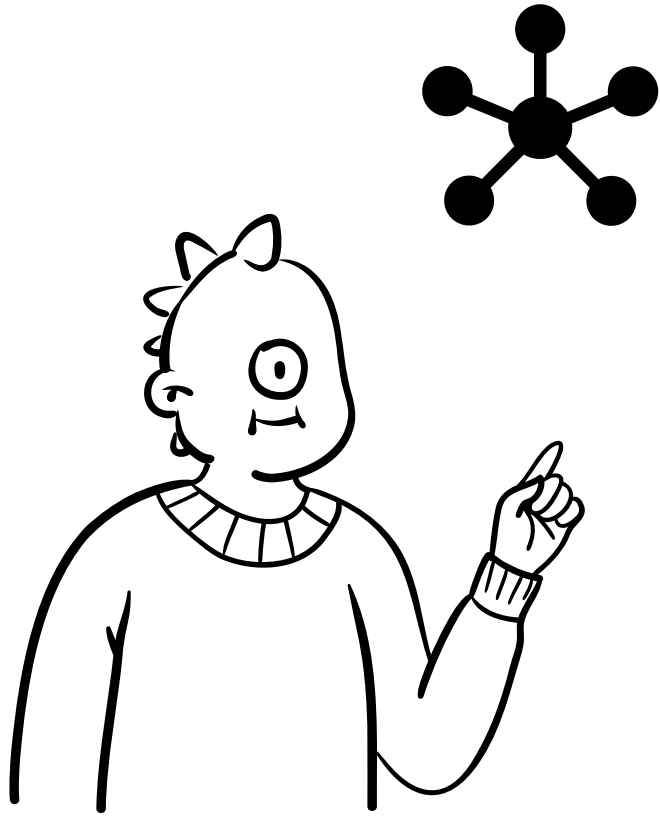
As participation in that conversation

requires a certain degree of orientation and familiarity (with the conversation)

rewards well-built contributions

How do readers work?





How should I structure my thesis?

Structure

Will be affected by your specific field, and by your specific research ...

But, there is a basic structure common to most IFI Master's theses:

What is IMRaD?

Introduction

Method

Results

and

Discussion

Introduction example from IFI master's thesis: IMRaD

Contents

List of Figures vi

List of Tables ix

I Introduction 1

1 Introduction 2

- 1.1 Motivation 3
- 1.2 Objective 3
 - 1.2.1 Research Questions 3
- 1.3 Thesis Structure 5

2 Theoretical Background 7

- 2.1 General Terms and Frameworks 7
 - 2.1.1 MITRE ATT&CK 7
 - 2.1.2 Key Concepts of Access Control 8
 - 2.1.3 Reconnaissance and Discovery 8
- 2.2 Relevant Technologies in Microsoft Windows 10
 - 2.2.1 Directory Services 10
 - 2.2.2 Lightweight Directory Access Protocol (LDAP) 10
 - 2.2.3 Active Directory 11
 - 2.2.4 Active Directory Service Interfaces (ADSI) 13
 - 2.2.5 .NET 14
 - 2.2.6 Command-line Shells 14
 - 2.2.7 Windows Management Instrumentation (WMI) 15
 - 2.2.8 The Windows Registry 15
- 2.3 Fundamentals of Windows Security 16
 - 2.3.1 Windows Access Control Model 16
 - 2.3.2 Windows Security Policies 17
 - 2.3.3 Credential Processing and Storage 18
 - 2.3.4 Windows User Authentication 18
 - 2.3.5 User Account Control 19
 - 2.3.6 Mandatory Integrity Control 20
 - 2.3.7 Execution Policy 21

iii

- 2.3.8 Microsoft Defender and Windows Firewall 21
- 2.4 Exploring the Term Live off the Land 22
 - 2.4.1 Defining "Live off the land" 23
 - 2.4.2 Fileless Attacks 25
 - 2.4.3 Dual Use Tools 27
 - 2.4.4 Motivation, Evasion, and Risk 27

II Methodology and Results 31

3 Methodology 32

- 3.1 Environment and Limitations 32
 - 3.1.1 Limitations 32
 - 3.1.2 Proxmox Virtual Environment 33
 - 3.1.3 Tailscale Virtual Private Network 33
 - 3.1.4 Windows Virtual Machines 34
 - 3.1.5 Users Groups and Access 36
 - 3.1.6 Host Configurations 37
- 3.2 Research Method 38
 - 3.2.1 Testing in the Environment 39
- 3.3 Related Works 41
- 3.4 Literature review 42
- 3.5 Script Development 43
 - 3.5.1 Script Limitations 44

4 Results 45

- 4.1 Assessment of Compromised User Account 46
- 4.2 Target System Assessment 51
 - 4.2.1 General System Informataion 51
 - 4.2.2 Identifying Virtual Environments 53
 - 4.2.3 Processes, Services, and Tasks 54
- 4.3 File and Directory Discovery 58
 - 4.3.1 File Shares 61
- 4.4 System and Domain Group Enumeration 63
- 4.5 User Enumeration 66
- 4.6 Session Enumeration 72
- 4.7 Policy Discovery 73
- 4.8 Active Security Features and Anti Malware 76
- 4.9 Device and Service Discovery 78
 - 4.9.1 Device Discovery 78
 - 4.9.2 Service Discovery 82

iv

III Discussion and Conclusion 85

5 Discussion 86

- 5.1 Initial Entry 86
 - 5.1.1 Assessing Privileges 87
 - 5.1.2 Detecting Weaknesses and Vulnerabilities 87
 - 5.1.3 Virtual Machine Escape 89
- 5.2 Users and Domain Activity 90
 - 5.2.1 Human Exploitation and LotL 91
 - 5.2.2 Relevant Insights 93
- 5.3 Environment Discovery and Lateral Movement 94
- 5.4 LotL Tools in Microsoft Environments 95
 - 5.4.1 Windows Defender, Policies and Firewalls 95
 - 5.4.2 LotL Tools: Tracking and Blocking 96
- 5.5 Limitations 98
- 5.6 Future Work 99
- 5.7 Reflections 99

6 Conclusion 101

A Code 104

B Tools and Technologies 106

v

Ernst, Even Christoffer Andersen. (2024). *Living off the Land: Exploring Native Windows Tools for Post-Exploitation – A Study of Live off the Land Techniques in Active Directory Environments* [Master's thesis]. University of Oslo

How IMRaD works

IMRaD mirrors a research process ...

I the idea, the context, the problem →

M what you did →

R what you found →

D what it means (and why it matters)

Intro example from IFI master's thesis: IMRaD variation

Contents

I Introduction	1
1 Introduction	3
1.1 Goals for this project	4
1.2 Organization of the thesis	4
2 Underwater sonar imaging	7
2.1 Synthetic Aperture Sonar	7
2.2 Making sonar images	8
3 Deep learning	9
3.1 Convolutional neural networks	9
3.2 Generative models	10
3.2.1 Generative Adversarial Networks	11
3.2.2 Comparison of generative models	12
3.3 Deep learning for sonar images	12
4 Motivation and relevant work	15
4.1 Relevant studies with GANs	15
4.1.1 MC-PIX2PIX	15
4.1.2 TRANSFER-LEARNING IN GENERATIVE ADVERSARIAL NETWORKS	17
4.1.3 GENERATIVE ADVERSARIAL NETWORK FOR IMAGES IN MULTIPLE FREQUENCIES	18
4.2 Motivation for this project	20
4.3 Other relevant studies	21
4.4 Choice of model	22
II The project	23
5 Project setup	25
5.1 The Model	25
5.1.1 PIX2PIX	25
5.1.2 CycleGAN	26
5.1.3 Loss-functions and optimization	26
5.1.4 U-Net	27
5.1.5 ResNet	29
5.1.6 PatchGAN	29
5.1.7 Parameter details	30
5.2 Dataset	30

iii

Contents

5.3 Evaluating results	32
6 Experimental setup	35
6.1 Experiment 1: Simple sketches	36
6.2 Experiment 2: Canny edge detection	42
6.3 Experiment 3: Gray-scaled objects	46
6.4 Final experiment: Complex data-augmentation	54
6.4.1 Pre-processing input objects	54
6.4.2 Complex data augmentations of ground truth images	58
6.4.3 Making the dataset	67
7 Results and discussion	69
7.1 Results from the selected approach	69
7.2 Improvements and validation	72
7.2.1 Differentiating between background and object pixels	72
7.2.2 Finding a suitable validation metric	73
7.2.3 Visual inspection of FID-scores	77
7.2.4 Expanding on selected evaluation metric	81
7.2.5 Optimize the model	82
7.2.6 Evaluation with the test dataset	86
7.2.7 Evaluating with classifier	88
7.2.8 Evaluating with our object simulator	90
III Conclusion and future work	93
8 Future work	95
9 Conclusion	97

[Kristensen, Erlend. \(2024\). Generating realistic objects in Synthetic Aperture Sonar images using Generative Adversarial Networks \[Master's thesis\]. University of Oslo.](#)

Intro example from IFI master's thesis: IMRaD variation

Contents

1	Introduction	1
1.1	Motivation	1
1.2	Problem Description and Research Questions	3
1.3	Research Method	3
1.4	Limitations	3
1.5	Main Contributions	4
1.6	Thesis Outline	4
2	Video Encoding	5
2.1	Color Representation in Digital Video	5
2.2	Data Representation in Video Encoding	6
2.3	Codec63	8
3	Field Programmable Gate Arrays	15
3.1	FPGAs versus other Hardware Architectures	15
3.2	Anatomy Overview	16
3.3	Hardware Description Languages	18
3.4	High Level Synthesis Introduction	19
3.5	Block Level Control	20
3.6	HLS Abstractions	21
3.7	HLS Pragmas	23
4	Experimental Setup	27
4.1	Tested Configurations	28
4.2	MPSoC Configurations	29
4.3	Bare Metal	30
4.4	Part Selection	32
5	Direct Memory Access	35
5.1	Introduction to Direct Memory Access	35
5.2	AXI-DMA	36
5.3	AXI-DMA Modes	38
5.4	Legal Configurations	44
6	HLS: FPGA Implementations	45
6.1	DCT and Quantization Optimizations	45
6.2	Common IO Protocol	48
6.3	DCT and Quantize Module Architectures	49
6.4	Computational Modules	50
6.5	Lessen CPU Load: MB Reorderer and Changing Port Data Types	56
6.6	Data Type Quantization	58
6.7	Stream-Based	59
6.8	Relevant Configurations on Kria K24	61

iii

Contents

7	Power Measurement	63
7.1	Power Advantage Tool	63
7.2	SMU Measurements	64
7.3	Estimated MPSoC Power Draw	66
7.4	K24 power estimations	67
7.5	Encoding Period Synchronization	67
7.6	Limitations	68
7.7	Nano Measurement	69
7.8	Power Measurement Units	69
8	Results	71
8.1	Resource Usage	71
8.2	Relevant Test Configurations	74
8.3	Performance Results	76
8.4	Power Measurements	81
9	Discussion	87
9.1	CPU, GPU and FPGA Accelerator Performance	87
9.2	Sharing Data with the FPGA	93
9.3	DCT and Quantize Architectures	94
9.4	HLS Advantages	96
9.5	Half-Precision Discussion	96
9.6	Thesis Challenges and Lessons Learned	98
10	Conclusion	101
10.1	Summary	101
10.2	Main Contributions	102
10.3	Future Work	104
A	Appendix	107
A.1	Code Snippets	107
A.2	Figures	115
A.3	Chosen AXI DMA Parameters	116
A.4	Artificial intelligence declaration	117
A.5	Thesis code	118

[Haaland, Sigmund. \(2024\). Investigating the Viability of FPGAs as General Purpose Accelerators \[Master's thesis\]. University of Oslo.](#)

Introductions

What do introductions do?

What do you expect to find in an introduction?

What is the purpose of an introduction?

What do introductions do?

Provide background / context, orient the reader toward the writer's intention

Make clear the problem or question

Move from the general to the specific

2 models to consider:

1) CARS: Creating a Research Space

Introductions: CARS model

CARS: Creating a Research Space (from John Swales, *Genre Analysis*, 1990)

Move 1: Establish the territory

Move 2: Identify a niche

Move 3: Occupy the niche

Introduction example from IFI master's thesis: CARS

The use of artificial intelligence and more advanced detection and mitigation tools and software introduces a complicated landscape for malicious actors. As it becomes more challenging to introduce malware into environments without risking detection, cybercriminals must use other ways to remain unnoticed and successful in their campaigns. This need has led actors to utilize already existing technologies in their advancements and, with time, introduced a concept we today often refer to as "Living off the Land."

In recent years, we have seen an increase in such techniques in the cyber domain. In 2017, the security software vendor Symantec released an internet security threat report discussing "Living off the Land" as a clear trend in cyber attacks [175]. Moreover, in 2021, the Institute of Electrical and Electronics Engineers (IEEE) released a large-scale investigation of the use of "Live off the Land" techniques. Here, they discovered that several popular anti-virus solutions, including but not limited to Windows Defender, McAfee Total Protection, and Avast Premium Security, almost all struggled to detect malicious use of "Live off the land" binaries [18]. Lastly, the American cybersecurity company CrowdStrike introduced a global threat report in 2023 revealing that 62% of attacks were malware-free in the final quarter of 2021 and that malicious actors regularly used legitimate credentials and native tools in its place [19].

According to several of these findings, "Living off the Land" is presented as an increasingly appealing and powerful evasion mechanism for malicious campaigns. However, despite its frequent use and increasing relevance in the protection of networks, it can be difficult to find concrete examples and explanations of how threat actors can use these techniques to compromise a network. Outside of reports of previous campaigns or analysis of specific malwares utilizing "Living off the land" techniques, few resources speak collectively of the hows and whys of "Living off the land". This thesis seeks to explore these strategies from the perspective of a threat actor, providing a detailed explanation of how and with what tools malicious actors can attempt to gain access to particular information within the Windows environment, how the environment reacts, and how the information can later be utilized. The result of the study will be a collection of scripts, commands, and strategies using native Windows tools that hope to contribute to a better understanding of "Living off the Land" techniques.

[Ernst, Even Christoffer Andersen. \(2024\). *Living off the Land: Exploring Native Windows Tools for Post-Exploitation – A Study of Live off the Land Techniques in Active Directory Environments* \[Master's thesis\]. University of Oslo, 2-3.](#)

Introduction example from IFI master's thesis: CARS

The use of artificial intelligence and more advanced detection and mitigation tools and software introduces a complicated landscape for malicious actors. As it becomes more challenging to introduce malware into environments without risking detection, cybercriminals must use other ways to remain unnoticed and successful in their campaigns. This need has led actors to utilize already existing technologies in their advancements and, with time, introduced a concept we today often refer to as "Living off the Land."

In recent years, we have seen an increase in such techniques in the cyber domain. In 2017, the security software vendor Symantec released an internet security threat report discussing "Living off the Land" as a clear trend in cyber attacks [175]. Moreover, in 2021, the Institute of Electrical and Electronics Engineers (IEEE) released a large-scale investigation of the use of "Live off the Land" techniques. Here, they discovered that several popular anti-virus solutions, including but not limited to Windows Defender, McAfee Total Protection, and Avast Premium Security, almost all struggled to detect malicious use of "Live off the land" binaries [18]. Lastly, the American cybersecurity company CrowdStrike introduced a global threat report in 2023 revealing that 62% of attacks were malware-free in the final quarter of 2021 and that malicious actors regularly used legitimate credentials and native tools in its place [19].

According to several of these findings, "Living off the Land" is presented as an increasingly appealing and powerful evasion mechanism for malicious campaigns. However, despite its frequent use and increasing relevance in the protection of networks, it can be difficult to find concrete examples and explanations of how threat actors can use these techniques to compromise a network. Outside of reports of previous campaigns or analysis of specific malwares utilizing "Living off the land" techniques, few resources speak collectively of the hows and whys of "Living off the land". This thesis seeks to explore these strategies from the perspective of a threat actor, providing a detailed explanation of how and with what tools malicious actors can attempt to gain access to particular information within the Windows environment, how the environment reacts, and how the information can later be utilized. The result of the study will be a collection of scripts, commands, and strategies using native Windows tools that hope to contribute to a better understanding of "Living off the Land" techniques.

[Ernst, Even Christoffer Andersen. \(2024\). *Living off the Land: Exploring Native Windows Tools for Post-Exploitation – A Study of Live off the Land Techniques in Active Directory Environments* \[Master's thesis\]. University of Oslo, 2-3.](#)

What do introductions do?

Provide background / context, orient the reader toward the writer's intention

Make clear the problem or question

Move from the general to the specific

2 models to consider:

1) CARS: Creating a Research Space

2) ABT: AND-BUT-THEREFORE

Introductions: ABT model

ABT: AND-BUT-THEREFORE

Move 1: AND (establishes context, says “this is how things are”)

Move 2: BUT (establishes tension, a conflict, something to be resolved)

Move 3: THEREFORE (proposes a solution, a resolution, or a way forward)

NB: The idea here is not that you must actually write these three words, these words are simply markers for the presentational sequence.

Introduction example from IFI master's thesis: ABT

Over the past few years, research on language models has been highly active (Vaswani et al., 2017; Devlin et al., 2019; Brown et al., 2020, etc.) and the performance of language models has significantly improved, leading to the expansion in the use of language models worldwide. Additionally, as the size of language models and the volume of training data have increased (Brown et al., 2020; Kaplan et al., 2020), and as the cross-lingual transfer ability in language models is discussed (Artetxe and Schwenk, 2019; Pires et al., 2019), interest in language models supporting various languages has also grown substantially (Lin et al., 2022; Shliazhko et al., 2022; Scao et al., 2023). The development of language models that support various languages has several benefits. Multilingual language models make language models available in many different languages, increasing the accessibility of language models to people around the world and allowing more people to benefit from the use of language models. They also can reduce the computational resources and time required to develop and maintain separate models for each language, thereby increasing overall efficiency.

However, are these language models sufficiently and appropriately multilingual? The common usage of language models today often involves using large-scale language models as base models and fine-tuning them with specific datasets suitable for downstream tasks, or eliciting appropriate answers from them through prompting without additional finetuning. The large-scale language models that serve as the base models require very large training data, and these training data are generally heavily skewed towards English, as shown in Table 1.1. This language bias in training data of language models could bring potential concerns or issues in the multilingualism of language models and the multilingual downstream tasks based on these models. Some of recent studies are actively investigating these concerns, from various perspectives: For example, large language models may perform better in English (Huang et al., 2023), their responses might carry grammatical nuances of English (Papadimitriou et al., 2023), they culturally reflect values of English-speaking countries (Masoud et al., 2023; Naous et al., 2023), or they “think” in English as a pivoting language (Etzaniz et al., 2023; Zhang et al., 2023; Wendler et al., 2024). Such English bias in widely used language models can potentially and gradually affect the diversity of languages, the diversity of cultures behind them, and further, the diversity of thought. Therefore, as the use of large language models is becoming more widespread, understanding the language bias of these language models is an important and timely research topic.

[Park, Narae. \(2024\). *Investigating Linguistic bias in large language models: A case study of Korean text generation* \[Master's thesis\]. University of Oslo.](#)

Introduction example from IFI master's thesis: ABT

Over the past few years, research on language models has been highly active (Vaswani et al., 2017; Devlin et al., 2019; Brown et al., 2020, etc.) and the performance of language models has significantly improved, leading to the expansion in the use of language models worldwide. **AND** Additionally, as the size of language models and the volume of training data have increased (Brown et al., 2020; Kaplan et al., 2020), and as the cross-lingual transfer ability in language models is discussed (Artetxe and Schwenk, 2019; Pires et al., 2019), interest in language models supporting various languages has also grown substantially (Lin et al., 2022; Shliazhko et al., 2022; Scao et al., 2023). **AND** The development of language models that support various languages has several benefits. Multilingual language models make language models available in many different languages, increasing the accessibility of language models to people around the world and allowing more people to benefit from the use of language models. They also can reduce the computational resources and time required to develop and maintain separate models for each language, thereby increasing overall efficiency.

However, **BUT** are these language models sufficiently and appropriately multilingual? The common usage of language models today often involves using large-scale language models as base models and fine-tuning them with specific datasets suitable for downstream tasks, or eliciting appropriate answers from them through prompting without additional finetuning. The large-scale language models that serve as the base models require very large training data, and these training data are generally heavily skewed towards English, as shown in Table 1.1. This language bias in training data of language models could bring potential concerns or issues in the multilingualism of language models and the multilingual downstream tasks based on these models. Some of recent studies are actively investigating these concerns, from various perspectives: For example, large language models may perform better in English (Huang et al., 2023), their responses might carry grammatical nuances of English (Papadimitriou et al., 2023), they culturally reflect values of English-speaking countries (Masoud et al., 2023; Naous et al., 2023), or they “think” in English as a pivoting language (Etxaniz et al., 2023; Zhang et al., 2023; Wendler et al., 2024). Such English bias in widely used language models can potentially and gradually affect the diversity of languages, the diversity of cultures behind them, and further, the diversity of thought. **THEREFORE** Therefore, as the use of large language models is becoming more widespread, understanding the language bias of these language models is an important and timely research topic.

[Park, Narae. \(2024\). *Investigating Linguistic bias in large language models: A case study of Korean text generation* \[Master's thesis\]. University of Oslo.](#)

Synthetic structure

(“scientific” writing – think IMRaD)

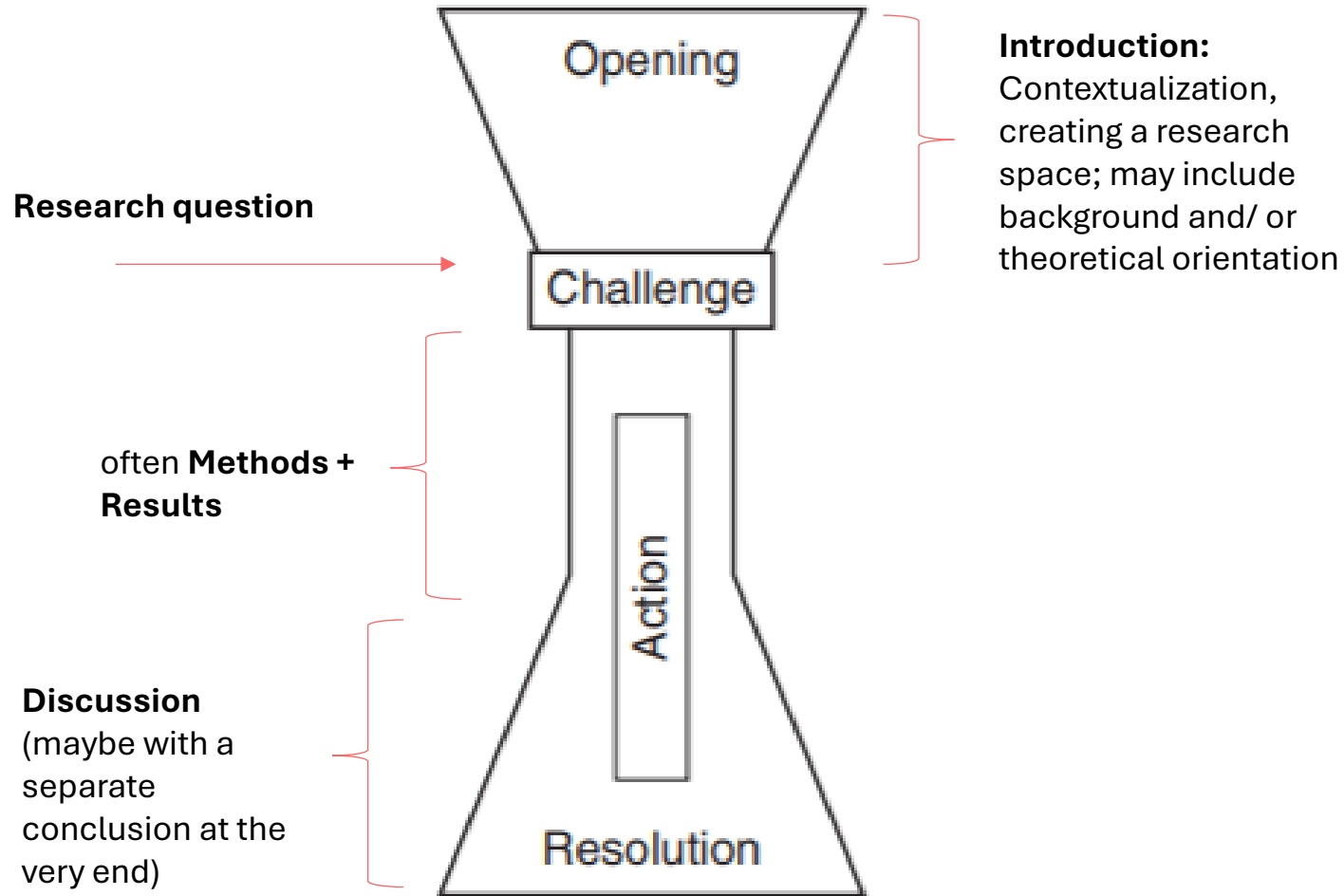


Figure adapted from : Schimel, Joshua. 2012. *Writing Science: How to Write Papers That Get Cited and Proposals That Get Funded*. 1st ed. Oxford: Oxford University Press.

Suggested outline of the extended project description

<https://www.mn.uio.no/ifi/english/studies/master/project-description/index.html>

■ Introduction

Overall, what the assignment is about

Motivation for the assignment/research question

Brief description of the research question, without technical details

■ Background, literature review, and clarification of concepts

What must one know to understand the research question?

Review of relevant literature and related work

■ Detailed description of the research question

What is the problem the assignment will solve/explore

Concrete examples

■ Preliminary plan for the work

Describe what needs to be done (write a program, collect data, perform tests, etc.)

Choice of methodology and methods, and what these involve

How and when to carry out the work (how to analyze the data, order of tasks, etc.)

Ethical reflections (if relevant)

Suggested outline of the extended project description

<https://www.mn.uio.no/ifi/english/studies/master/project-description/index.html>

■ Introduction

Overall, what the assignment is about

Motivation for the assignment/**research question**

Brief description of **the research question**, without technical details

■ Background, literature review, and clarification of concepts

What must one know to understand **the research question**?

Review of relevant literature and related work

■ Detailed description of **the research question**

What is the problem the assignment will solve/explore

Concrete examples

■ Preliminary plan for the work

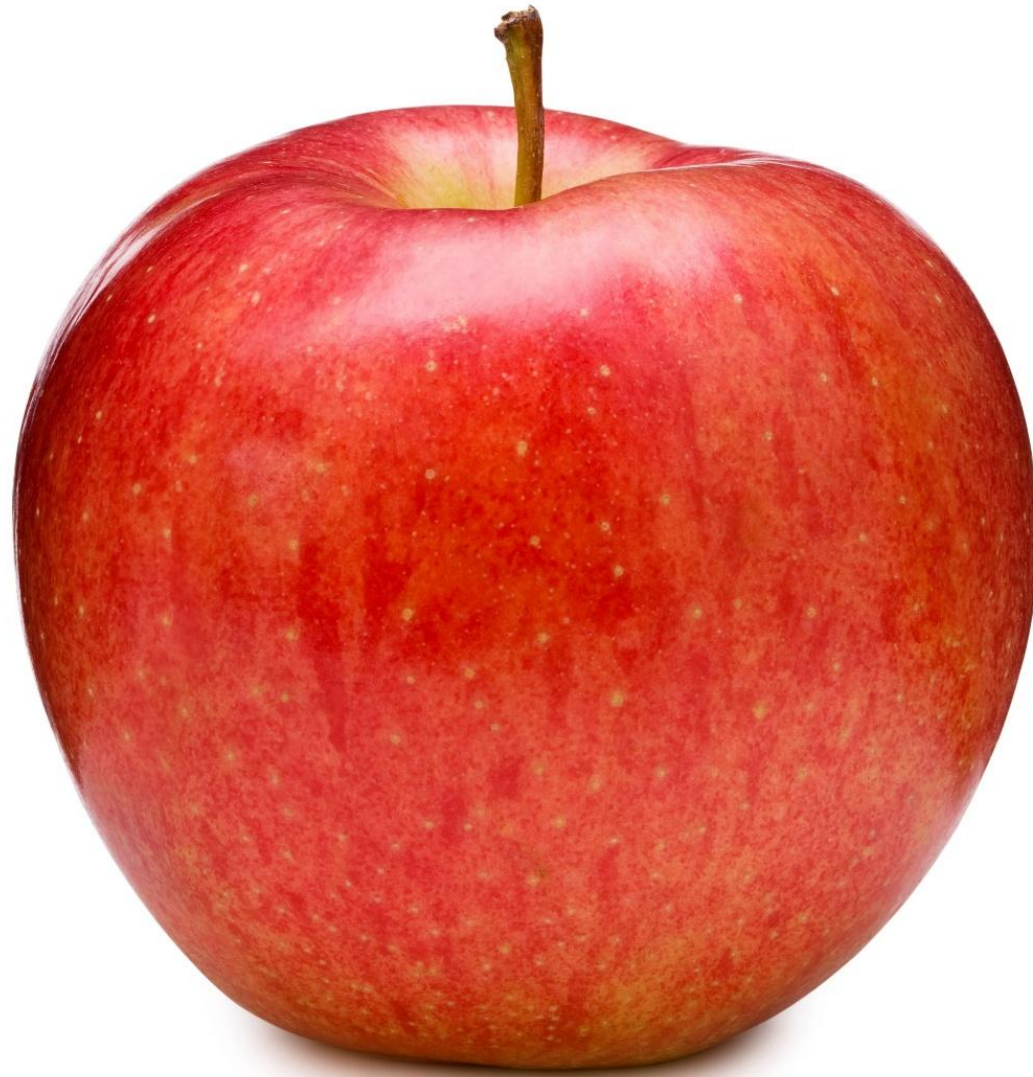
Describe what needs to be done (write a program, collect data, perform tests, etc.)

Choice of methodology and methods, and what these involve

How and when to carry out the work (how to analyze the data, order of tasks, etc.)

Ethical reflections (if relevant)

What is ~~academic~~ writing?



Agenda

- 1) “Academic” writing
- 2) Writing as process

writing is... a product

UNIVERSITY
OF OSLO

Master's thesis

Investigating the Viability of
FPGAs as General Purpose
Accelerators

Sigmund Haaland

Informatics: Robotics and Intelligent systems
60 ECTS study points

Department of Informatics
Faculty of Mathematics and Natural Sciences

Spring 2024



UiO : DUO Research Archive

English Administration

Home / Det matematisk-naturvitenskapelige fakultet / Institutt for informatikk / Institutt for informatikk / Search

Search

Go

Masteroppgave x

Show Advanced Filters

Now showing items 1-100 of 2844

Doing meaningful data work in an increasing digitalized healthcare environment: the case of ELISE in Oslo municipality.

Restricted Access

Fauconnier, Marie (Master thesis / Masteroppgave, 2024)

The Norwegian healthcare sector is increasingly becoming digitalized through national and regional initiatives. These initiatives in turn lead to datafication of healthcare practices, where health activities are transformed ...

NLP-based classification of test, test debt and test types in project management issues.

Durani, Neha (Master thesis / Masteroppgave, 2024)

Styring av IT med to hastigheter.

Restricted Access

Flagestad, Hans (Master thesis / Masteroppgave, 2024)

Combining Deep Learning with Neuromodulated Neural Networks.

Zelentsov, Anton (Master thesis / Masteroppgave, 2024)

Deep learning has progressed a lot since its viability was proven in 2012, being capable of solving a wide variety of problems and upending society with novel applications of advanced, deep neural networks. However, deep ...

Implications of Gender Composition in Agile Software Engineering Teams: Investigating a Large Capstone Course.

Sæter, Gyda Elisa (Master thesis / Masteroppgave, 2024)

Automatic priority classification for issues in issue tracking systems using transformers.

Haugerud, Kristian Marison (Master thesis / Masteroppgave, 2024)

For students / employees

Submit master thesis

Access to restricted material

All of DUO

Communities & Collections

By Issue Date

Authors

Titles

This Collection

By Issue Date

Authors

Titles

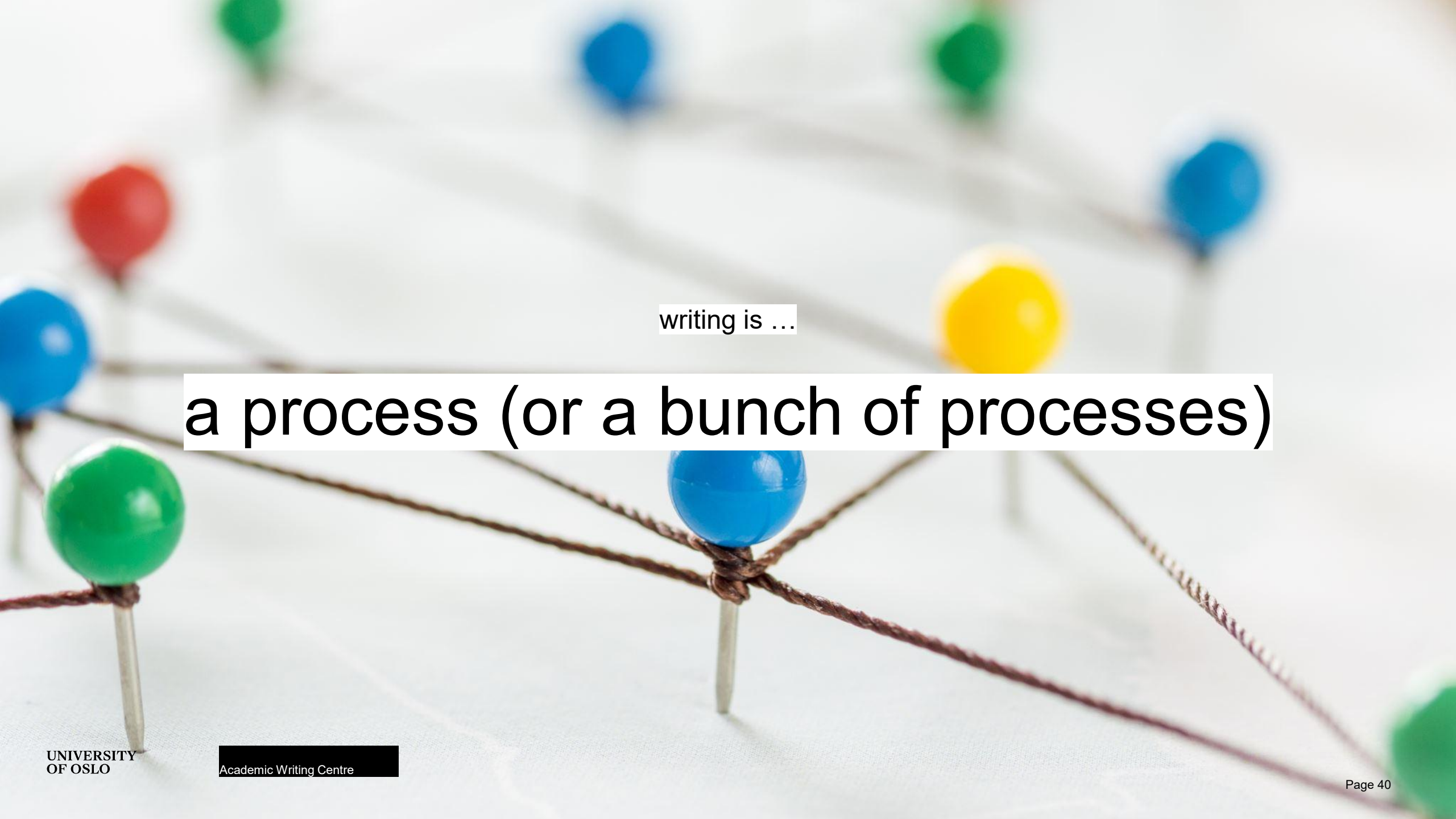
Date Issued

2020 - 2024 (974)

2010 - 2019 (1307)

2003 - 2009 (562)

Document Type



writing is ...

a process (or a bunch of processes)

Writing as process

Writing for presentation... builds on writing to think

Det er et «skille mellom "presentasjonsskriving" (altså skriving for å *kommunisere* ideer) og "tenkeskriving" (altså skriving for å *utvikle* ideer). Når du skriver for å tenke, trenger du ikke ta hensyn til om andre skal forstå det du skriver, og du kan skrive så rotete og uformelt du bare vil. Det sentrale er å utforske og utvikle tankene dine, noe du gjør på en annen måte når du skriver enn når du bare har disse i hodet:

"Man skriver ikke tankene sine ned eller ut. (...) Tankene oppstår underveis, av selve anstrengelsen med å formulere seg" (fra Anders Johansen, *Samtalens tynne tråd*, 2003).»

- Marlon, Skrivementor ved Akademisk skrivesenter

Suggested outline of the extended project description

<https://www.mn.uio.no/ifi/english/studies/master/project-description/index.html>

■ Introduction

Overall, what the assignment is about

Motivation for the assignment/research question

Brief description of the research question, without technical details

■ Background, literature review, and clarification of concepts

What must one know to understand the research question?

Review of relevant literature and related work

■ Detailed description of the research question

What is the problem the assignment will solve/explore

Concrete examples

■ Preliminary plan for the work

Describe what needs to be done (write a program, collect data, perform tests, etc.)

Choice of methodology and methods, and what these involve

How and when to carry out the work (how to analyze the data, order of tasks, etc.)

Ethical reflections (if relevant)

Free writing: Get started writing!

1. Free write about a relevant topic which interests you, or on the topic you have decided to write your thesis about
2. Complete the following sentence and keep writing:
 - What I really want to say / show / know / explore is
 - I need to know more about

Writing as process – When to focus on what?

Higher Order Concerns (HOCs):

- Idea development
- Structure
- Terminology and conceptual framing

Lower Order Concerns (LOCs):

- Grammar
- Spelling
- Language, diction and syntax
- Formatting and formal considerations

Revising – When should I edit?

Principles:

- Give yourself space to think, and a frame to succeed.
- Revising is a central part of writing
 - ex.: to clarify terminology, to refine a research question after more reading

... **but**, proofreading as you write can ruin your flow and focus

Suggestions:

- Allow yourself to write a shitty first drafts; get your ideas out messy and incomplete first
- Revise with HOCs og LOCs in mind: *where am I now, what do I need to focus on?*
 - Are you just getting started? Try to keep your focus on the ideas – Are they clear? Do they make sense? Do they work together? Are your terms consistent and appropriate?
 - Almost finished? Sweat the small stuff: Proofread, consider sentences – *does this sound okay? Do I use this word a bit too much? Can I shorten this sentence or split it up?*

How to speak with your supervisor

- Ask for feedback based on your process
 - Where are you in your process, what do you need input on?
 - Remember HOCs and LOCs
- Ask specific questions

Ex.: What do you think? v. Does my use of X in light of Y make sense?

What about the rest of the extended project description?

What about the thesis itself?

A few tips...



Norwegian Research Information Repository

+ New result

UIO My page David

Clear selection

Showing 1-10 of 3,874 sorted by Last modified

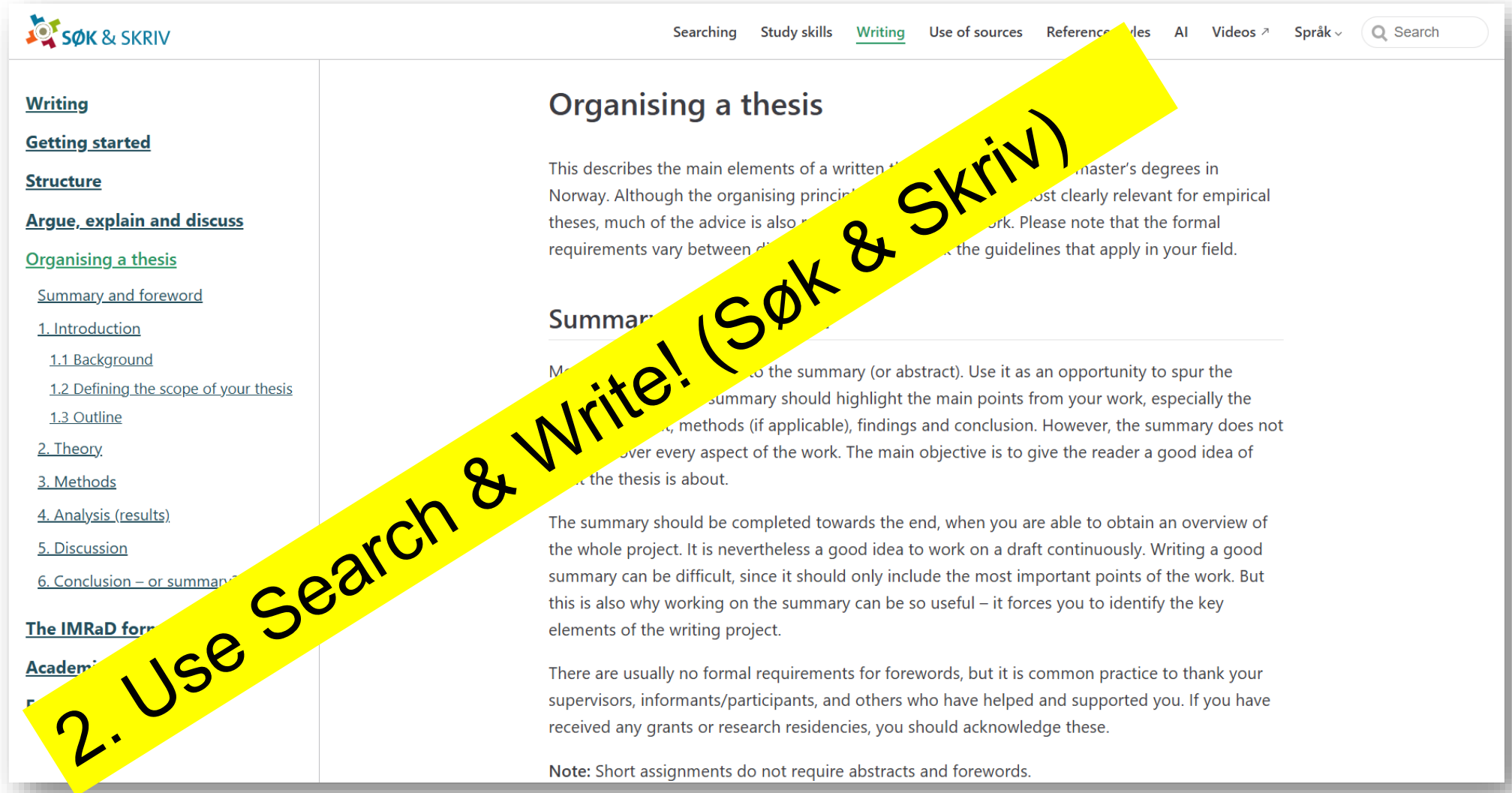
Master thesis 21.11.2025 | Universitetet i Oslo
Exploring Multispecies Voices
Ruud, Tina Morønning; (+ 2 others)

Master thesis 01.12.2025 | Universitetet i Oslo
Evaluating LLM-Generated Feedback for Medical Students on Exam Questions: The Role of Temperature Settings in Feedback Quality
Popescu, Daria Maria; (+ 2 others)
— Abstract and files will be published: 2026-12-01

Master thesis 24.11.2025 | Universitetet i Oslo
LLM-Based Generation of Release Notes from Issue Tracker Data: A Mixed-Methods Evaluation Using Expert Comparisons and Semantic Similarity Metrics
Fatema, Kanis; (+ 2 others)
Generating release notes for large, complex software products has traditionally been difficult, effort-prone and time consuming that can take up to eight hours per release. Historically, attempts to fully or semi-automate this manual process often failed because they lacked the necessary flexibility and contextual awareness to manage diverse target audiences and domains. However, with the recent commercial availability of Large Language Models...

1. Take a look at other IFI master's theses in the Norwegian Research Information Repository (NVA)

A few tips...



The image shows a screenshot of the 'Søk & Skriv' website, which is a resource for academic writing. The website has a navigation bar at the top with links for 'Searching', 'Study skills', 'Writing' (which is highlighted), 'Use of sources', 'Reference styles', 'AI', 'Videos', and 'Språk'. A search bar is located on the right side of the navigation bar. On the left side of the page, there is a sidebar with a list of links under the heading 'Writing'. The links include 'Getting started', 'Structure', 'Argue, explain and discuss', 'Organising a thesis' (which is highlighted in green), 'Summary and foreword', '1. Introduction', '1.1 Background', '1.2 Defining the scope of your thesis', '1.3 Outline', '2. Theory', '3. Methods', '4. Analysis (results)', '5. Discussion', and '6. Conclusion – or summary'. The main content area on the right is titled 'Organising a thesis'. It contains a paragraph of text and a section titled 'Summary'. A large yellow banner with the text '2. Use Search & Write! (Søk & Skriv)' is overlaid diagonally across the center of the page.

Writing

[Getting started](#)

[Structure](#)

[Argue, explain and discuss](#)

[Organising a thesis](#)

[Summary and foreword](#)

[1. Introduction](#)

[1.1 Background](#)

[1.2 Defining the scope of your thesis](#)

[1.3 Outline](#)

[2. Theory](#)

[3. Methods](#)

[4. Analysis \(results\)](#)

[5. Discussion](#)

[6. Conclusion – or summary](#)

The IMRaD form

Academic

Organising a thesis

This describes the main elements of a written thesis for master's degrees in Norway. Although the organising principles are most clearly relevant for empirical theses, much of the advice is also relevant for other types of work. Please note that the formal requirements vary between disciplines, so check the guidelines that apply in your field.

Summary

Make a summary (or abstract). Use it as an opportunity to spur the reader on. The summary should highlight the main points from your work, especially the introduction, methods (if applicable), findings and conclusion. However, the summary does not cover every aspect of the work. The main objective is to give the reader a good idea of what the thesis is about.

The summary should be completed towards the end, when you are able to obtain an overview of the whole project. It is nevertheless a good idea to work on a draft continuously. Writing a good summary can be difficult, since it should only include the most important points of the work. But this is also why working on the summary can be so useful – it forces you to identify the key elements of the writing project.

There are usually no formal requirements for forewords, but it is common practice to thank your supervisors, informants/participants, and others who have helped and supported you. If you have received any grants or research residencies, you should acknowledge these.

Note: Short assignments do not require abstracts and forewords.

A few tips...

UNIVERSITY OF OSLO University of Oslo Library NO EN Menu

← Courses and events ← Events ← All libraries ← 2026

2026
2025
2024

Writers' Night 2026

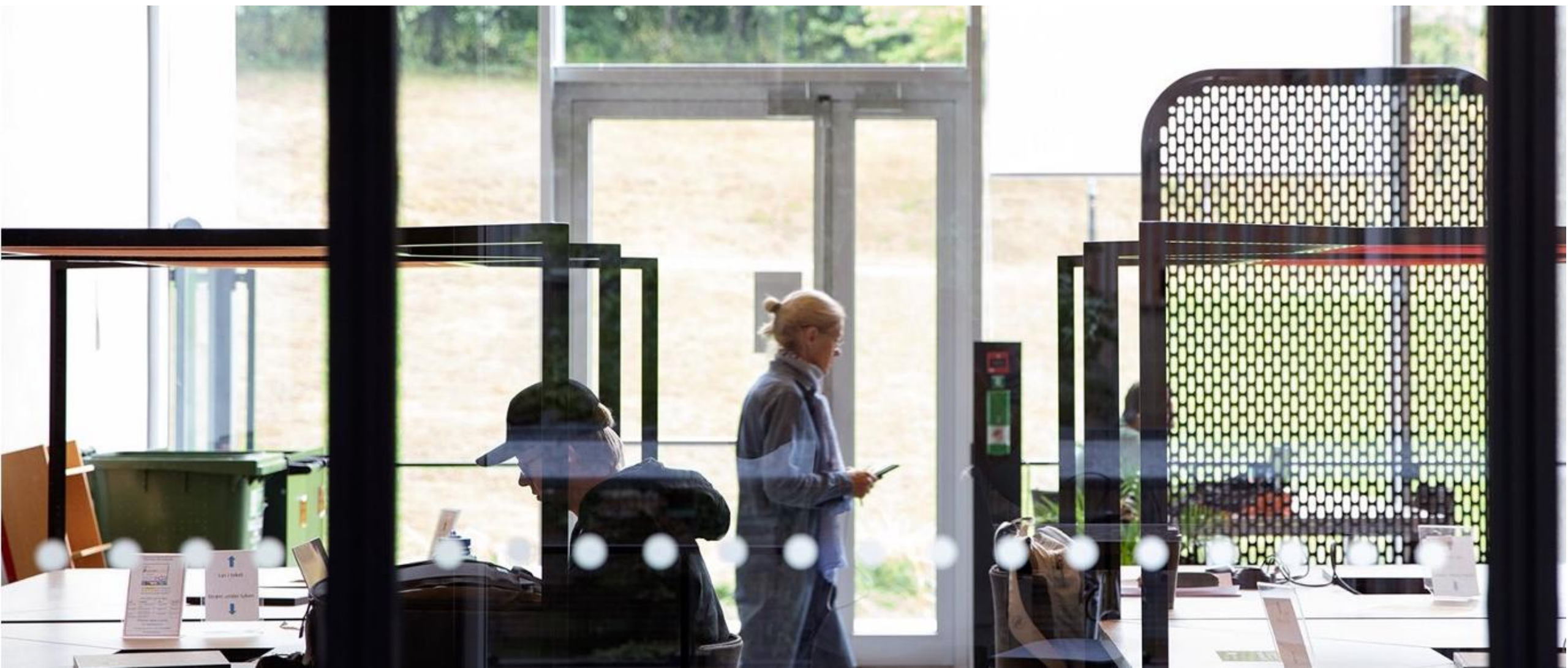
Welcome to Writers' Night, an evening at the library all about writing! The program includes sessions on artificial intelligence at UiO, data visualization, citing and referencing, and the other side of writing. And as always, there will be *Shut Up & Write* sessions and consultations with mentors from the Academic Writing Centre.

Thursday, April 16, 2026 4:30 PM – 11:00 PM, [HumSam-biblioteket](#)



3.

Break



Agenda

- 1) Finding scientific literature
- 2) Referencing
- 3) AI

Where do you find scientific articles?



[← Subjects](#)

<https://www.ub.uio.no/fag/informatikk/>

Subject page for informatics

[Search Oria – the library catalogue](#)

Find books, articles, journals, databases



[Help](#) [Go to Oria](#) [Access from home](#)

Contact



Andri Spilker

Subject librarian informatics
[Informatics Library](#)



Matthew Good

Leading development of the
[Digital Scholarship Centre](#)

Databases and other sources

Fulltext resources

- [ACM Digital Library](#) (subscription with fulltext)
- [IEEE Xplore](#) (subscription with fulltext)
- [MathSciNet](#) (subscription, mathematics from 1800 and on)
- [Computing Research Repository \(CoRR\)](#) (Search, browse and download papers through its online repository)
- Collection of Computer Science Bibliographies (Archived)

Get an overview

Search in multiple resources at once

- [Scopus](#)
- [Web of Science](#)
- [Google scholar](#)

→ [More on informatics databases](#)

Springer

- [Monographs in Theoretical Computer Science](#) (book series)
- [Lecture Notes in Computer Science](#) (LNCS - book series)
inkluderer *Lecture Notes in Bioinformatics* og *Lecture Notes in Artificial Intelligence*
- [IFIP Advances in Information and Communication Technology](#) (book series)
- [Studies in Big Data](#) (book series)
- [the above and more from Springer](#) (more science and other disciplines)

Other e-books

- Check [IEEE Xplore](#)

Miscellaneous

- [Computing Reviews](#)
Read reviews on new informatics books and feel free to suggest acquisitions to the library (through guest book in right margin)
- [Publications from Department of Informatics](#) Master theses, Research reports, and more

Web of Science
Scopus



Interdisciplinary
citation databases

- Strict criteria for what is included.
- Transparent criteria.
- Very good level of metadata.
- Good for navigating between related papers with topic search words.
- Controlled by: libraries, scientific community

ACM digital library
IEEE Xplore



Subject databases

- Exist for different fields
- Find what is used in YOUR field!
- Controlled by: scientific community.

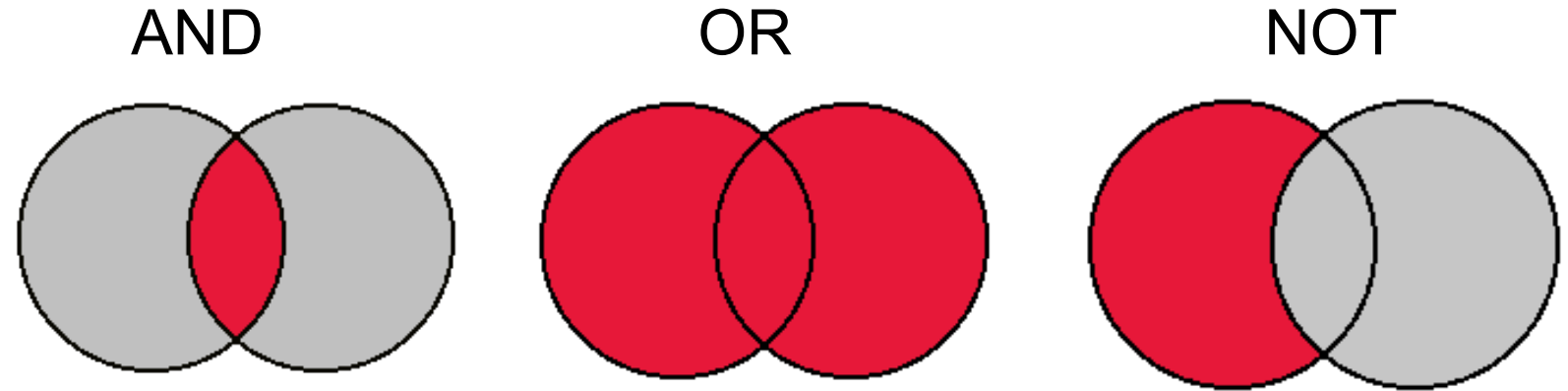
Google Scholar

Not a database

- Quick and easy.
- Not transparent.
- Not easy to reproduce search results.
- Controlled by: Google.

How to search in databases

- Use booleans



- Use quotation marks, otherwise default is AND
 - “quantum measurement problem” **not** quantum AND measurement AND problem
 - (“quantum measurement problem” OR “wavefunction collapse”) AND computing

How do you know you can trust a scientific article?

Peer reviewed

Sources

I dont

Cited often

??

If they are fagfelleverderte

Peer reviewed

How many citations it has

depends on the source

Check sources

Renowned author

How many who have cited the article

Basic criteria to judge if an article is trustworthy

✓ Is it in a reputable, peer-reviewed journal?

kanalregister.hkdir.no

 Kanalregisteret

Norwegian Register for Scientific Journals, Series and Publishers

In the Norwegian Register, you will find an overview over academic journals, series and publishers (publication channels), and you are welcome to suggest new.

Find journals and publishers

☒ Journal ☐ Publisher

Search by title, ISSN or ISBN prefix

 physical review

Search

Physical Review X

American Physical Society

Level 2

 Indexed in DOAJ

 Indexed in Open Policy Finder

 Not included in publishing agreement

Classification of academic publications:

Level 2: very high-quality

Level 1: standard

Level 0: not approved or not assessed

✓ Does your supervisor approve?

Where to start

- Review articles
- Your supervisor's articles or suggestions
- The most cited in the field
- Find the key references in the introductions!
 - “Snowball” on to other relevant papers
 - Look for the papers that cite the papers you read

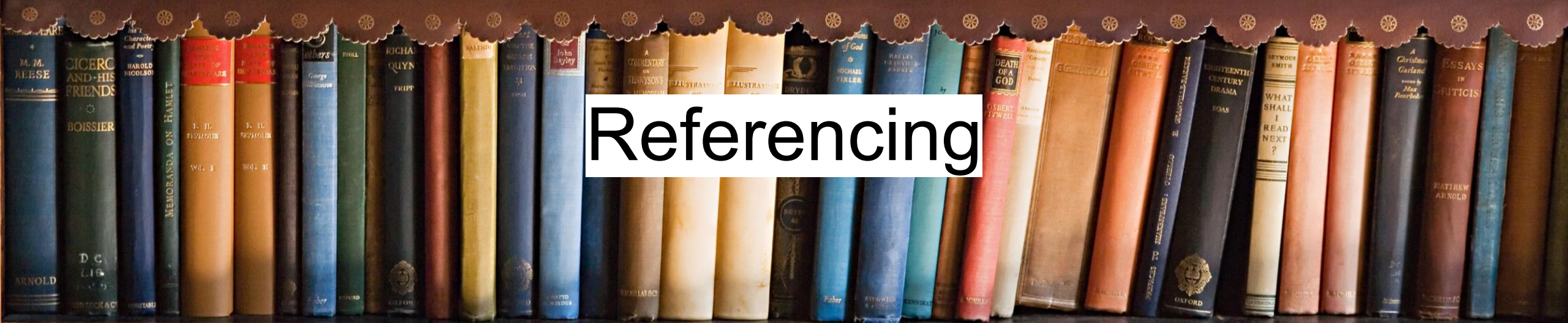
Follow the “paper trail”



Generated with MS Copilot



D



Referencing

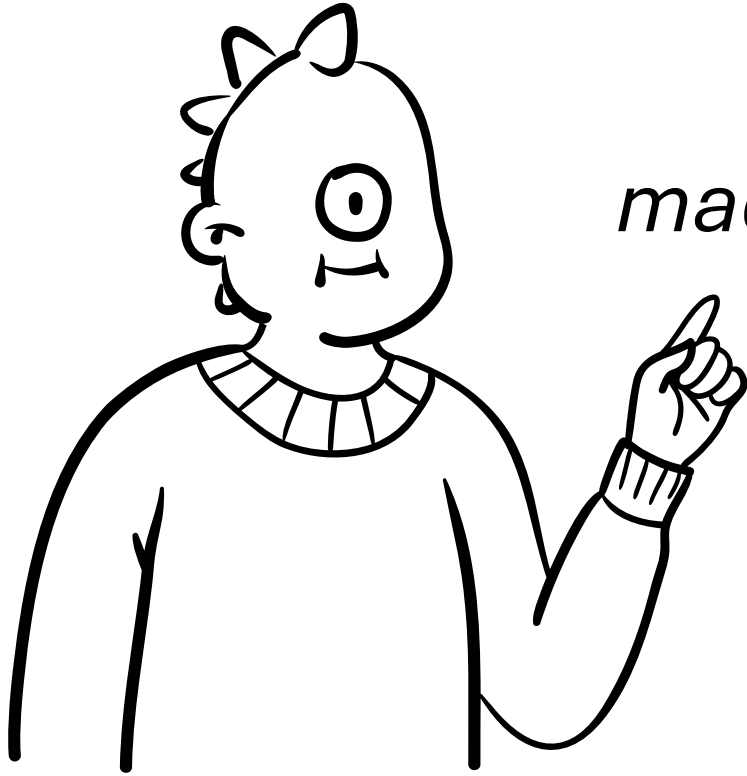
E



Referencing

The Academic Interaction

*is a conversation...
made visible by reference.*



General (but not absolute) rule for when to cite

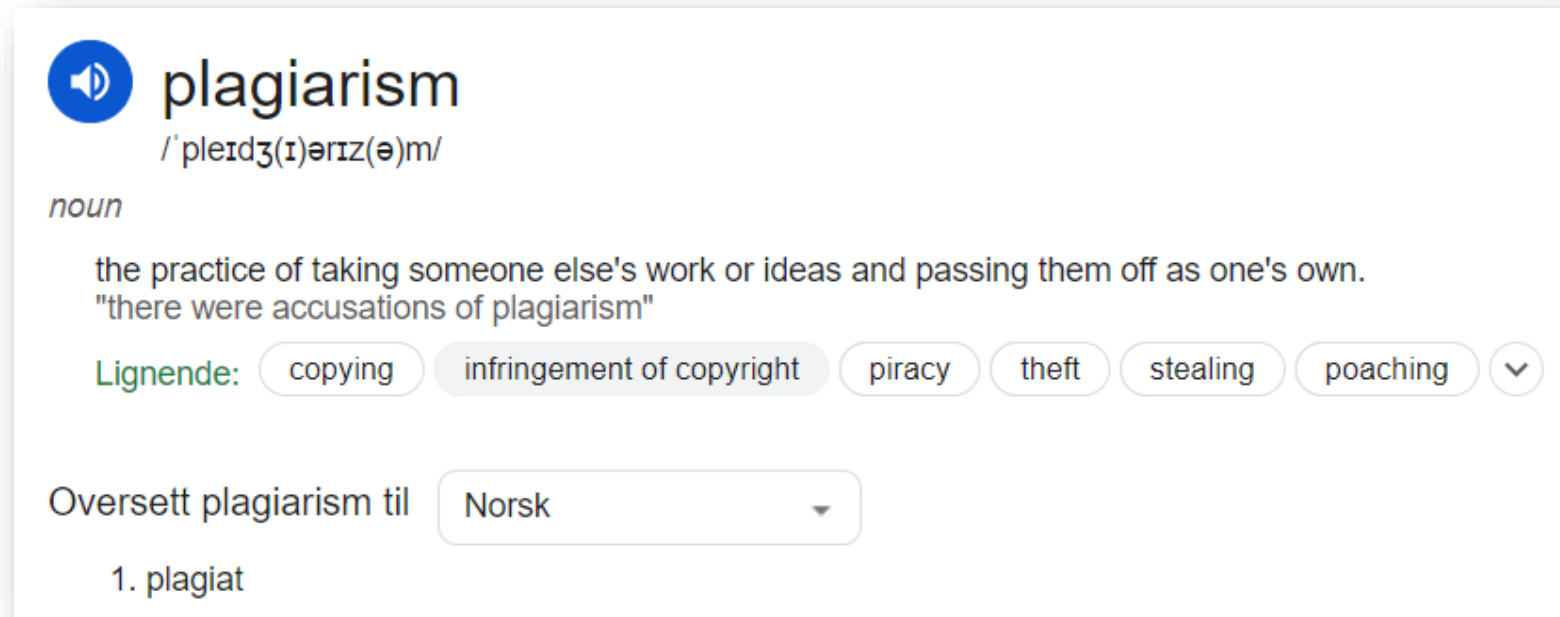
Generally, all claims in scientific writing should be **substantiated**:

- ...by the authors' own work (experiment, simulations)

OR:

- ...by *citing* others

Develop a good reference practice



The screenshot shows the Cambridge Dictionary entry for the word 'plagiarism'. It includes a speaker icon for pronunciation, the word 'plagiarism' in a large font, its phonetic transcription /'pleɪdʒ(ɪ)ərɪz(ə)m/, and the part of speech 'noun'. The definition is 'the practice of taking someone else's work or ideas and passing them off as one's own.' An example sentence is 'there were accusations of plagiarism'. Below the definition, there is a section labeled 'Lignende:' (Synonyms) with buttons for 'copying', 'infringement of copyright', 'piracy', 'theft', 'stealing', and 'poaching'. At the bottom, there is a section 'Oversett plagiarism til' (Translate plagiarism to) with a dropdown menu set to 'Norsk' and a result '1. plagiat'.

 **plagiarism**
/'pleɪdʒ(ɪ)ərɪz(ə)m/
noun

the practice of taking someone else's work or ideas and passing them off as one's own.
"there were accusations of plagiarism"

Lignende: copying infringement of copyright piracy theft stealing poaching ▼

Oversett plagiarism til Norsk ▼

1. plagiat

Avoid plagiarism by:

- writing references when you first begin to engage with them
- including references when taking notes
- Rule of thumb: if the idea or information came from somewhere, cite it

Organize the literature you read (so you can reference them later)



- Free and open-source reference management tool
- Features to annotate and organize files
- Integration with Word, Overleaf, BibTeX
- Free course from UiO Library!

Cite in text, list at end

[Shor, P. W. \(1995\). Scheme for reducing decoherence in quantum computer memory. *Physical review A*, 52\(4\), R2493.](#)

Numbers in text

Recently, interest has been growing in an area called *quantum computation*, which involves computers that use the ability of quantum systems to be in a superposition of many states. These computations can be modeled formally by defining a quantum Turing machine [1,5], which is able to be in the superposition of many states. Instead of considering the computer itself to be in a superposition of states, it is sufficient to assume that the contents of the memory cells are in a superposition of different states and that the computer performs deterministic unitary transformations on the quantum states of these memory cells [2]. This model resembles a quantum circuit [3] more than a quantum Turing machine. After Schumacher [4], we will call a two-state memory cell

List the references you cite,
cite the references you list

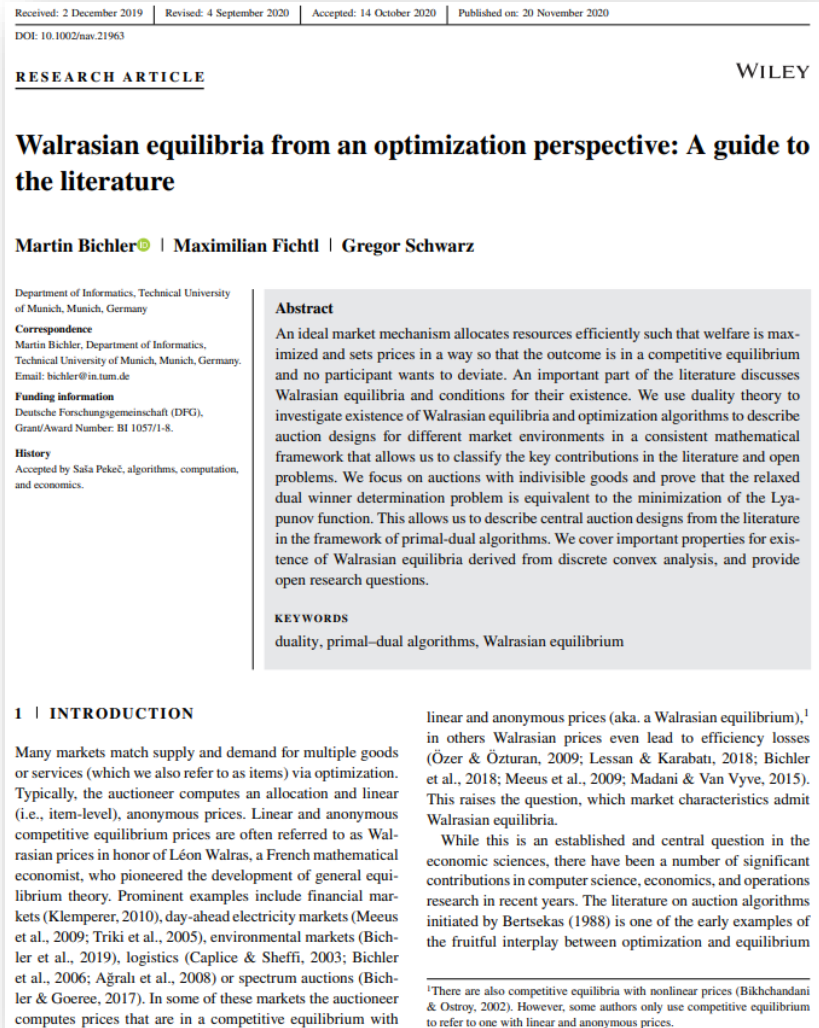
Numerical reference list in the end

- [1] D. Deutsch, Proc. R. Soc. London Ser. A **400**, 96 (1985).
- [2] A. Yao, in *Proceedings of the 34th Annual Symposium on Foundations of Computer Science* (IEEE Computer Society, Los Alamitos, CA, 1993), p. 352.
- [3] D. Deutsch, Proc. R. Soc. London Ser. A **425**, 73 (1989).
- [4] B. Schumacher, Phys. Rev. A **51**, 2738 (1995).
- [5] E. Bernstein and U. Vazirani, in *Proceedings of the 25th Annual ACM Symposium on the Theory of Computing* (Association for Computing Machinery, New York, 1993), p. 11.
- [6] D. Simon, in *Proceedings of the 35th Annual Symposium on Foundations of Computer Science*, edited by S. Goldwasser (IEEE Computer Society, Los Alamitos, CA, 1994), p. 116.
- [7] P. W. Shor, in *Proceedings of the 35th Annual Symposium on Foundations of Computer Science* (Ref. [6]), p. 124.
- [8] R. Landauer (unpublished).

Citations must unambiguously
identify the source!

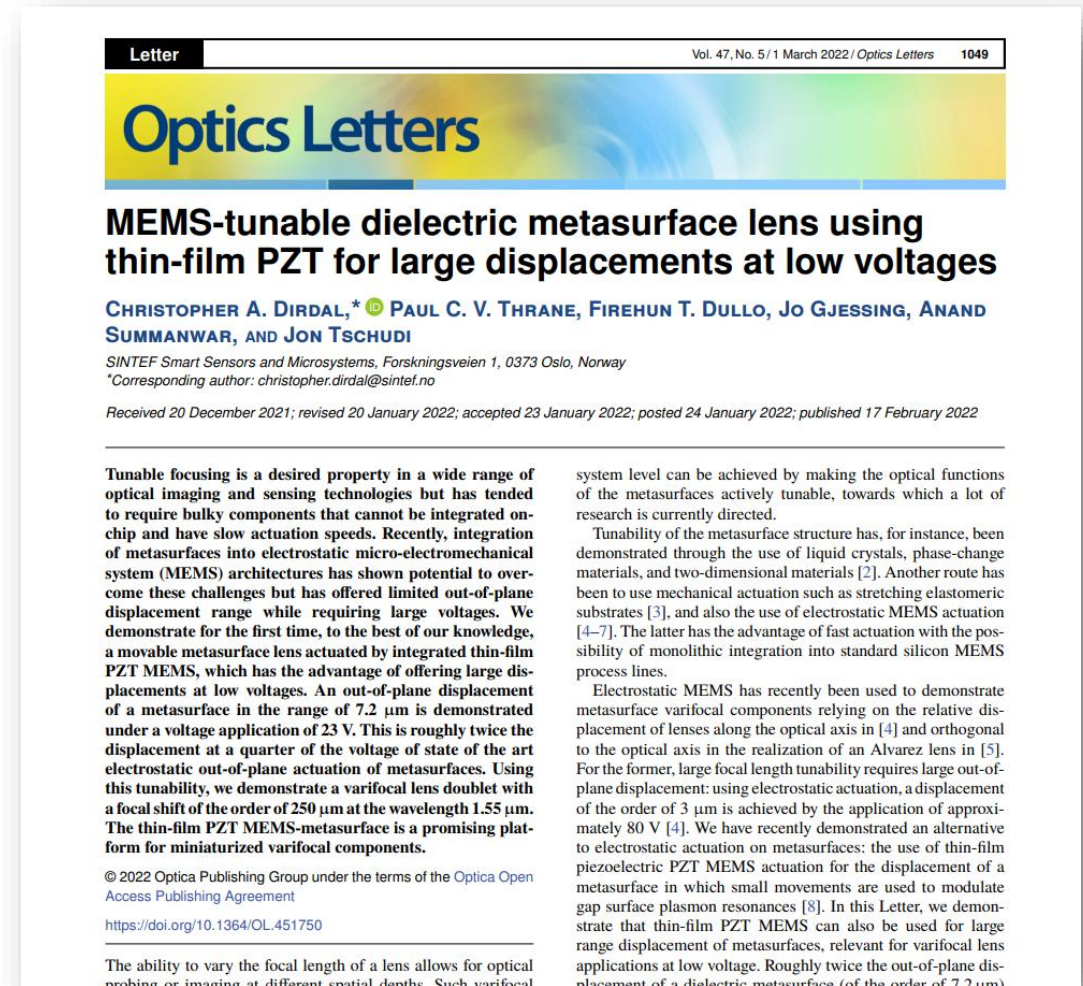
Reference Styles

Author-year references, ex. [APA 7th](#)



<https://onlinelibrary.wiley.com/doi/epdf/10.1002/nav.21963>

Numerical references, ex. [IEEE](#), [Vancouver](#)



<https://opg.optica.org/ol/fulltext.cfm?uri=ol-47-5-1049&id=469578>

Different ways of citing

- Summarising (shorter version, own words)

It now appears that, at least theoretically, quantum computation may be much faster than classical computation for solving certain problems [5–7], including prime factoriza-

- Paraphrasing (same length, other words)

Webster-Stratton (2016) described a case example of a 4-year-old girl who showed an insecure attachment to her mother; in working with the family dyad, the therapist focused on increasing the mother's empathy for her child (pp. 152–153).

- Direct citation (quotation marks, no change to text)

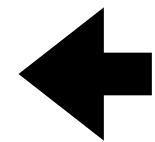
Baez et al. have noted that "full 3D stacking can potentially offer additional advantages for memory and processor applications" [7, p. 14].

Citing

- Read UiO web pages on sources and citations and cheating
- Cite (and read!) the *original* source
- Different sources are cited in different ways (e.g. web pages must include *when* you accessed them)
- Use Søk og skriv (Search and write) *and read through* your reference list (but don't wait until the last day)
- Make it clear what your contribution is!

Using citations correctly ensures that

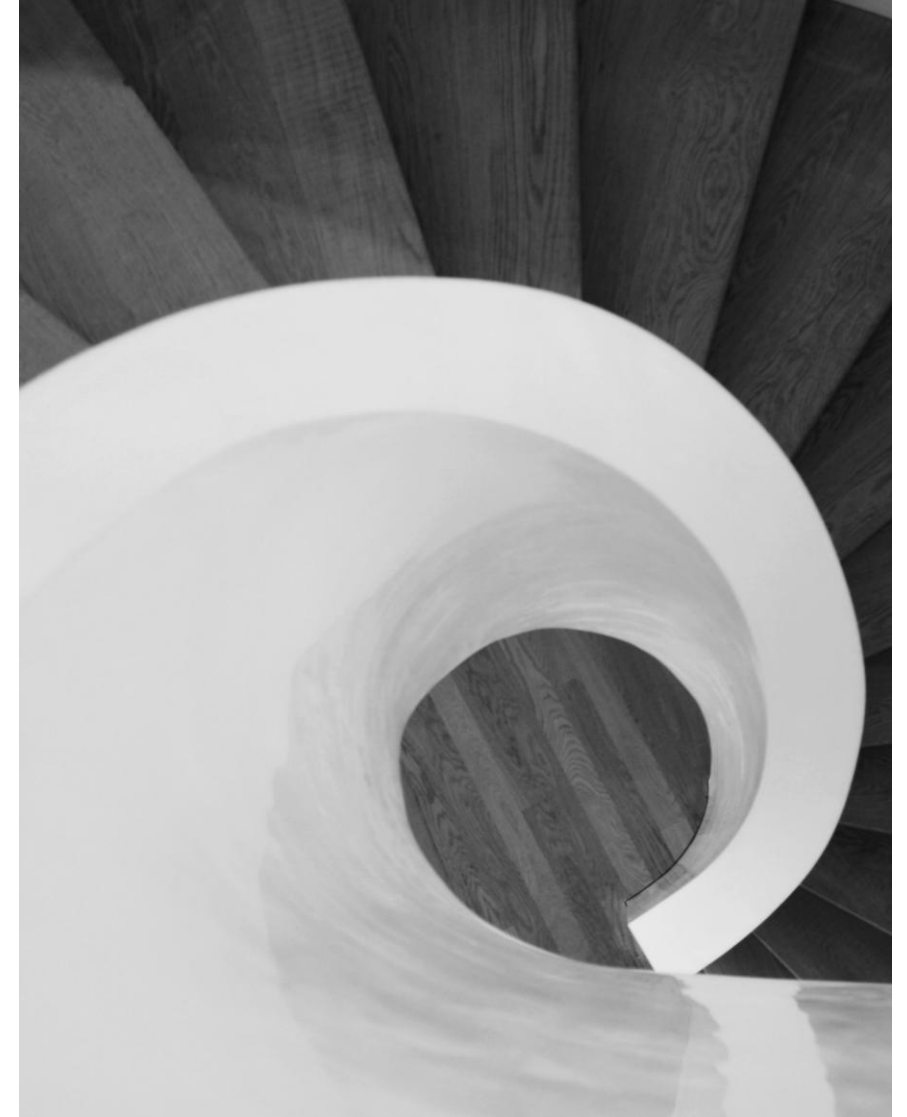
- The reader knows where to read more about something
- The reader can check your facts and verify your results
- You credit the right person for a discovery, claim, line of reasoning etc. rather than pretending you made it up yourself
→ NB: Also applies to re-using your own previous work! (self-plagiarism)

 Avoid plagiarism!

Read: [UiO: Cheating](#) [UiO: Sources and citations](#) [From UiO: Examination](#)

Illustrations and software

- Pictures, figures, graphs, tables, drawings and software belong to someone
- Copyright protected
- Check licence (CC-BY, Public domain etc.)
 - different licenses give different levels of flexibility
- No licence? Ask for permission
- Cite them correctly



Office 365

What am I allowed to use premium creative content for?
(microsoft.com)

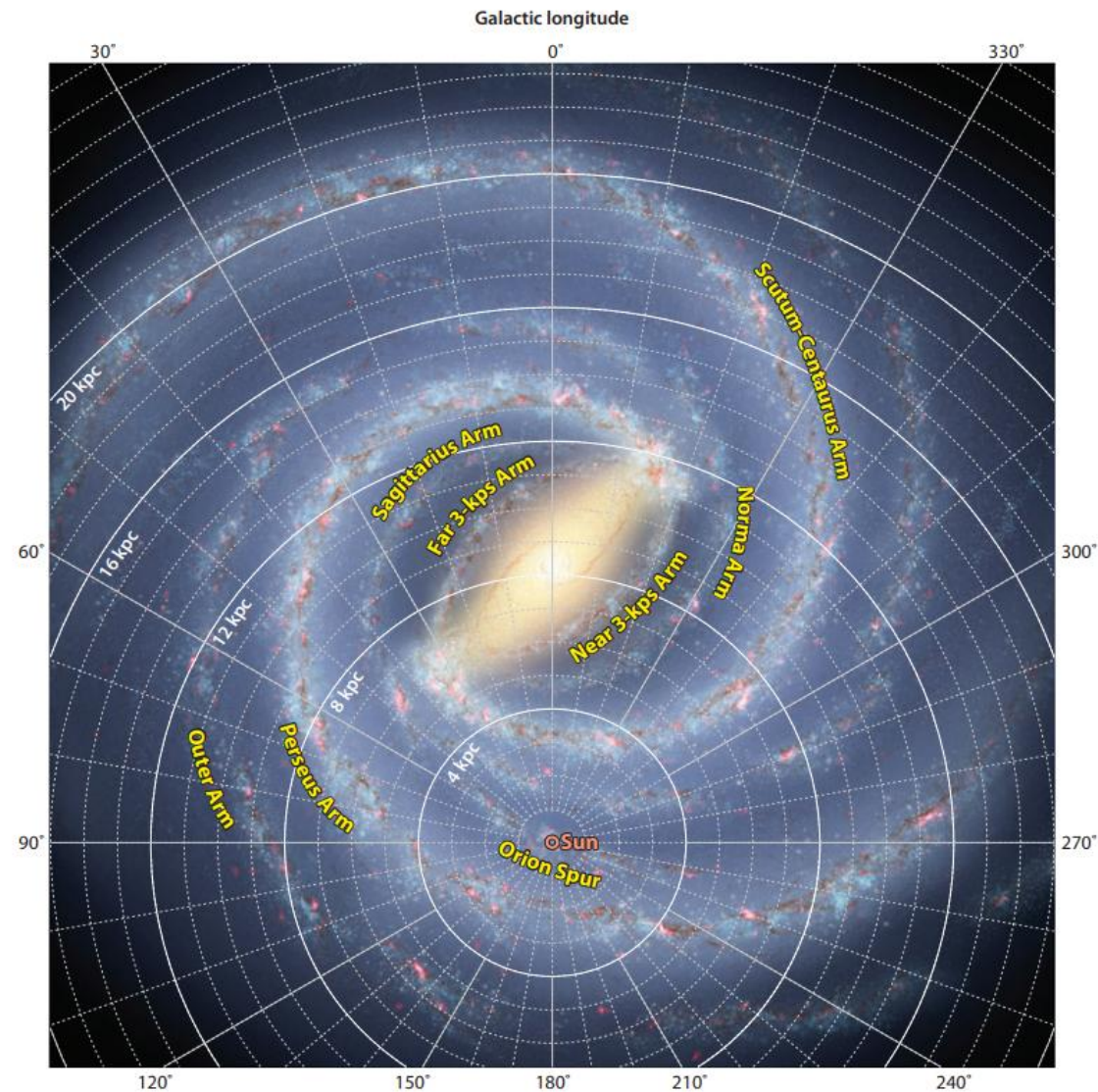


Figure 5

Sketch of approximately how the Galaxy is likely to appear viewed face-on, with Galactic coordinates overlaid and the locations of spiral arms and the Sun indicated. The image is based on data obtained from the literature at radio, infrared, and visible wavelengths. As viewed from a great distance, our Galaxy would appear to be a grand-design two-armed barred spiral with several secondary arms: The main arms are the Scutum-Centaurus and Perseus, and the secondary arms are Sagittarius, the outer arm, and the 3-kpc expanding arm. Adapted by R. Benjamin from a figure originally made by R. Hurt of the Spitzer Science Center in consultation with R. Benjamin at the University of Wisconsin-Whitewater and available in Churchwell et al. (2009). The original figure appeared in the *Publications of the Astronomical Society of the Pacific*, Copyright 2009, Astron. Soc. Pac.; reproduced with permission of the Editors.

Kennicutt & Evans
(2012). Star
formation in the Milky
Way and Nearby
Galaxies. *Annual
Review of Astronomy
and Astrophysics*,
50:531-608

How do I ask permission?

- Sometimes there is a big friendly button!
- Journal/publisher web pages: “Figure re-use permission” or contact details
- E-mail corresponding author

“Can I use this in my master thesis at the University of Oslo (link to <https://nva.sikt.no/>), and how should I cite it?”

Translating active objects into colored Petri nets for communication analysis ☆

Anastasia Gkolfi ^a  , Crystal Chang Din ^a , Einar Broch Johnsen ^a ,
Lars Michael Kristensen ^b , Martin Steffen ^a , Ingrid Chieh Yu ^a 

Show more ▼

+ Add to Mendeley  Share  Cite

<https://doi.org/10.1016/j.scico.2019.04.002> ↗

Under an Elsevier [user license](#) ↗

[Get rights and content](#) ↗

● [Open archive](#)

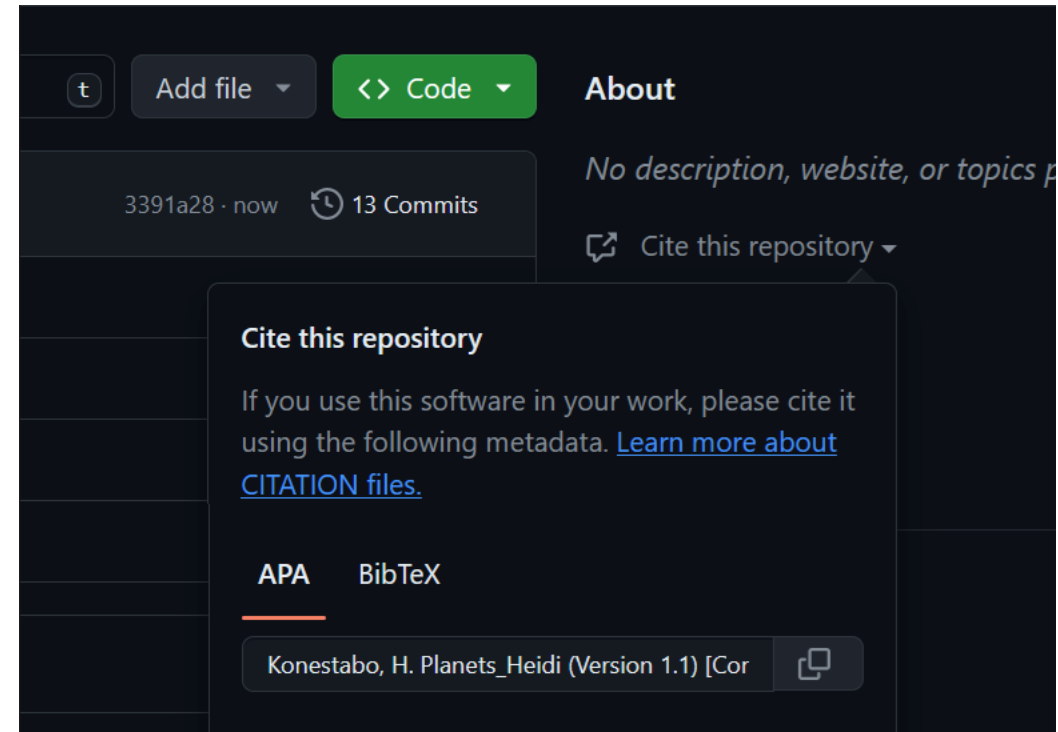
Abstract

Actor-based languages attract attention for their ability to scale to highly parallel architectures. Active objects combine the asynchronous communication of actors with object-oriented programming by means of asynchronous method calls and synchronization on futures. However, the combination of asynchronous calls and

Citing code

“Cite this repository”

APA/BibTeX styles



Example from Github

Citing code

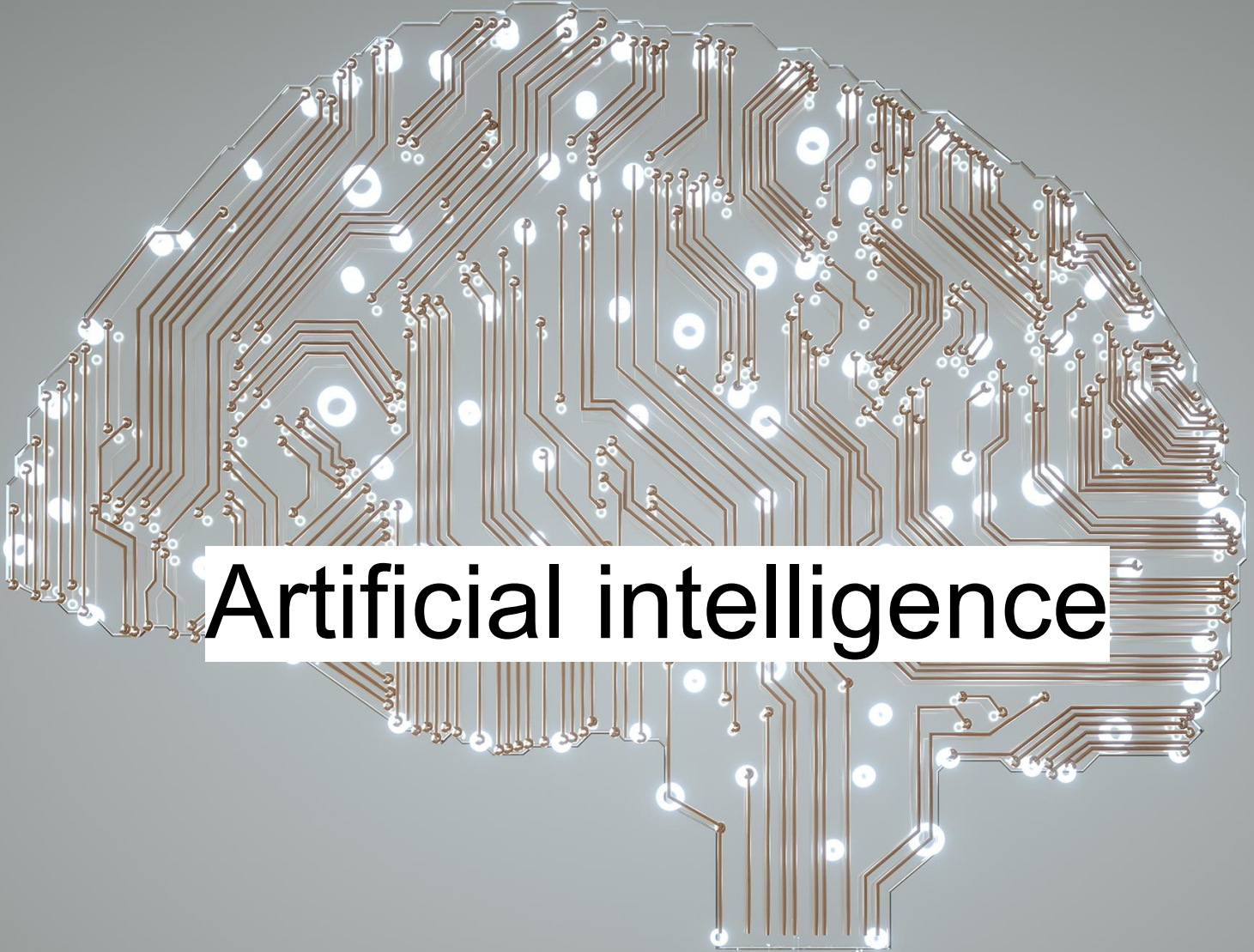
- Author(s) name (Individual or corporation)
- Date
- Title of program/source code
- Code version
- Type (e.g. computer program, source code)
- Web address or publisher (e.g. program publisher, URL) (link to GitHub if applicable)

[Citing Programming Code - University of Arkansas](#)

[Citing Code - New York University](#)

Endnote/Zotero: Reference type (Computer Program)

Questions about referencing?

A stylized brain shape composed of glowing circuitry and data points, with a central text box.

Artificial intelligence

UiOs official guidelines on AI use

The rules for using AI will vary between courses and assignments. Always ask your lecturer if you are uncertain about what is permitted.

Guidelines for using AI

- Use AI **as a support**, not as a replacement for your own work.
- Clearly indicate **when and how** you have utilised AI.
- AI can be a supplement for understanding topics, curriculum, and terminology, but always **verify the information** against reliable sources.
- **Avoid sharing sensitive information and copyrighted material** in AI tools without approval.

You (and your advisor) are responsible for making your own assessment on what is sensible AI-use!

Something to think about:

1. Where does AI generated text come from?
2. Where does the material you enter into the AI go?

Your research data and written text is generally classified as **yellow data: unpublished research data**

Don't give them away to any AI model out there

AI services accessible via UiO login

GPT UiO – UiOs privacy friendly GPT chat
IT in research. IT in education

  Yellow and green data*

Autotekst – speech to text with Whisper from OpenAI
Audio and video recording. IT in education. Web publishing and search

   Up to red data*

Microsoft Copilot (Bing Chat Enterprise)
IT in research. IT in education. Administrative IT services

 Green data

NotebookLM
IT in research. IT in education. Administrative IT services

  Yellow and green data

UiO Local LLM on Educloud OnDemand
IT in research. IT in education

  Yellow and green data

Google Cloud Platform
Programs, computer and mobile. IT in research

  Yellow and green data

Many options for AI literature search...

Advantages

- Easy to search
- Quick answers, brief summaries
- Potentially finds sources that do not appear in traditional database searches

Disadvantages

- No transparent search mechanism
→ **large risk of bias**
- Can be hard for sensors to understand how you found your sources
- Amount of results / usefulness is bound to subscription – they will often give you better results if you pay
- More energy demanding than traditional search in subject databases

You must declare & document AI use in detail

Declaration of the use of generative artificial intelligence

In this scientific work, generative artificial intelligence (AI) has been used. All data and personal information have been processed in accordance with the University of Oslo's regulations, and I, as the author of the document, take full responsibility for its content, claims, and references. An overview of the use of generative AI is provided below.

(Bullet point list of AI usage descriptions)

Recommended elements to include:

- That AI has been used
- What specific tools were used, and what they are used for
- Reflection of the risks & consequences
- Take full responsibility for the content

(Tone C. Gadmar)

For concrete examples of AI declarations, see:
[Suggestion for declaration of AI usage in assignments](#)

Vidar Skogvoll's «great learning theorem»

$$L = E \cdot t$$

Learning = Energy x time

- Learning requires energy and time → When you save energy and time you also save learning
- What you spend time and energy on, you learn
 - When you write with AI, you learn to write with AI
- If you spend the time you gain from using AI on learning something useful, it could be good

«Using chatGPT to complete assignments is like bringing a forklift into the weight room; you will never improve your cognitive fitness that way.»

Ted Chiang, Why AI isn't going to make art (2024)

Questions about AI?

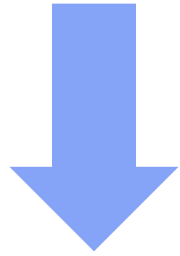


Landing for today

Takeaways

- Writing is important throughout career!
- You can use writing to think and to learn
- Use library resources & supervisor to find articles
- Learn correct use of citations
- Be aware of AI use, write declaration

Writing to get a product



Writing as a process

Writing to think, writing to learn

Academic Writing Centre

The Writing Centre is open for students and researchers who wish to improve their writing. Come and discuss your ideas, drafts and questions with one of our writing consultants.

Come for a consultation!

We offer physical consultations, and e-consultations for all our services. Consultations can be booked two weeks in advance.

Book an appointment



We are located at the [Georg Sverdrup's house](#) at Blindern, Library of the Humanities and the Social Sciences, ground floor.

Opening hours

- Monday: 10–14
- Tuesday: 10–14
- Wednesday: 14–18
- Thursday: 13–18
- Friday: 11–16

Variations may occur.

Resources to use

<https://www.phdontrack.net/>



& <https://sokogskriv.no/>



Master seminars to help you through your masters

Writing seminar (TODAY):

- Academic writing
- Structure and the reader
- Writing as a process
- Correct citations
- AI in writing

Master seminar fall:

- More on finding and reading scientific literature
- Writing and citing
- Data management
- Planning your master project

Master seminar final (spring):

- How is your masters grade set?
- Final writing tips
- Ultimate checklist for delivering your master
- Presenting your master: how to give a great scientific presentation

You can influence what happens in upcoming seminars!

We appreciate your feedback!

Let us know if you have
questions or comments, or if
we can help with anything 😊

matthew.good@ub.uio.no

andri.spilker@ub.uio.no



<https://nettskjema.no/a/616250>