

Introduction to the MSc Geomatics Graduation thesis (GEO2010 + GEO2020)

Hugo Ledoux (coordinator)

Academic year 2021-2022
(2021-04-28)

Agenda

1. All information is on the website
2. What is an MSc thesis?
3. The graduation manual (the rules)
4. The milestones (the Ps)
5. Some research tips
6. How to pick a topic?
7. Questions

New coordinator from September 2021



Clara García-Sánchez

<https://3d.bk.tudelft.nl/gsclara/>

<https://3d.bk.tudelft.nl/courses/geo2020/>

Brightspace is not used

GEO2020--MSc Geomatics

https://3d.bk.tudelft.nl/courses/geo2020/

GEO2020 MSc Geomatics

- Info about the Ps
- FAQ
- Example theses
- Templates for deliverables
- Research & writing tips
- Potential topics
- Graduating with a company
- Stuff for supervisors

Latest news

- 15 Apr 2021: [Intro to GEO2020 is Wednesday 28 April 2021 at 10:00](#)
- 29 Mar 2021: [Deadline for P4 registration is 9 April 2021](#)
- 26 Feb 2021: [mid-term presentations](#)
- 13 Jan 2021: [Introduction to GEO2020 for those starting at Q3](#)
- 12 Nov 2020: [Research data management: the slides](#)

[longer list of news](#)

Current Theses

Dates

- [BK academic graduation calendar 2020-2021](#)

GEO2020 MSc Geomatics

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News

https://3d.bk.tudelft.nl/courses/geo2020/news/

News

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16 Oct 2020
[Three announcements](#)

01 Sep 2020
[Introduction to GEO2020](#)

13 Jul 2020
[Reproducibility update](#)

10 Jul 2020
[MSc topics choices](#)

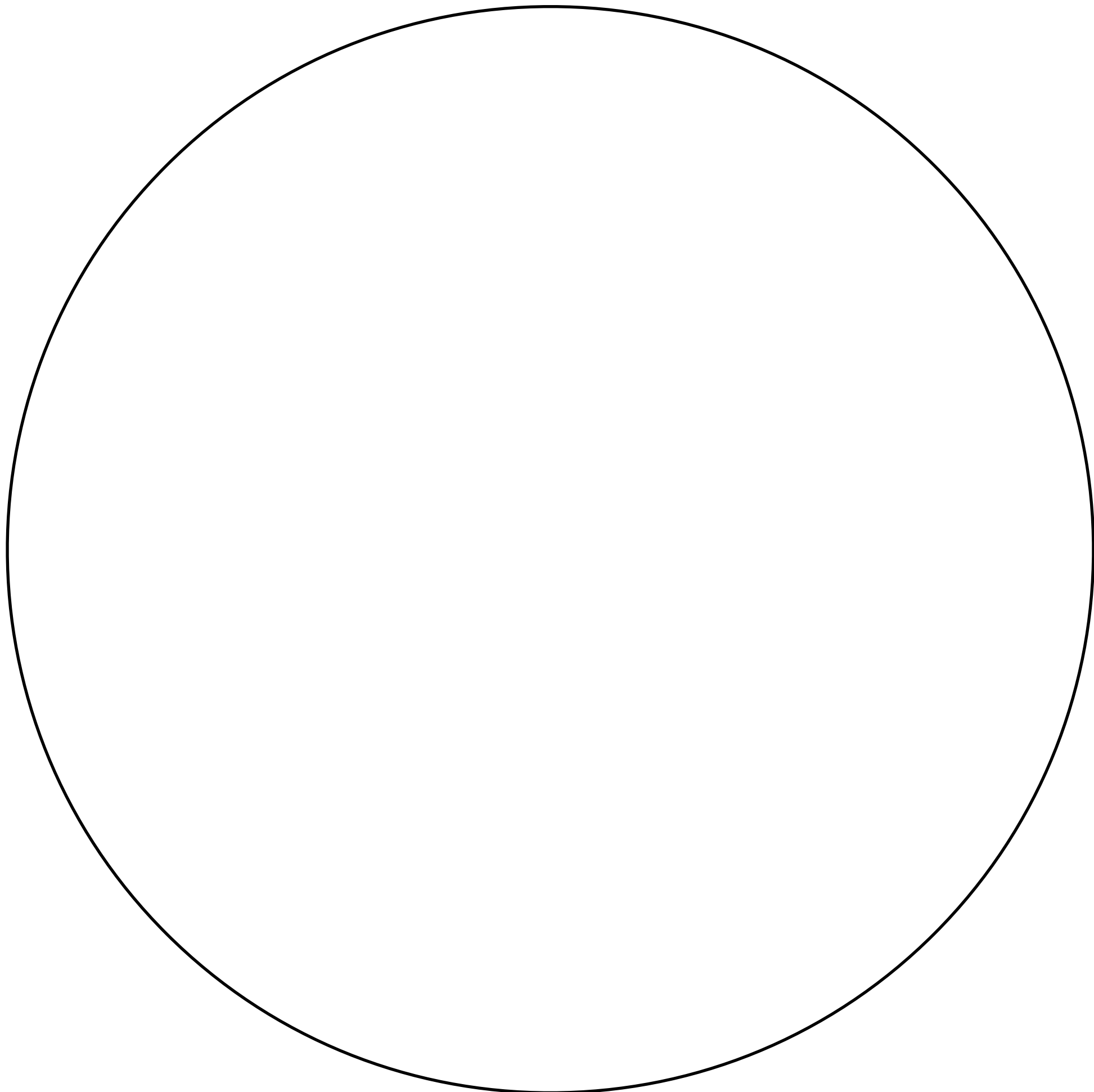
12 Jun 2020
[Your thesis in the virtual Urbanism museum 2020?](#)

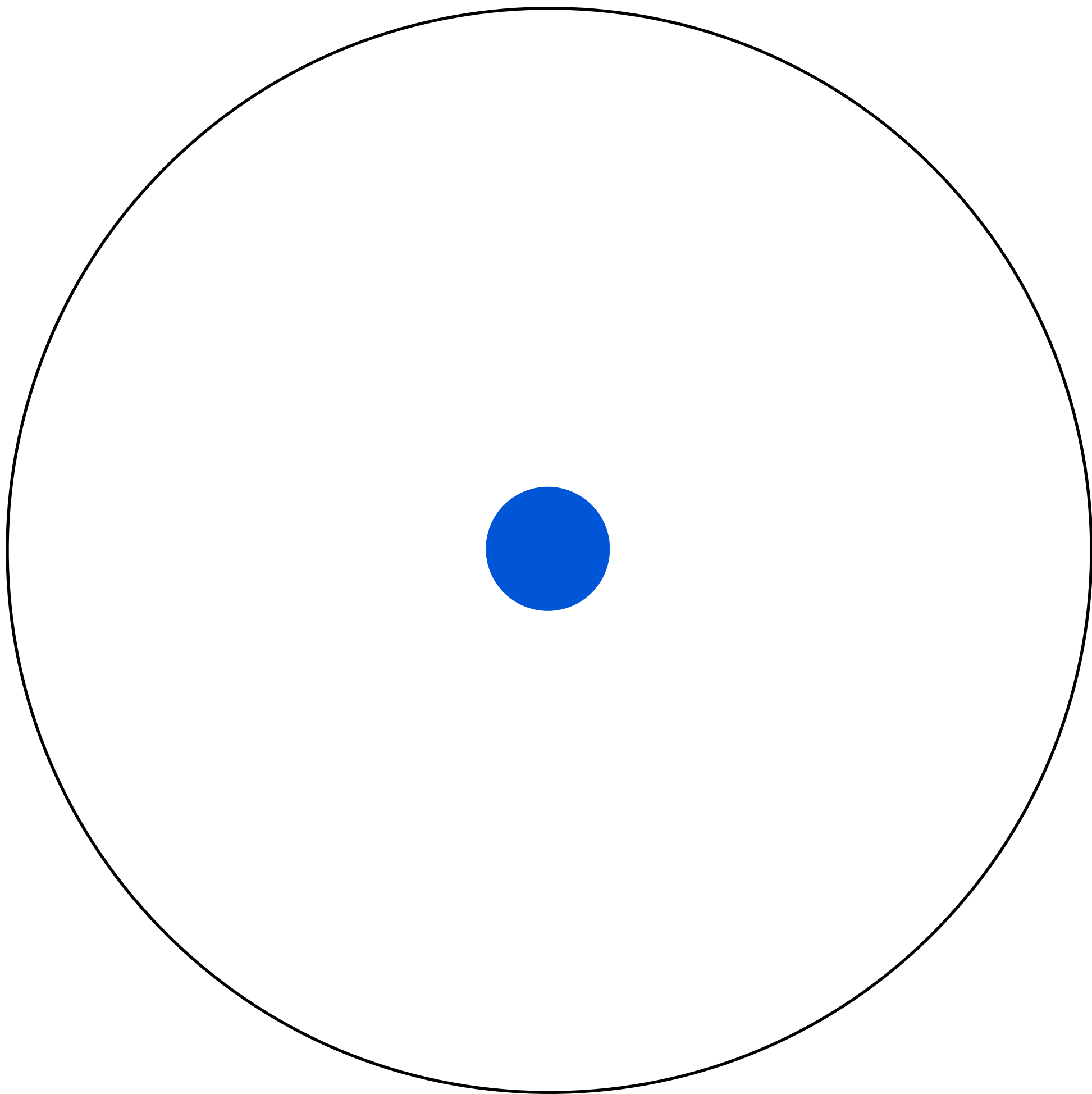


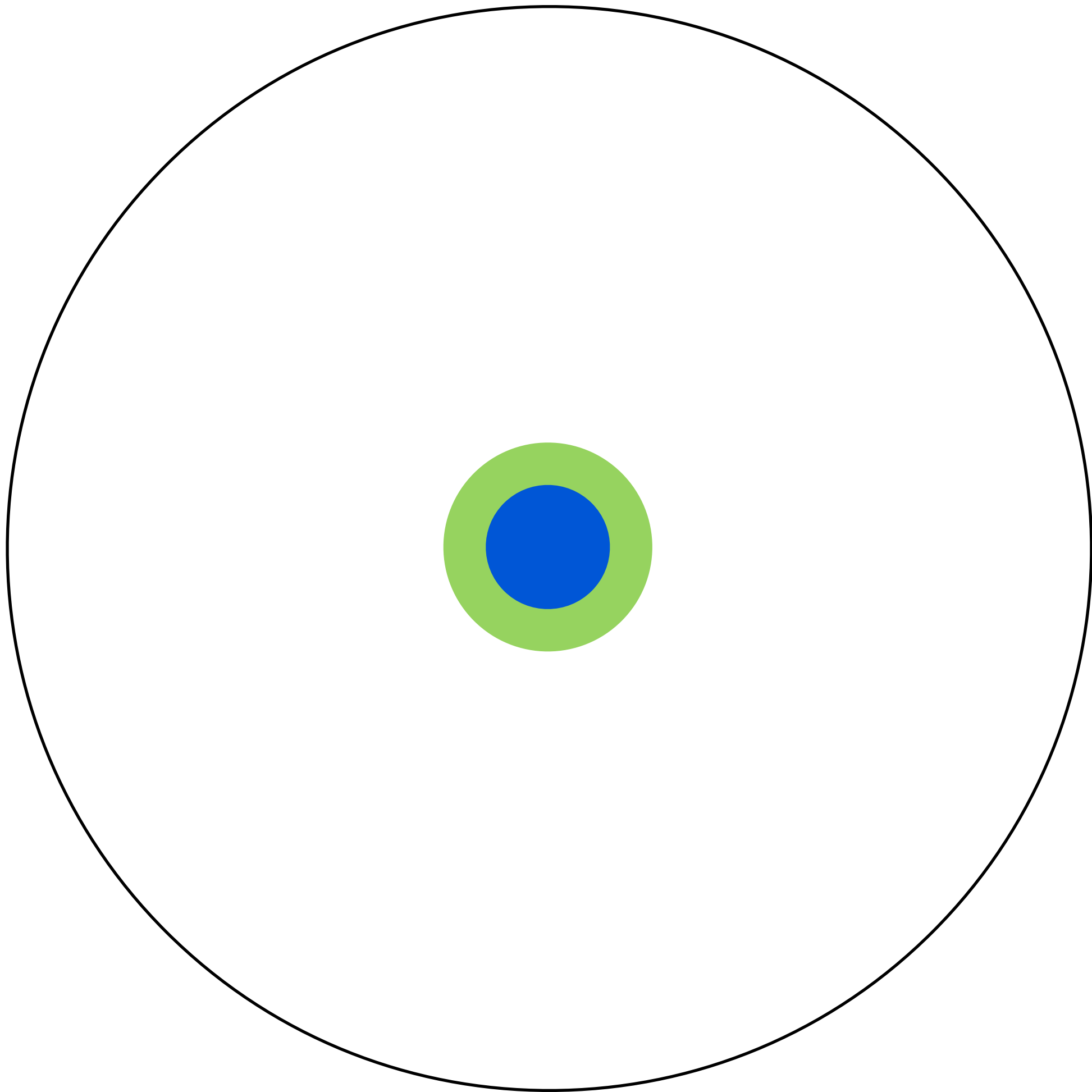
**register for the news,
I will not
send emails**

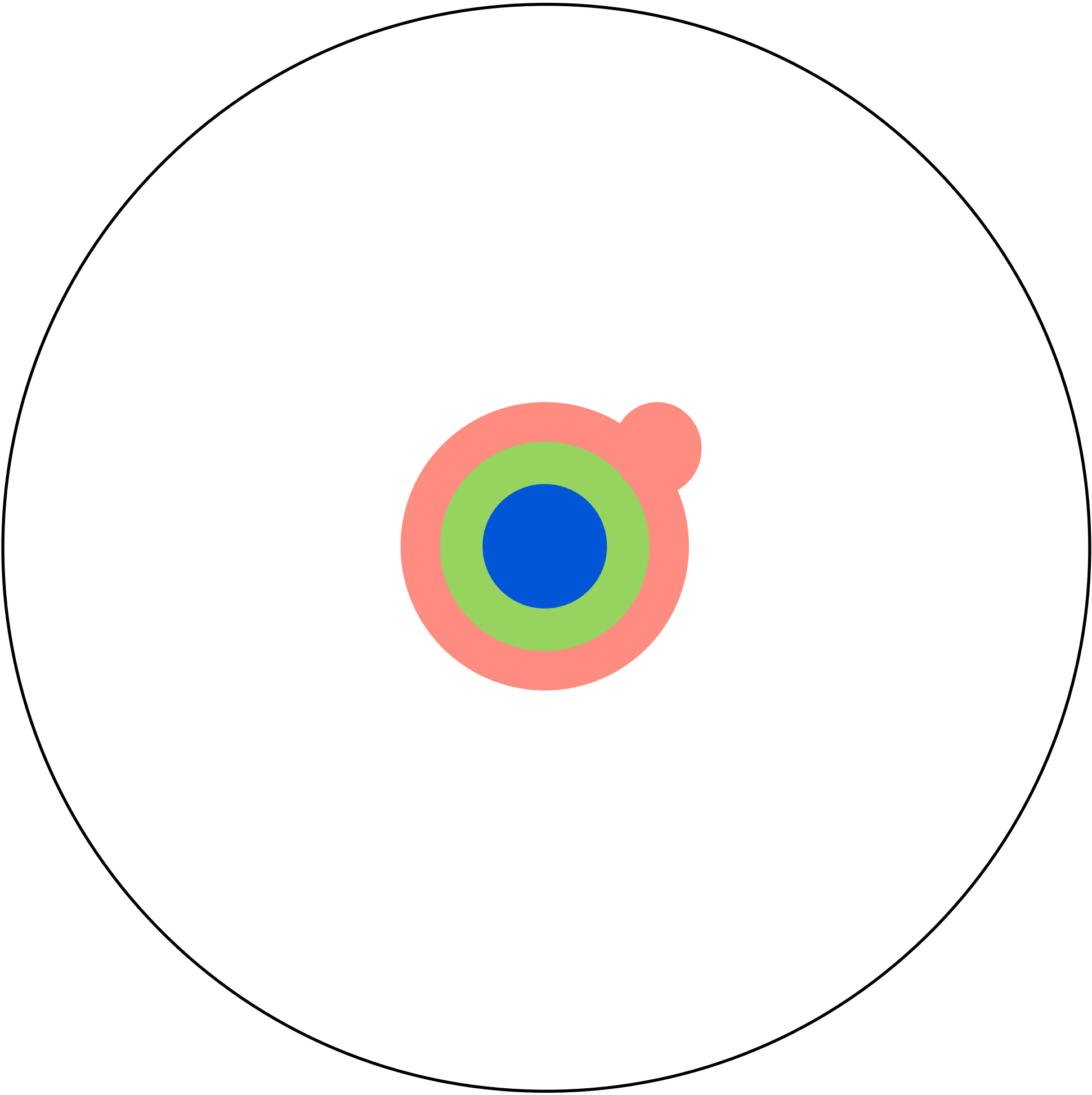
**But check #geo2020
on discord (simpler!)**

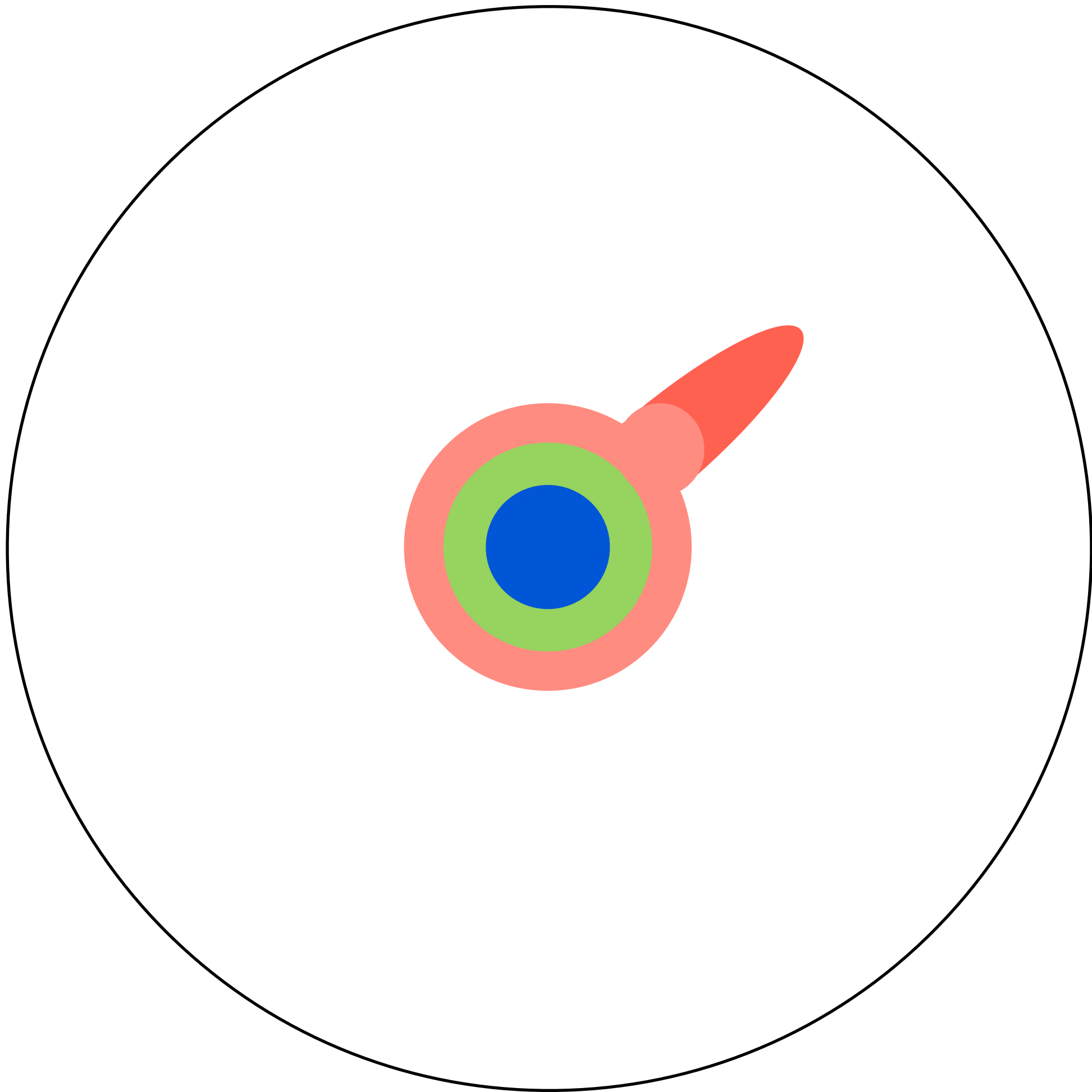
2. What is an MSc thesis?

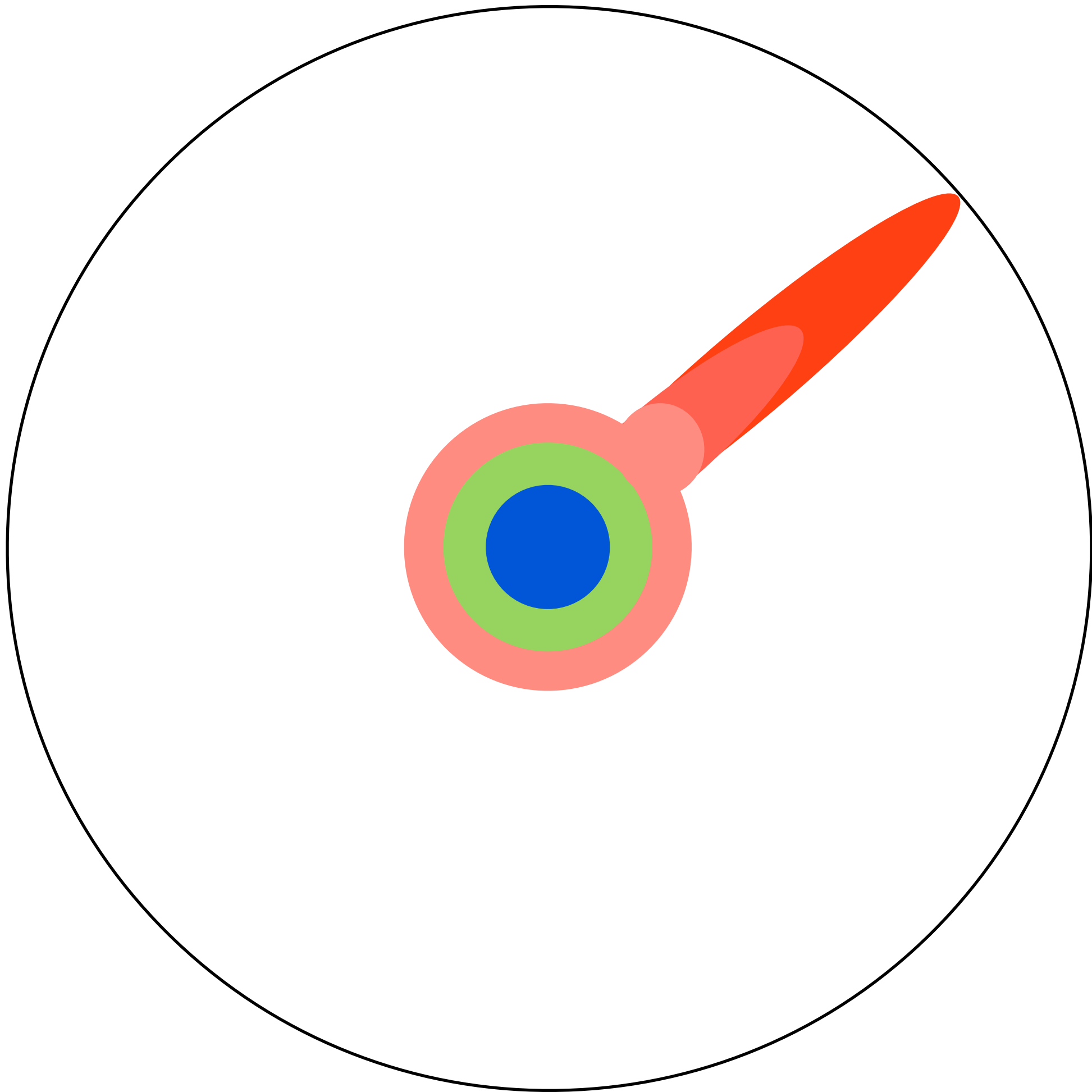


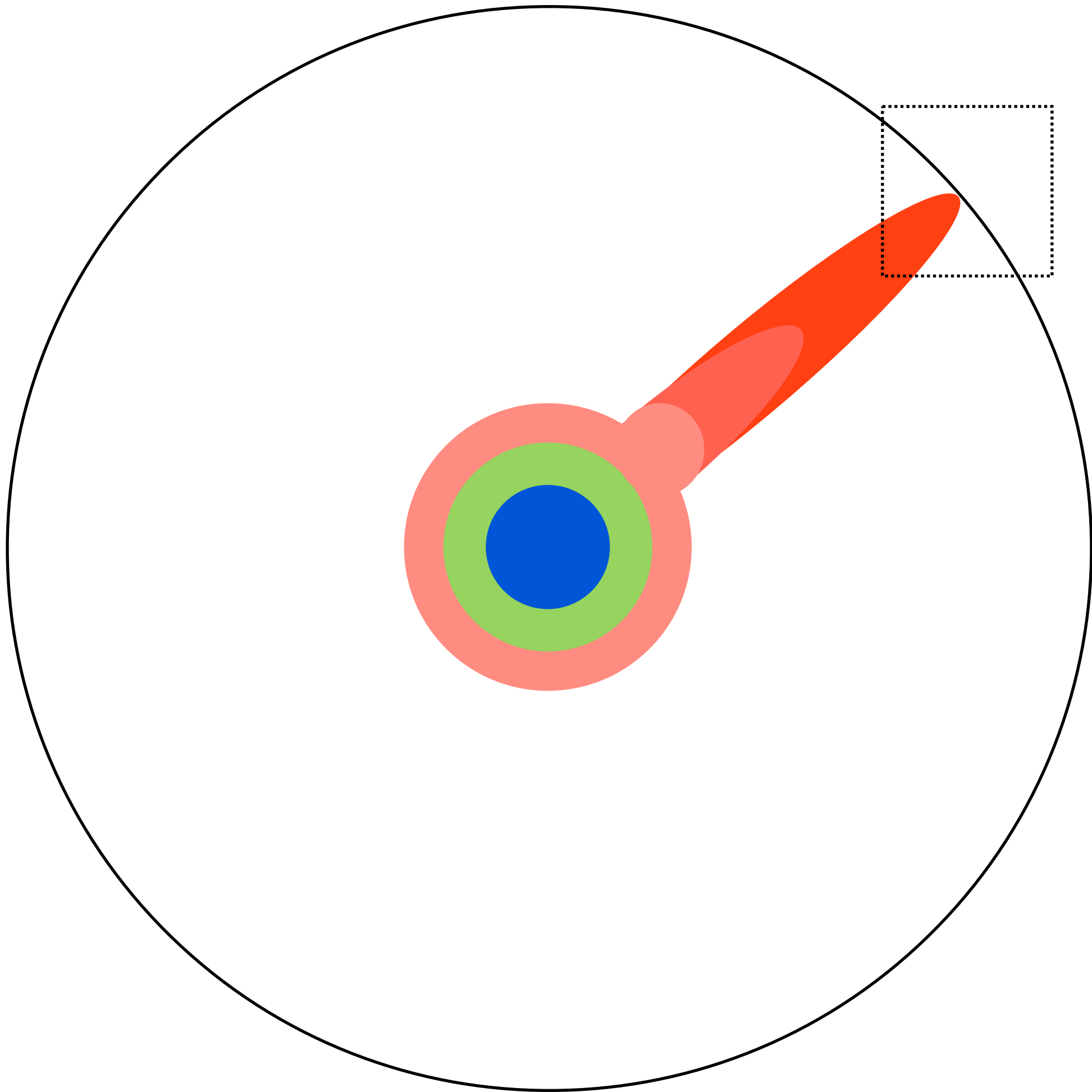


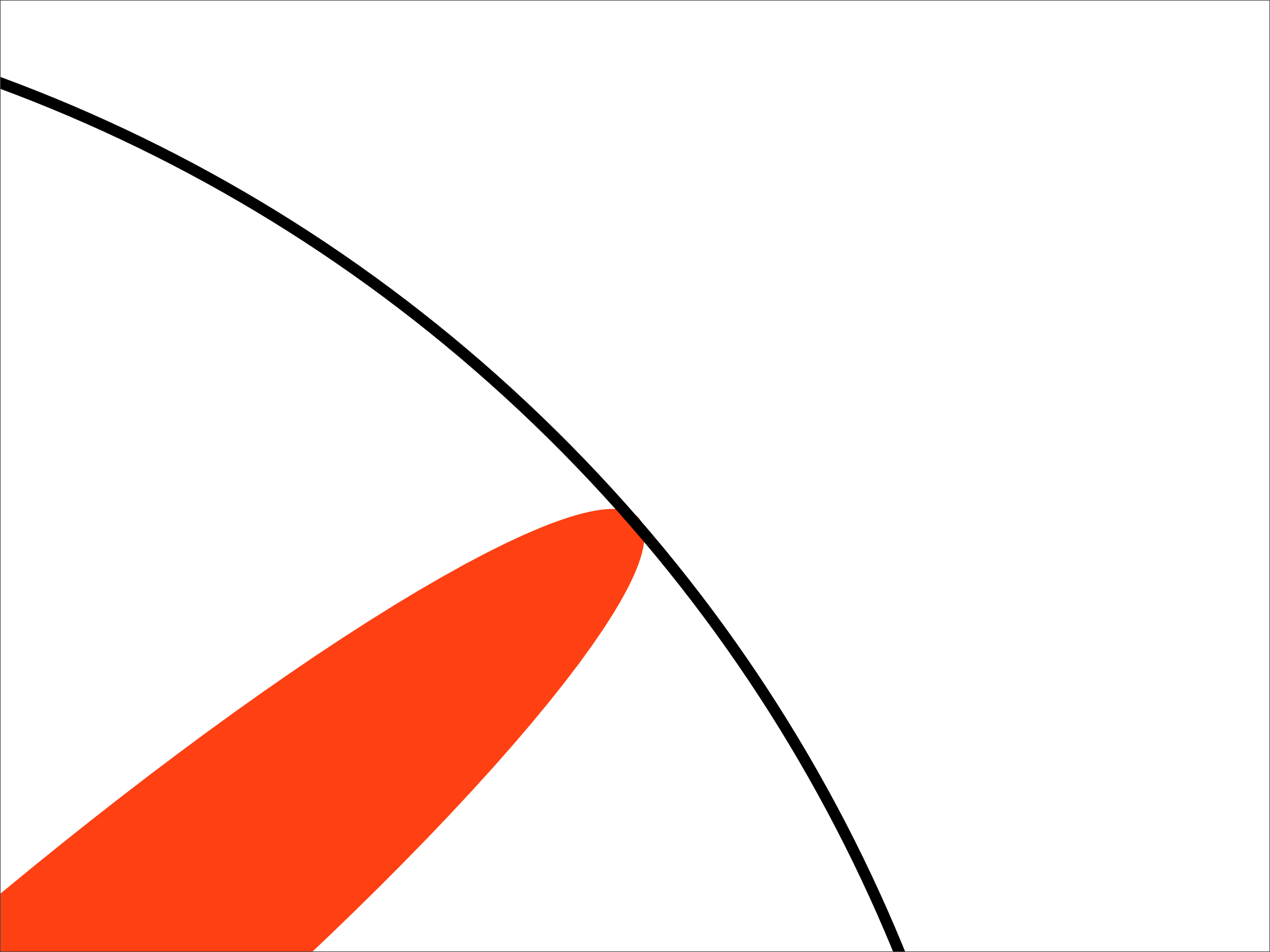


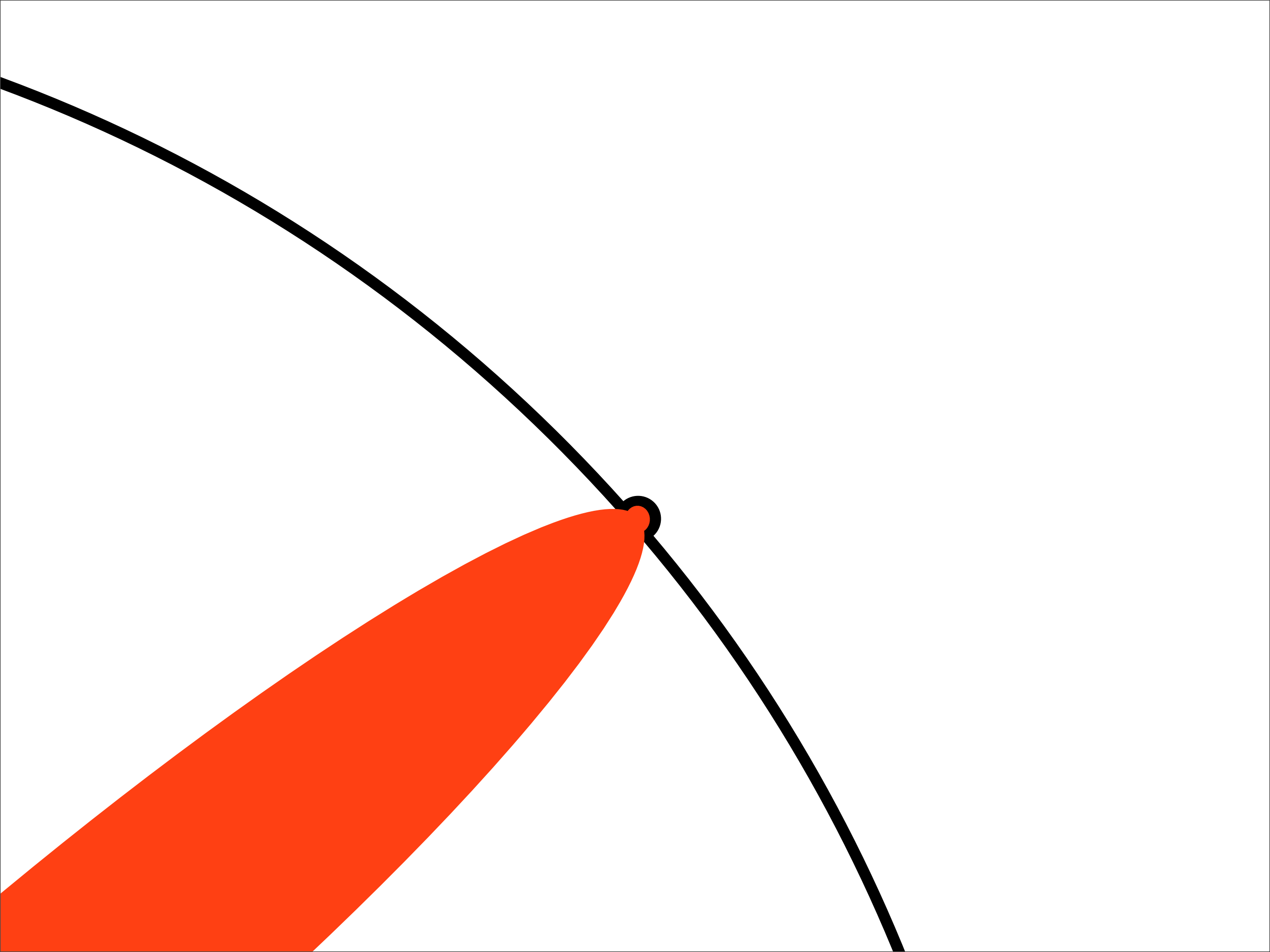


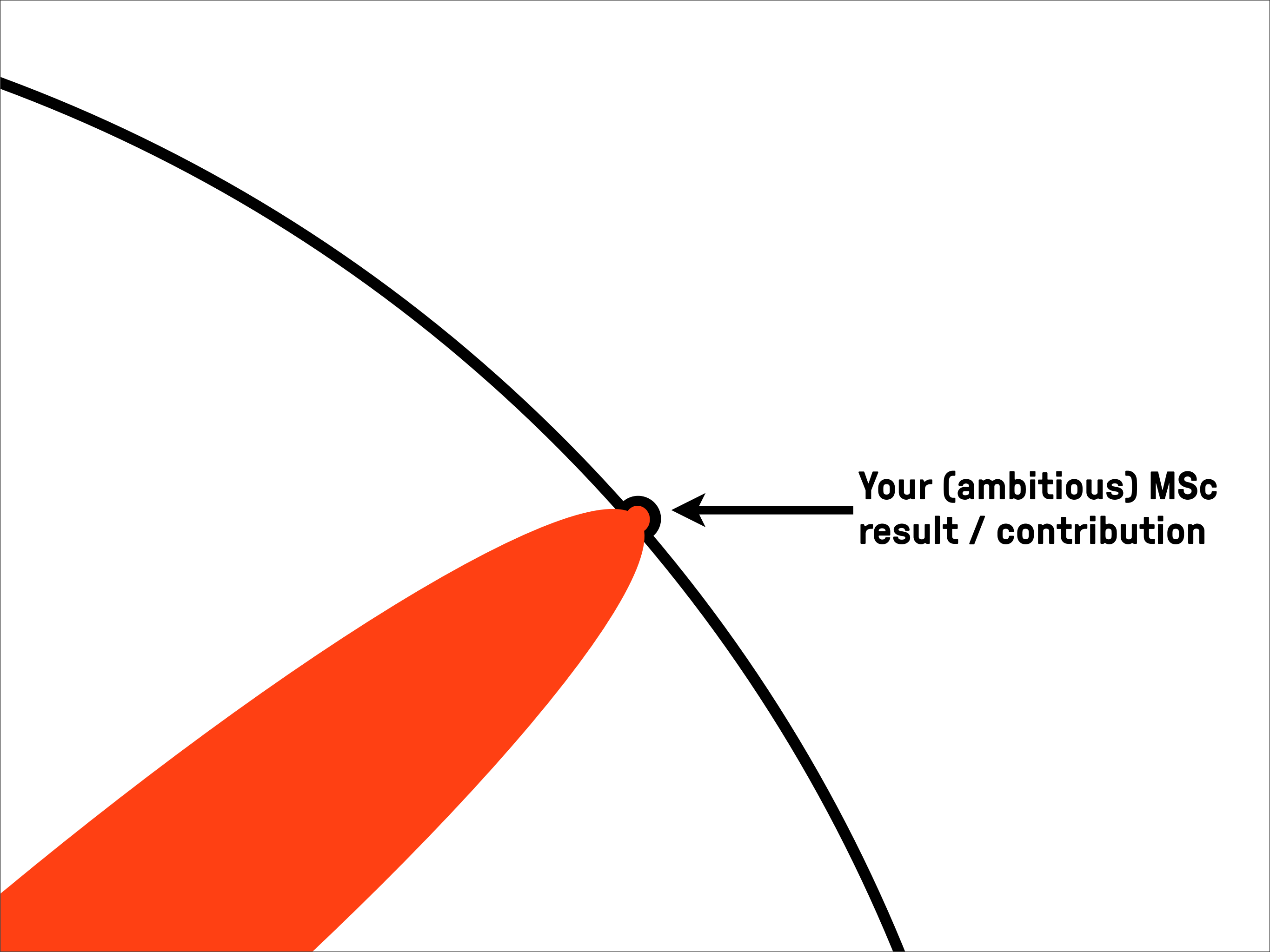








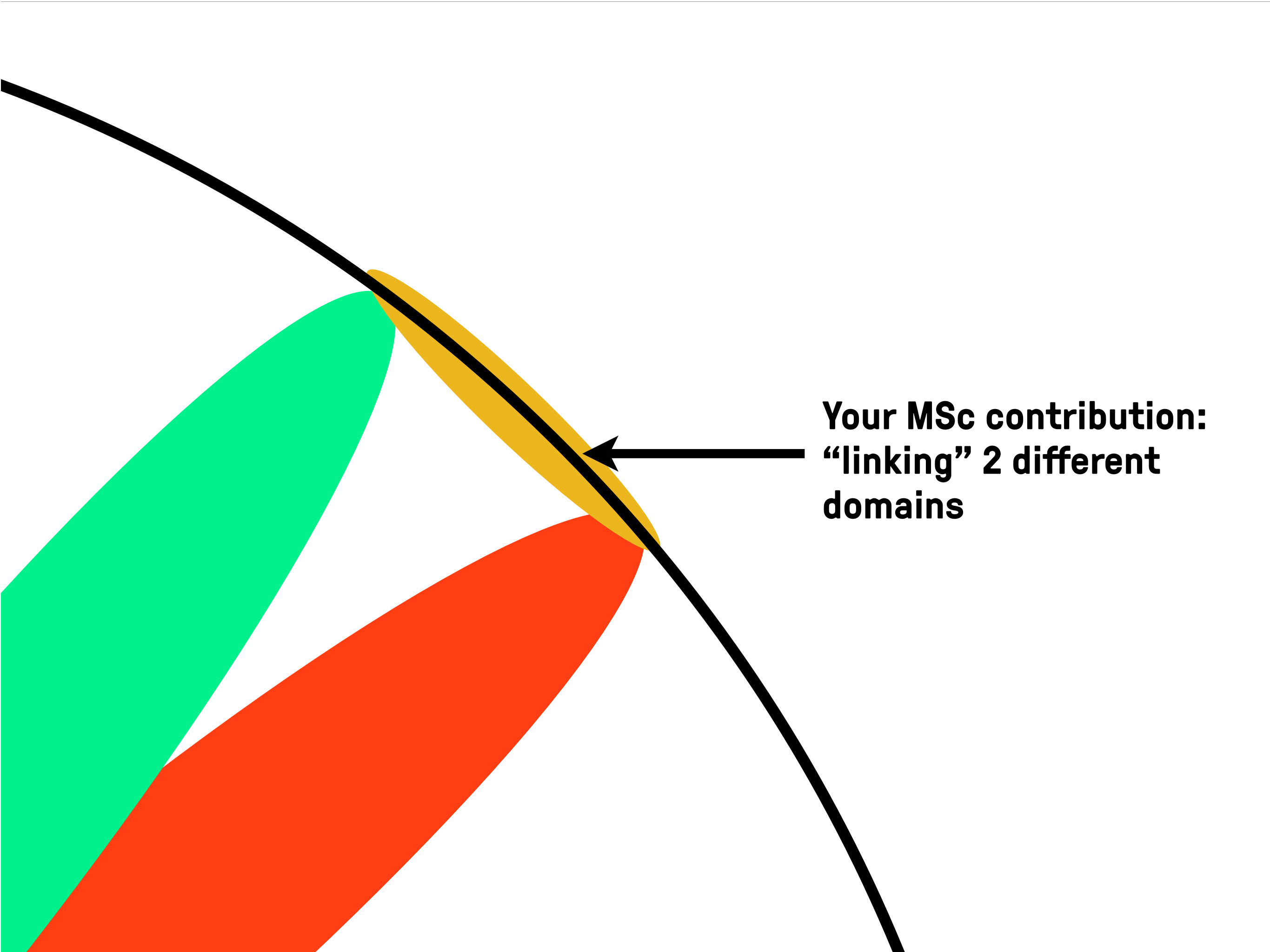




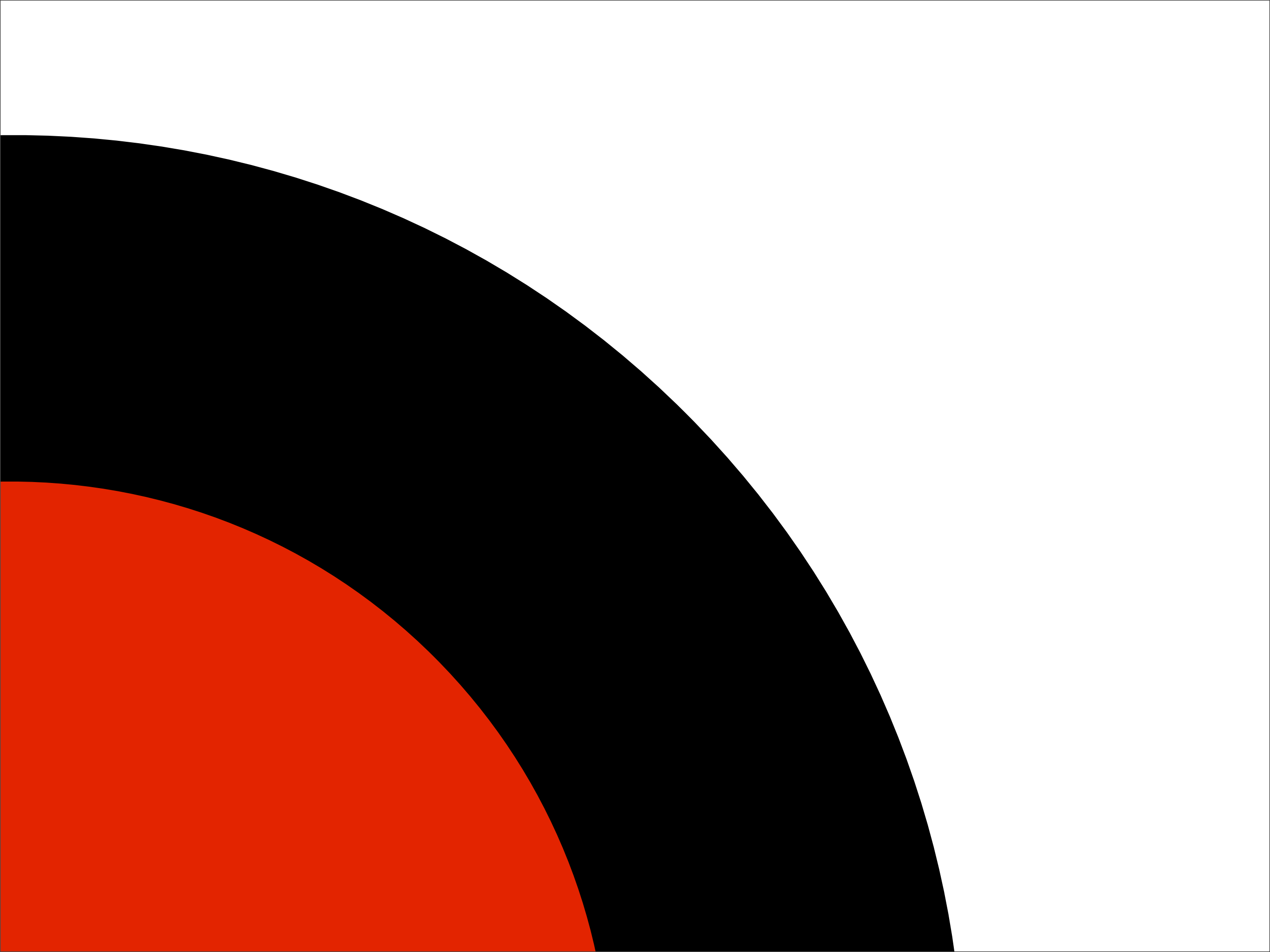
**Your (ambitious) MSc
result / contribution**

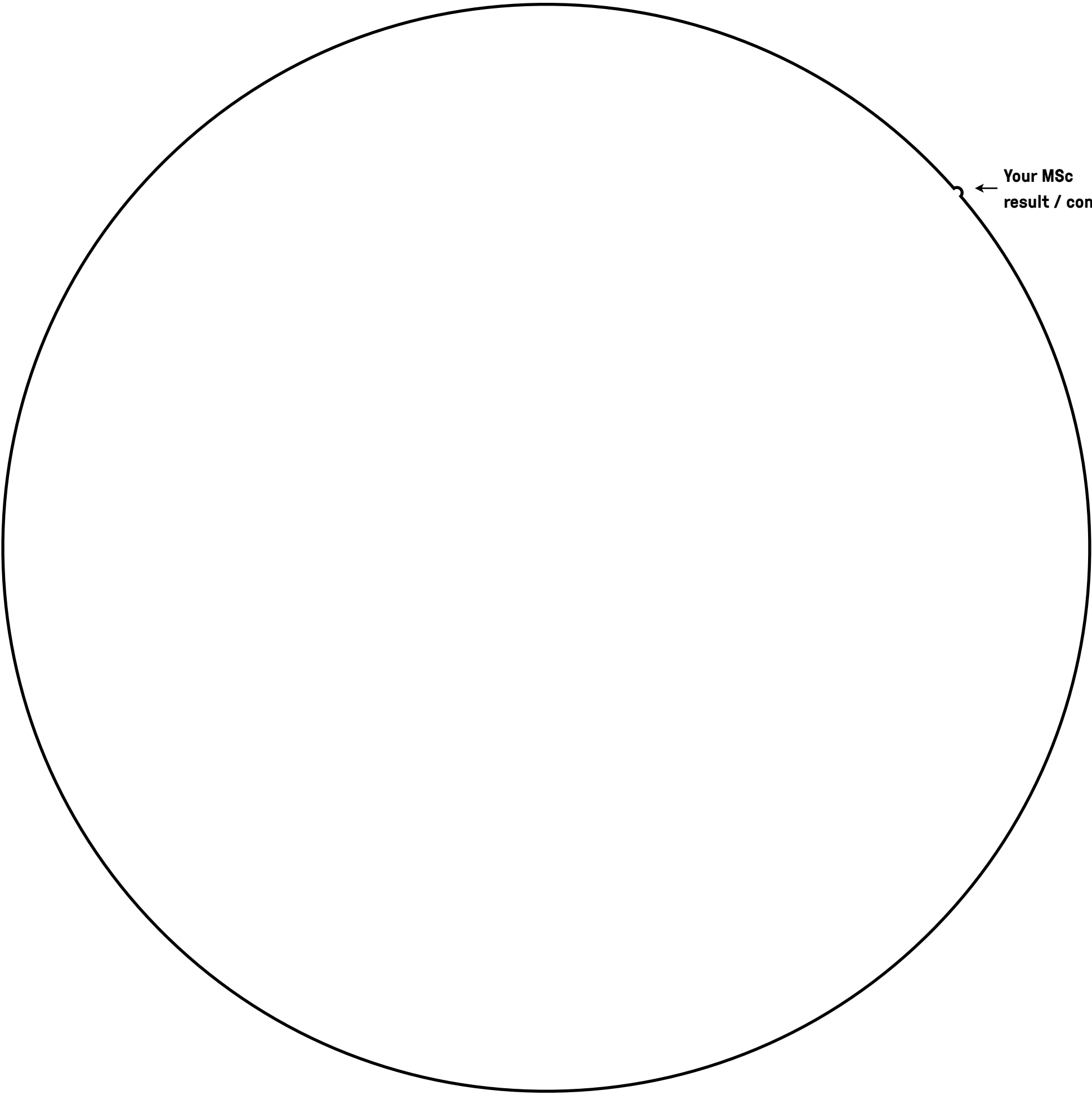
A diagram illustrating a geometric configuration. A thick black line starts from the top-left and slopes downwards towards the bottom-right. Two overlapping, elongated, teardrop-shaped regions are shown. The upper region is bright green, and the lower region is bright orange. The black line passes through the green region, then through the orange region, and finally through the white background. The text "or also possible: 2 different fields" is positioned to the right of the line.

**or also possible:
2 different fields**



**Your MSc contribution:
“linking” 2 different
domains**





← Your MSc
result / contribution

1. Scientific thesis

- scientific character, reproducible?
- should document your results and the engineering decisions you took to achieve your main result

2. Code and/or data

- documented, clear, organised
- efforts to make code/data open and reusable

3. Presentations

These aspects are also evaluated

- whether you worked independently or not
- how you carried out the research project
- how complex is your topic
- your main contribution to the state-of-the-art of your area of research

There's a grading scheme for the thesis (rubric)

		10	9	8	7	6
Research	50%					
motivation/problem definition	5%	Excellent motivation. The complexity of the problem is very well understood to the details and addressed	Very good motivation. The complexity of the problem is well understood and addressed	Good motivation. The complexity of the problem is fully taken into consideration	Adequate motivation. The complexity of the problem is only partially taken into consideration	Just adequate motivation. The complexity of the problem not fully taken into consideration
theoretical framework	10%	Has independently developed a new piece of theory	Has independently collected, processed and integrated theory from different fields or sources and independently applied theory to the performed research	Understands and can reproduce directly relevant theory at the level of MSc textbooks, scientific literature and applied theory to the performed research	Understands and can reproduce directly relevant theory at the level of MSc textbooks and is able to apply this theory to the performed research, after being shown how to do so	Understands and can reproduce directly relevant theory at the level of MSc textbooks, but has difficulties applying theory to performed research
analysis, research results	15%	Has produced new knowledge and/or methods, not previously available in the world.	Has produced new knowledge and/or methods not previously available in the group	Has well extended existing knowledge and/or methods, not previously available in the field	Has sufficiently extended existing knowledge, data or methods available in the field	Has only verified knowledge, data and/or methods available in de field
conclusion recommendation	15%	Perfectly structured scientific conclusions and judgement of own results, literature and specialists. Recommendations are towards new directions not available in the world	Very well balanced scientific conclusions and judgement of own results, literature and specialists. Recommendations are good and sound	Good scientific conclusions and judgement of own results, literature and specialists. Recommendations are good and sound	Sufficient scientific conclusion and judgement of own results, limited critical attitude towards literature and specialists. Recommendations are adequate	Limited scientific conclusions and judgement of own results. Recommendations are just adequate
references	5%	Sources of information are fully clear and elaborated and used fully consistently and conscientiously	Sources of information and scientific references are elaborated and used with care.	Sources of information and scientific references are clear and used in a consistent manner	Sources of information and scientific references are provided but not in a adequate way	Sources of information and scientific references are provided but are not complete
Presentation	20%					
written report	5%	Written report has perfect structure, consistency and clarity. No corrections needed to be appointed out by supervisors	Written report has a very good structure, consistency and clarity. Virtually no corrections needed to be appointed out by supervisors	Written report has good structure, consistency and clarity. limited corrections needed to be appointed out by supervisors	Written report has adequate structure, consistency and clarity. Important corrections needed to be appointed out by supervisors	Written report has just right with structure, consistency and clarity. Significant corrections needed to be appointed out by supervisors
oral (answering questions)	10%	Excellent and persuasive speaker. Answers questions perfectly to the point and with depth	Very good and persuasive speaker. Answers questions very well. Answers sound and well explained	Good speaker, give a clear presentation. Answers questions well. Answers are correct	Adequate speaker. Can answer questions. Not all answers are good	As a speaker just adequate. Has difficulties answering questions
graphics and demo presentation	5%	Excellent presentation material. Makes use of all possibilities	Very good presentation material. Makes use of possibilities	Good presentation material. Appropriate demos	Adequate presentation material. No specific demos	Presentation material just adequate
Project	15%					
originality and scientific level	8%	Has surprised us all with some brilliant new ideas	Has had several original ideas not initiated or thought of by the supervisor	Has had at least one original contribution to the project not initiated or thought of by the supervisor	Has made a partial original contribution to the project	Has made a contribution to the project, but not really original
independence and own initiative, planning	7%	The student proactively initiated (new) methods and approaches. Has complete autonomy	Methods and approaches were essentially selected by the student. Very good planning	Significant own initiative and input into methods and approaches. Good planning	Took occasionally initiative to extend and modify methods and approaches suggested by the supervisor(s). Adequate planning	Showed little initiative and executed methods and approaches suggested by the supervisor(s). Difficulties with planning
Process	15%					
skills, academic attitude	8%	Exceptional analytical, logical and integration skills, actively seeking for feedback to improve him/herself	Very good analytical, logical and integration skills, uses feedback to improve him/herself	Good analytical, logical and integration skills, can handle feedback in a positive way	Sufficient on analytical, logical and integration skills, responds to feedback, but can get demotivated by feedback	Just sufficient analytical, logical and integration skills, responds to feedback in a defensive way, or gets demotivated by feedback
reflection	7%	is good in self-reflection and steers the project, based on own insights and sought after advice from others	is good in self-reflection and takes the right decisions based on own insights and sought after advice from others	Good balance between independent opinion, self-reflection and openness to advise and feedback from specialist	Sufficient level of self-reflection, but could be more open to advise and feedback	Just sufficient level of self-reflection, but should be more open to advise and feedback

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Presentation						
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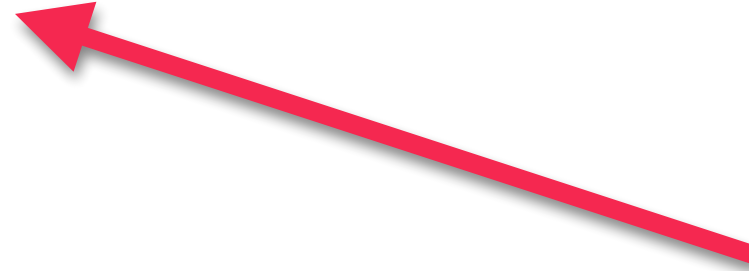
It's available online

3. The graduation manual

Graduation Manual

Master Geomatics

Academic year 2020–2021



For you will be 2021-2022



Graduation Manual

All the rules are in it, thus read it!

Master Geomatics

Academic year 2020–2021



Graduation Manual

All the rules are in it, thus read it!

Master Geomatics

Academic year 2020–2021

TWICE!



Little known fact:

Your supervisors don't know the rules.

It's your responsibility to know them.

4. The milestones (the Ps)

Milestones (the Ps)

- **P1:** Topic defined + 2 supervisors known. You're listed at <https://3d.bk.tudelft.nl/courses/geo2020/theses/2021feb/>
- **P2:** Full research proposal (go/nogo) + 15min presentation. You have preliminary results
- **P3:** mid-term meeting with your supervisor (up to your supervisors to decide which form it takes)
- **P4:** final go/nogo. You have a full draft thesis. Your supervisors assess whether you can finish within 4-6 weeks.
- **P5:** final defence: thesis finalised + full 30min presentation + diploma/flowers

- **GE02010** is for the preparation work and up to the P2 (including it). If you pass P2, you pass GE02010 (and get the 15 ECTS). There is no grade attached to it, it's either a pass or a fail (a retake is possible though).
- **GE02020** is for the rest of the graduation trajectory; you get a grade at the end of P5 (and the remaining 30 ECTS).

(from graduation manual):

1.1 Admission

Students may only embark on the graduation work if they have participated in all common core courses and have completed them or at least 50 EC of them.

Students will only be admitted to the P2 if they have completed all core courses (first MSc year) with a maximum of 5 EC unfinished. Students must meet these admission requirements no later than the final registration date of the P2 registrations.

Admission (2)

(from graduation manual):

For final period (P4)

Student has obtained all educational components.

Academic Graduation Calendar 2020 / 2021

Autumn semester

Calendar Week	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	1	2	3	4
Teaching week	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	2.1	2.2	2.3	2.4	2.5	2.6	---	---	2.7	2.8	2.9	2.10

	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
Mon	31	7 14 21 28	5 12 19 26	2 9 16 23 30	7 14 21 28	4 11 18 25
Tues	1	8 15 22 29	6 13 20 27	3 10 17 24	1 8 15 22 29	5 12 19 26
Wed	2	9 16 23 30	7 14 21 28	4 11 18 25	2 9 16 23 30	6 13 20 27
Thurs	3	10 17 24 1	8 15 22 29	5 12 19 26	3 10 17 24 31	7 14 21 28
Fri	4	11 18 25 2	9 16 23 30	6 13 20 27	4 11 18 25 1	8 15 22 29

Spring semester

Calendar Week	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Teaching week	--	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	3.10	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	4.10	4.11

	Feb.	Mar.	Apr.	May	June
Mon	1 8 15 22	1 8 15 22 29	5 12 19 26	3 10 17 24 31	7 14 21 28
Tues	2 9 16 23	2 9 16 23 30	6 13 20 27	4 11 18 25 1	8 15 22 29
Wed	3 10 17 24	3 10 17 24 31	7 14 21 28	5 12 19 26 2	9 16 23 30
Thurs	4 11 18 25	4 11 18 25 1	8 15 22 29	6 13 20 27 3	10 17 24 1
Fri	5 12 19 26	5 12 19 26 2	9 16 23 30	7 14 21 28 4	11 18 25 2

Summer period

Calendar Week	27	28	29	30	31	32	33	34
Summer period	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8

	July	Aug.
Mon	5 12 19 26	2 9 16 23
Tues	6 13 20 27	3 10 17 24
Wed	7 14 21 28	4 11 18 25
Thurs	8 15 22 29	5 12 19 26
Fri	9 16 23 30	6 13 20 27

Public Holidays	
Christmas period	: Dec. 21 up and until Jan. 1
Spring Break	: Febr. 1 up and until Febr. 5
Good Friday	: April 2
Easter	: April 5
Kings Day	: April 27
Liberation Day	: May 5
Ascension Day	: May 13 (and 14 free)
Whit Monday	: May 24



Final registration dates for P2
 Final application dates for P4: go / no-go
 P5 date and final application date for next P4 period: go / no-go
 Last date P4 and also final application dates for P5: Public Final Presentations
Public final presentations takes place in the period immediately after the prior P4: go / no-go period



Education
 No regular education
 P2: Dates presentations: 1 Jan. up and until 20 Jan., 7 June up and until 18 June
 P4: Dates go / no-go assesments: 21 Sept. up and until 2 Oct., 30 Nov. up and until 11 Dec., 1 Mar. up and until 12 Mar., 17 May up and until 28 May
 P5: Dates final public presentations: 26 Oct. up and until 6 Nov., 21 Jan. up and until 29 Jan., 6 Apr. up and until 16 Apr., 21 June up and until 9 July

Academic Graduation Calendar 2020 / 2021

Autumn semester

Calendar Week	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	
Teaching week	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	2.2	2.3	2.4	2.5	2.6	---	---	2.7	2.8	2.9	2.10
	Aug.	Sept.			Oct.					Nov.					Dec.				Jan.			
Mon	31	7	14	21	28	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25
Tues	1	8	15	22	29	6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26
Wed	2	9	16	23	30	7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27
Thurs	3	10	17	24	1	8	15	22	29	5	12	19	26	3	10	17	24	31	7	14	21	28
Fri	4	11	18	25	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29

Spring semester

Calendar Week	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Teaching week	---	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	3.10	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	4.10	4.11
	Feb.				Mar.					Apr.			May				June					
Mon	1	8	15	22	1	8	15	22	29	5	12	19	26	3	10	17	24	31	7	14	21	28
Tues	2	9	16	23	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29
Wed	3	10	17	24	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23	30
Thurs	4	11	18	25	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24	1
Fri	5	12	19	26	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25	2

Summer period

Calendar Week	27	28	29	30	31	32	33	34
Summer period	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8
	July				Aug.			
Mon	5	12	19	26	2	9	16	23
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Fri	9	16	23	30	6	13	20	27

P4	Public Holidays	P5
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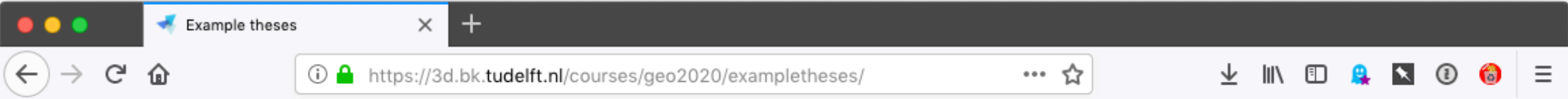
P2: final graduation plan + 15min presentation

- 10-15 pages
- we offer as a template a good one from a previous year
- Structure:
 - an **introduction** in which the relevance of the project and its place in the context of geomatics is described, along with a clearly-defined problem statement;
 - a **related work** section in which the relevant literature is presented and linked to the project;
 - the **research questions** are clearly defined, along with the scope (ie what you will not be doing);
 - overview of the **methodology** to be used;
 - **time planning**—having a Gantt chart is probably a better idea than just a list;
 - since specific **data** and **tools** have to be used, it's good to present these concretely, so that the mentors know that you have a grasp of all aspects of the project;
 - **references**

P1 = ~15 November 2021

5. Some research tips

Read many scientific papers and theses



Example theses

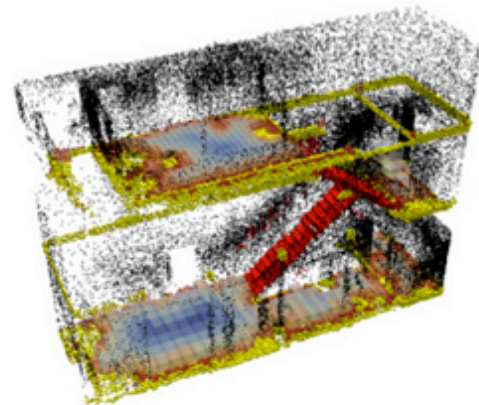
Some good theses that can be used as examples



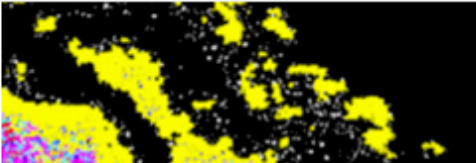
Stella Psomadaki
(2017)
Using a Space Filling Curve for the Management of Dynamic Point Cloud Data in a Relational DBMS



Ivo de Liefde
(2016)
Exploring the use of the semantic web for discovering, retrieving and processing data from sensor observation services



Florian Fichtner
(2016)
Semantic enrichment of a point cloud based on an octree for multi-storey pathfinding



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The unofficial guide for authors

*(or how to produce research
articles worth citing)*

Tomislav Hengl
&
Mike Gould



Use LaTeX (and not Word)

thesis.pdf (page 17 of 29)

INTRODUCTION

This is a complete template for the MSc Geomatics thesis. It contains all the parts that are required and is structured in such a way that most/all supervisors expect. Observe that the MSc Geomatics at TU Delft has no formal requirements (except the reflection part, which is put here as an Appendix, but it can also be submitted as a separate document), how the document looks like (fonts, margins, headers, etc) is entirely up to you. We basically took the template `arsclassica` (by Lorenzo Pantieri), which is an adaption of the original `classicthesis` package from André Miede, added the front/back matters (cover page, copyright, abstract, etc.), and gave examples for the insertion of figures, tables and algorithms.

It is not an official template and it is not mandatory to use it.

But we hope it will encourage everyone to use \LaTeX for writing their thesis, and we also hope that it will *discourage* some from using Word.

If you run into mistakes/problems/issues, please report them on the GitHub page, and if you fix an error, then please submit a pull request.
<https://github.com/tudelft3d/MScGeomaticsThesisTemplate>.

1.1 HOW TO GET STARTED WITH \LaTeX ?

Basically everything you need to know—from installation to details—is there: <http://en.wikibooks.org/wiki/LaTeX>

To compile this template, you need a full installation of `MiKTeX` (Windows) or `TeXLive` (cross-platform) or `MacTeX` (OSX).

1.2 CROSS-REFERENCES

The command `autoref` can be used for chapters, sections, subsections, figures, tables, etc.

Chapter 1 is what you are currently reading, and its name is `INTRODUCTION`. Section 1.8 is about pseudo-code, and Section 1.3.1 is about something else. The next chapter (`RELATED WORK; TITLE WHICH CAN SPAN MULTIPLE LINES`), is on page 7.

1.3 FIGURES

Figure 1.1 is a simple figure. Notice that all figures in your thesis should be referenced to in the main text. The same applies to tables and algorithms.

It is recommended *not* to force-place your figures (e.g. with commands such as `\newpage` or by forcing a figure to be at the top of a page). \LaTeX usually places the figures automatically rather well. Only if at the end of your thesis you have small problem then can you solve them.

1

```
introduction.tex
1 %!TEX root = ../thesis.tex
2
3 \chapter{Introduction}
4 \label{chap:introduction}
5
6
7 This is a complete template for the MSc Geomatics thesis.
8 It contains all the parts that are required and is structured in such a way that most/all
9 supervisors expect.
10 Observe that the MSc Geomatics at TU Delft has no formal requirements (except the
11 reflection part, which is put here as an Appendix, but it can also be submitted as a
12 separate document), how the document looks like (fonts, margins, headers, etc) is
13 entirely up to you.
14 We basically took the template \texttt{arsclassica} (by Lorenzo Pantieri), which is an
15 adaption of the original \texttt{classicthesis} package from André Miede, added the
16 front/back matters (cover page, copyright, abstract, etc.), and gave examples for the
17 insertion of figures, tables and algorithms.
18
19 \emph{It is not an official template and it is not mandatory to use it.}
20
21
22 But we hope it will encourage everyone to use \LaTeX for writing their thesis, and we
23 also hope that it will \emph{discourage} some from using Word.
24
25 If you run into mistakes/problems/issues, please report them on the GitHub page, and
26 if you fix an error, then please submit a pull request.
27
28 \url{https://github.com/tudelft3d/MScGeomaticsThesisTemplate}.
29
30
31
32
33
34 \section{How to get started with \LaTeX?}
35 \label{sec:startlatex}
36
37 Basically everything you need to know---from installation to details---is there:\\
38 \url{http://en.wikibooks.org/wiki/LaTeX}
39
40 To compile this template, you need a full installation of \href{http://miktex.org/about}
41 \{MiKTeX\} (Windows) or \href{https://www.tug.org/texlive/}\{TeXLive\} (cross-platform) or
42 \href{https://tug.org/mactex/}\{MacTeX\} (OSX).
43
44
45
46
47
48 \section{Cross-references}
49
```

[Compiling /Users/hugo/latex/thesis_template/thesis.tex]

TraditionalBuilder: Invoking latexmk... done.

No errors. Warnings:

/usr/local/texlive/2015/texmf-dist/tex/latex/classicthesis/classicthesis.sty: Class scrreprt Warning: Us
/usr/local/texlive/2015/texmf-dist/tex/latex/titlesec/titlesec.sty: Package titlesec Warning: Non standa
/usr/local/texlive/2015/texmf-dist/tex/latex/titlesec/titlesec.sty: Package titlesec Warning: Non standa

6 errors, 2 lines, 1 characters selected Spaces: 2 LaTeX

There's a LaTeX template available for the thesis

1 Introduction

This is a complete template for the MSc/Doctoral thesis. It contains all the parts that are required, and is structured in such a way that most/all requirements are covered. Observe that the MSc/Doctoral at TU Delft has no formal requirements, from the structure of the thesis (books, margins, bookends, etc.) is entirely up to you. We basically took the template we created at the University of Twente, which is an adaptation of the original `ctexbook` package from TeX Live, added the front/back matter (cover page, copyright, abstract, etc.) and gave examples for the insertion of figures, tables and algorithms.

It uses an `article` layout and is in two-column mode.

But we hope it will encourage everyone to use L^AT_EX in writing their thesis, and we also hope that it will encourage some interesting thesis.

If you find this template (problems/successes), please report back on the GitHub page, and if you do not want that please submit a pull request.

https://github.com/rob01134/MScThesisTemplate

1.1 How to get started with L^AT_EX

Basically everything you need to know—often installation is difficult—is there: `http://www.latex-project.org/latex/`

To compile this template, you need a multiplatform solution:

- MikTeX (Windows)
- MacTeX (MacOS)
- TeX Live (Linux)

We suggest the following solution:

- TeX Live (Windows)
- MikTeX (MacOS), which is bundled with MacTeX,

but any other solution works.

1.2 Cross-references

The standard source of cross-references used in chapters, sections, subsections, figures, tables, etc.

Chapter 1 is for you as currently reading, and its name is Introduction. Section 1.1 is about pseudo-code, and Section 1.1.1 is about something else. The next chapter (to be read next), title is both can span multiple lines in a page.

1

2 Introduction

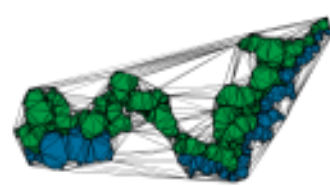


Figure 1.1: One nice figure

1.3 Figures

Figures 1.1 is a simple figure. Notice that all figures in your thesis should be referenced to in the same way. The same applies to tables and algorithms.

It is recommended not to have your figure(s) with captions such as

2

1.3 Figure

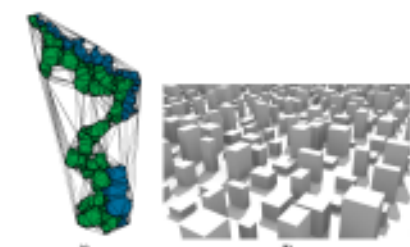


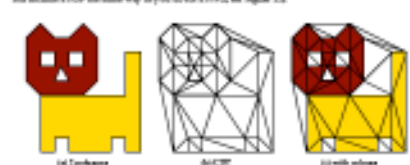
Figure 1.3: Two figures side-by-side. (a) A visualization of 12 polygons. (b) Something not related at all.

or by having a figure to be at the top of a page. L^AT_EX usually places the figures automatically rather well. Only if at the end of your thesis you have small figures then you're interested.

As shown in Figure 1.3, it is possible to have two figures (or more) side by side. You can also enter a subfigure, see Figure 1.3.

1.3.1 Figures in PDF are possible and even encouraged!

If you use Adobe Illustrator or the like you can create your figures vectorial and save them in PDF. You include a PDF in the same way as you do with a PNG, see Figure 1.3.



(a) Cat figure (b) wireframe (c) with colors

Figure 1.3: Three PDF figures.

3

2 Introduction

	100 trials	1000 trials	10000 trials
length	270	4200	23700
area	107	4500	9900
angle	1420	18300	20700

Table 1.1: Details concerning the datasets used for the experiments.

1.4 How to add references?

References are best handled using Bib_LA_TX. See the `apptools` manual. A great cross-platform online cross manager is JabRef.

Overcite (Bib_LA_TX) works fine and that (Prinz, 2008; Chelvan, 2006) instead of citing the whole paper (Chelvan, 2006) it is also possible to cite only the author (e.g. Chelvan).

1.5 Footnotes

Footnotes are a good way to write text that is not essential for the understanding of the text.

1.6 Equations

Equations and variables can be put inline in the text, but also numbered.

Let S be the set of points in \mathbb{R}^2 . The convex hull of a point $p \in S$, defined CH_p is the set of points $q \in S^2$ that are closer to p than any other point in S that is

$$\|q - p\| \leq \|r - p\| \quad \forall r \in S, \quad \forall q \in CH_p. \quad (1.1)$$

The convex hull of the convex hull of all generating points $p \in S$ both the convex diagram of S , defined $VD(S)$.

1.7 Tables

The package `booktabs` permits you to make more tables than the basic ones in L^AT_EX. See the manual Table 1.1.

1.8 Plots

The best way to use `matplotlib`, or its more beautiful version `matplotlib`. With these, you can use `matplotlib` to generate nice PDF plots, such as that in Figure 1.4.

In the sidebar, `figure`, there is an example of a CSV file of the temperature of Delft, taken somewhere from the CSV file plot generated with the script `convtemp.py`.

*Temperature in Celsius

4

2.7 Pseudo-code

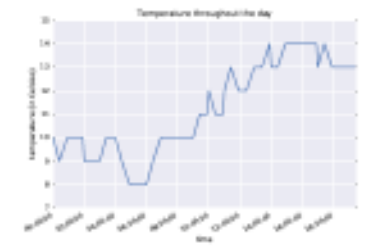


Figure 1.4: A simple plot

1.9 Pseudo-code

Please avoid putting code (Python, C++, Matlab) in your thesis. Small snippets are probably fine (for some cases) but do not put all the code in an appendix. Instead, put your code somewhere online (e.g. GitHub) and just point to it in your thesis. The package `cleveref` is pretty handy, see for instance the algorithm 1.1, all your algorithms will be automatically added to the list of algorithms of the beginning of the thesis. Observe that you can put blocks containing lines (code) and their references in the beginning of the thesis.

Algorithm 1.1: Walk (T, C, p)

Input: A collection of triangles T , a starting triangle t_1 , and a square point p

Output: t : the triangle in T containing p

```

1 while  $p$  not found do
2    $h = 0$ 
3    $S = \{t_1\}$ 
4    $t = \text{get the opposite vertex } t_1$ 
5    $r = \text{get the rightmost triangle of } t$ 
6    $S = S \cup \{r\}$ 
7    $t = r$ 
8    $t_1 = t$ 
9   if  $t_1$  contains  $p$  then
10    return  $t_1$ 
11 else
12    $C = C \cup S$ 

```

Note on line 4 of the Algorithm 1.1 (is it helpful).

If you want to put some code (or SM, for instance), use the package `listings`, e.g. you can wrap it in a figure so that it does not span over multiple pages.

5

2 Introduction

```

\begin{acronym}
\acropp{3D}{{3D}}
\acropp{4D}{{4D}}
\acropp{5D}{{5D}}
\acropp{6D}{{6D}}
\acropp{7D}{{7D}}
\acropp{8D}{{8D}}
\acropp{9D}{{9D}}
\acropp{10D}{{10D}}
\acropp{11D}{{11D}}
\acropp{12D}{{12D}}
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\acropp{47D}{{47D}}
\acropp{48D}{{48D}}
\acropp{49D}{{49D}}
\acropp{50D}{{50D}}
\end{acronym}

```

Figure 1.5: Some CSV file (a) (b) (c)

1.10 Acronyms

If you want to have a list of acronyms you use in your thesis, use the `acronym` package. The first time you speak about geographical information system (GIS), it will be spelled out. Further on, you'll get the acronym (GIS) by itself in the list of the acronyms of the thesis.

Add points to `convtemp.py`. Notice that only these will be printed, e.g. Delft (using `convtemp.py`) and triangular angular network (TAN).

1.11 Miscellaneous

To be the experience, use their own code handy shortcuts. This is the way to properly write these different systems. Use in that the `spacing` package.

You should use `use` for the hyper between words (multi-dimensional), `use` for a range between numbers (1991, 1995), and `use` for a procedure in a system (I like, could my father, could I build multi-dimensional models).

6

There's a LaTeX template available for the thesis

1 Introduction

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If you find any mistakes (typos/errors), please report them on the GitHub page, and if you do not want that please submit a pull request.

https://github.com/rob01134/MScThesisTemplate

1.1 How to get started with L^AT_EX?

Basically everything you need to know—often installation is difficult—in thesis:

```
http://www.ctan.org/ctan/ctan.html
```

To compile this template, you need a multiplatform solution:

- MikTeX (Windows)
- MacTeX (MacOS)
- TeX Live (Linux)

We present the installation instructions.

2 Introduction

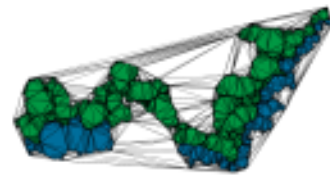


Figure 1.1: One nice figure

1.3 Figures

Figures 1.1 is a simple figure. Notice that all figures in your thesis should be referenced to in the main text. The same applies to tables and algorithms.

It is recommended not to have your figure as a .eps file, but to use a format such as

1.3 Figures

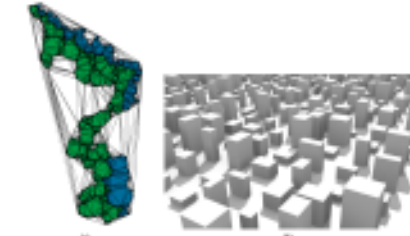


Figure 1.3: Two figures side-by-side. (A) Visualization of 1 (polygons). (B) Something not linked at all.

or by having a figure to be at the top of a page. L^AT_EX usually places the figures automatically unless you specify. Only at the end of your thesis you have small figures like copyright information.

As shown in Figure 1.3, it is possible to have two figures (or more) side by side. You can also enter a subfigure, see Figure 1.3.

1.3.1 Figures in PDF are possible and even encouraged!

If you use Adobe Illustrator or the like you can create your figures vectorial and save them in PDF. You include a PDF file the same way as you do with a PNG, see Figure 1.3.

Structure and template thesis are not prescribed

width	area	volume	constraint
length	270	4.250	1.070
area	107	4.540	0.961
volume	1.020	18.070	20.731

Table 1.1: Details concerning the datasets used for the experiments.

1.4 How to add references?

References are best handled using Bib_LA_TX. See the page for more. It is also a good idea to use a reference manager if you have a lot of references. Observe that Bib_LA_TX will not find references from 1980, 1980, 1980, instead of using the whole year (1980, 1980, 1980) it is also possible to write only the month (e.g. October).

1.5 Footnotes

Footnotes are a good way to write text that is not essential for the understanding of the text.

1.6 Equations

Equations and variables can be put inline in the text, but also numbered.

Let S be the set of points in \mathbb{R}^2 . The convex hull of a point $p \in S$, defined $\text{CH}(p)$, is the set of points $q \in \mathbb{R}^2$ that are closer to p than any other point in S that is

$$\|q - p\| \leq \|q - r\| \quad \forall r \in S, \quad \forall q \in \text{CH}(p). \quad (1.1)$$

The convex hull of the convex hull of all generating points $p \in S$ from the convex diagram of S , defined $\text{CH}(S)$.

1.7 Tables

The package booktabs provides you to make more tables than the basic ones in L^AT_EX. See the manual Table 1.1.

1.8 Plots

The best way to use `matplotlib`, or its more beautiful version `matplotlib`. With this, you can use `matplotlib.pyplot` to save PDF files, such as that in Figure 1.4.

In the figure `plot_temperature`, there is an example of a CSV file of the temperature of Delft, taken somewhere from the CSV file plot generated with the script `generate_data.py`.

*The plot is generated with the script `generate_data.py`.

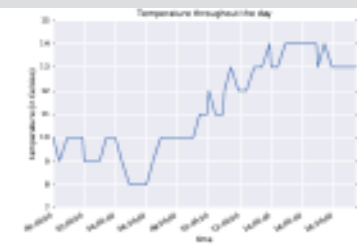


Figure 1.4: A simple plot

1.9 Pseudo-code

Please avoid putting code (Python, C++, Matlab) in your thesis. Small snippets are probably fine (for some cases) but do not put all the code in an appendix. Instead, put your code somewhere online (e.g. GitHub) and just provide a link in your thesis. The package `cleveref` is really handy, see for instance the algorithm 1.1, all your algorithms will be automatically added to the list of algorithms at the beginning of the thesis. Observe that you can put links to online files (GitHub) and their references in the list of algorithms.

Algorithm 1.1: Walk (T, C, p)

Input: A collection of triangles T , a starting triangle t_1 , and a square point p

Output: A list of triangles in T containing p

```
1 while  $p$  not found do
2    $list = []$  to find
3    $list = []$  to find opposite vertex  $v$  in  $T$ 
4    $list = []$  to find
5    $v = []$  to get neighboring triangles of  $v$  incident to  $p$ 
6    $list = []$  to find
7    $list = []$  to find
8    $list = []$  to find
9    $list = []$  to find
10  return  $list$ 
```

Observe that the Algorithm 1.1 (list) is supporting.

If you want to put some code (or some images) use the package `listings`, e.g. you can wrap it in a figure so that it does not span over multiple pages.




Figure 1.5: Some CSV file (a) (b) (c)

1.10 Acronyms

If you want to have a list of acronyms you use in your thesis, use the `acronym` package. The first time you speak about geographical information system (GIS), it will be spelled out. Further on, you will get the acronym (GIS) by links to the list in the preface of the thesis.

All points to `list-acronym.tex`. Notice that only these words are printed, e.g. `Distance` (long distance) and `triangular angular network` (TAN).

1.11 Miscellaneous

To be the experience, use their own code handy shortcuts. This is the way to properly write these different systems, use the `list-acronym.tex` file in the preface of the thesis.


You should use `---` for a hyphen between words (multi-dimensional), `---` for a range between numbers (1991-1993), and `---` for a punctuation in a sentence (I like... could say better... could still be dimensional models).

Other ones?

- Use a reference manager (eg Endnote, JabRef, Mendeley)
- Start writing early in the process (it takes more than 2 weeks to write 75 pages...)
- Use vector figures/plots (~~Windows Paint~~, Adobe Illustrator)
- Report on the good and the bad aspects of your method
- Eat vegetables every day, and sport
- It's not a sprint, it's a marathon

6. How to pick a topic?

How do I pick a topic?

-  3d.bk.tudelft.nl/courses/geo2020/potentialtopics/
- Each staff has 3-4 potential topics to offer
- You are allowed to propose own topic to staff (speak directly to them first)
- By July 1st, you need to submit your top 3 topics, in order of preferences
- We will try to balance everything and let you know ASAP

My personal advice

1. Pick a supervisor you like and think you can work with for ~9 months.
 2. Pick a topic that you **love**, otherwise it'll be painful...
-
- most of us have a personal website
 - look at the research interests, publications, theses supervised, etc

You need 2 mentors (=supervisors)

- **1st supervisor:** daily supervisor (anyone involved in MSc Geomatics, including PhD students)
 - **2nd supervisor:** another specialist in the area, anywhere at TU Delft.
- at least one of your mentors should hold a PhD degree

Can I do my thesis work at a company?

Yes and no.

That is, you are allowed to pick a topic that is proposed by a company. However, the main mentor of the project has to be a staff of the university and the project has to be a *scientific one*.

Order is (1) speak to staff here; (2) speak to company.

graduation

!=

internship

Open science requirements

Most staff follow the *open science requirements*, which means that even if you carry out the work in collaboration with a company you need to publish your thesis openly, have the code open, no embargoes, etc.

 <https://3d.bk.tudelft.nl/courses/geo2020/openscience/>

GEO2020--MSc Geomatics

https://3d.bk.tudelft.nl/courses/geo2020/

GEO2020 MSc Geomatics

- Info about the Ps
- FAQ
- Example theses
- Templates for deliverables
- Research & writing tips
- Potential topics
- Graduating with a company**
- Stuff for supervisors

Latest news

- 14 Jan 2019: [Some comments about the P2s](#)
- 02 Jan 2019: [New year, new design](#)
- 19 Dec 2018: [More info about the P2](#)
- 16 Nov 2018: [Git\(Hub\) course: Monday 26 Nov 15:00-17:00](#)
- 14 Nov 2018: [registration P2 + Git\(Hub\) course](#)

[longer list of news](#)

Important dates

- P2:** 2019-01-09 – 2019-01-22
- P4 registration:** 2019-04-18

[all the dates](#)

https://3d.bk.tudelft.nl/courses/geo2020/news

**Thesis in company?
Paperwork mandatory**

7. Questions?

<https://3d.bk.tudelft.nl/courses/geo2020/>