4TH SEMESTER: THESIS RESEARCH

"*LIFE AFTER DRESDEN…*"

Dresden – 29 October 2026

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Cartography M.Sc.

Co-funded by the Erasmus+ Programme of the European Union

Agenda

TODAY:

- Why a thesis and what is it?
- The research semester
- Thesis Topic determination: the process
- Q & A

TOMORROW:

- Thesis Topic determination: the contents

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Why an MSc Thesis, and what is it…?

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The MSc Thesis

In the 4th semester you have to prove that you have gained the compentencies to become an **independent researcher**

Our website says "*The Master's Thesis is a scientific elaboration within a time period of six months.*"

- **six months** = 1 full semester (30 EC)
- **elaboration** = writing a ±50 page thesis, guided (not instructed!) by a supervisor, plus presenting & defending it in public
- **scientific** = ...?

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The MSc Thesis

Scientific =

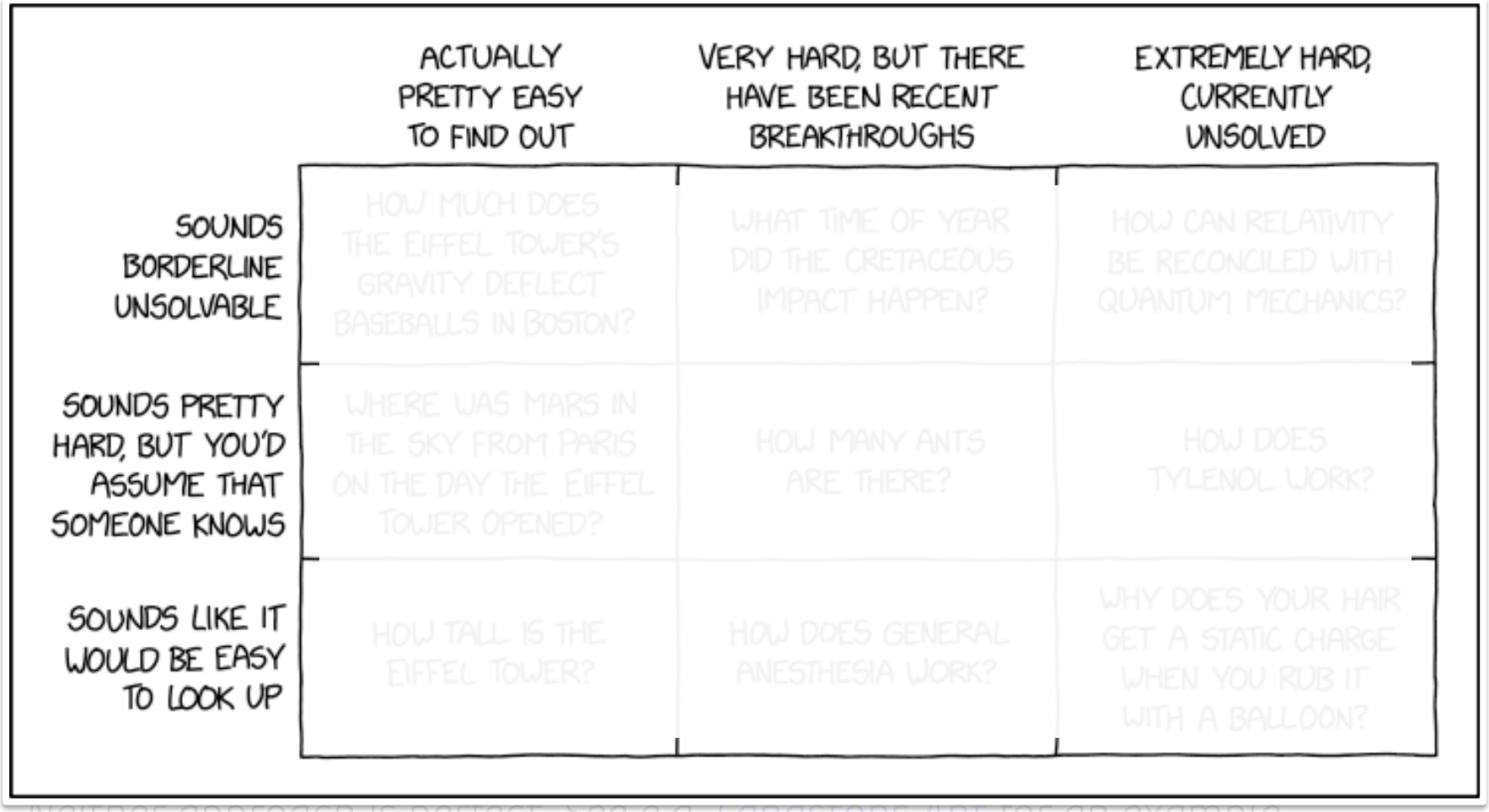
- based on, and embedded in existing research (literature review, prior work, existing theory and research frameworks)
- looking into well-contemplated research questions and/or hypotheses
- conclusions and recommendations that take the field of **cartographic science** further

  → *more than "science with some maps"...!*

- using **proper scientific methodology** to answer said questions

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Science defined



https://xkcd.com/2682/

Neither approach is perfect. See e.g. Langstons Ant for an example of how reductionism fails...

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Science defined

	ACTUALLY PRETTY EASY TO FIND OUT	VERY HARD, BUT THERE HAVE BEEN RECENT BREAKTHROUGHS	EXTREMELY HARD, CURRENTLY UNSOLVED
SOUNDS BORDERLINE UNSOLVABLE	HOW MUCH DOES THE EIFFEL TOWER'S GRAVITY DEFLECT BASEBALLS IN BOSTON?	WHAT TIME OF YEAR DID THE CRETACEOUS IMPACT HAPPEN?	HOW CAN RELATIVITY BE RECONCILED WITH QUANTUM MECHANICS?
SOUNDS PRETTY HARD, BUT YOU'D ASSUME THAT SOMEONE KNOWS	WHERE WAS MARS IN THE SKY FROM PARIS ON THE DAY THE EIFFEL TOWER OPENED?	HOW MANY ANTS ARE THERE?	HOW DOES TYLENOL WORK?
SOUNDS LIKE IT WOULD BE EASY TO LOOK UP	HOW TALL IS THE EIFFEL TOWER?	HOW DOES GENERAL ANESTHESIA WORK?	WHY DOES YOUR HAIR GET A STATIC CHARGE WHEN YOU RUB IT WITH A BALLOON?

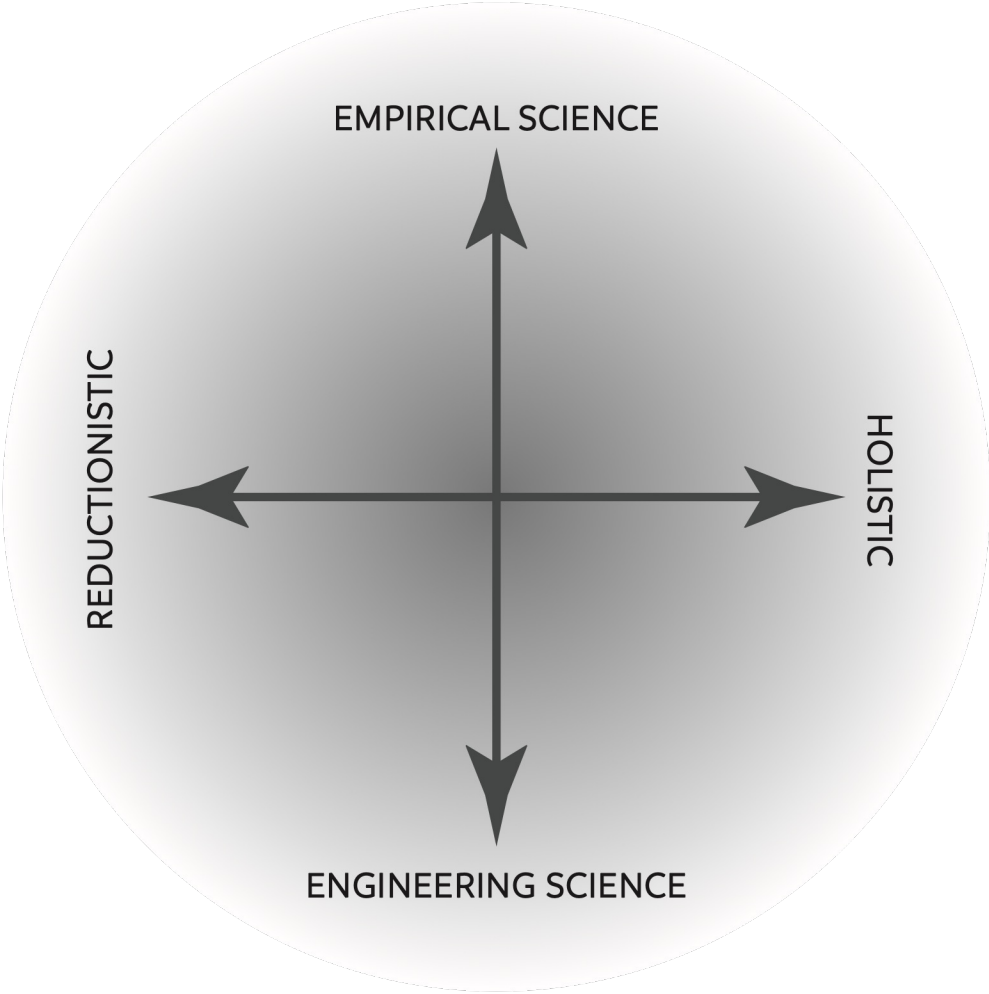
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Neither approach is perfect. See e.g. Langstons Ant for an example of how reductionism fails...

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Scientific method in Cartography?

- Can be be based in/on different methodologies, as the discipline is on the interface between many sciences
- Thus, your method can be somewhere in the “research space”, between empirical or engineering oriented, reductionist or holistic…

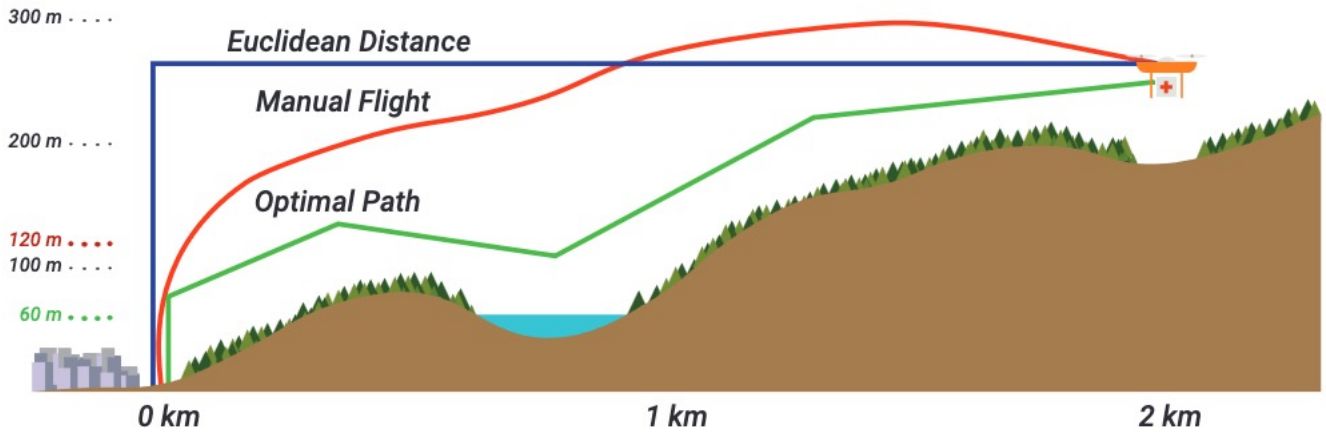


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Towards an automatic UAS-based mapping tool for first responders



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Scientific method in Cartography?

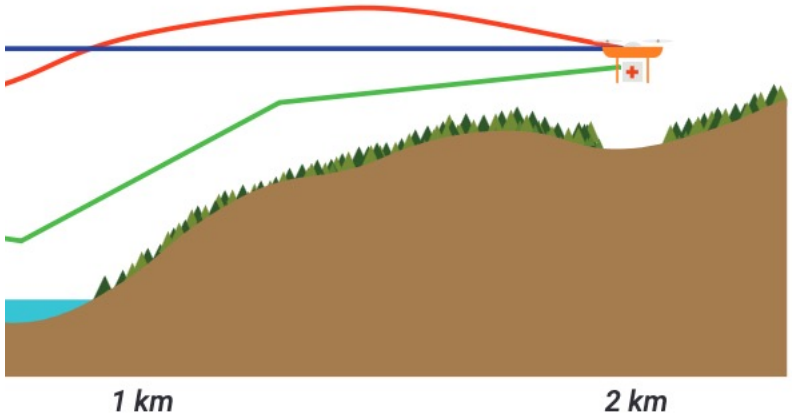
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Materiality in Cartography,
A First Attempt to Evaluate its Usefulness



Fig. 2. Unconventional media map of the degradation in the Amazonia. Materials: Cow bones and coins.

Towards an automatic UAS-based mapping tool for first responders



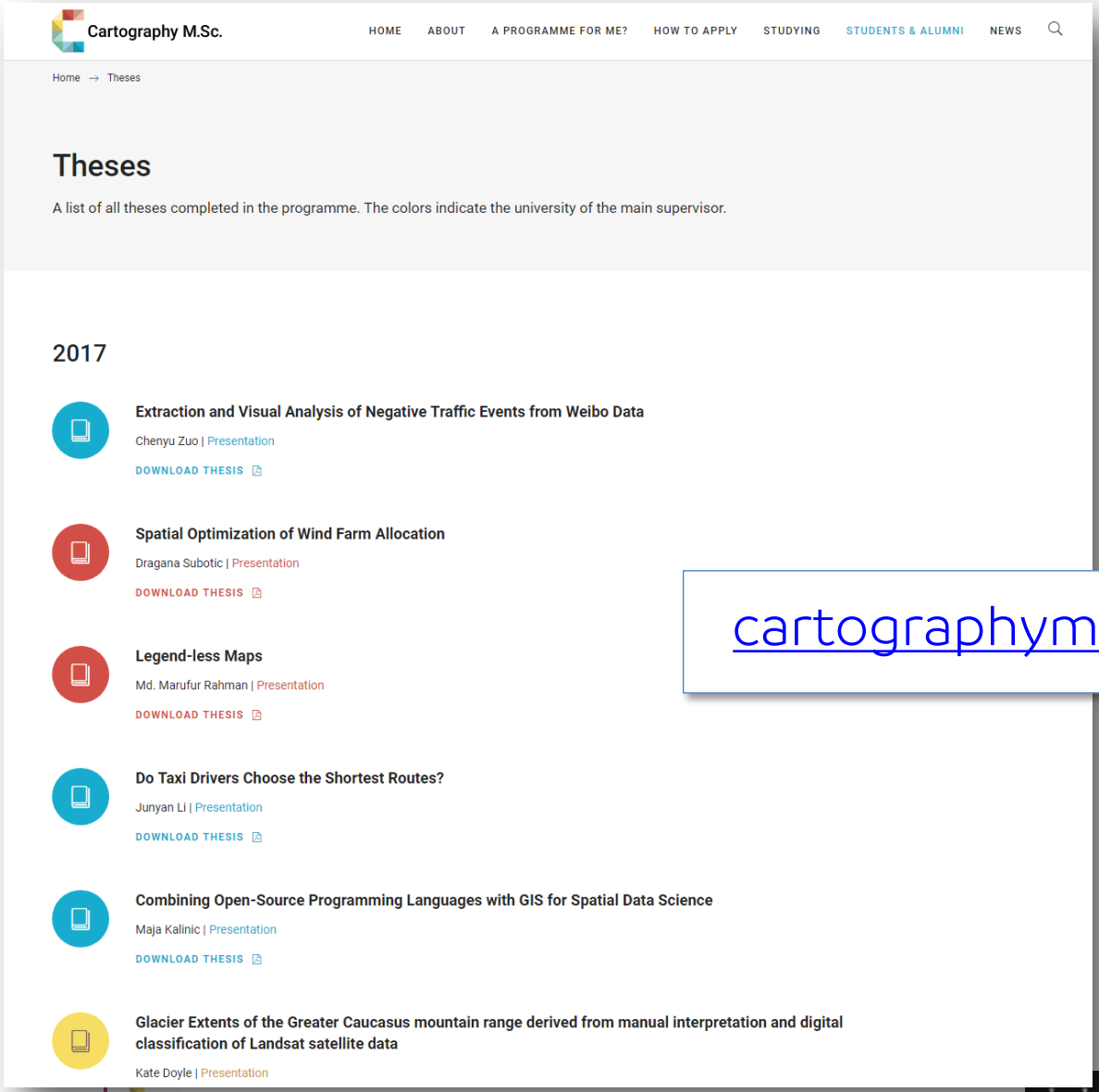
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*So what will **you** research…?*

Thesis Topic determination (the process)

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Topics Examples – Completed Theses



Cartography M.Sc.

HOME ABOUT A PROGRAMME FOR ME? HOW TO APPLY STUDYING STUDENTS & ALUMNI NEWS

Home → Theses

Theses

A list of all theses completed in the programme. The colors indicate the university of the main supervisor.

2017

Extraction and Visual Analysis of Negative Traffic Events from Weibo Data
Chenyu Zuo | Presentation
DOWNLOAD THESIS

Spatial Optimization of Wind Farm Allocation
Dragana Subotic | Presentation
DOWNLOAD THESIS

Legend-less Maps
Md. Marufur Rahman | Presentation
DOWNLOAD THESIS

Do Taxi Drivers Choose the Shortest Routes?
Junyan Li | Presentation
DOWNLOAD THESIS

Combining Open-Source Programming Languages with GIS for Spatial Data Science
Maja Kalinic | Presentation
DOWNLOAD THESIS

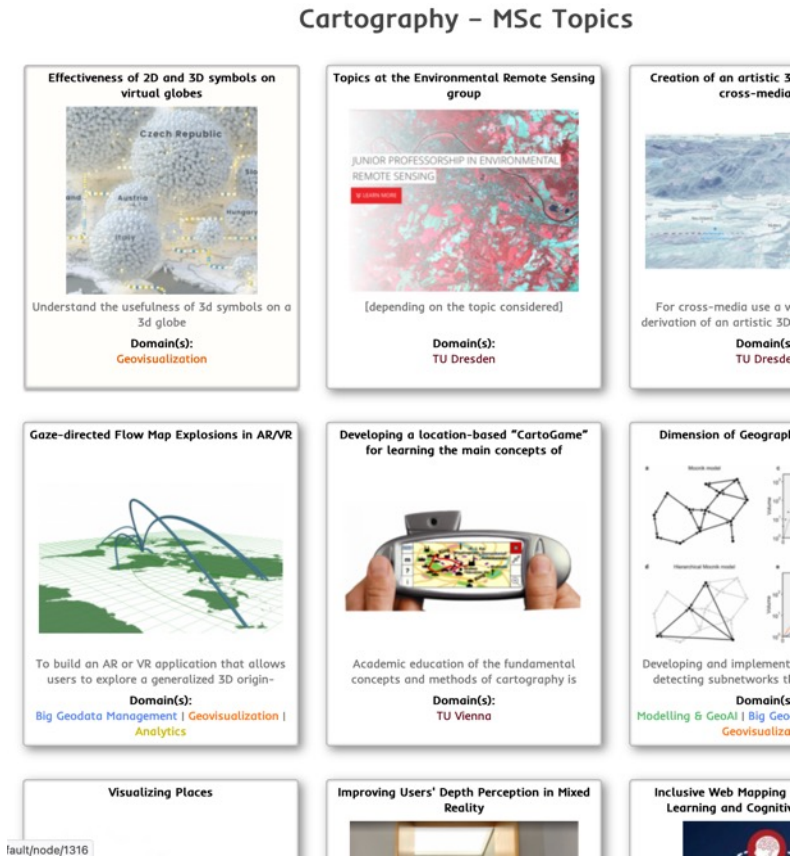
Glacier Extents of the Greater Caucasus mountain range derived from manual interpretation and digital classification of Landsat satellite data
Kate Doyle | Presentation

cartographymaster.eu/theses/

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Proposed Thesis Topics

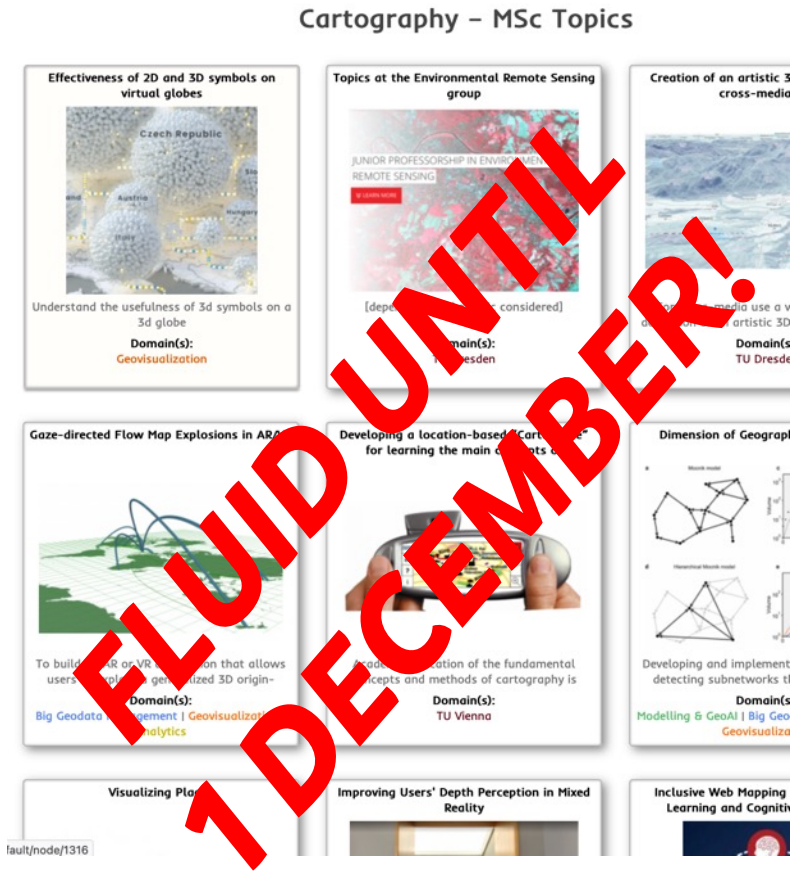
- Research topics are proposed by all 4 members of the consortium: kartoweb.itc.nl/msc-carto-thesis/topics/
- Selecting a topic determines your supervisor and thus where you will write your thesis:
  TUM, TUW, TUD or UT-ITC
- Note that:
  - The programme strives for an even distribution of thesis students over the 4 partner universities
  - Mobility rules make that German and Austrian students with EM scholarship **must** write their thesis at UT-ITC



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Proposed Thesis Topics

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Where do these topics come from?

The groups at the 4 partners have a focus on particular research fields:

- **TUM**: Dashboard design, mixed-reality, spatial learning, map-based storytelling, HD mapping
- **TUW**: Location-based services, cartographic storytelling, theoretical cartography, knowledge networks
- **TUD**: Geovisual Analytics (of Location-based Social Media), Artistic Map Design, Automated Generalisation and Multiple Representation
- **ALL**: AI technology for Cartography, AI ethics.

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mixed-reality

Artistic Map Design

spatial learning
HD mapping

Automated Generalisation and
Multiple Representation

Geovisual Analytics

Atlas /
Dashboard design

Location-
based services

Cartographic storytelling

(Map) AI technology

Theoretical cartography

Map AI & Ethics

Knowledge networks

This is our partners "research space"....

Is that all the choice I have....?

- The topics on the list are **suggestions and ideas**. The staff proposing these ideas considered them interesting, relevant and do-able. They are **not a finished proposal**

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Is that all the choice I have....?

- The topics on the list are **suggestions and ideas**. The staff proposing these ideas considered them interesting, relevant and do-able. They are **not a finished proposal**

- You are **very welcome** to propose **your own** cartographic topic!
- Talk with us, we'll help determine if a topic is viable, and who could supervise it.

- There is another workshop (**16 Dec**) + consultation days (**17+18 Dec**) helping you shape your topic – from the list or your own

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mixed-reality

Artistic Map Design

spatial learning
HD mapping

Automated Generalisation and
Multiple Representation

Atlas /
Dashboard design

Geovisual Analytics

Location-
based services

Cartographic storytelling

SOMETHING ELSE

(Map) AI technology

Theoretical cartography

Map AI & Ethics

Knowledge networks

This is your "research space"....

Break-out

1. make one or more Post-Its
   with your name on it

2. place them in the “research fields” overview near research areas where
   you NOW can “see yourself” doing your thesis…

BREAK-OUT

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PREPARE FOR TOMORROW

- Look at the topic list online and/or your own topic ideas.
- Try to formulate 1 or 2 "topics":
  - only a one-line description
    +
  - the 'research field' you think this fits in.

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Topic determined, what then…?

The research semester

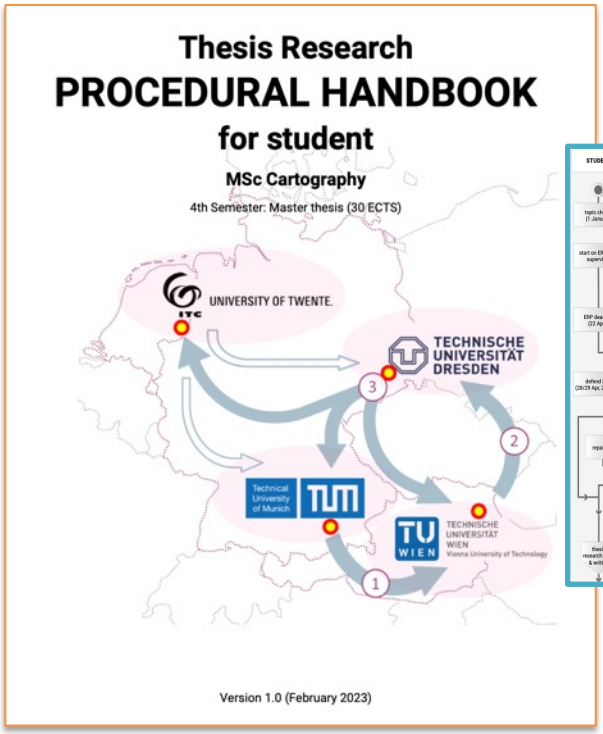
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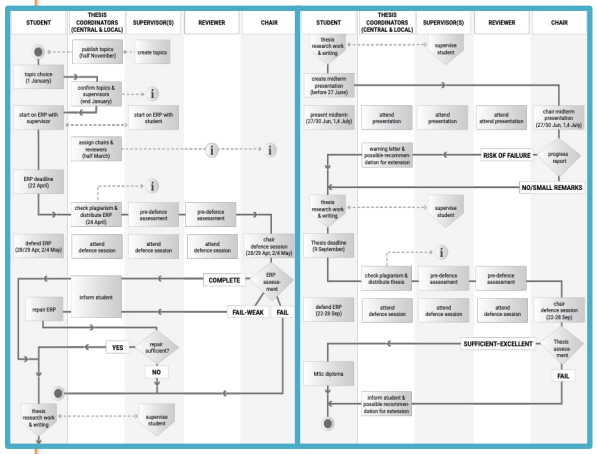
Sources of information

- Thesis semester website: kartoweb.itc.nl/msc-carto-thesis/

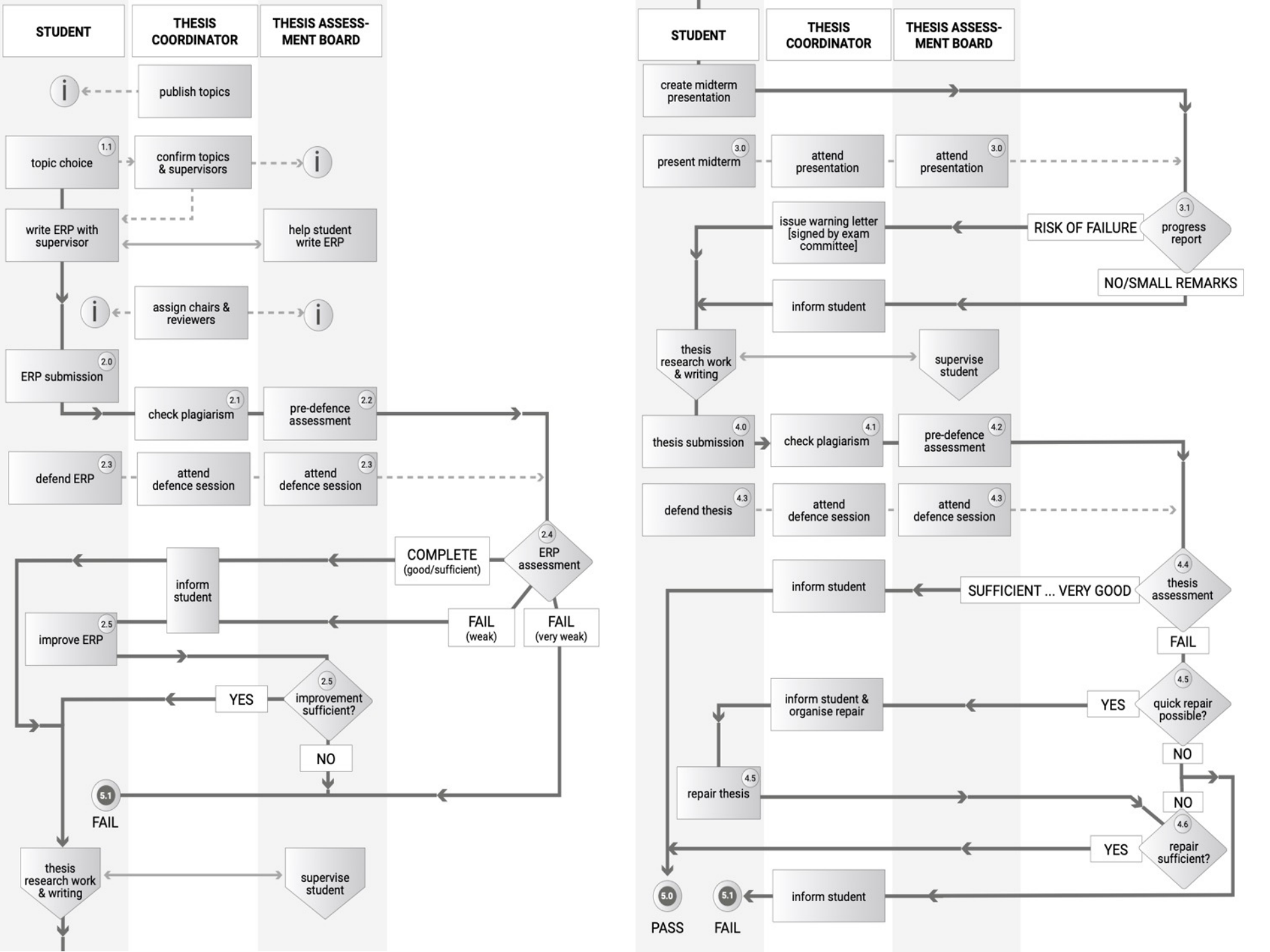


- Procedural handbook





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STUDENT
THESIS COORDINATOR
THESIS ASSESS-MENT BOARD
publish topics
topic choice
1.1
confirm topics & supervisors
write ERP with supervisor
help student write ERP
assign chairs & reviewers
ERP submission
2.0
check plagiarism
2.1
pre-defence assessment
2.2
defend ERP
2.3
attend defence session
attend defence session
2.3
COMPLETE (good/sufficient)
ERP assessment
2.4
inform student
improve ERP
2.5
FAIL (weak)
FAIL (very weak)
YES
improvement sufficient?
2.5
NO
5.1
FAIL
thesis research work & writing
supervise student
STUDENT
THESIS COORDINATOR
THESIS ASSESS-MENT BOARD
create midterm presentation
present midterm
3.0
attend presentation
attend presentation
3.0
issue warning letter [signed by exam committee]
RISK OF FAILURE
progress report
3.1
NO/SMALL REMARKS
inform student
thesis research work & writing
supervise student
thesis submission
4.0
check plagiarism
4.1
pre-defence assessment
4.2
defend thesis
4.3
attend defence session
attend defence session
4.3
inform student
SUFFICIENT ... VERY GOOD
thesis assessment
4.4
FAIL
inform student & organise repair
YES
quick repair possible?
4.5
NO
repair thesis
4.5
NO
YES
repair sufficient?
4.6
5.0
PASS
5.1
FAIL
inform student

Start Requirements

- If you have obtained **at least 90 credits** in the first three semesters, you **have permission** to start with thesis research
- If you have between 80 and 89 credits, you ***may obtain*** permission to start, from the Exam Committee:

  write a special request for starting your thesis – addressed to Juliane Cron as secretary of the Exam Committee; final decision on your request will be made by the Committee.

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Enrolment and scholarship

- For the 4th semester you need to **enrol and pay** the **registration** fees at the partner university that employs the first supervisor, and also at TUM (as administrating university).
  - for EM Scholarship students these fees will be paid by EM
  - during the thesis writing you need to comply with the rules and regulations of the university concerned

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The process

- Students will have to select their topic on 1 January - ***well before*** the start of the 4th semester
  - Choose 2-3 topics, own or existing…

Existing topics:

- use the list at kartoweb.itc.nl/msc-carto-thesis/topics/
- feel free to contact the proposing people, discuss your ideas with them…

Your own topic:

- contact people early that can help you with developing it
- make sure a partner Uni is *involved (through coordinators)*

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The p

- Stude - *well before*
  - Cho

Cartography M.Sc.

MSc Thesis TOPIC CHOICES

Name student : .....

TUM matriculation nr : .....

First Choice (required)

Topic title : .....

☐ is topic from list

☐ is own topic - possible supervisor(s): .....

Second Choice (required)

Topic title : .....

☐ is topic from list

☐ is own topic - possible supervisor(s): .....

Third Choice (optional)

Topic title : .....

☐ is topic from list

☐ is own topic - possible supervisor(s): .....

Notes or remarks : .....

.....

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The process

- Students will have to select their topic on 1 January - ***well before*** the start of the 4th semester
  - Choose 2-3 topics, own or existing…
- The selected topics will be approved by the Steering Committee, and a TAB *(supervisor(s)* and a *chair)* will be assigned, around end January
- Later that also a *reviewer* (from another Uni) will be appointed

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The process

- Students will have to select their topic on 16 January - ***well before*** the start of the 4th semester
  - Choose 2-3 topics, own or existing…
- The selected topics will be approved by the Steering Committee, and a TAB *(supervisor(s)* and a *chair)* will be assigned, around end January
- Elaborate on your topic in an ERP:
  Extended Research Proposal – deadline 17 April 2026
- Present and defend your ERP
  (27 Apr 1 May)

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Extended Research Proposal (ERP)

- You will start with the topic ideas and mould them them into your own <u>Extended Research Proposal (ERP)</u>

- Your **supervisor(s)** will help you write your ERP
  - Your 1st supervisor is assigned to you based on your topic choice
  - In most cases they are the person that proposed the topic
- Depending on the topic, there may be further supervisors, also from other research institutes or companies
- Your 1st supervisor's university is **where** you write your thesis:
  - You should in principle be *available in person* there
  - You follow *their* programme (intro, defenses, workshops, etc.). There might also be joined activities of all partners.

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Supervisor's role

- Your supervisor(s) is (are) your research *coach*
  ⟶ *you* are in charge & responsible for the research!
- Consider what the supervisor proposes - Be *teachable*
- Plan your time (e.g., use Gantt charts, etc), and check whether you are on schedule. If not, adjust plans and inform your supervisor when necessary
- Ask for feedback on important decisions
- Discuss (intermediate) results
- Note that your supervisor will not be available 24/7. They have more things on their agenda (unlike you...!)

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Primary Supervisor's role

- Your supervisor is your research *coach* – you are in charge & responsible for the research!
- Consider what the supervisor proposes.
  Be *teachable* and learn
- Plan your time (e.g., use Gantt charts, Kanban boards, etc), and check whether you are on schedule. If not, adjust plans and inform your supervisor when necessary
- Ask for feedback on important decisions
- Discuss (intermediate) results
- Note that your supervisor will **not** be available 24/7.
  They have other things on their agenda (unlike you ;-)

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The Thesis Assessment Board

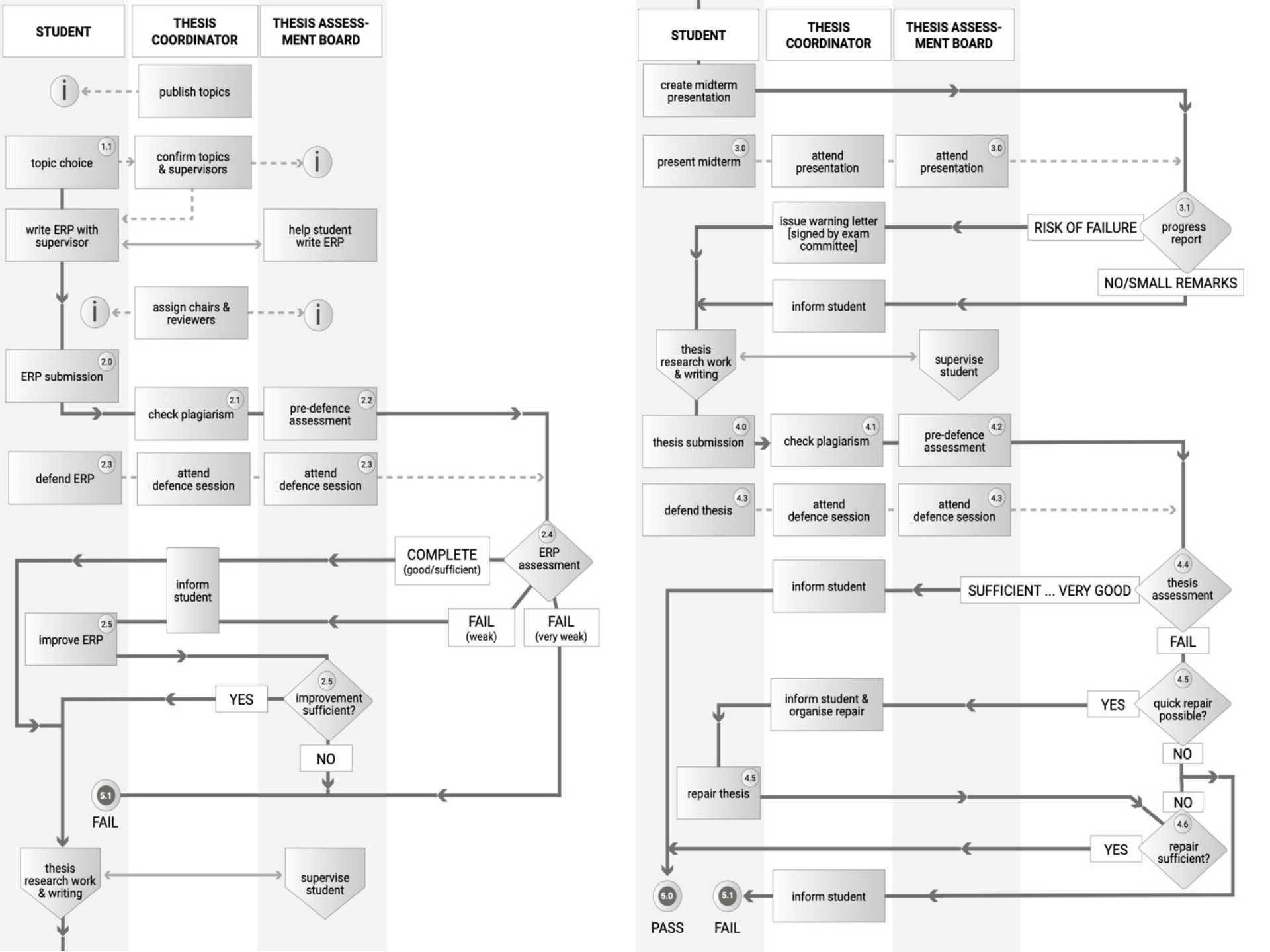
The TAB consists of at least 3 members:

- The **chair** is a full or associate professor (of the university where you write)
- The second member is your **primary supervisor**,
- The third member is an **external reviewer**, from a university other that your supervisor's.
- other supervisors can be additional members

The TAB **assesses** your work:

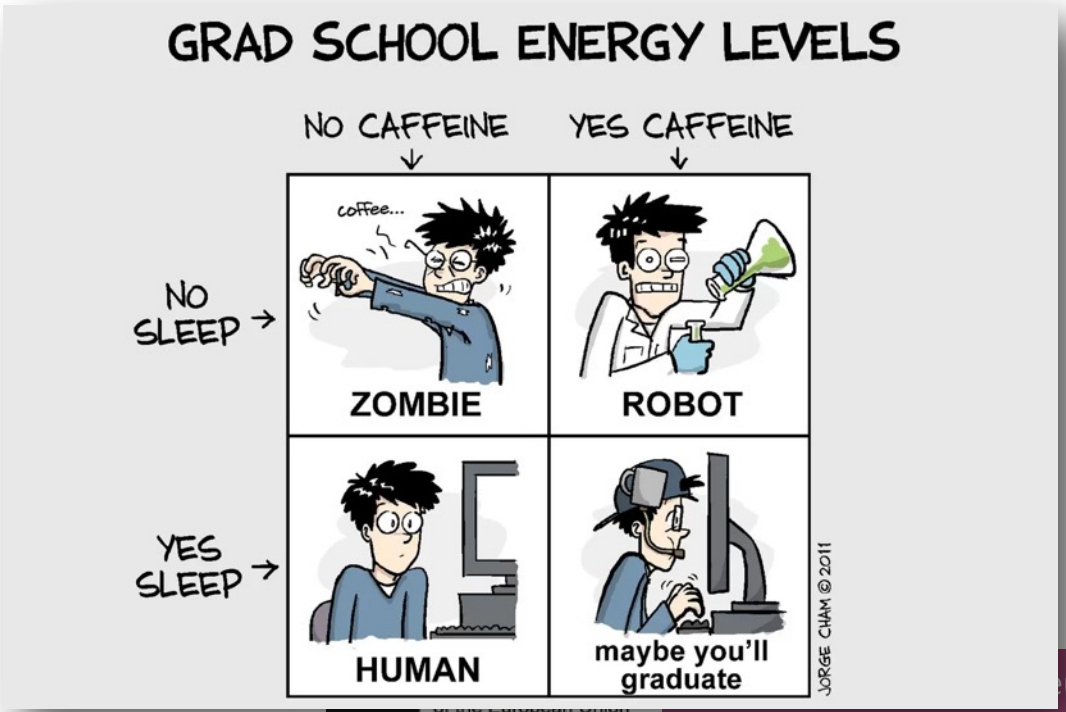
- In the beginning: your ERP (Extended Research Proposal), at the proposal defence – you can't start until it's approved!
- At the end: your finalised thesis, at the Thesis Defence – your final mark will be determined by the TAB

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check plagiarism
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pre-defence assessment
2.2
defend ERP
2.3
attend defence session
attend defence session
2.3
COMPLETE (good/sufficient)
ERP assessment
2.4
inform student
improve ERP
2.5
FAIL (weak)
FAIL (very weak)
YES
improvement sufficient?
2.5
NO
5.1
FAIL
thesis research work & writing
supervise student
STUDENT
THESIS COORDINATOR
THESIS ASSESS-MENT BOARD
create midterm presentation
present midterm
3.0
attend presentation
attend presentation
3.0
issue warning letter [signed by exam committee]
RISK OF FAILURE
progress report
3.1
NO/SMALL REMARKS
inform student
thesis research work & writing
supervise student
thesis submission
4.0
check plagiarism
4.1
pre-defence assessment
4.2
defend thesis
4.3
attend defence session
attend defence session
4.3
inform student
SUFFICIENT ... VERY GOOD
thesis assessment
4.4
FAIL
inform student & organise repair
YES
quick repair possible?
4.5
NO
repair thesis
4.5
NO
YES
repair sufficient?
4.6
5.0
PASS
5.1
FAIL
inform student

Planning the stages

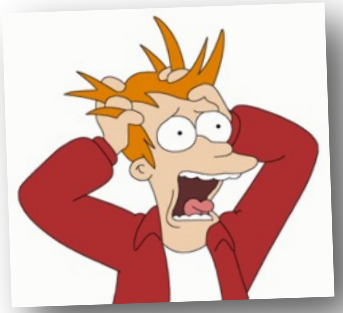
- Stage 1: Propose research questions, design of methodology; present & defend proposal (1st month)
- Stage 2: Literature review, finalizing methodology, setting up experiment/prototyping/user requirements; writing first chapters (±2 months).
- Stage 3: Data collection/prototyping/user tests, analysis, conclusions; presentation of results (±2.5 months).



Timing in a Nutshell:

1 Dec	thesis topics list finalised
1 January	topic selection by students
during Jan	approval of thesis topic & supervisor
Jan-Feb	*academic writing workshops*
…	*…work on proposal…*
1 Apr	official start of semester 4
17 Apr	Extended Research Proposal (ERP)
26 - 30 Apr	ERP defences
…	*….working….*
21-25 June	midterm presentation
…	*….working….*
6 Sep	deadline for submission
20-24 Sep	thesis defences







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Q&A

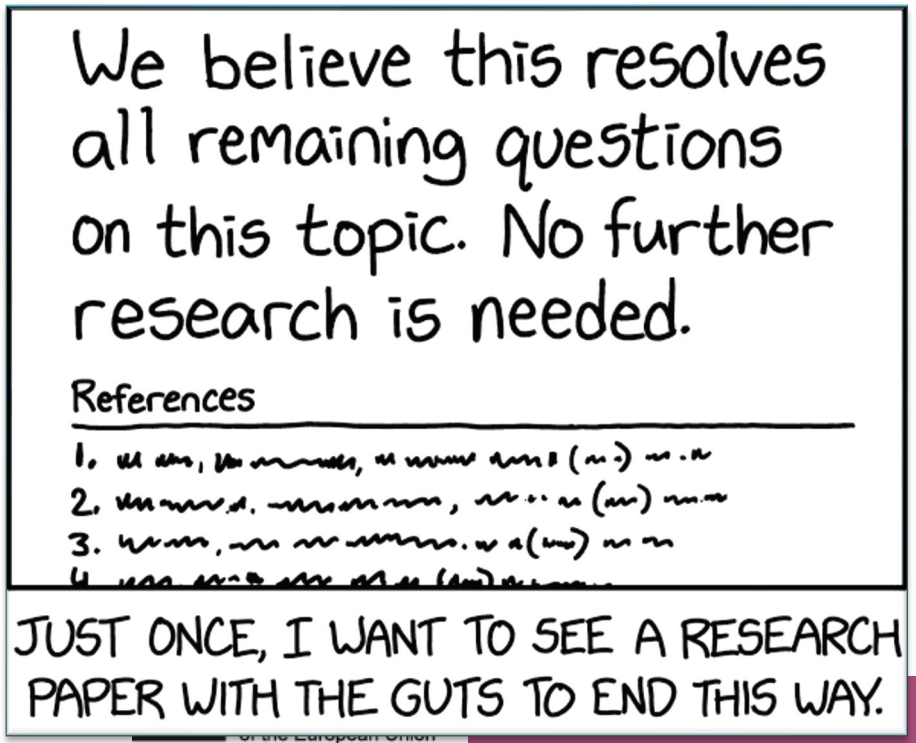
For further information & questions regarding your thesis semester, we have a dedicated website:

kartoweb.itc.nl/msc-carto-thesis

Barend Köbben
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Coordinator of the
Master's thesis semester
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+31-(0)53 4874253



https://xkcd.com/2268/



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