4TH SEMESTER: THESIS RESEARCH
"*LIFE AFTER DRESDEN…*"

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Cartography M.Sc.

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Agenda

- Why a thesis and what is it?

- Thesis Topics

- The research semester

- Q & A

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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

	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?

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

https://xkcd.com/2682/

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Science defined

- **Science** aims to improve our understanding of how reality works. Facts matter, not opinions.

- In general we distinguish two types (extremes?):

  - *Reductionist* science studies singularities
    (focus, leave out detail – interprets a complex system as
    the sum of its (simple) parts
    e.g. Mathematical logic

  - *Holistic* science studies complete systems
    (pay attention to everything – as a indivisible whole)
    e.g. Psychiatry

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

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Different Science: different methods

https://xkcd.com/2539/

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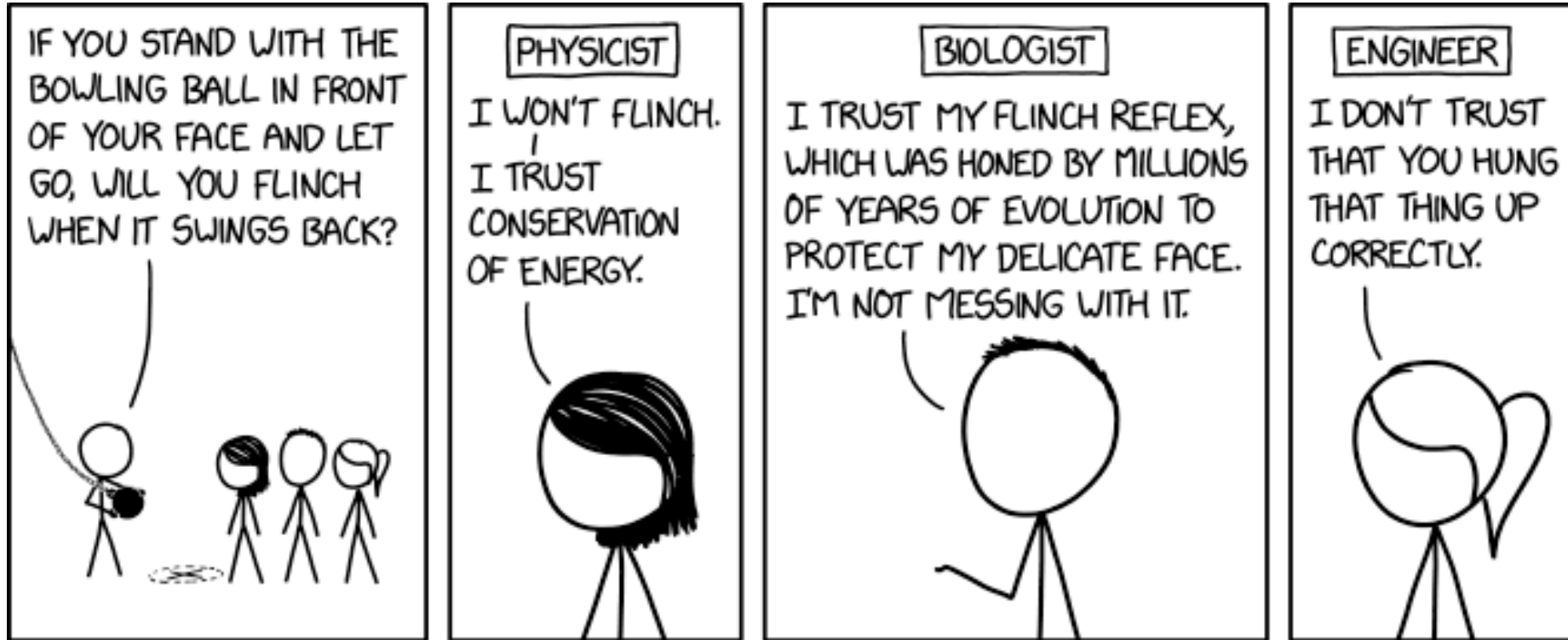
What is a scientific method?

- An established system to conduct research

  +

- a set of associated practices.

- The generic method is (ICREA):
  1. Initiate
  2. Conceptualize
  3. Realize
  4. Evaluate
  5. Act

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ICREA in Empirical Science

step	
Initiate	Observe the objects/patterns/phenomena of study
Conceptualize	Create a model/hypothesis that explains the o/p/p and that allows predictions
Realize	Perform experiments and collect data (to validate the model/hypothesis)
Evaluate	Interpret the results of the validation
Act	Use model to predict

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ICREA in Engineering Science

step	
Initiate	Define desirable system properties in actions and responses (requirements)
Conceptualize	Translate properties to formal statements about system functions and interactions (specifications)
Realize	Design and implement prototype (design phase)
Evaluate	Test the prototype against requirements
Act	Build the real system

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Scientific method in Cartography?
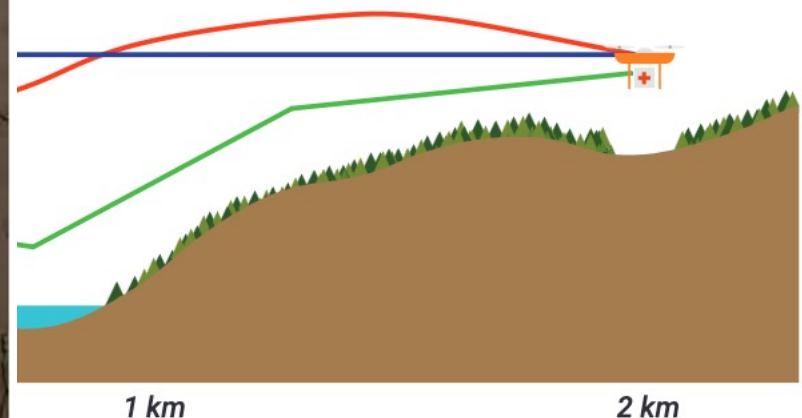
- Can be be based in/on different methodologies, as the discipline is on the interface between many sciences

- Thus, your method can be somewhere in the "research space", between empirical or engineering oriented, reductionist or holistic...
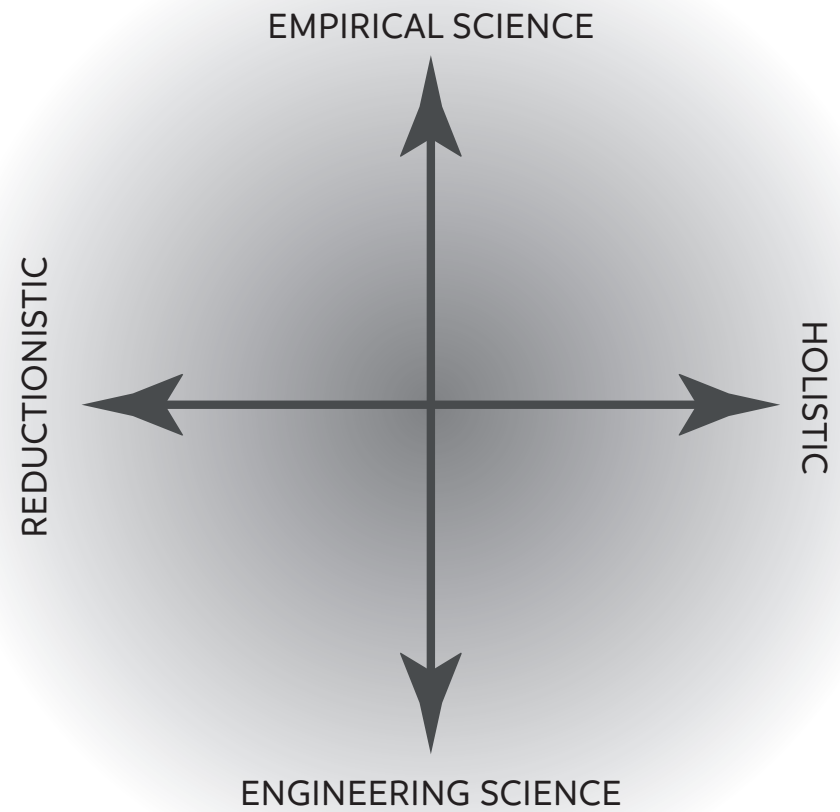
Scientific method in Cartography?

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Towards an automatic UAS-based mapping tool for first responders
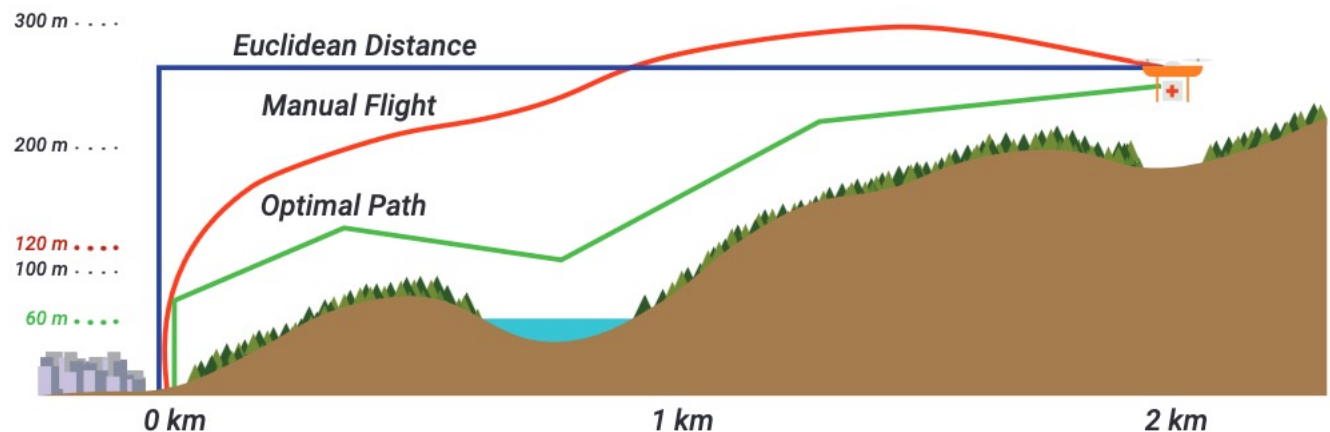
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Scientific method in Cartography?

- Can be be based in/on different methodologies, as the discipline is on the interface between many sciences

- Thus, your method can be empirical or engineering oriented, reductionist or holistic...

Materiality in Cartography,
A First Attempt to Evaluate its Usefulness

Towards an automatic UAS-based mapping tool for first responders

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

1 km   2 km

*So what will **you** research…?*

Thesis Topics

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Topics Examples – Completed Theses

cartographymaster.eu/theses/

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

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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

Cartography – MSc 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

- **UT-ITC**: Atlases/Dashboards, Map AI & Map Ethics, Mapping time, Place & Space, Visualization of automated workflows, Data visualization

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RESEARCH FIELDS IN MUNICH

- Mixed Reality based indoor navigation and spatial learning
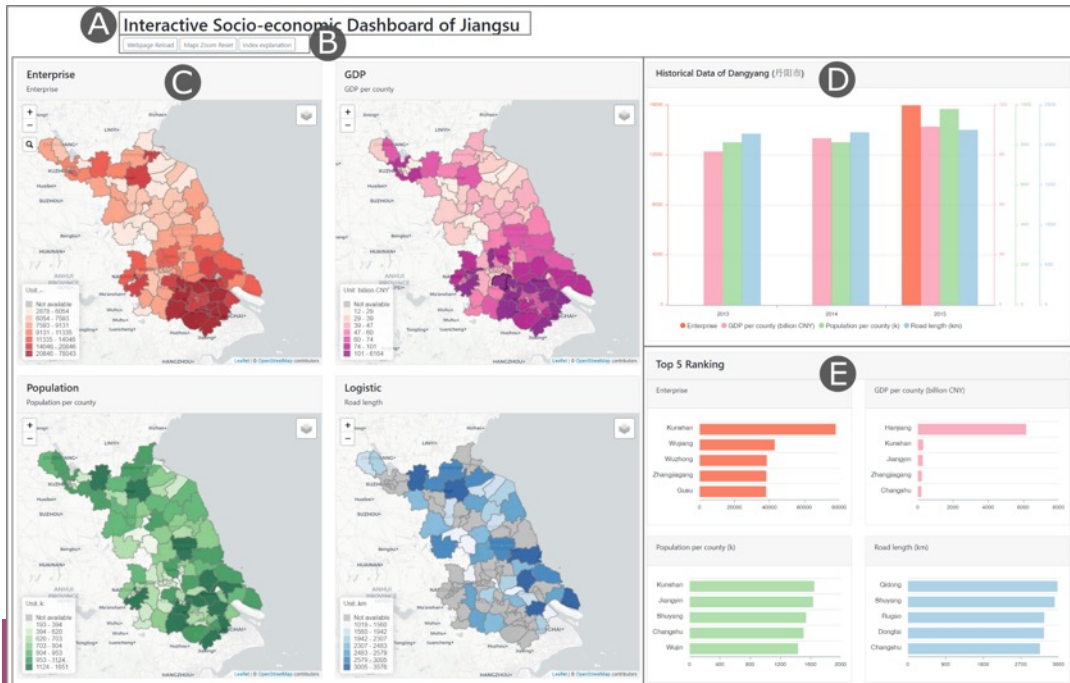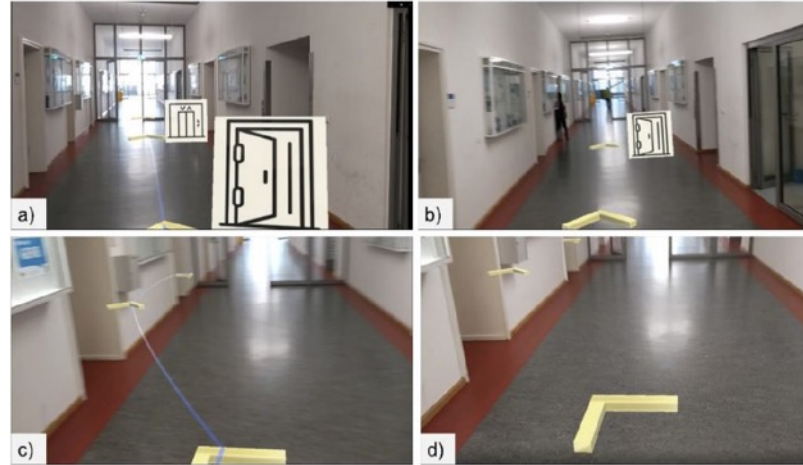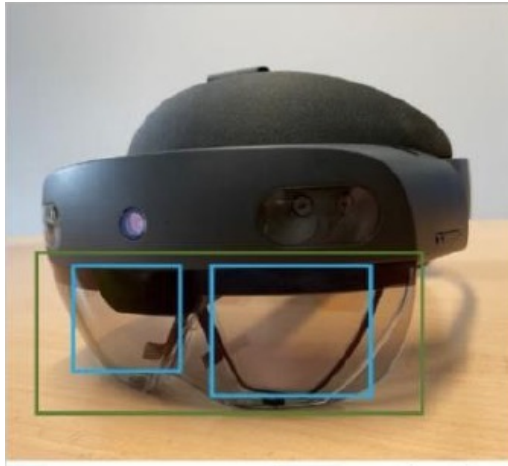
- Map-based dashboard

RESEARCH FIELDS IN MUNICH

- HD Mapping

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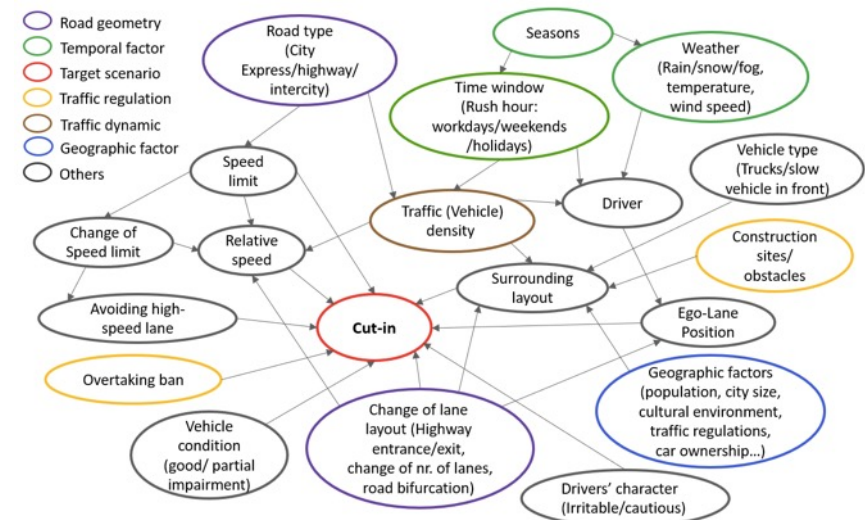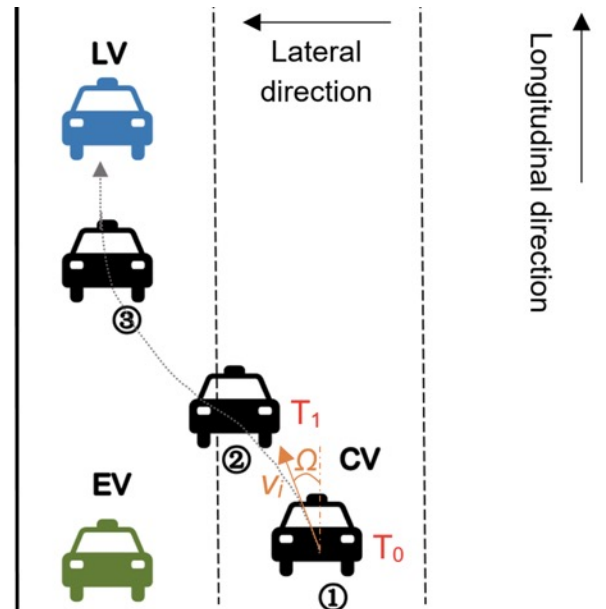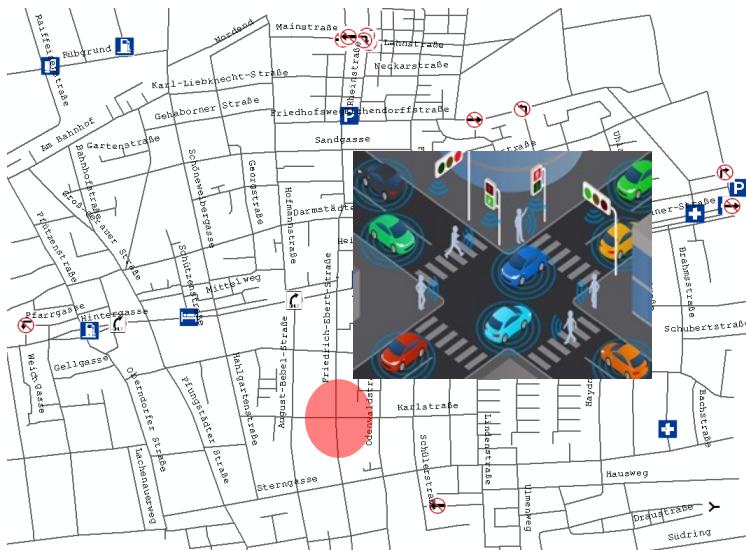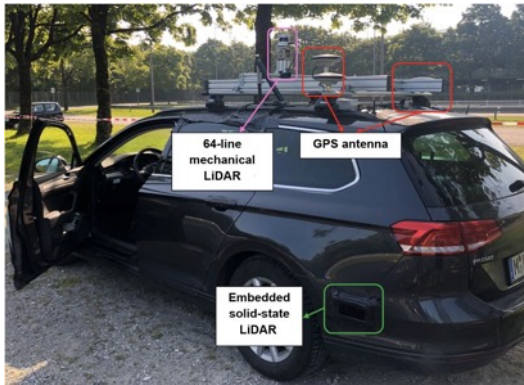
RESEARCH FIELDS IN VIENNA

- Location-based services

(a) User is far away - Landmark is not shown

(b) User is close - Landmark is shown.

VIENNA || Footprint (NKDE): All points
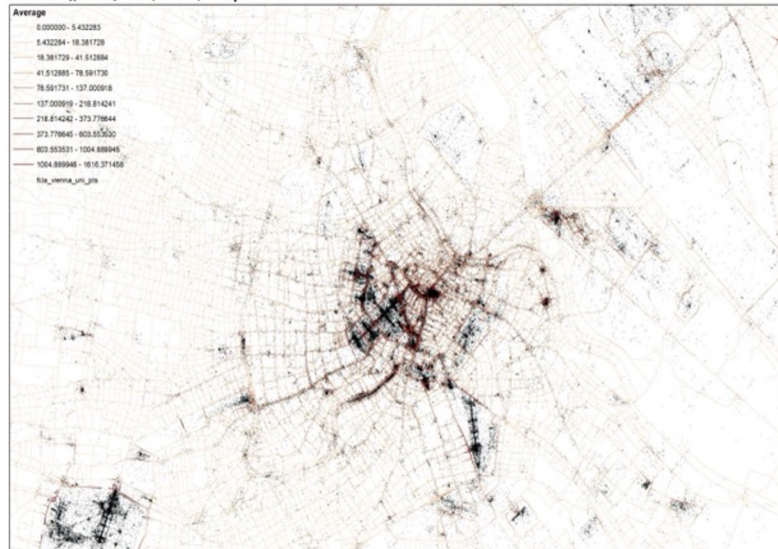
Was Sie auf genderatlas.at erwartet...

- Cartographic storytelling

- Knowledge networks

- Theoretical cartography

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RESEARCH FIELDS IN DRESDEN

A) Geovisual Analytics
(of Location-based Social Media)
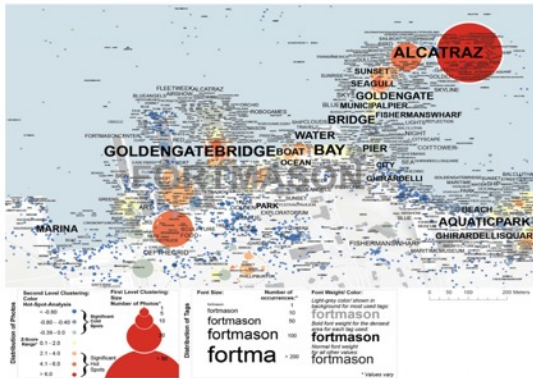
B) Artistic Map Design

C) Automated Generalisation and Multiple Representation

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RESEARCH FIELDS IN ENSCHEDE
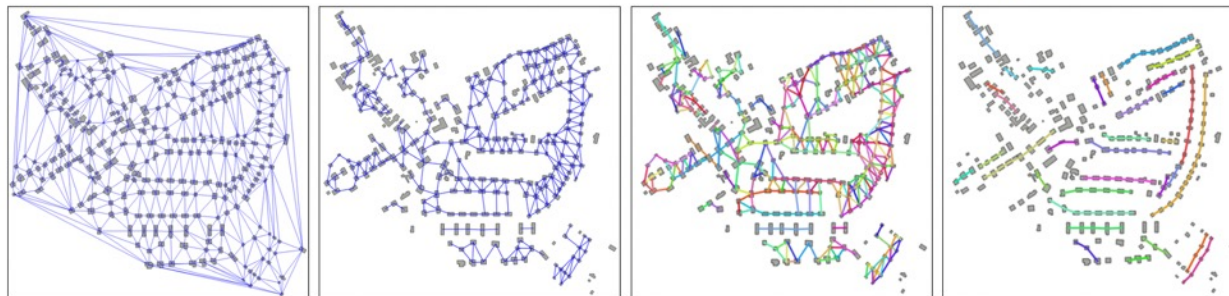
Cartographic interests in Twente

- Atlases / Dashboards
- Map AI & Map Ethics
- Mapping time
- Place & Space
- Visualization of automated workflows
- Data visualization

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THIS WERE YOUR CHOICES LAST YEAR IN MUNICH....

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 can "see yourself" doing your thesis...

BREAK-OUT

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mixed-reality

Artistic Map Design

spatial learning
HD mapping

Automated Generalisation and
Multiple Representation

Atlases / Dashboard design

Geovisual Analytics
(of Location-based Social Media)

Cartographic storytelling

Location-based services

Map AI & Map Ethics

Mapping time

Theoretical cartography

Place & Space

Knowledge networks

Visualization of automated workflows

Data visualization

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.

- We will organise a workshop (in S3) helping you shape your topic (from the list or your own)

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Tips & Practical Issues

- You'll have to select your topic on 1 January 2024 , well before the start of the 4th Semester. The better it follows your interests and ambitions, the better the result will be: **Start thinking now!**

- Keep a log book/diary for notes, ideas, questions, sketches, etc. Collect topic ideas in it.

- Talk with your fellow students & staff about it. Trying to explain your idea to others helps you shape and sharpen it!

- Start collecting & reading literature about things that interest you

  - use a reference manager (e.g., BibTeX, Zotero, Mendeley,…).

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Topic determined, what then...?

The research semester

Sources of information

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

- Procedural handbook

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Left Diagram

STUDENT	THESIS COORDINATOR	THESIS ASSESSMENT BOARD

- (i) ← publish topics
- topic choice **1.1** → confirm topics & supervisors → (i)
- write ERP with supervisor ↔ help student write ERP
- (i) ← assign chairs & reviewers → (i)
- ERP submission **2.0** → check plagiarism **2.1** → pre-defence assessment **2.2** →
- defend ERP **2.3** ⋯ attend defence session **2.3** ⋯ attend defence session **2.3** ⋯
- COMPLETE (good/sufficient) ← ERP assessment **2.4**
- inform student ← COMPLETE (good/sufficient)
- FAIL (weak) ← / FAIL (very weak)
- improve ERP **2.5** →
- improvement sufficient? **2.5** — YES → / NO ↓
- **5.1** FAIL
- thesis research work & writing ↔ supervise student

Right Diagram

STUDENT	THESIS COORDINATOR	THESIS ASSESSMENT BOARD

- create midterm presentation →
- present midterm **3.0** ⋯ attend presentation **3.0** ⋯ attend presentation **3.0** ⋯
- progress report **3.1** — RISK OF FAILURE → issue warning letter [signed by exam committee]
- 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 **4.3** ⋯ attend defence session **4.3** ⋯
- thesis assessment **4.4** — SUFFICIENT ... VERY GOOD → inform student
- FAIL ↓
- quick repair possible? **4.5** — YES → inform student & organise repair
- NO ↓
- repair thesis **4.5** → NO
- repair sufficient? **4.6** — YES →
- inform student ←
- **5.0** PASS   **5.1** FAIL

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 collected 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 by the start of Semester 4.

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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 your primary supervisor
  [also at TUM as administrating university]

  - beware that for UT-ITC registration fees are high (ca. €6.200) compared to TUM, TUD and TUW!
    [additional limited grants might be available]

  - for EM Scholarship students these fees will be paid by us

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Extended Research Proposal (ERP)

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

- Your **supervisors** will help you write your ERP
  - Your primary supervisor is assigned to you based on your topic choice
  - In most (not all) cases they are the person that proposed the topic
  - Your supervisor's university will be where you write your thesis
- Depending on the topic, there may be further supervisors, also from other research institutes or companies

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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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Left diagram

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  - COMPLETE (good/sufficient) → inform student
  - FAIL (weak) → improve ERP (2.5)
  - FAIL (very weak)
- improvement sufficient? (2.5)
  - YES
  - NO
- FAIL (5.1)
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Right diagram

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- create midterm presentation →
- present midterm (3.0) ⋯ attend presentation (3.0) ⋯ attend presentation (3.0)
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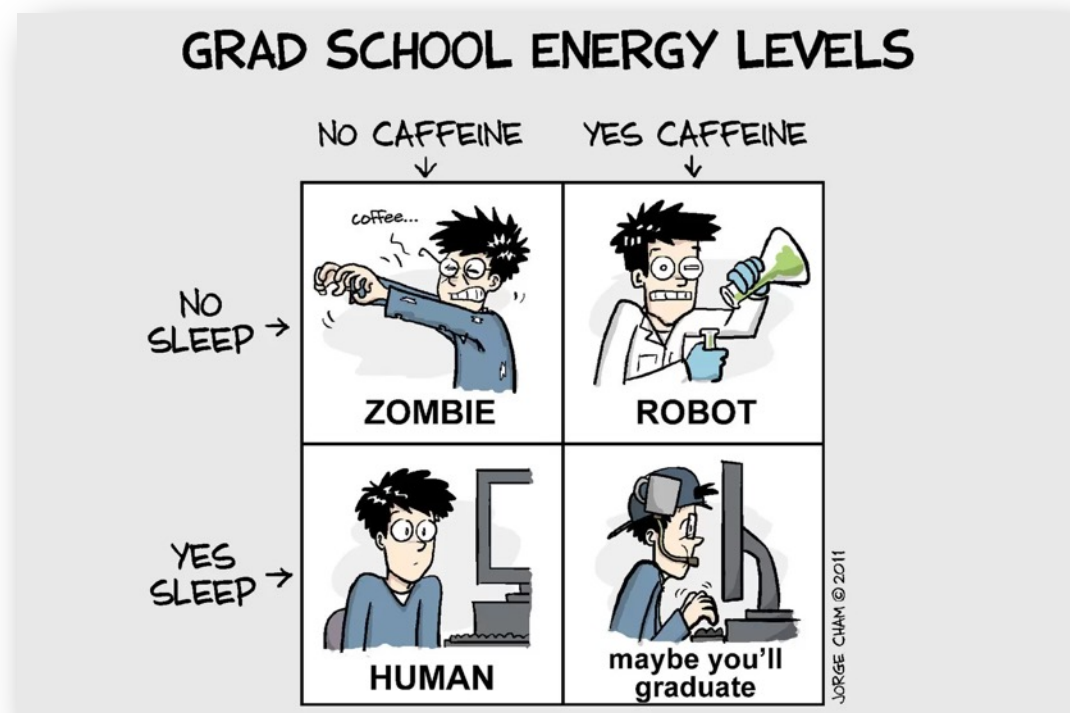- thesis research work & writing ↔ supervise student
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  - SUFFICIENT … VERY GOOD → inform student
  - FAIL
- quick repair possible? (4.5)
  - YES → inform student & organise repair → repair thesis (4.5)
  - NO
- repair sufficient? (4.6)
  - YES
  - NO → inform student
- PASS (5.0)
- FAIL (5.1)

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).

GRAD SCHOOL ENERGY LEVELS

NO CAFFEINE   YES CAFFEINE

NO SLEEP → coffee... ZOMBIE   ROBOT

YES SLEEP → HUMAN   maybe you'll graduate

JORGE CHAM © 2011

Timing in a Nutshell:

1 Dec	thesis topics list finalised
12 Dec	*topic choice & definition workshop*
1 January	topic selection by students
during Jan	*academic writing workshop*
during Jan	approval of thesis topic & supervisor
…	*…work on proposal…*
1 April	official start of semester 4
19 Apr	Extended Research Proposal (ERP)
29 Apr-5 May	ERP defence
…	*….working….*
24-27 June	midterm presentation
…	*….working….*
6 Sep	deadline for submission
23-27 Sep	thesis defences
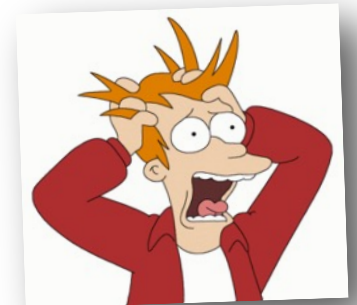
Q&A

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

kartoweb.itc.nl/msc-carto-thesis

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https://xkcd.com/2268/

We believe this resolves all remaining questions on this topic. No further research is needed.

References
1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]

JUST ONCE, I WANT TO SEE A RESEARCH PAPER WITH THE GUTS TO END THIS WAY.