NTK
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Národní technická knihovna
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National Centre
for Information Support of Research,
Development, and Innovation

NCIP VaVal KnowledgeStor Case Study: Doctoral candidate, final year of studies, applying for Czech Science Foundation (CSF)'s POSTDOC INDIVIDUAL FELLOWSHIP – 2023 OUTGOING (https://gacr.cz/file-download/49774)

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Content approved in April 2022 by individuals involved in the case study.

Expected audience: doctoral candidates applying for postdoctoral research funding at another European institution, with a planned return to the Czech Republic (year three)

Keywords: doctoral candidates, PhD students, postdoctoral research funding, Europe, Czech Republic

Table of Contents

Summary

What?

This document summaries **mentorship work with a doctoral candidate** in his final year of doctoral studies, preparing for international postdoctoral fellowships, including the Czech Science Foundation's (CSF's) outgoing postdoctoral fellowship.

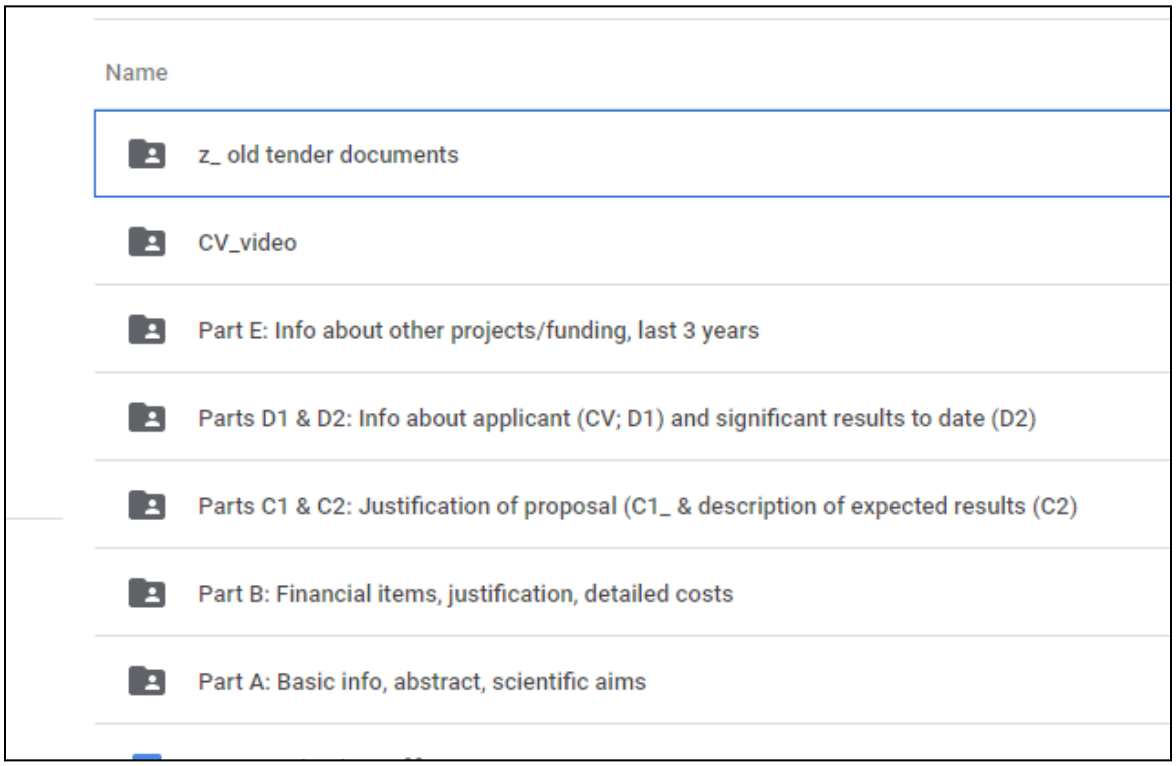
Who?

The student I worked with was a doctoral candidate, alum of NTK's (with Czech Technical University's [CTU]) scientific writing and presentation classes, which supported him, as a supplement to his two mentors' activities, in preparing to co-author his first articles and attend his first international conferences. PhD candidate at **CTU's Faculty of Civil Engineering, Department of Mechanics, and Department of Mathematics** (mentors from each department). Final year of studies, writing fellowship proposal prior to compiling his doctoral dissertation, a compilation of articles written in the course of his doctoral studies with defense completed in late 2022. Originally from Slovakia; completed Bachelor and Master work at Brno University of Technology's Faculty of Civil Engineering prior to CTU doctoral studies.

Where?

The student has an office at CTU, but has a young child and completed most of the writing of this proposal at home and, upon my request, he also spent **time in order to concentrate better at NTK**. During COVID, he was working mostly at home, which led to some distance from his colleagues in the research group (i.e., while he participated in online research group meetings, he did not work as closely with other members of his research group as in non-remote-work times). This meant **less casual interaction** with other doctoral students and postdoctoral researchers than in "normal" times, which he is trying to supplement at this point by reaching out individually to colleagues, where needed, for proposal presentation and particular skills (e.g., creation of a Gantt chart for this project, sample dissertation template from a colleague who recently defended his dissertation).

The proposal creation process itself was, due to the necessity of collaboration with his mentors (the researcher he wanted to work with [April 2023: now works with] in Germany) managed via Google Docs in a dedicated folder managed by the CTU Open Mechanics Group. The proposal was submitted through the CSF online system, with parts of the proposal entered into the system directly and other sections uploaded as PDFs into the system. After final collaborative editing in Google Docs, the student downloaded the files into Overleaf/LaTeX, for managing citations and final document preparation, before generating final PDFs.



Screenshot: collaborative Google editing space (anonymous folders only). The entire project workspace consisted of folders for each section of the proposal, a PDF of CSF's proposal requirements document, and an initial one-page summary mentors created with the doctoral candidate to solidify the idea before moving on to the actual proposal. Notes about all this are outlined later in this document.

I met with the doctoral candidate **weekly from January to April 2022 via Zoom** to **check in on project progress, discuss next steps, and define tasks** for the week ahead. I also attended his annual performance review conducted by the students' two mentors, upon the doctoral

candidate's request, to gain a broader understanding of his activities and plans prior to assisting with proposal preparation.

Why?

Following his doctoral studies, this student, at the time still undecided about his long-term career plans (academic career versus nonacademic programming career), needed to (1) conduct postdoctoral studies in the Czech Republic or (2) go abroad or (3) decide to leave academia. This was a **difficult life decision** for this doctoral candidate, because he'd spent his whole adult life so far in academia. He had excellent mentors who supported him (including supporting him in the past by facilitating research stints abroad before and helping him build his academic professional network) and who desired that he would receive good postdoctoral funding at a research group where he can continue his work on the disciplinary "edge" of mathematics, veering towards applied mathematics, including simulations for possible future use in 3D printing manufacturing.

His mentors identified this fellowship, and it was also possible for him to use the materials prepared for this application in other contexts, such as the Czech Research Foundation's JUNIOR STAR program, https://gacr.cz/en/types-of-grant-projects/, and the internationally-prestigious and competitive Marie Skłodowska-Curie (MSCA) postdoctoral fellowship program, https://marie-sklodowska-curie-actions.ec.europa.eu/actions/postdoctoral-fellowships. As of time of updating (April 2023), he is on the MSCA waiting list after receiving an excellent MSCA score. While he awaits news about that, he is a recipient of the CSF fellowship (i.e., our proposal writing effort was successful in his case).

When?

The deadline for this postdoctoral fellowship was **April** 7, with decisions to be made by **December** 2, 2022, and the student and I began working towards this submission goal in mid-January, following earlier work with his mentors on the one-page project description.

The task of creating the one-page description was challenging for this student, and its refinement took much investment of time (both in and out of weekly mentor meetings) from his mentors. The student also found time management and working independently on writing tasks to be difficult, so these are challenges we addressed from mid-January on, as will be explained below.

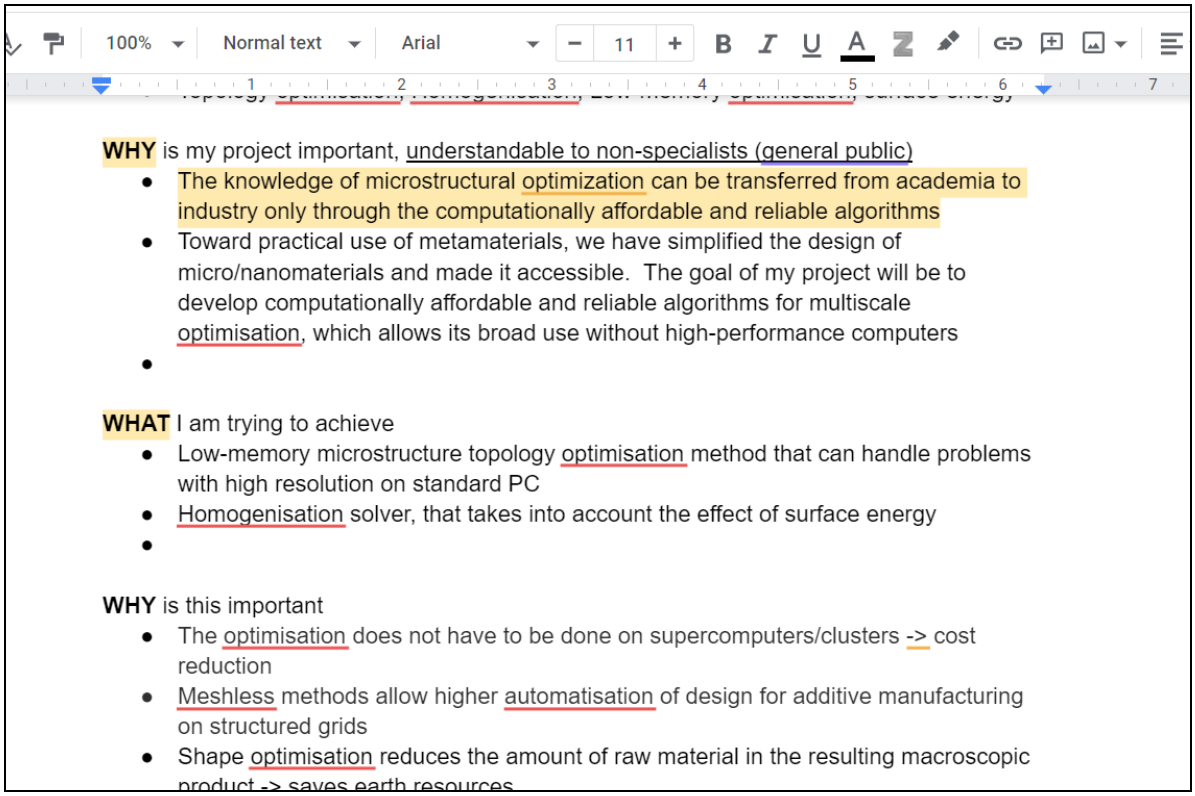
Details, collaboration with student, January to April 2022

The following sections describe work with the student over this time period.

January

Intensive work with this student, including weekly meetings, began in January. We started with an **initial Zoom** to touch bases again (the first discussions since the NTK presentation class several years before, so we did already know each other). I read through the students' one-page proposal first, to get an idea of what he was working on and the status of work with his mentors. This brainstorming document was already almost 20 pages long because of various draft versions, kept in the document to make sure the student saw progress, with the mentors trying to get the student to define, for the project, a title and **what/where/why/when/how statement** regarding his proposal idea. The mentors also introduced the student to the typical **project outline**, including a state-of-the-art summary and related literature.

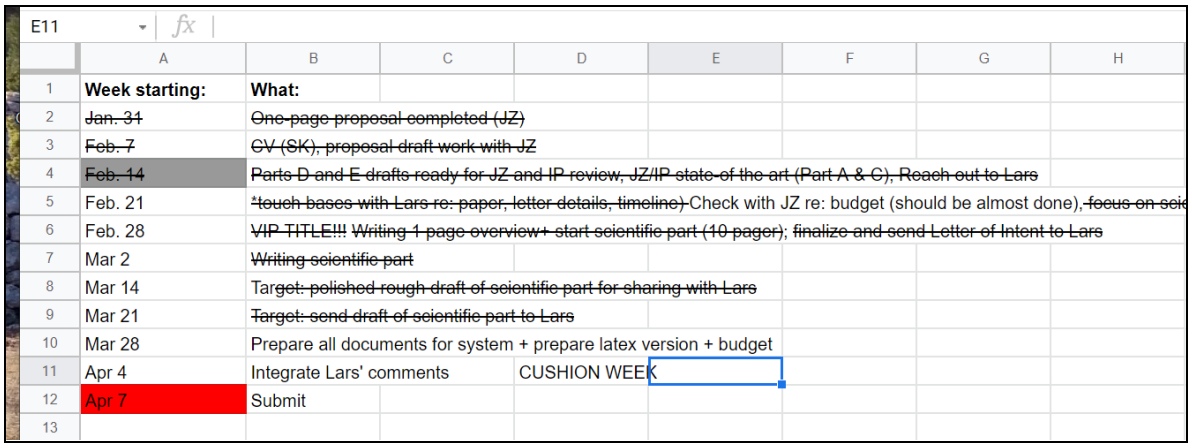
The student struggled somewhat in filling out these blanks, and it was not until later, in March, that everything "clicked" for the student, including his summary of literature in areas new to him and a clear definition of what he was trying to do. This happened when he finally **concentrated on the task at hand**.



Screenshot: Having the student define things in bullet points prior to starting to write the narrative proposal text.

After reading through the one-pager and talking to the student, it was clear to me that the student really was stuck, like a deer in the headlights, with the overwhelming nature of the task ahead, mostly due to lack of time to concentrate and the ability to independently divide the task (writing the proposal) into sub-tasks, even though he was trying to use the project/time management tool Trello (https://trello.com/), a tool marketed directly to people via ads on search engines and so on. Unfortunately, I often find that these **tools can confuse students more often than they assist them**, because the students combine these notifications with other notifications from social media and end up being notified about many things but not able to concentrate on any of them, without realizing they are unable to concentrate.

Thus, in the shared folder, I created a simple **completion timeline** in Google Sheets that we could refer to and discuss each week, myself breaking down the timeline into constituent components as an example for the student in also **thinking about work packages and tasks** in the proposal itself, focusing on simplicity rather than undue complexity.



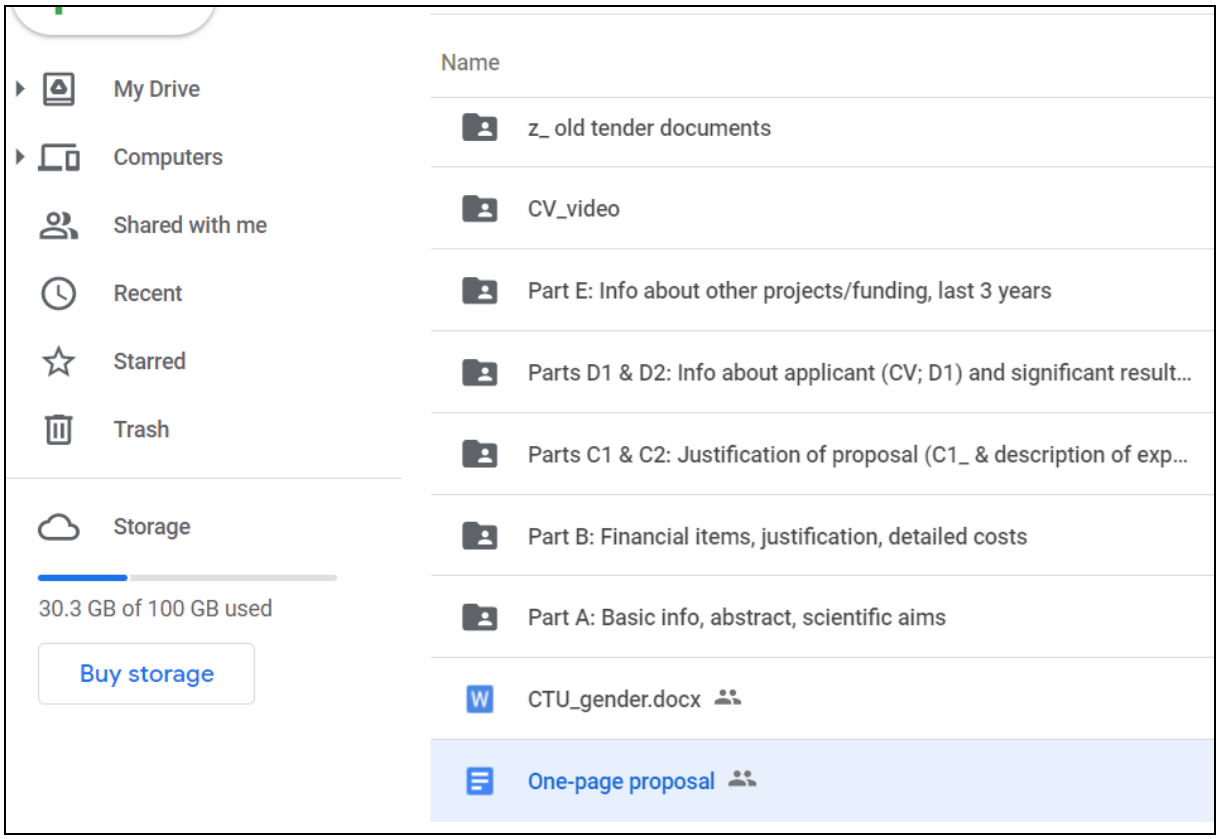
	A	B	C	D	E	F	G	H
1	**Week starting:**	**What:**						
2	~~Jan. 31~~	~~One-page proposal completed (JZ)~~						
3	~~Feb. 7~~	~~CV (SK), proposal draft work with JZ~~						
4	~~Feb. 14~~	~~Parts D and E drafts ready for JZ and IP review, JZ/IP state-of the art (Part A & C), Reach out to Lars~~						
5	Feb. 21	~~*touch bases with Lars re: paper, letter details, timeline)~~ Check with JZ re: budget (should be almost done), ~~focus on sci~~						
6	Feb. 28	~~VIP TITLE!!!~~ ~~Writing 1 page overview+ start scientific part (10 pager)~~; ~~finalize and send Letter of Intent to Lars~~						
7	Mar 2	~~Writing scientific part~~						
8	Mar 14	Tar~~get: polished rough draft of scientific part for sharing with Lars~~						
9	Mar 21	~~Target: send draft of scientific part to Lars~~						
10	Mar 28	Prepare all documents for system + prepare latex version + budget						
11	Apr 4	Integrate Lars' comments		CUSHION WEEK				
12	Apr 7	Submit						
13								

Screenshot: Sample tasklist in Google Sheets.

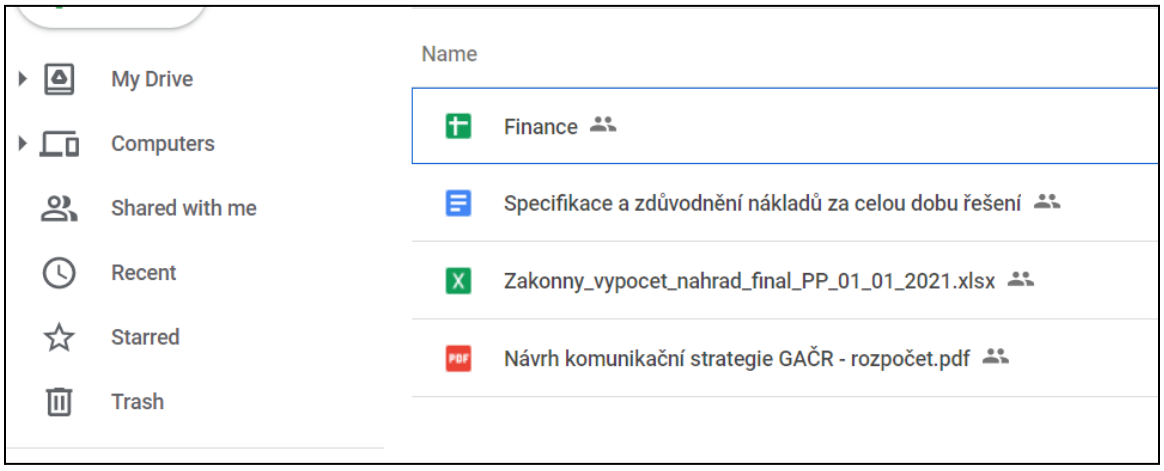
Following this, I read through the **entire CSF proposal instructions** to familiarize myself with them. Surprisingly, these were nicely structured by someone who purposefully wanted to have students walk through a proposal process that would emulate that of European Research Council (ERC, https://erc.europa.eu/) grants, which was particularly apparent to me since I'd assisted a CTU postdoc with an ERC proposal the month before. Excellent proposal instructions are a wonderful learning tool because the doctoral candidates, with this kind of structured proposal, **need to pull together all the information they need to not only apply for an EU grant in the future but also apply for any position in academia**. This means that, by preparing this kind of proposal, the doctoral candidates are not surprised by this process down the road. In this student's case, he went through this process a full decade before the postdoc I mention above, who also was putting together his CV and "life story" in this kind of format for the very first time in the ERC context.

Since the proposal instructions were very clear and the structure of the proposal was broken into sections, which allowed me to **make Google Drive folders for each section**, dropping into each section any background information (e.g., a resume created previously by the student) helpful to that section.

I labeled each section so that the student (and myself and his mentors) would have an easy overview of what was in each folder.



Screenshot: Section folders on Google Drive, with brief labels (anonymous version).



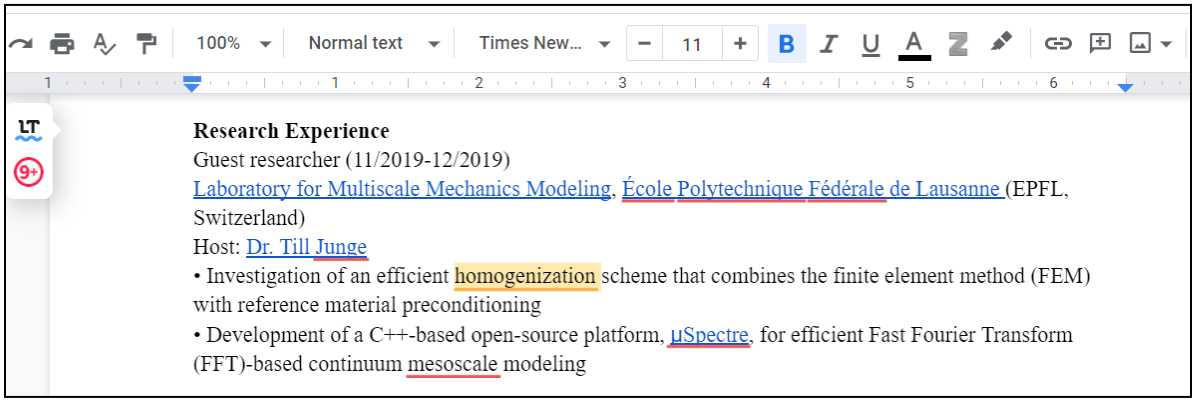
Screenshot: Sample budget folder, with documents from mentor, who actively assisted with educating the student about proper budget formulation.

Since the student at this time was still completing the one-page proposal with mentors, I suggested we **begin working on the "easy" parts** of the proposal first in parallel with his work on the scientific part. These were the parts related to the students' biography:

- CV (two pages)
- Description of significant results (no page limit defined by CSF)
- Info about project experience to date

For the CV, Jan Zeman (one of the mentors mentioned above) and I had, through the course of our work with the aforementioned postdoc working on his ERC proposal, found that **a textual summary augmenting the traditional academic CV** format was helpful, also to doctoral candidates in summarizing, *to themselves*, what their actual research interests are. Surprisingly, many of the early career researchers we work with do not seem to understand fully what they are doing and what career opportunities might be, so this exercise is helpful to all of them.

Because the doctoral candidate was struggling with the blank page, I helped him by taking information I already had from his brief resume, re-formatting it into a CV outline, and then **asking him to complete missing sections and fill out additional information** needed. After he did this, I asked him to send the link to the draft CV text to his mentors for their review.



Screenshot; Collaborative work on student's CV, me and Jan Zeman collaborative commentaries at right (cropped to maintain privacy of student), anonymous cropped version.

Focusing on these sections also enabled the student to carefully read the proposal guidelines; I started listing these in the three collaborative documents for this section, and he completed the instructions, using comments to make notes to himself. During this process, he noticed that we

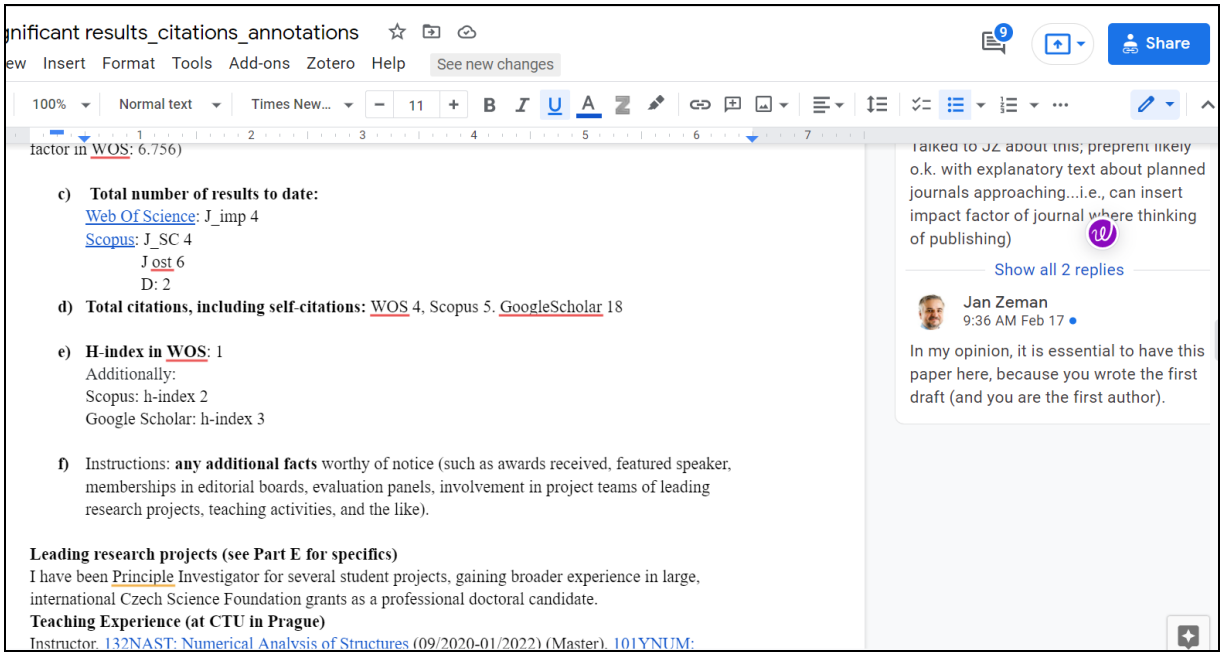
were working with CSF instructions from the previous year, and so he completed an automated comparison of the two instructional PDFs and revised our folder labels and added details not in the document from the year before into our collaborative documents, which was very helpful to me and his mentors because we did not have to perform this work ourselves for him. He showed great initiative in this regard.

The **summary of significant results** was slightly difficult for the student, so we talked about this over Zoom and I had the fresh model in my mind from his colleague's ERC proposal, so could use this as an example. I helped with some skeleton text and:

- Reminded him about proper citation formats
- Introduced him to the CreDiT taxonomy, https://www.elsevier.com/authors/policies-and-guidelines/credit-author-statement, for describing author contributions
- Showed him how to access SCOPUS and WOS via NTK in order to retrieve his citation data, journal impact factors, and various h-indexes
- Reminded him to update all his online profile pages
- Reminded him to check CSF definitions for what can be considered an article in the Czech national system (he checked this then independently on the CSF pages)

He noted that he **remembered hearing about this in the NTK/CTU Scientific Writing course**, but that he hadn't had to compile that information since that time.

I explained how it's useful to **update one's CV at six-month intervals**, and that the careful work of listing everything he experienced now as a doctoral candidate (including teaching and conference experiences) would make this task easier in the future.

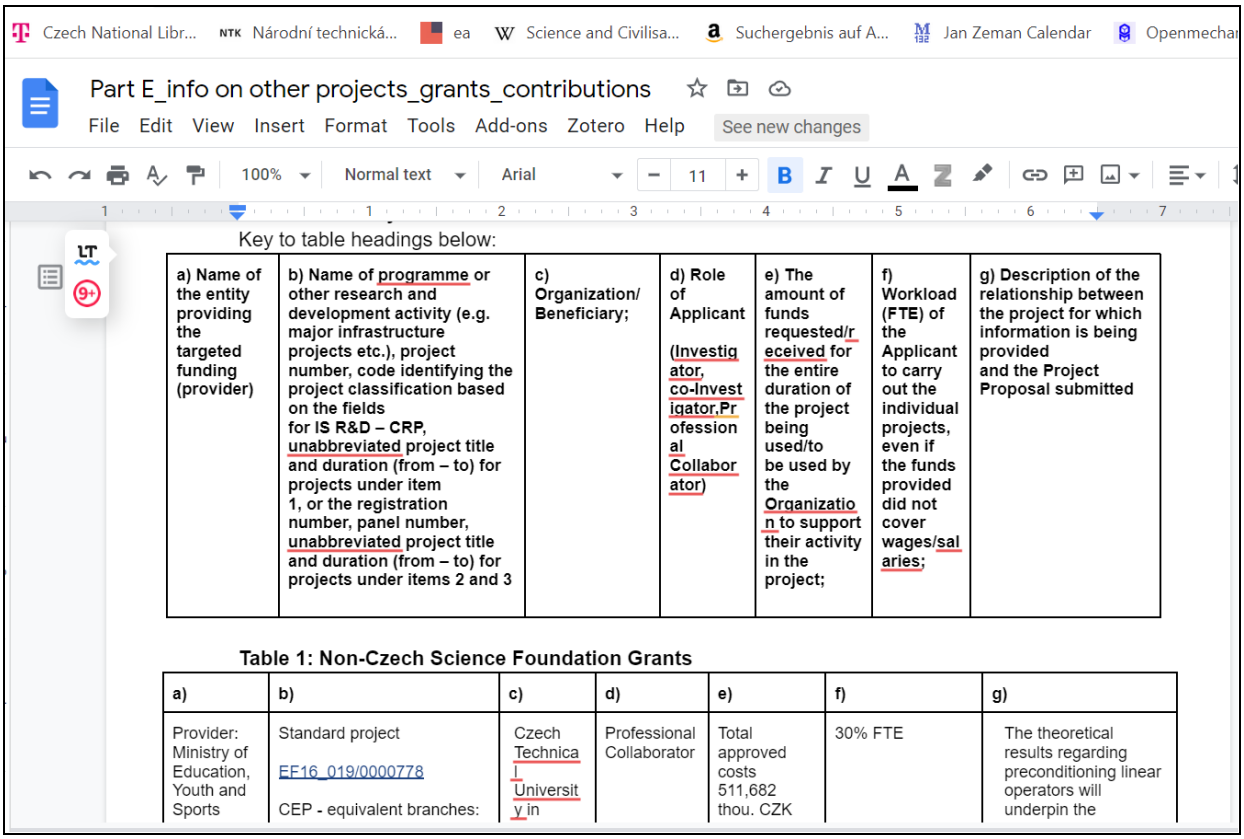


Screenshot: Sample from significant results section, with mentor dialogue and results summaries (other sections contain identifying information about this student, so are not pictured here).

For the section pertaining to project participation to date, I assisted the student by setting up a table, again using the aforementioned postdoc ERC proposal as an example, and noting where he needs to fill in relevant information. Screenshots are provided below, since information professionals may often not see examples of this activity.

The doctoral candidate found the **description of activities (his own) in prior projects**, tying these into how prior experiences prepared him for this proposed fellowship, to be the most difficult task. I had to provide some starting text. **Mentors made sure the roles presented were accurate and suggested edits**. The student double-checked all project titles and numbers in the official Czech grant funding system.

The following five screenshots are of the project descriptions (note: the doctoral candidate approved publication of these screenshots).



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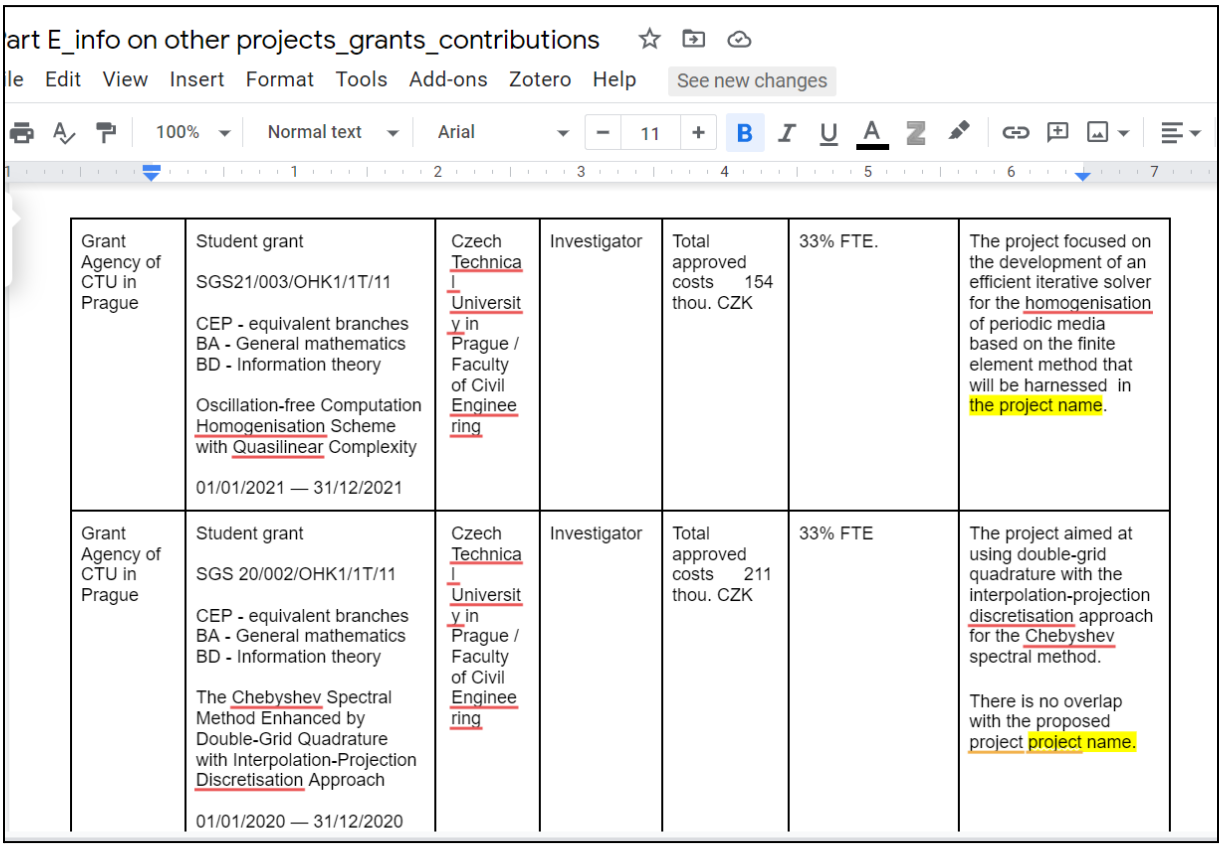
Key to table headings below:

a) Name of the entity providing the targeted funding (provider)	b) Name of programme or other research and development activity (e.g. major infrastructure projects etc.), project number, code identifying the project classification based on the fields for IS R&D – CRP, unabbreviated project title and duration (from – to) for projects under item 1, or the registration number, panel number, unabbreviated project title and duration (from – to) for projects under items 2 and 3	c) Organization/ Beneficiary;	d) Role of Applicant (Investigator, co-Investigator,Professional Collaborator)	e) The amount of funds requested/received for the entire duration of the project being used/to be used by the Organization to support their activity in the project;	f) Workload (FTE) of the Applicant to carry out the individual projects, even if the funds provided did not cover wages/salaries;	g) Description of the relationship between the project for which information is being provided and the Project Proposal submitted

Table 1: Non-Czech Science Foundation Grants

a)	b)	c)	d)	e)	f)	g)
Provider: Ministry of Education, Youth and Sports	Standard project EF16_019/0000778 CEP - equivalent branches:	Czech Technical University in	Professional Collaborator	Total approved costs 511,682 thou. CZK	30% FTE	The theoretical results regarding preconditioning linear operators will underpin the



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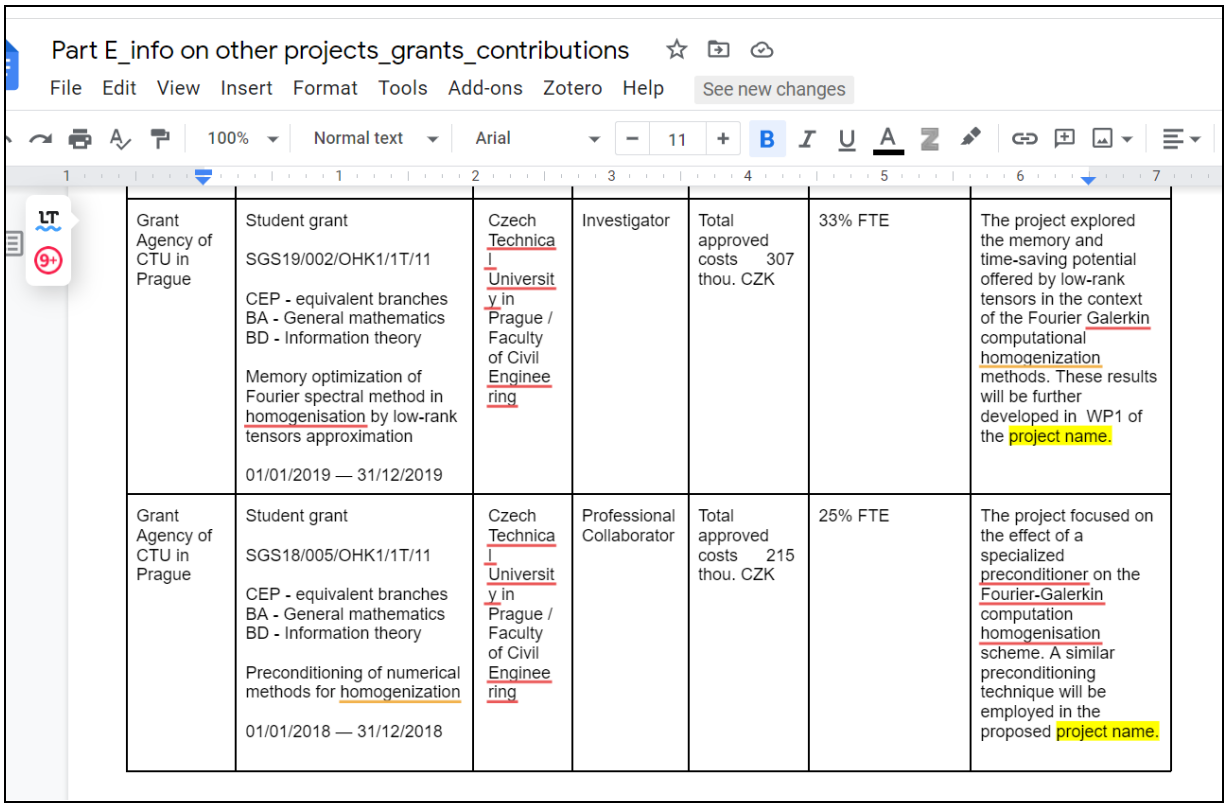
Grant Agency of CTU in Prague	Student grant SGS21/003/OHK1/1T/11 CEP - equivalent branches BA - General mathematics BD - Information theory Oscillation-free Computation Homogenisation Scheme with Quasilinear Complexity 01/01/2021 — 31/12/2021	Czech Technical University in Prague / Faculty of Civil Engineering	Investigator	Total approved costs 154 thou. CZK	33% FTE.	The project focused on the development of an efficient iterative solver for the homogenisation of periodic media based on the finite element method that will be harnessed in the project name.
Grant Agency of CTU in Prague	Student grant SGS 20/002/OHK1/1T/11 CEP - equivalent branches BA - General mathematics BD - Information theory The Chebyshev Spectral Method Enhanced by Double-Grid Quadrature with Interpolation-Projection Discretisation Approach 01/01/2020 — 31/12/2020	Czech Technical University in Prague / Faculty of Civil Engineering	Investigator	Total approved costs 211 thou. CZK	33% FTE	The project aimed at using double-grid quadrature with the interpolation-projection discretisation approach for the Chebyshev spectral method. There is no overlap with the proposed project project name.



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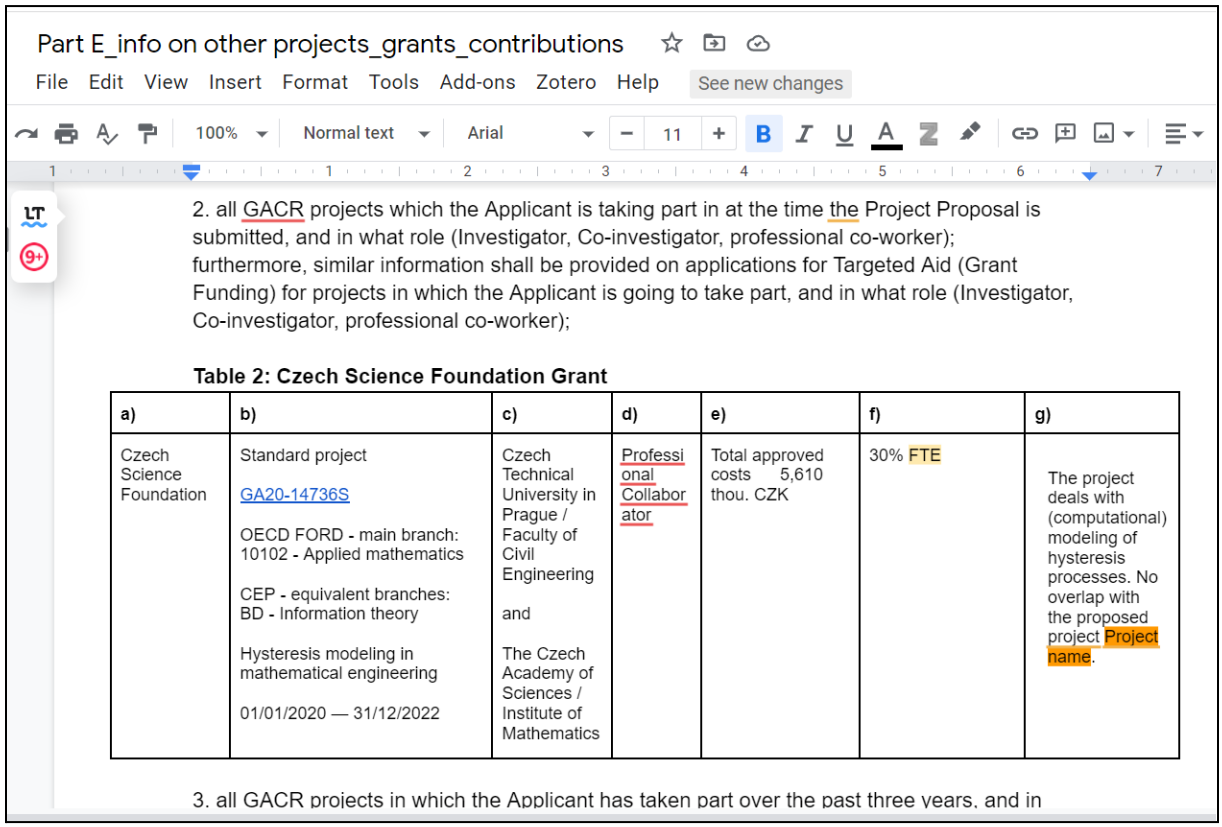
Grant Agency of CTU in Prague	Student grant SGS19/002/OHK1/1T/11 CEP - equivalent branches BA - General mathematics BD - Information theory Memory optimization of Fourier spectral method in homogenisation by low-rank tensors approximation 01/01/2019 — 31/12/2019	Czech Technical University in Prague / Faculty of Civil Engineering	Investigator	Total approved costs 307 thou. CZK	33% FTE	The project explored the memory and time-saving potential offered by low-rank tensors in the context of the Fourier Galerkin computational homogenization methods. These results will be further developed in WP1 of the project name.
Grant Agency of CTU in Prague	Student grant SGS18/005/OHK1/1T/11 CEP - equivalent branches BA - General mathematics BD - Information theory Preconditioning of numerical methods for homogenization 01/01/2018 — 31/12/2018	Czech Technical University in Prague / Faculty of Civil Engineering	Professional Collaborator	Total approved costs 215 thou. CZK	25% FTE	The project focused on the effect of a specialized preconditioner on the Fourier-Galerkin computation homogenisation scheme. A similar preconditioning technique will be employed in the proposed project name.



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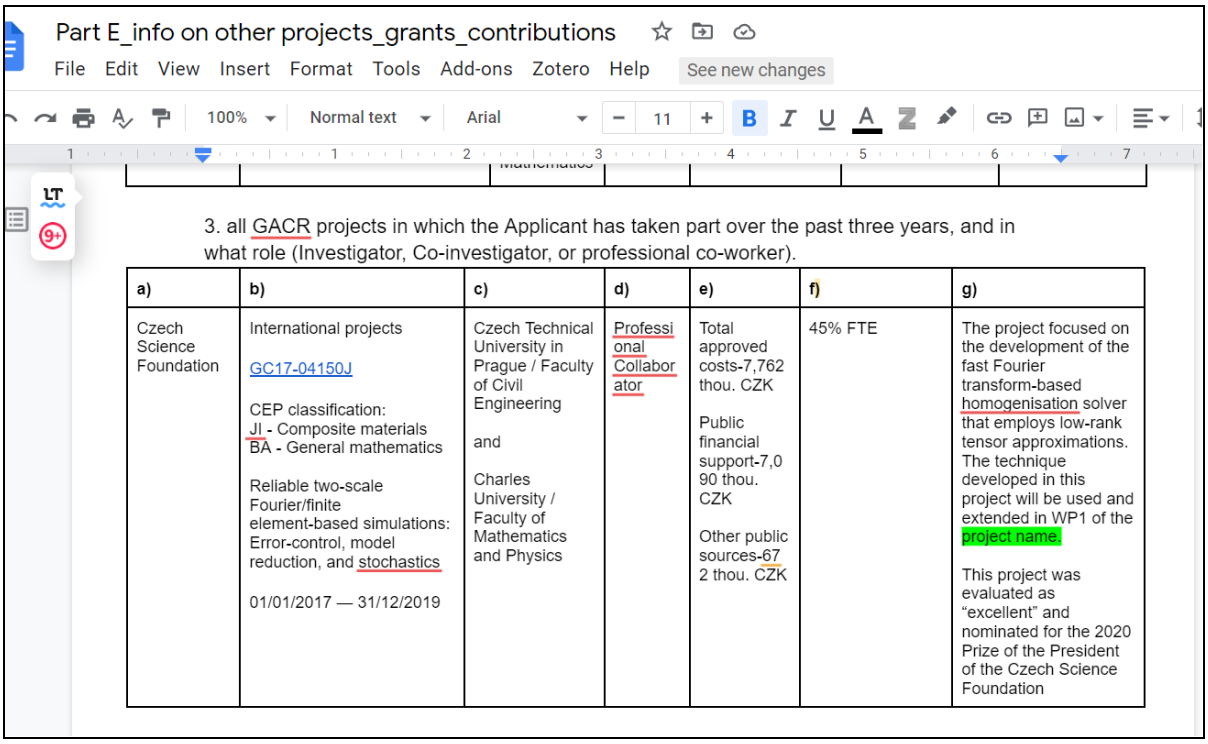
2. all GACR projects which the Applicant is taking part in at the time the Project Proposal is submitted, and in what role (Investigator, Co-investigator, professional co-worker); furthermore, similar information shall be provided on applications for Targeted Aid (Grant Funding) for projects in which the Applicant is going to take part, and in what role (Investigator, Co-investigator, professional co-worker);

Table 2: Czech Science Foundation Grant

a)	b)	c)	d)	e)	f)	g)
Czech Science Foundation	Standard project GA20-14736S OECD FORD - main branch: 10102 - Applied mathematics CEP - equivalent branches: BD - Information theory Hysteresis modeling in mathematical engineering 01/01/2020 — 31/12/2022	Czech Technical University in Prague / Faculty of Civil Engineering and The Czech Academy of Sciences / Institute of Mathematics	Professional Collaborator	Total approved costs 5,610 thou. CZK	30% FTE	The project deals with (computational) modeling of hysteresis processes. No overlap with the proposed project Project name.

3. all GACR projects in which the Applicant has taken part over the past three years, and in



3. all GACR projects in which the Applicant has taken part over the past three years, and in what role (Investigator, Co-investigator, or professional co-worker).

a)	b)	c)	d)	e)	f)	g)
Czech Science Foundation	International projects GC17-04150J CEP classification: JI - Composite materials BA - General mathematics Reliable two-scale Fourier/finite element-based simulations: Error-control, model reduction, and stochastics 01/01/2017 — 31/12/2019	Czech Technical University in Prague / Faculty of Civil Engineering and Charles University / Faculty of Mathematics and Physics	Professional Collaborator	Total approved costs-7,762 thou. CZK Public financial support-7,090 thou. CZK Other public sources-672 thou. CZK	45% FTE	The project focused on the development of the fast Fourier transform-based homogenisation solver that employs low-rank tensor approximations. The technique developed in this project will be used and extended in WP1 of the project name. This project was evaluated as "excellent" and nominated for the 2020 Prize of the President of the Czech Science Foundation

Screenshots directly above: Prior project descriptions and ties to the proposal project.

Finally, the doctoral candidate took the s**ample Letter of Intent** text from the CSF proposal instructions and mocked it up in Google Docs for review by mentors. He later, once he selected a project title in March, sent the letter to his host researcher in Germany for review, who then returned the signed letter which is then uploaded into the CSF system space together with an affidavit of proposed dissertation defense date, which he obtained from CTU and assistance from his mentors.

Summary: information resources and their use in the biographical materials sections

Regarding work with **information resources during the creation of the CV and related materials**, "traditional" and "nontraditional" information resources used included:

- Google Scholar (h-index)
- SCOPUS (journal impact factor and h-index)
- WOS (journal impact factor and h-index)
- ORCiD (made sure set-up and functioning properly)
- Publons (double-checked ID matching WOS)
- ResearchGate (own profile and publication announcements)
- GitLab (where the student stores open code)

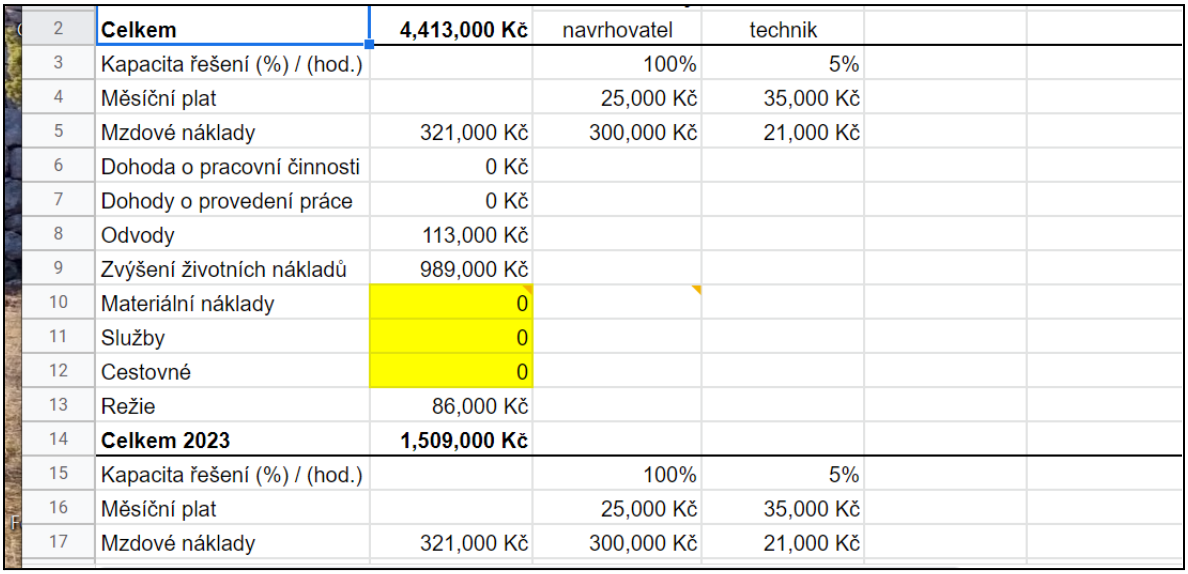
- arXiv (where the student publishes preprints)
- Citace PRO (formatted citations but student decided to use a different style and manage in Overleaf)

February and March

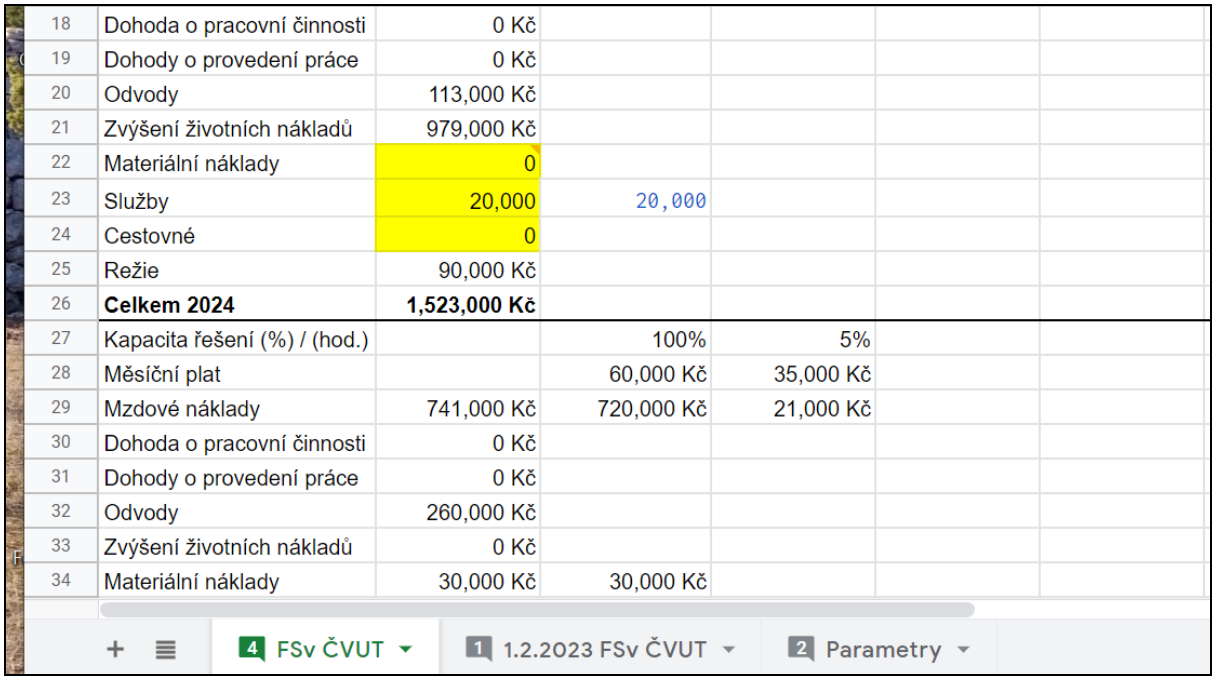
Work in these months was less about information reporting and was focused on **writing the scientific parts** of the proposal

Jan Zeman took on mentorship for the budget section, using examples from prior CSF projects. For the budget, he provided **definitions** of what can be funded (i.e., definitions of various costs) and CSF provided the funding levels in the proposal documentation for Germany, where the doctoral candidate would be placed the first two years of the fellowship.

Since information professionals and doctoral candidates just starting out often do not see this part of such a proposal, five screenshots are included below as examples:

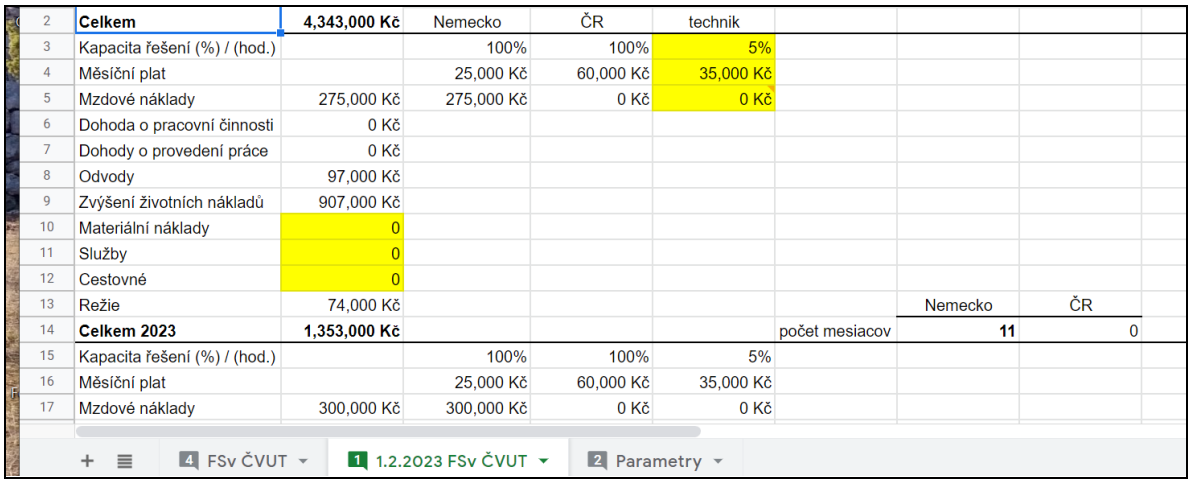


2	**Celkem**	**4,413,000 Kč**	navrhovatel	technik
3	Kapacita řešení (%) / (hod.)		100%	5%
4	Měsíční plat		25,000 Kč	35,000 Kč
5	Mzdové náklady	321,000 Kč	300,000 Kč	21,000 Kč
6	Dohoda o pracovní činnosti	0 Kč		
7	Dohody o provedení práce	0 Kč		
8	Odvody	113,000 Kč		
9	Zvýšení životních nákladů	989,000 Kč		
10	Materiální náklady	0		
11	Služby	0		
12	Cestovné	0		
13	Režie	86,000 Kč		
14	**Celkem 2023**	**1,509,000 Kč**		
15	Kapacita řešení (%) / (hod.)		100%	5%
16	Měsíční plat		25,000 Kč	35,000 Kč
17	Mzdové náklady	321,000 Kč	300,000 Kč	21,000 Kč



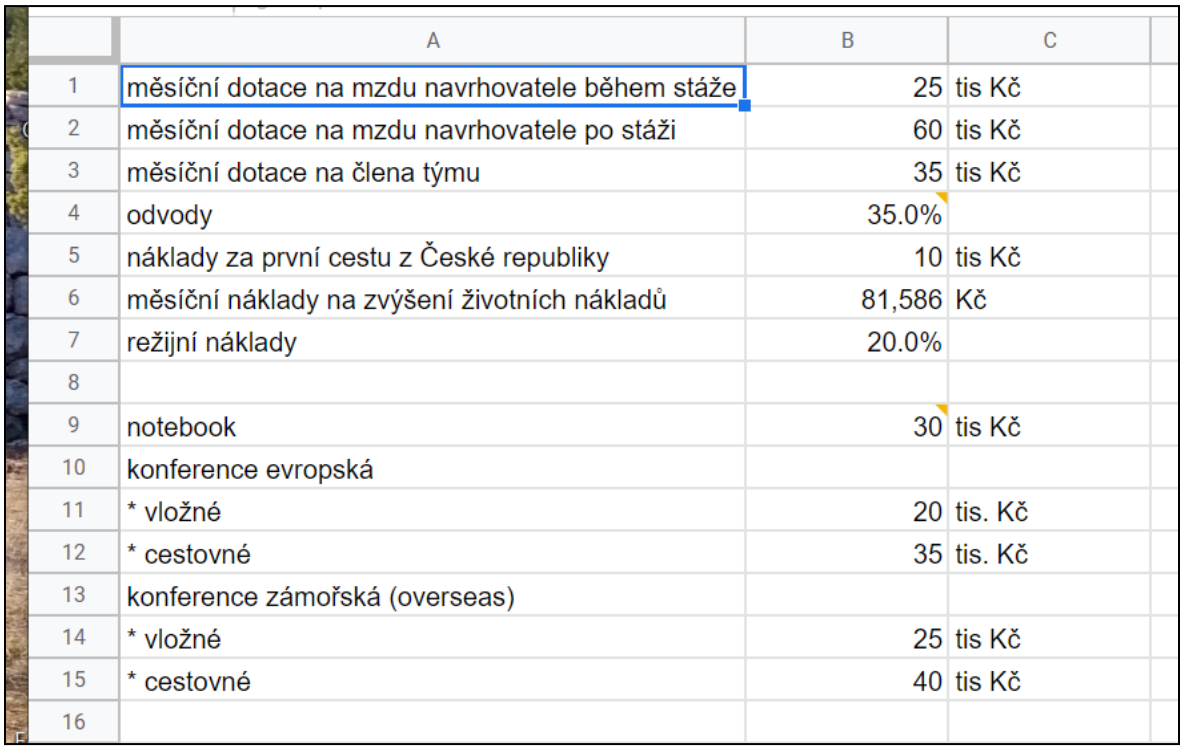
18	Dohoda o pracovní činnosti	0 Kč				
19	Dohody o provedení práce	0 Kč				
20	Odvody	113,000 Kč				
21	Zvýšení životních nákladů	979,000 Kč				
22	Materiální náklady	0				
23	Služby	20,000	20,000			
24	Cestovné	0				
25	Režie	90,000 Kč				
26	**Celkem 2024**	**1,523,000 Kč**				
27	Kapacita řešení (%) / (hod.)		100%	5%		
28	Měsíční plat		60,000 Kč	35,000 Kč		
29	Mzdové náklady	741,000 Kč	720,000 Kč	21,000 Kč		
30	Dohoda o pracovní činnosti	0 Kč				
31	Dohody o provedení práce	0 Kč				
32	Odvody	260,000 Kč				
33	Zvýšení životních nákladů	0 Kč				
34	Materiální náklady	30,000 Kč	30,000 Kč			

26	**Celkem 2024**	**1,523,000 Kč**		
27	Kapacita řešení (%) / (hod.)		100%	5%
28	Měsíční plat		60,000 Kč	35,000 Kč
29	Mzdové náklady	741,000 Kč	720,000 Kč	21,000 Kč
30	Dohoda o pracovní činnosti	0 Kč		
31	Dohody o provedení práce	0 Kč		
32	Odvody	260,000 Kč		
33	Zvýšení životních nákladů	0 Kč		
34	Materiální náklady	30,000 Kč	30,000 Kč	
35	Služby	45,000 Kč	45,000 Kč	
36	Cestovné	75,000 Kč	75,000 Kč	
37	Režie	230,000 Kč		
38	**Celkem 2025**	**1,381,000 Kč**		
39	Kontrolní součet	0 Kč		
40				



2	**Celkem**	**4,343,000 Kč**	Nemecko	ČR	technik				
3	Kapacita řešení (%) / (hod.)		100%	100%	5%				
4	Měsíční plat		25,000 Kč	60,000 Kč	35,000 Kč				
5	Mzdové náklady	275,000 Kč	275,000 Kč	0 Kč	0 Kč				
6	Dohoda o pracovní činnosti	0 Kč							
7	Dohody o provedení práce	0 Kč							
8	Odvody	97,000 Kč							
9	Zvýšení životních nákladů	907,000 Kč							
10	Materiální náklady	0							
11	Služby	0							
12	Cestovné	0							
13	Režie	74,000 Kč					Nemecko	ČR	
14	**Celkem 2023**	**1,353,000 Kč**				počet mesiacov	**11**	0	
15	Kapacita řešení (%) / (hod.)		100%	100%	5%				
16	Měsíční plat		25,000 Kč	60,000 Kč	35,000 Kč				
17	Mzdové náklady	300,000 Kč	300,000 Kč	0 Kč	0 Kč				

FSv ČVUT | 1.2.2023 FSv ČVUT | Parametry



	A	B	C
1	měsíční dotace na mzdu navrhovatele během stáže	25	tis Kč
2	měsíční dotace na mzdu navrhovatele po stáži	60	tis Kč
3	měsíční dotace na člena týmu	35	tis Kč
4	odvody	35.0%	
5	náklady za první cestu z České republiky	10	tis Kč
6	měsíční náklady na zvýšení životních nákladů	81,586	Kč
7	režijní náklady	20.0%	
8			
9	notebook	30	tis Kč
10	konference evropská		
11	* vložné	20	tis. Kč
12	* cestovné	35	tis. Kč
13	konference zámořská (overseas)		
14	* vložné	25	tis Kč
15	* cestovné	40	tis Kč
16			

Screenshots: Budget spreadsheets

Regarding proposal writing, **C1 - justification of the proposal, was the most difficult task** for the doctoral candidate, and thus writing this section took several weeks and assistance from his mentorship team. After prompting from his mentors and from me, the student put an outline in Google Docs based on CSF proposal requirements, including expected page requirements, and the mentorship team and the student started with the easiest sections first.

His scientific mentors proposed he **start with bullet points for defining work packages, tasks, and deliverables per year of the fellowship as well as project risks**, and I assisted with the following sections, including drafting sample text for the student to work from:

- Host institution and history of collaboration
- Applicant readiness, data management (DMP) and gender equality plan (GEP)

DMP and GEP were new to the CSF fellowship proposal requirements in 2022, and their inclusion took the mentors by surprise. Thus, I had to do some **basic education about these things with the doctoral candidate via Zoom**, since the concepts as required in a proposal (something that usually happens at the ERC/EU proposal level) were newly-introduced in this CSF context at this level. Also, it was a new experience for this student to look up and describe information about his host institution and place it into a **context whereby he could discuss knowledge transfer from Germany back to the Czech Republic, one of the key goals of this fellowship**. Talking about open data was something the doctoral candidate was used to from prior publication activities and from work with colleagues in the context of GitLab.

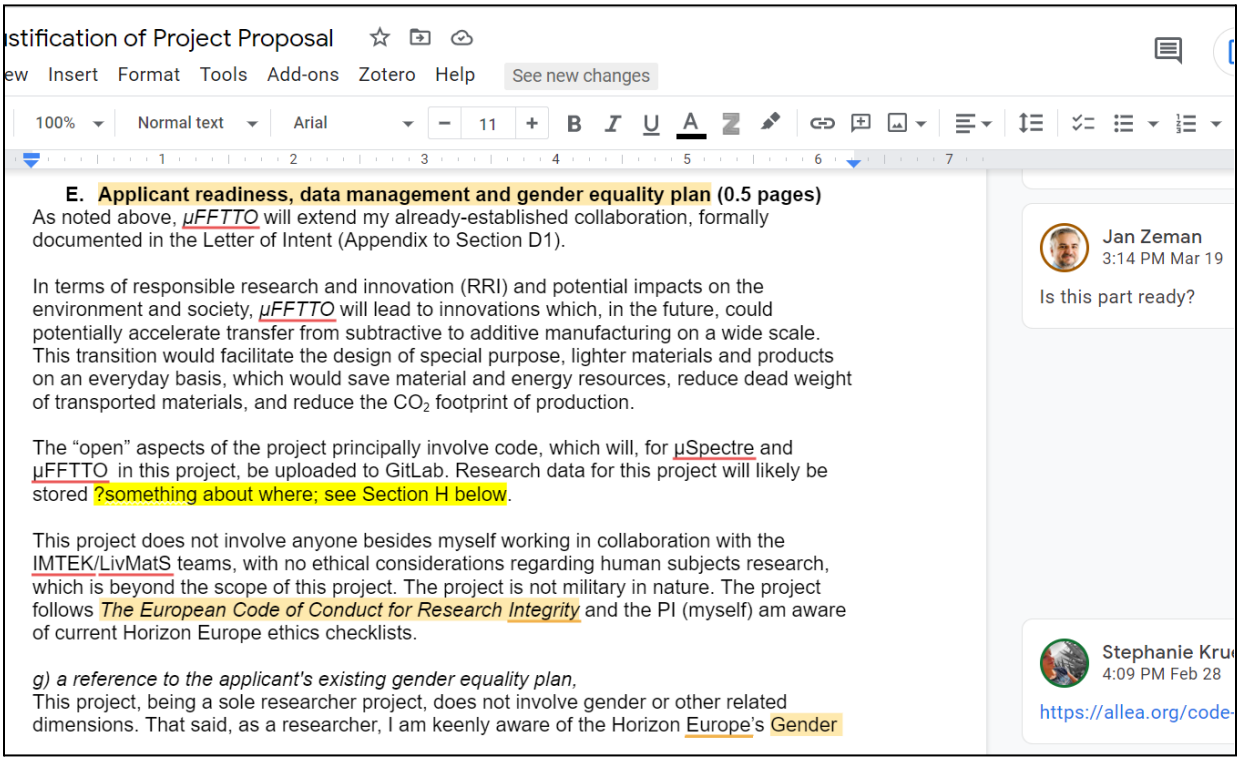
For the DMP and GEP, we could be brief in this proposal due to page requirements. I believe the CSF's educational goal was achieved: to **introduce doctoral candidates and mentors to concepts they will encounter at the European level**.

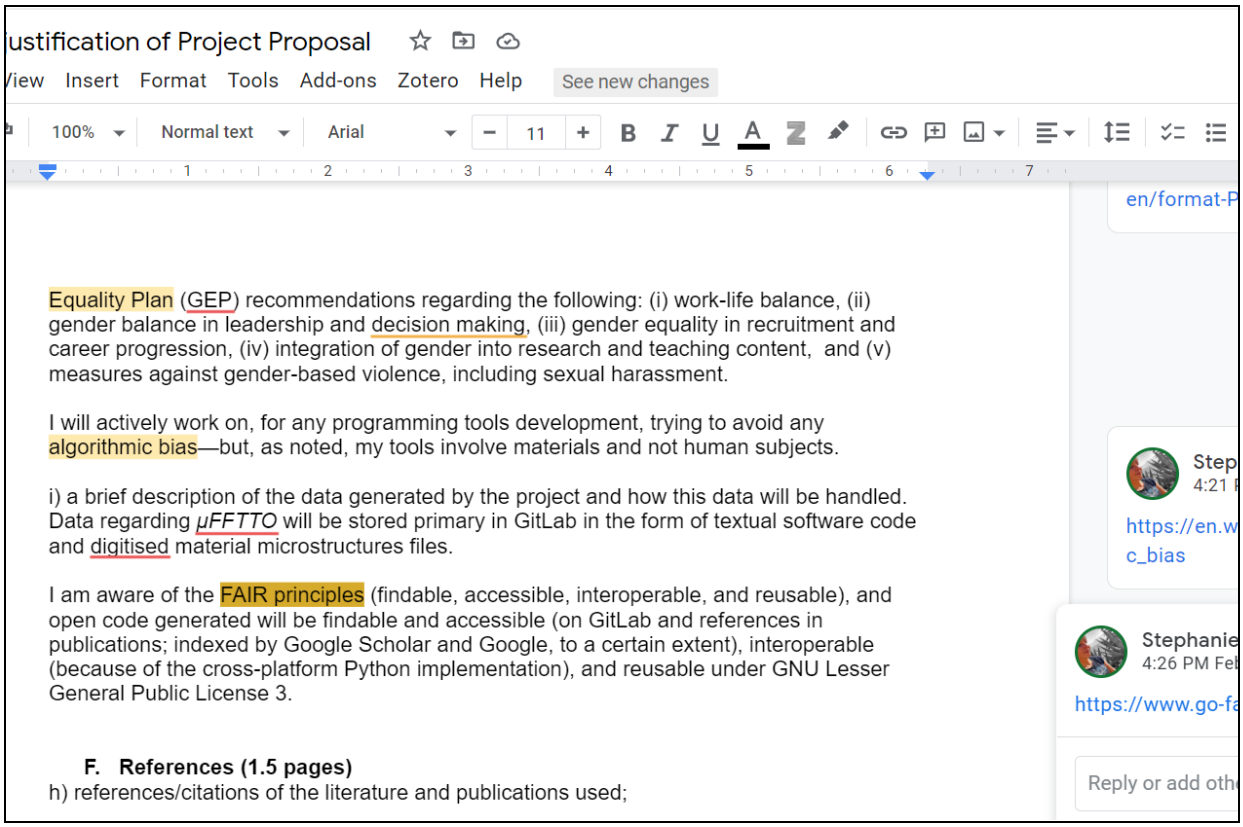
DMP and GEP: Background information used to educate student

- The European Code of Conduct for Research Integrity, https://allea.org/code-of-conduct/
- Horizon Europe's Gender Equality Plan (GEP) recommendations regarding the following: (i) work-life balance, (ii) gender balance in leadership and decision-making, (iii) gender equality in recruitment and career progression, (iv) integration of gender into research and teaching content, and (v) measures against gender-based violence, including sexual harassment. https://op.europa.eu/hr/publication-detail/-/publication/ffcb06c3-200a-11ec-bd8e-01aa75ed71a1/language-en/format-PDF/source-232129669&sa=D&source=docs&ust=1648378535460104&usg=AOvVaw0HI-aALxUSNvB1WZuSc_Ic
- Algorithmic bias, https://en.wikipedia.org/wiki/Algorithmic_bias&sa=D&source=docs&ust=1648378535460463&usg=AOvVaw0m7jb8CuV8YY6N7ooSUSZ0

- FAIR principles, https://www.go-fair.org/fair-principles/&sa=D&source=docs&ust=1648378535460825&usg=AOvVaw0FDb2aCOqzCcM8_CFeQKts

Screenshots of this section below are provided since sample text may not often be seen by information professionals and doctoral candidates just starting out.





DMP and GEP: Sample short texts

At this point, with easier tasks completed, the doctoral candidate became very worried about the introductory/state-of-the art sections. Thus, we talked at that point about **time management and concentration**, as noted above, and I did a mini-lecture (repeating information mentors had provided already in the preparation of the one-page proposal) on key aspects of any proposal. I coincidentally found, via academic Twitter, a helpful document (image below) lacking citation. This I used in my mini-lecture for the doctoral candidate, and I provided it to Jan Zeman as well so that we could, over the summer, create an original version for future students. I encouraged the student to make a sketch of his thoughts, since this has been helpful in other contexts, but I am not sure he used this technique. I also encouraged him to, while staring at the blank page, to start transferring work he had already performed into the (what will be 10-page) justification document.

Recipe for a proposal

Abstract or Overarching aim (I even include this when it's not required)
1. WHAT is the big problem, WHY is this important/ urgent
2. WHAT do we not know (overarching knowledge gap)
3. Recent, *highly relevant* advances (combination of own work and that of others)
4. "Here, we/ I will ...." - explain HOW you will address this knowlegde gap
(4a Overarching hypothesis)
5. What big breakthroughs is this work going to result in? Include both scientific and societal breakthroughs.

Background (it's very important to include enough white space to make reading easier)

increasing level of detail

1 Importance of the thing you're researching and its importance for the problem
WHAT do we not know (knowledge gap)

2 Bit that we do know
but... (smaller knowledge gap)

3 Bit that we do know
but... (smaller knowledge gap)

x Bit that we do know
but... (smaller knowledge gap)

Overall objective (and specific Objectives 1, 2, x)

Overall hypothesis
Hypothesis 1
Hypothesis 2
Hypothesis x
a good hypothesis is testable, and it has a *direction* (*i.e.* not "x is different from y" but "x is higher than y")
all parts of your hypotheses should have been addressed in paragraphs 1-x

Include **boxes, diagrams, and illustrations** throughout the proposal to clarify important concepts, explain mechanisms, and indicate links between hypotheses, objectives, experiments and work packages. These items also make the proposal aesthetically pleasing and easier to read and navigate.

If you can, include **pilot data** that show that your methods work or that give preliminary support for your hypotheses.

Cite and emphasise **your own relevant work** throughout!

Underline, or **use bold font for key sentences/ statements**.

Approach/ methodology
Instead of diving straight into the detail, first include a paragraph that clearly outlines the approach and how this will test your hypotheses and meet your objectives.

WP1/ Experiment 1 "in this WP, we/ I will addres Objective 1 and test Hypothesis 1"
Explain WHY you are doing WHAT - give the necessary detail (replicates, total number of samples, methods, equipment). It often works best to put the WHY before the WHAT ("To assess the fate of C that enters the systems, we will...." instead of "We will use this specific technique to assess..."). Include detail on data analyses and end with what the WP will result in/ accomplish.

WP2/ Experiment 2 "in this WP, we/ I will addres Objective 2 and test Hypothesis 2"
Similar structure as WP1

WPx/ Experiment x as above

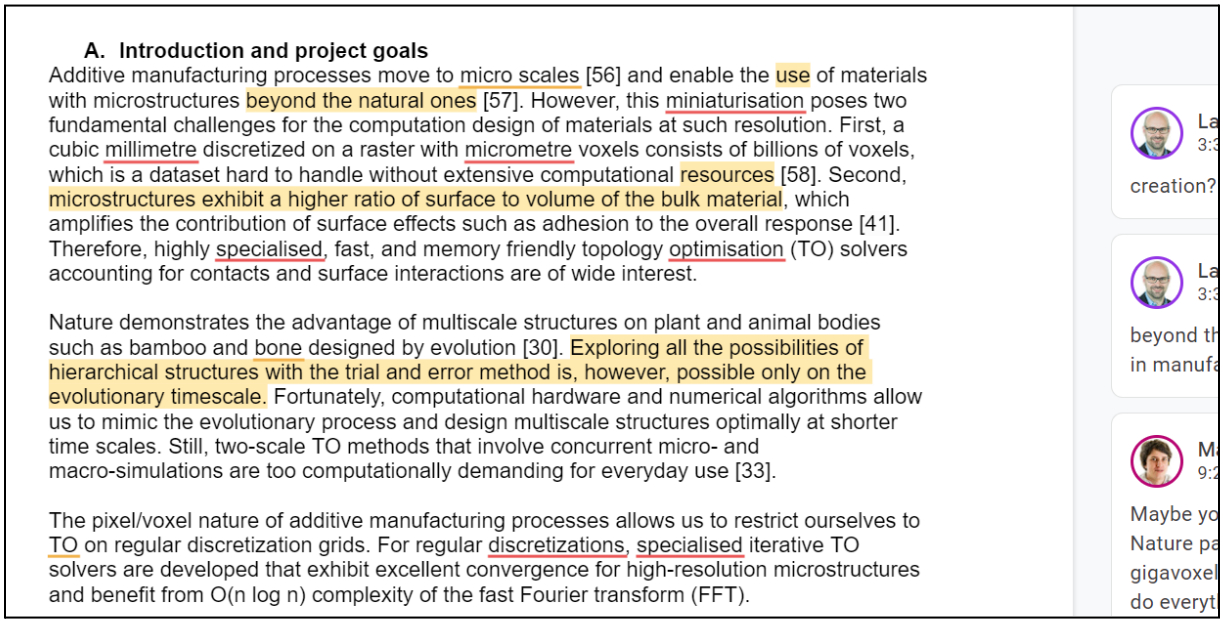
Synthesis/ impact I always like to end with a section outlining how all WPs together address the objectives and what will be done to ensure scientific and societal impact.

Justification of the budget include detail on why what is done/ needed, which WP it links to, cost per item/ sample, total number, total cost

References if you have space, use names rather than numbers in the text, and write out authors list and title in the reference list

Screenshot above: Helpful proposal writing document from Twitter (no citation to authors provided there)

This document together with scheduled concentration time at NTK appears to have helped the doctoral candidate, who finally, on schedule (mid-March), was able to write a simple and clear introduction to his topic (i.e., “everything clicked”). The doctoral candidate sent these sections to his mentors for review, and Jan Zeman, at this point, encouraged him to share with his potential host PI in Germany. Jan also arranged for review by one of the student’s peers who defended his dissertation last year, and we encouraged him to reach out to another peer who has extensive experience in making nice Gantt charts. Samples from the introduction and work package sections where you can see collaborative editing in action are below.



A. Introduction and project goals

Additive manufacturing processes move to micro scales [56] and enable the use of materials with microstructures beyond the natural ones [57]. However, this miniaturisation poses two fundamental challenges for the computation design of materials at such resolution. First, a cubic millimetre discretized on a raster with micrometre voxels consists of billions of voxels, which is a dataset hard to handle without extensive computational resources [58]. Second, microstructures exhibit a higher ratio of surface to volume of the bulk material, which amplifies the contribution of surface effects such as adhesion to the overall response [41]. Therefore, highly specialised, fast, and memory friendly topology optimisation (TO) solvers accounting for contacts and surface interactions are of wide interest.

Nature demonstrates the advantage of multiscale structures on plant and animal bodies such as bamboo and bone designed by evolution [30]. Exploring all the possibilities of hierarchical structures with the trial and error method is, however, possible only on the evolutionary timescale. Fortunately, computational hardware and numerical algorithms allow us to mimic the evolutionary process and design multiscale structures optimally at shorter time scales. Still, two-scale TO methods that involve concurrent micro- and macro-simulations are too computationally demanding for everyday use [33].

The pixel/voxel nature of additive manufacturing processes allows us to restrict ourselves to TO on regular discretization grids. For regular discretizations, specialised iterative TO solvers are developed that exhibit excellent convergence for high-resolution microstructures and benefit from O(n log n) complexity of the fast Fourier transform (FFT).

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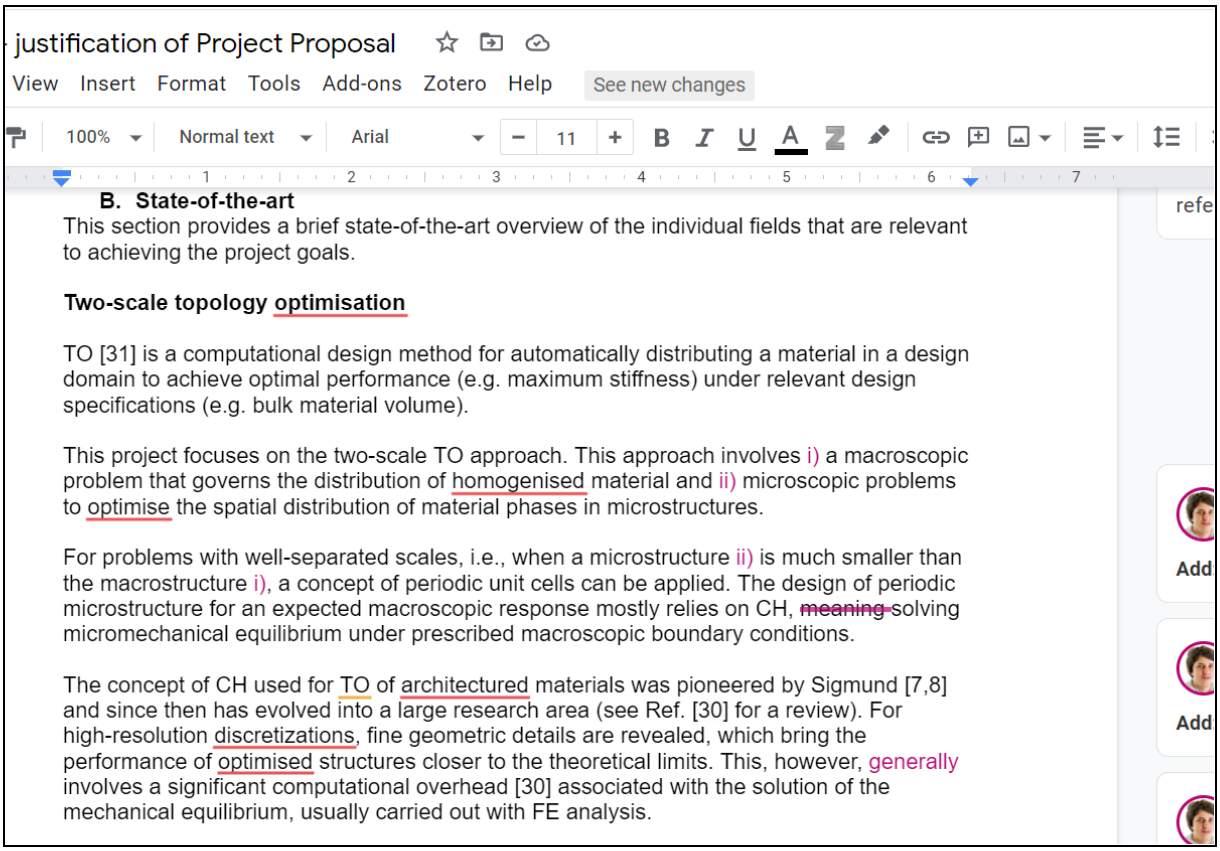
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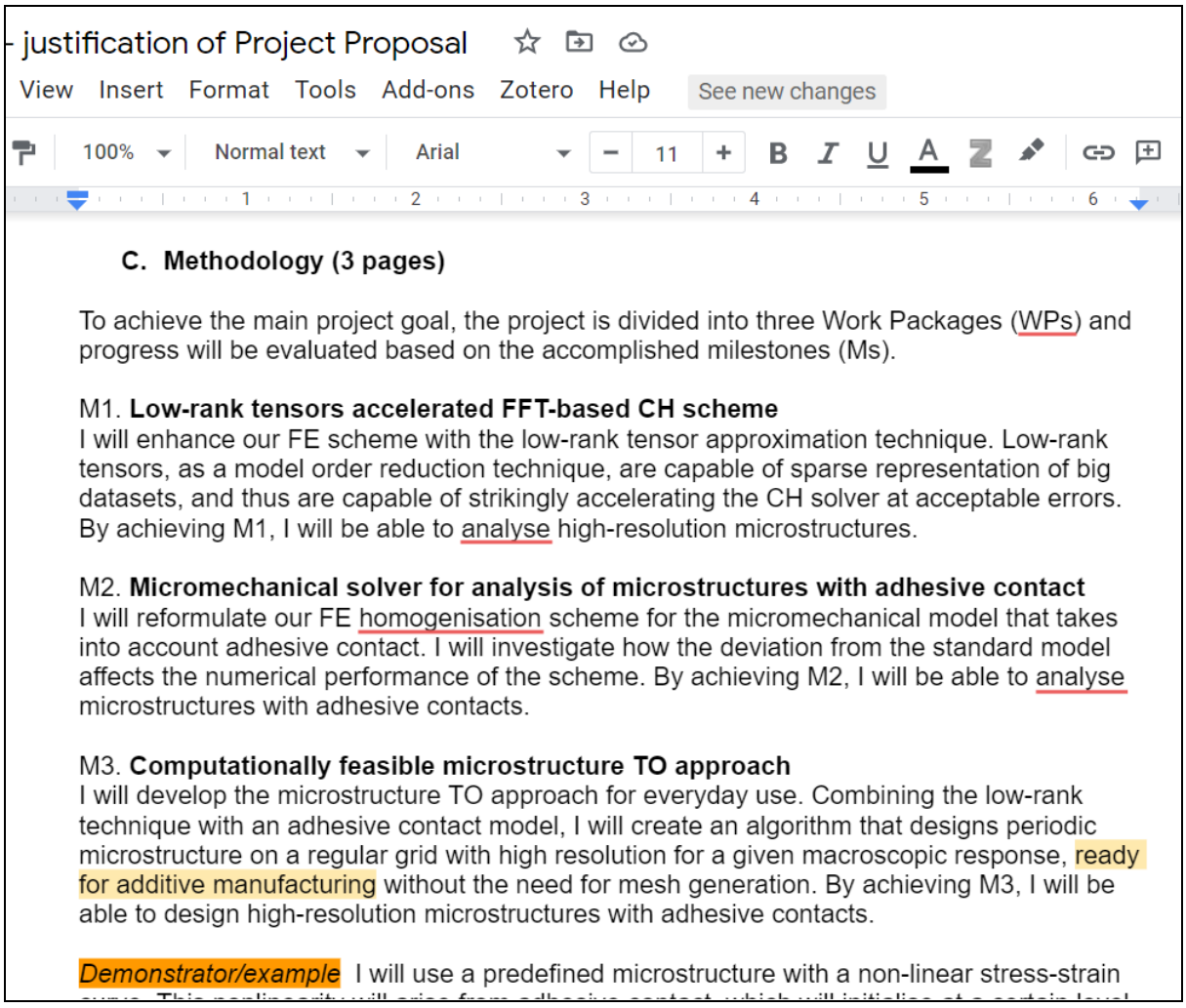
B. State-of-the-art
This section provides a brief state-of-the-art overview of the individual fields that are relevant to achieving the project goals.
Two-scale topology optimisation
TO [31] is a computational design method for automatically distributing a material in a design domain to achieve optimal performance (e.g. maximum stiffness) under relevant design specifications (e.g. bulk material volume).
This project focuses on the two-scale TO approach. This approach involves i) a macroscopic problem that governs the distribution of homogenised material and ii) microscopic problems to optimise the spatial distribution of material phases in microstructures.
For problems with well-separated scales, i.e., when a microstructure ii) is much smaller than the macrostructure i), a concept of periodic unit cells can be applied. The design of periodic microstructure for an expected macroscopic response mostly relies on CH, meaning solving micromechanical equilibrium under prescribed macroscopic boundary conditions.
The concept of CH used for TO of architectured materials was pioneered by Sigmund [7,8] and since then has evolved into a large research area (see Ref. [30] for a review). For high-resolution discretizations, fine geometric details are revealed, which bring the performance of optimised structures closer to the theoretical limits. This, however, generally involves a significant computational overhead [30] associated with the solution of the mechanical equilibrium, usually carried out with FE analysis.



C. Methodology (3 pages)

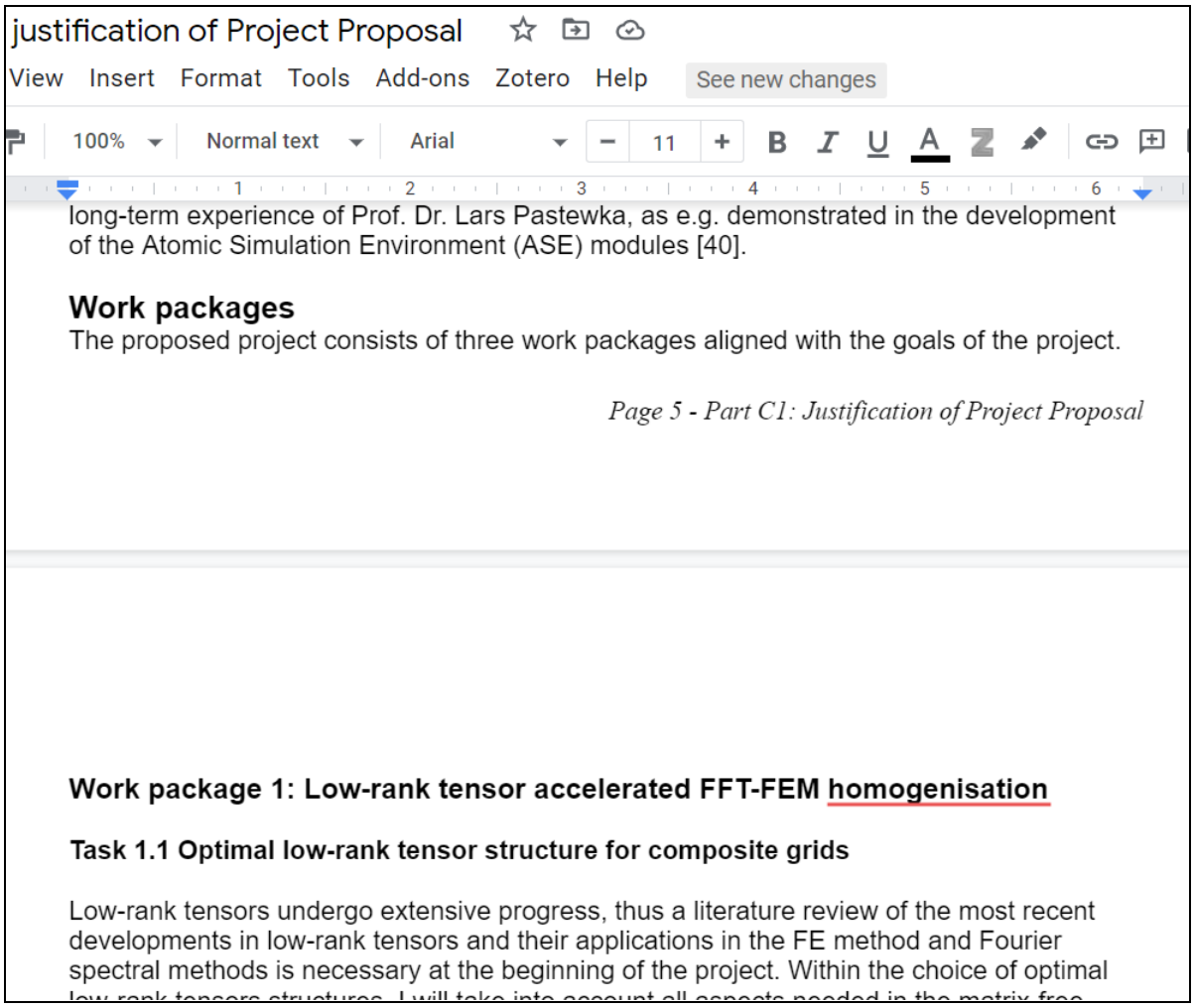
To achieve the main project goal, the project is divided into three Work Packages (WPs) and progress will be evaluated based on the accomplished milestones (Ms).

M1. **Low-rank tensors accelerated FFT-based CH scheme**
I will enhance our FE scheme with the low-rank tensor approximation technique. Low-rank tensors, as a model order reduction technique, are capable of sparse representation of big datasets, and thus are capable of strikingly accelerating the CH solver at acceptable errors. By achieving M1, I will be able to analyse high-resolution microstructures.

M2. **Micromechanical solver for analysis of microstructures with adhesive contact**
I will reformulate our FE homogenisation scheme for the micromechanical model that takes into account adhesive contact. I will investigate how the deviation from the standard model affects the numerical performance of the scheme. By achieving M2, I will be able to analyse microstructures with adhesive contacts.

M3. **Computationally feasible microstructure TO approach**
I will develop the microstructure TO approach for everyday use. Combining the low-rank technique with an adhesive contact model, I will create an algorithm that designs periodic microstructure on a regular grid with high resolution for a given macroscopic response, ready for additive manufacturing without the need for mesh generation. By achieving M3, I will be able to design high-resolution microstructures with adhesive contacts.

Demonstrator/example I will use a predefined microstructure with a non-linear stress-strain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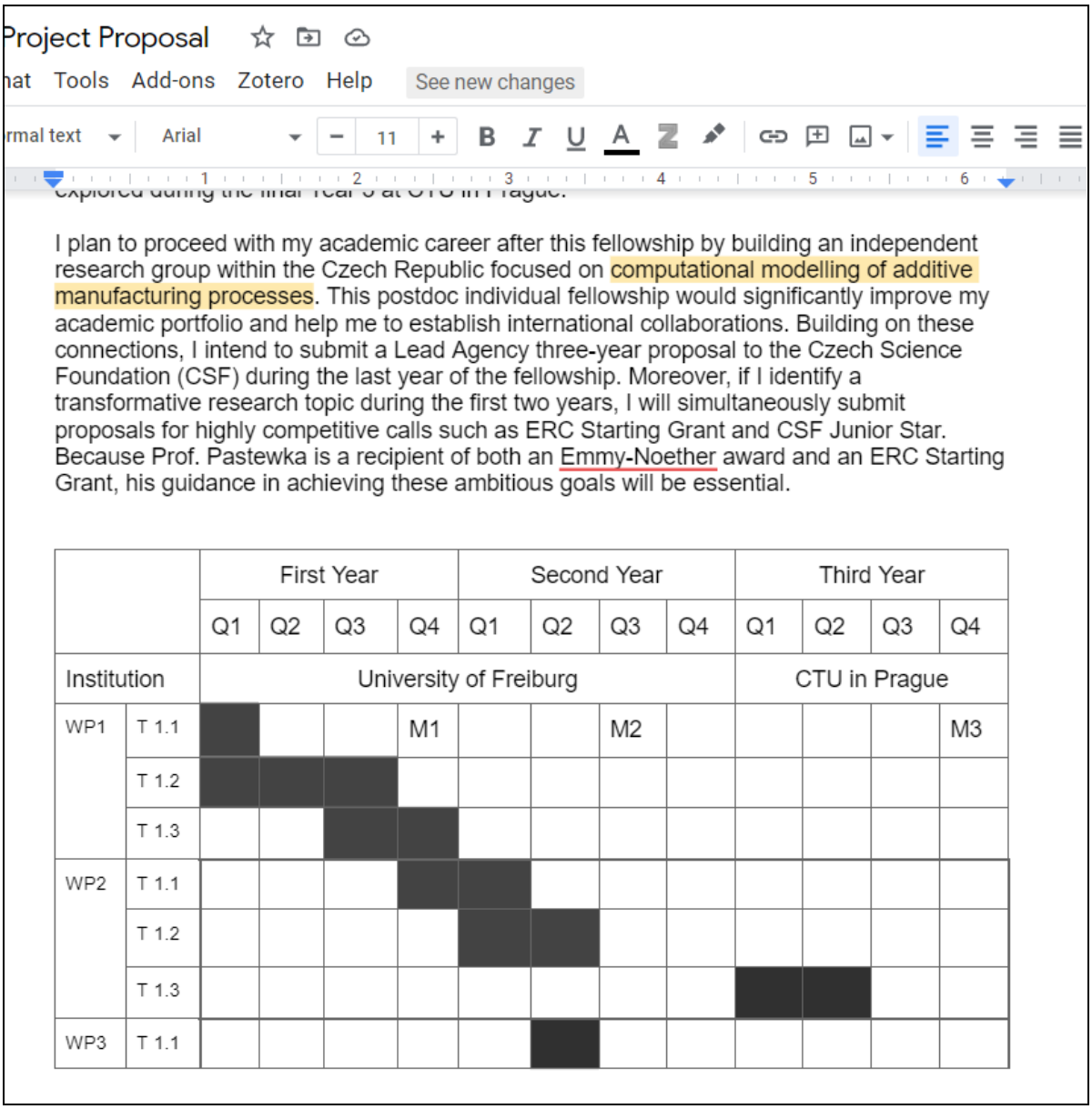
long-term experience of Prof. Dr. Lars Pastewka, as e.g. demonstrated in the development of the Atomic Simulation Environment (ASE) modules [40].
Work packages
The proposed project consists of three work packages aligned with the goals of the project.
Page 5 - Part C1: Justification of Project Proposal
Work package 1: Low-rank tensor accelerated FFT-FEM homogenisation
Task 1.1 Optimal low-rank tensor structure for composite grids
Low-rank tensors undergo extensive progress, thus a literature review of the most recent developments in low-rank tensors and their applications in the FE method and Fourier spectral methods is necessary at the beginning of the project. Within the choice of optimal



Screenshots: Work on scientific parts of the project proposal drafts

The doctoral candidate placed the document into Overleaf/LaTeX, and the final week prior to submission he focused on integrating feedback from the mentorship team (including his host researcher in Germany and his peers in addition to his formal mentors and me) and he uploaded everything into the CSF system prior to the April 7 deadline.

April 2023 note: As noted at the beginning of the document, the doctoral candidate completed his doctorate, received funding, and has started working in Germany with his host research group.