How they test: Papeeria, ShareLaTeX, and Overleaf

Ooh La LaTeX

Authors who publish documents or books with LaTeX can tap into online services using modern browsers, on both desktop and mobile devices, and as a collaborative tool. *By Harald Jele*

Users who have come to understand and appreciate the advantages of a typesetting program like LaTeX [1] prefer to use it exclusively when drafting text. These same users also want it to be available for everyday use on all of their devices. In fact, various possibilities do exist for installing the program on tablets and the like. However, the installation process comes with numerous problems. Consequently, even experienced users are not always able to complete installation successfully without apps like TeX Writer [2] or VerbTeX [3] already running on the target platform.

Therefore, the idea of using LaTeX in an online browser is appealing, because it is a simple and elegant solution that gets around the problems encountered when installing other applications. Addi-

tionally, online access makes it possible to work in groups and take advantage of versioning. In this article, I examine three candidates – Papeeria [4], ShareLaTeX [5], and Overleaf [6] – to see whether online services offer faultless capabilities or whether users are forced to accept restrictions so painful that they forego using the services altogether.

Building, distributing, and maintaining this type of online service is a complicated endeavor. Not everybody is up to the task, as is evident from the failures experienced by such services as Fidus Writer [7], FlyLaTeX [8], SpanDeX [9], LaTeX Lab [10], and MonkeyTeX.

How They Work
The approaches taken by the online services tested here share striking similarities:
- They install one or more releases of TeX Live [11] as the standard LaTeX on a Linux server.
- The files to be edited land in the user's document directory on the server, and the service automatically saves them there regularly.
- Users edit the files remotely in their browser via an online editor; mean-

while, the editor allows multiple users to share a file.
- An online PDF viewer displays the LaTeX document that has been compiled on the server. The compiling process is the same as the one LaTeX uses on a local installation.

This seemingly simple concept can only be implemented with the involvement of a wide range of technologies. The online editors are mostly implemented as asynchronous JavaScript applications.

The Competition
The test data came from two existing LaTeX projects that were uploaded and compiled online, with the results checked thoroughly. In this article, I looked at a project shared between co-workers, as well as a project in which work was performed simultaneously by multiple users on the same file.

Those who want to create new projects will find that the services typically offer a plethora of templates. For the most part, they are applicable to dissertations and articles for scientific journals. The number of file templates should not be the criterion you use to decide for or against a

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particular service, though. Because all LaTeX services behave like a local installation, it suffices to put any random template in the document directory. LaTeX finds the file and integrates it. The same goes for LaTeX packages that you want to load during compilation. If they are not preinstalled, you only need to get them via the Internet and move them to the document directory.

LaTeX can handle any number of text types in addition to scientific text, including everything from Advent calendars to greeting cards. However, the people interested in these types of documents are probably not interested in the online services I talk about in this article. One as yet unresolved issue is that none of the templates come with information on the LaTeX compile settings. This goes for all of the services described here. Presumably, most users compile with pdflatex, whereas a few turn to XeLaTeX to get working PDF files.

Additionally, all three services offer free access to a more restricted version than the fee-based choice in terms of time period for use or the number of available functions.

Papeeria

Although Papeeria [4] was created by a Russian company, the LaTeX user is barely aware of it because most of the

pages are in English. When using free testing access to the program, it is important to remember that the platform makes all saved documents publicly accessible after the first project. A fee-based account costs $5 dollars per month.

To begin, you upload an existing LaTeX project as a ZIP archive, and the service decompresses and puts the files in your document directory. The standard setting uses TeX Live 2015. If problems occur, you can turn to a 2013 version to compile.

The developers have not corrected all of the installation errors. During testing, I found that installation of the EB Garamond font was faulty. Once notified, Papeeria responded promptly via email that three full-time programmers had received an SMS alert. However, I was still able to reproduce the bug two months later; thus, it would seem that bug reports are ignored in spite of intensive communication efforts.

Figure 1 shows the very straightforward interface. Those familiar with LaTeX will be able to navigate easily. The four frames display the project files, LaTeX code, PDF presentation, and error messages and warnings.

Pretty Tired

Unfortunately, users who chooses the free test version are informed that their jobs

are queued to compile behind all of the paying customers. The right-hand frame in Figure 1 shows the dialog window.

In most cases, this downgrade also meant that the website displayed the cached or erroneous modules instead of those most recently updated. Therefore, free test access does not actually work for meaningful testing. The tester should request access that does not have these restrictions; otherwise, you will check your well-written code in vain for errors. The situation is similar with embedded graphics, which are often not depicted by Papeeria in test mode, and a warning failed to appear that would explain what caused the behavior.

It was possible to compile the two uploaded LaTeX projects with both the TeX Live 2015 and 2013 releases. The results for the 2013 version added empty pages, and none of the available settings corrected this issue.

If you compile frequently to do things like code-checking, you will encounter yet another problem with Papeeria. The embedded scripts demand so much performance from the browser that it offers to stop the running scripts.

On a positive note, Papeeria has done a good job of implementing both the visual display and the menubar. The menu provides quick access to essential tasks and makes the service easy to operate,
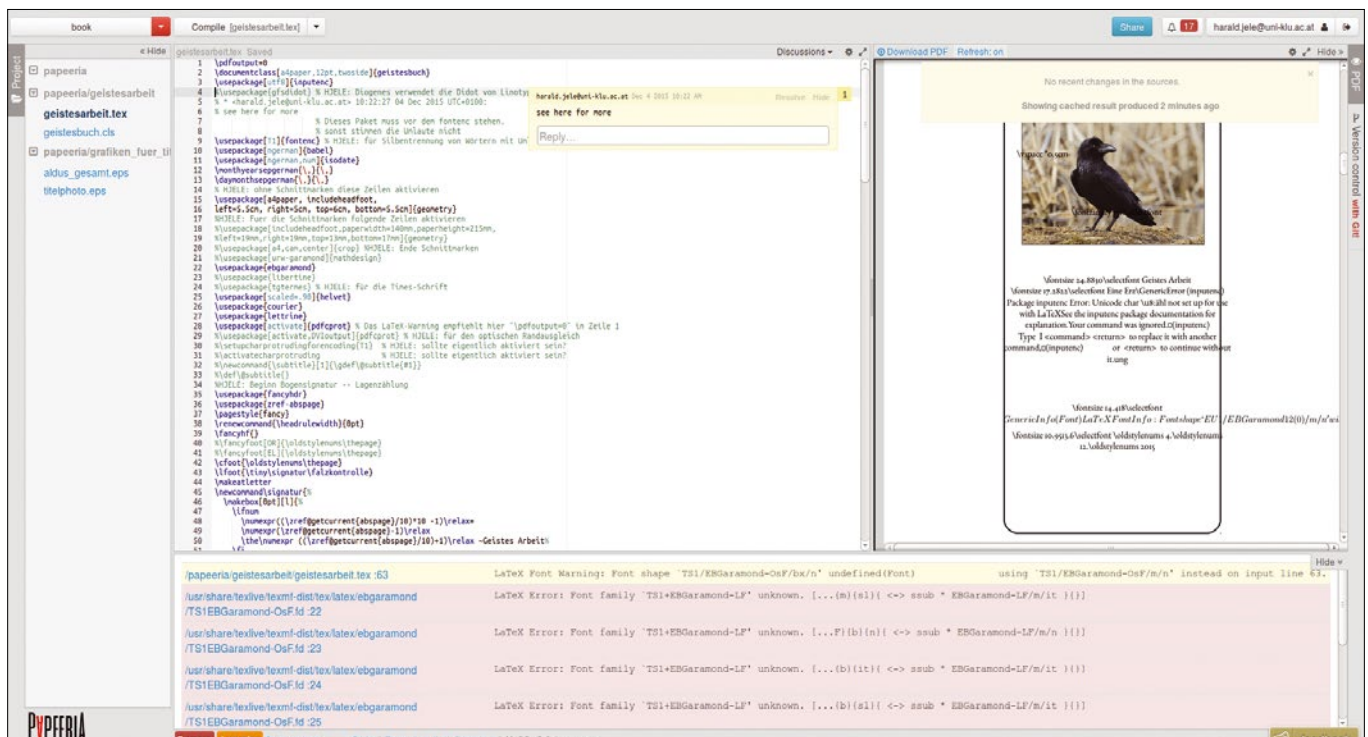

Figure 1: The LaTeX online platform Papeeria divides the work area into four frames and offers TeX Live 2013 and 2015.

so it is not necessary constantly to switch between various screen pages. Because the online editor responds correctly to the usual shortcuts, you do not have to learn new ones.

The associated spell checker does not know many German language terms (my language), which gave me the impression during testing that language sorting does not work properly and would not be suitable for professional use.

The editor only supports UTF-8 character encoding and displays text in Western ISO Latin 1 incorrectly. However, LaTeX reacts well during compilation, as long as you do not make any changes to the text that would serve to create faulty character encoding. Even then, the editor displays the compiled Latin 1 texts incorrectly, albeit not each and every time (Figure 2).

DVI, AUX, and LOG (device-independent binary, auxiliary, debugging) files created during compilation are not accessible; you can only download the PDF files from the server. Papeeria offers the following options for compiling: pdflatex, XeLaTeX, Legacy TeX Live 2013, and PGF 3.0.

Divide and Plot

If you want to share text with other users, you click the *Share* button at the upper right. The platform then sends an email message to the target users, who need to confirm. The user interface is silent during this procedure, and the need for action is only revealed when your coworkers, perhaps accidentally, take a look at their inboxes. Papeeria applies color highlights to each change and marking made in the text by the sharing recipients. The program augments the highlighted changes and markings with the email address of the user who made them.

In addition to LaTeX, the platform offers gnuplot [12], which can create impressive graphics from existing data. However, this utility is only available with a fee-based account. The free version includes a simple plot builder.

Thanks to Papeeria's session management, it is possible for a user to work on multiple projects simultaneously, supporting team effectiveness. If this option is missing, you have to log out of a project constantly to jump into another one before helping out. Then the logout-login procedure has to be repeated to get back into the other project.

Support (e.g., for operation of the interface with embedded programs such as the editor, PDF viewer, file browser, etc.) is not well integrated at all, including interaction with LaTeX itself. Contacting the developers is possible through various services like Twitter, Google Plus, and TeX-LaTeX Stack Exchange [13].

However, it takes time to find the right people and the proper communication channel.

Paying customers can operate a maximum of 10 private projects and synchronize them with public and private Git repositories. Additionally, Papeeria offers regular snapshots for back ups.

ShareLaTeX

Most of the developers working on the second online service tested, ShareLaTeX [5], are British [14]. The start page evaluates the language of the browser and indicates that your interface will display in your language, if supported, which you select with the flag symbol located at the lower edge of the page. However, ShareLaTeX documentation and support are only offered in English.

Once you log into ShareLaTeX, the first thing to appear is an overview of existing projects. New projects are set up in the overview by loading existing LaTeX files as a ZIP archive into the corresponding document directory or by selecting a template for starting a new project. Alternatively, you can import a project from GitHub. The overview helps keep you organized if you are working on multiple projects simultaneously and want to participate in more.

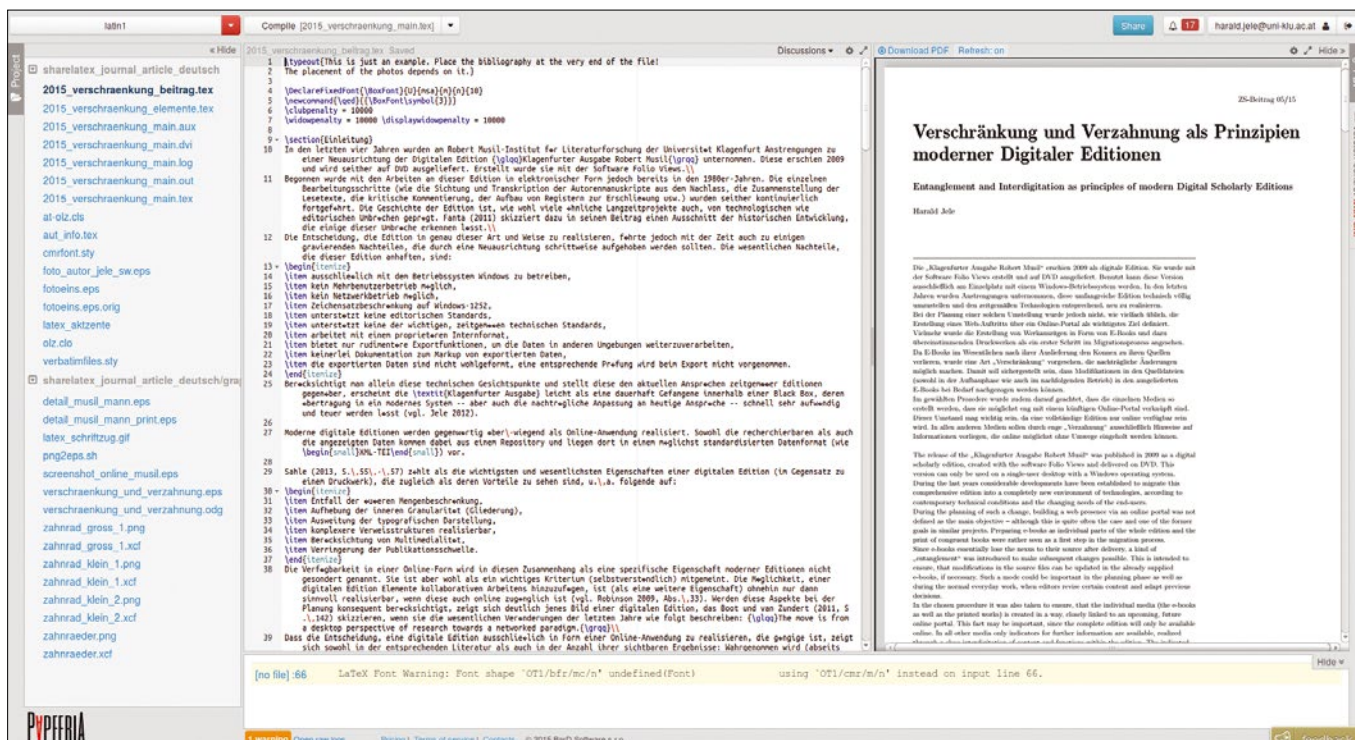Also in the overview is an easily accessible and convenient logout button

Figure 2: Even an erroneously displayed text encoding can give correct results. By default, Papeeria is set for UTF-8.

for those working on multiple projects. The button is only available on this page and is not found elsewhere. The user should keep in mind that only one project can be open per browser session. The session administration currently implemented does not handle multiple projects in various browser windows or tabs. Therefore, you would have to install a number of browsers to work in parallel on projects. When it comes to teamwork, this could be particularly disadvantageous.

When you open a ShareLaTeX project from the project directory, another view opens for editing the files. Once the online platform recognizes a `main` file, it will compile the file and display the PDF generated in a frame next to the editing area. Usually this occurs surprisingly fast. Even a very large piece of work with 300 pages appears within just a few seconds, thus giving the impression that you are sitting in front of a local installation.

The screen display is divided into coherent frames, each of which is devoted to a particular task (Figure 3). To the far left is a simple file tree. This is where the files you have uploaded appear. The support and logfiles remain hidden; however, they become visible when you download the document directory with the DVI files.

General settings applicable to the current project are located above the file browser. Settings include options for compiling, language selection for spell checking, and a few display settings. The compiling utilities offered by the service include pdflatex, LaTeX, XeLaTeX, and LuaLaTeX.

Leaping

The online editor and the PDF viewer lie in the next two frames to the right. You can jump in both directions with an arrow key, switching from a PDF document to the relevant place in the editor, and vice versa. This feature proves to be extremely helpful when working with LaTeX. Buttons for compiling, viewing the log, and access to other output files are placed above the PDF viewer.

The frame to the far right provides an area for project-related conversations. The design is generally modest in a positive sense, although the unified menubars in Papeeria occasionally organize work somewhat more elegantly.

The frame division proves to be somewhat inconvenient when you are working in the editing layer if you want to look up documentation or support functions, which are only accessible at the project layer. The developers are not currently planning to add context-sensitive support.

Editing functions are limited to the essentials, which is perfectly adequate for speedy and smooth work with LaTeX.

Automatic code completion is a well-implemented feature and is turned on and off separately for each project. An interesting addition for those who have only a little experience with LaTeX would be to make the LaTeX code invisible so that only the content could be seen. Unfortunately, the editor does not offer this feature.

The editor supports files with UTF-8 encoding exclusively, which means projects that have been in progress for decades cannot be continued when changing over to ShareLaTeX. According to the developers, this aspect of LaTeX is rarely criticized; therefore, it will probably not see any changes in the near future.

The LaTeX version installed is TeX Live 2014, which compiled all of the prepared documents without any errors. However, I could not figure out why some of the texts did not produce a valid PDF with pdflatex, even though the DVI file generated could be converted without problem into error-free PS and PDF files. Once I compiled the text again, I was always successful. The error appeared only rarely during testing and was possibly the result of short periods of high server load.

TeX Live behaves like a local installation. If you move LaTeX packages and style files not made available by the provider into the document directory, LaTeX finds them during compilation. If
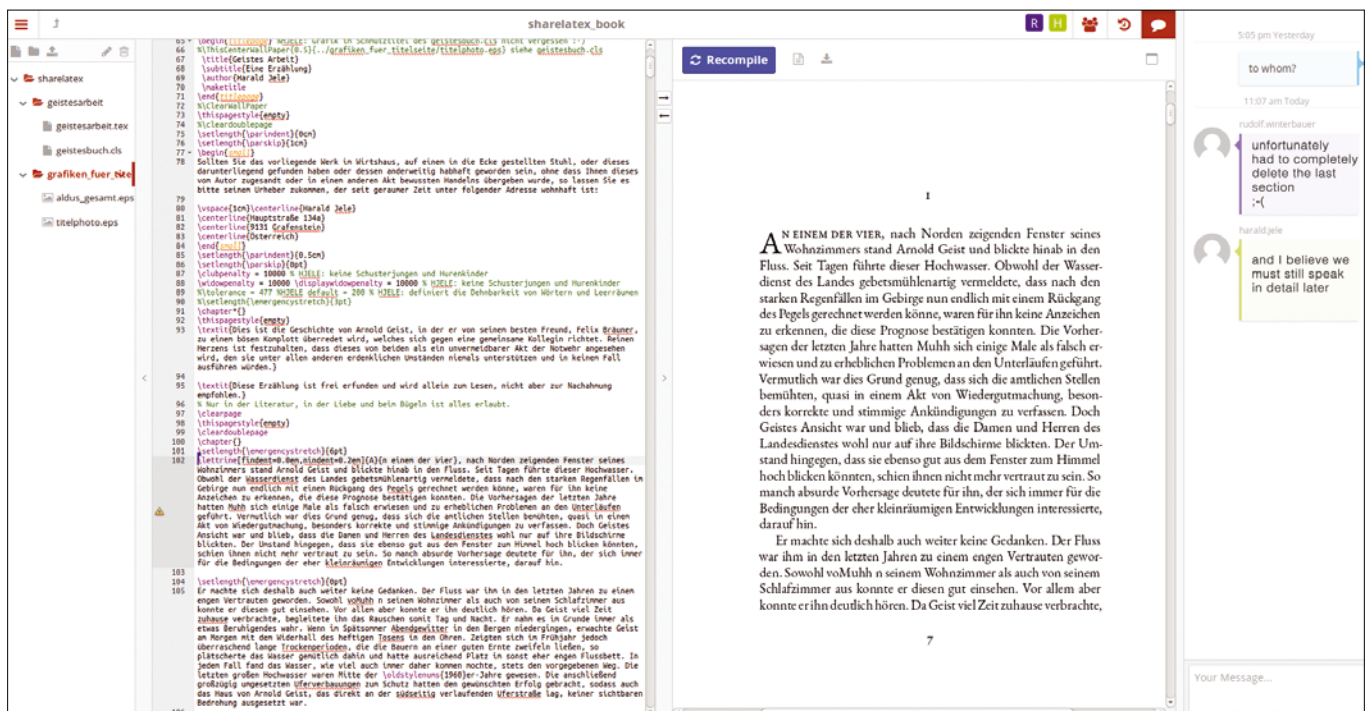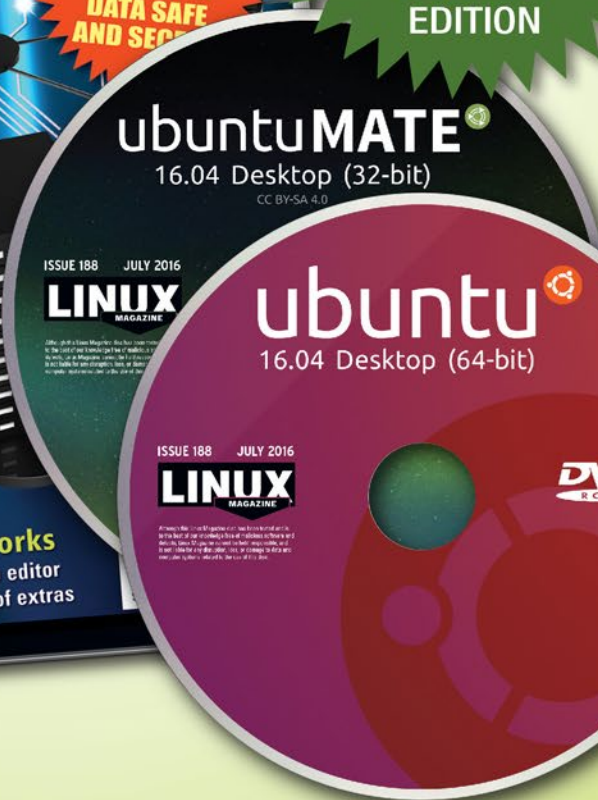

Figure 3: ShareLaTeX divides the screen into frames. Project files appear to the left, LaTeX code is in the middle, and the results plus comments are to the right.

requested packages are missing, the ShareLaTeX team installs most of them when asked to do so.

Very Inviting

The ShareLaTeX user can make a project available at the editing layer, either with write permission or as read only. The share settings have been well designed. Invited collaborators do not have to do anything to accept the invitation. ShareLaTeX lists the most recent changes to the open file right next to the share list (Figure 4). This file history, or *Recent Changes*, lets you undo changes or re-create them. The history also shows which user has made which change. The service synchronizes the project files with other services and local installations via Dropbox and GitHub.

ShareLaTeX has an impressive number of templates for creating new text files. Unfortunately they are not tagged, nor are they very well sorted. For example, if you go to the *Thesis* category, you will find 185 templates for use with undergraduate theses, dissertations, and undergraduate and graduate papers. The program advises you as to which template fulfills requirements set by a particular university. However, the program is silent on the topic of how the template is built and the settings used for compiling it. You will also look in vain for a filter

that restricts the view to templates that are compilable with XeLaTeX. Templates for use outside of the scientific disciplines are in short supply in the ShareLaTeX directory.

ShareLaTeX costs $15 per month for 10 coworkers and $30 per month for an unlimited number of coworkers. The service also incorporates a fee-based editing service, Enago [15], which lets you purchase text-related services ranging from proofreading to text editing.

Large portions of the project are freely available in the source code. This means that users can look at the source code if they are thinking of building a similar service or if they want to get a glimpse behind the scenes [16]. ShareLaTeX also offers a service named DataJoy [17] for the statistical computing language R and for working with Python, although the service is not accepting new accounts and will be shut down completely on January 2, 2017.

The developers were easy to communicate with and information exchange went quickly. The web pages clearly state who is responsible for what.

Overleaf

The online service Overleaf [6], previously known as WriteLaTeX, was started in 2011. The goal of the founder was to support all users who wanted to compose

their text with LaTeX and exchange their work with teams at the same time. The thought was that an online service would allow users to focus their attention on content instead of spending so much time dealing with installation issues.

Once logged in, you land directly in the project directory as you would with other services. The directory contains the usual project-related functions (e.g., create new file, rename, delete, archive, copy). Additionally, you can *clone* LaTeX projects to GitHub from here. All of the other functions are found on the editing layer.

An extensive set of templates are available for setting up a new project, and they come with comments and are tagged with keywords. All users, not just scholars, can profit by using Overleaf templates. Some templates can be used for everyday office activities, creating posters, sending visually pleasing business correspondence, or designing a calendar for annual vacation planning.

Figure 5 shows the clean display in editing mode, which is only available in English. The screen looks tidy and well put together thanks to the organization of the frames. Compared with ShareLaTeX, the horizontal arrangement of frames has a simple and easy-to-understand menu structure that is much more appealing.

The left frame is used for file administration and can be hidden and displayed
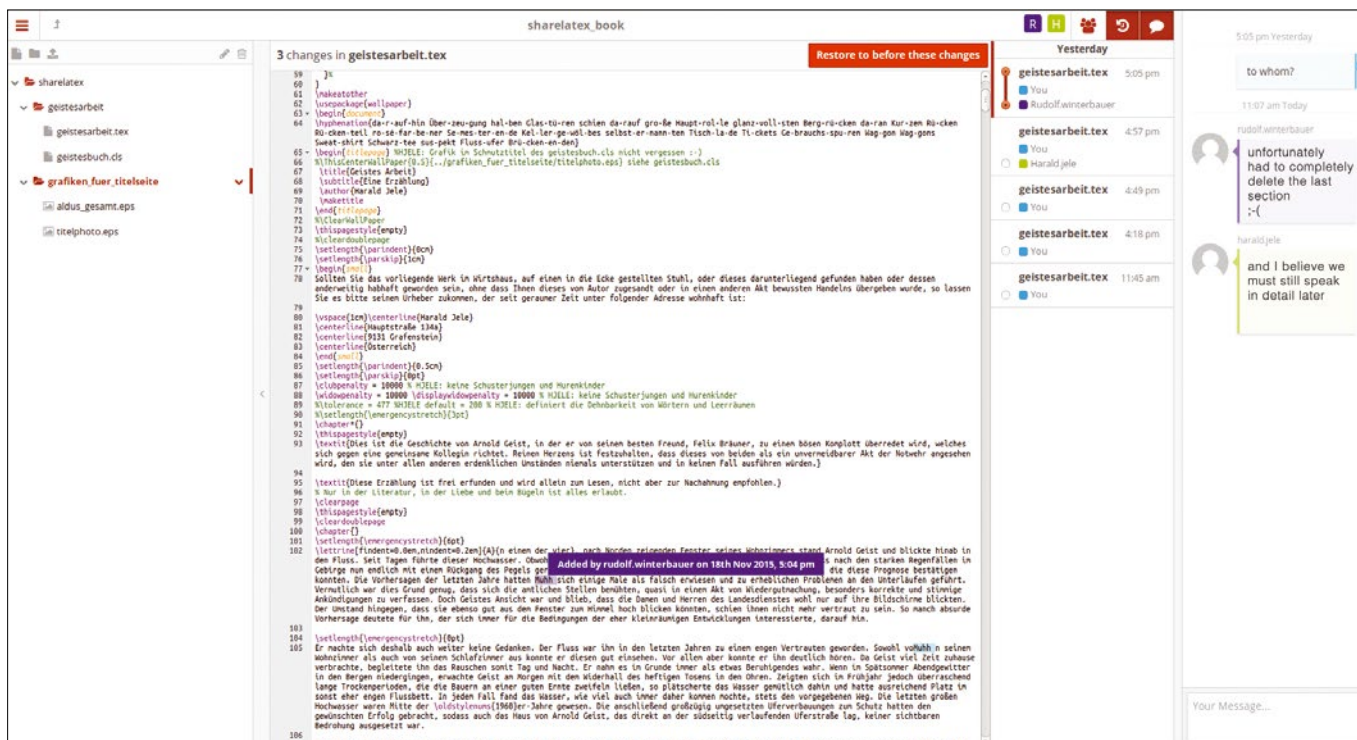

Figure 4: The file history shows the details of any changes made to the document.

by clicking the *Project* button that sits above. This frame also contains commands for downloading the project files from the server (*Download as ZIP*) or for depositing them in a Dropbox account. Google Drive users can also upload files. Overleaf hides DVI, AUX, and LOG files in this structure. However, the files are found in the downloadable ZIP archive of each project.

Like ShareLaTeX, the Overleaf division of functions is somewhat inconsistent. It is unclear which belong to the project layer and which to the editing layer, although you can easily become familiar with this situation in both services. The nearby buttons *Versions* and *Share* are self-explanatory: the *Versions* button lets you compare multiple versions of a file in frames that sit side by side, and *Share* generates links for write permission or read-only access to the project files to be shared.

When sensitive content is involved, you should exercise caution, because everyone who receives a link has user rights. The fee-based version, however, has extended access control. During testing, I was surprised to see links that provide access to projects that had already been deleted.

Behind the *Publish* button are a series of repositories of scientific literature. If you want to publish your project here, you can set it up easily.

Linux Ahoy!

With Overleaf, you have project-specific and overlapping settings under the *Settings* icon on the right side of the screen. A pleasant discovery is that the default settings for the editor can be adapted to Vim and Emac. This should make Linux users happy, especially because numerous editor themes are provided.

The second frame containing the editor can be hidden or displayed. Its menu structure offers various common functions important in dealing with LaTeX, like keyboard shortcuts.

The *Rich Text* display mode should be interesting in the context of team work. Overleaf has put numerous control commands and LaTeX code sequences there and displays the results they generate. This is an experimental feature, but it should nonetheless be helpful for those who are put off by the thought of text coding.

Overleaf does not display comments in its own frame and instead embeds them in the text. Short text is therefore difficult to administer and read. The conversation structure in ShareLaTeX is easier to use. Moreover, the chat information in Overleaf gets lost when a project is transferred from one colleague to another.

The editor displays the UTF-8 character encoding and other international character encodings correctly. Unfortunately, a valid PDF file did not appear

when the test file was compiled in ISO Latin 1 text encoding. Strangely, Overleaf repeatedly failed to generate PDFs even though the DVI files that had been created appeared to be free of errors. These files also could be converted into valid and display-ready PDF files without problem. Apparently, the Overleaf programmers are taking the LaTeX errors and warnings too seriously. As a result, the platform will occasionally not display functioning PDF files.

The current version of Overleaf uses the TeX Live 2015 distribution. This behavior, as noted with the other two services, is conspicuously inconspicuous.

When you encounter frequent coding problems in LaTeX, it is a good idea to read the help files and logfiles created during compilation. Papeeria and ShareLaTeX make these available online. With Overleaf, you will need to evaluate the data locally, which is cumbersome on a notebook, extremely difficult on mobile devices, and therefore ultimately one of the major shortcomings of the service.

Helpful

Both LaTeX and Overleaf help is available from a button located on the right side of the screen in the horizontal bar. Thoughtfully organized, a search function quickly takes you to important information. The remainder of the LaTeX
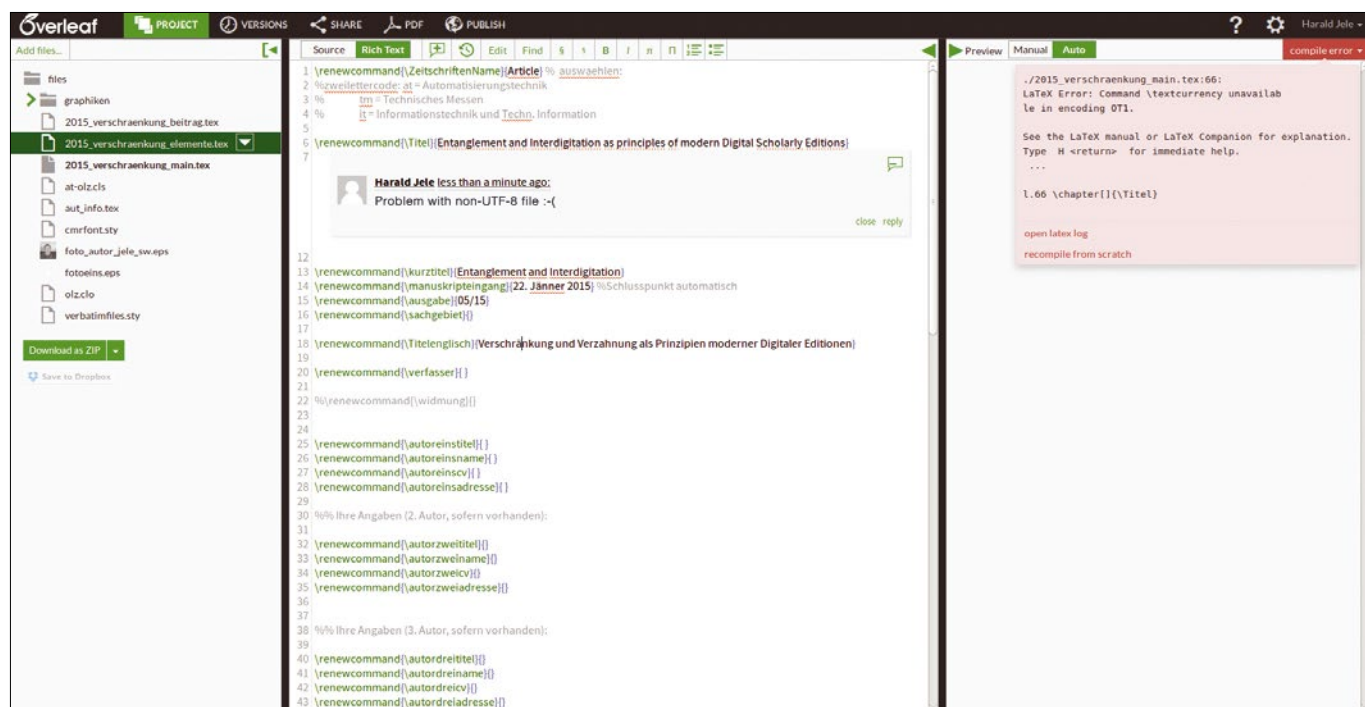

Figure 5: Editing mode in Overleaf, which only comes in English. LaTeX displays an error message when you try to compile a file with ISO Latin 1 encoding.

body of knowledge is typically found using your favorite search engine.

Session management in Overleaf also prevents you from participating in multiple projects at the same time unless you log out and back in again. Sadly, you often gain important insight just after logging out. LaTeX users who administer their bibliography and cited sources in clear text with Zotero [18] or Mendeley [19] find that Overleaf accepts data from both services.

The free version permits an unlimited number of projects and collaborators provided there are no more than 60 files per project. The fee-based versions cost $8 and $12 per month for 10GB, and no more than 500 files, and 20GB, and no more than 1,000 files, of storage space, respectively.

Communication with the Overleaf developers via the contact form on the website and by email worked perfectly. Their answers were helpful and delivered promptly. As it turned out, though, we had the fewest number of questions with Overleaf.

Conclusion

If you want to use LaTeX anytime and anywhere, the three online solutions presented here are eminently practical. Authors who lack funds are better advised not to use the free version of Papeeria, because it has significant disadvantages

not found in its fee-based counterparts that impede productive work.

All three providers expend considerable effort to create a frictionless environment for teamwork, and they have succeeded. Two of the providers, ShareLaTeX and Overleaf, are deficient in session management by preventing users who want, or need, to work on multiple projects from achieving effective teamwork. Papeeria shines here because its developers have taken this particular scenario into account.

To derive reasonable use from the services, it suffices to have basic LaTeX knowledge and a modern browser. Large display screens have a positive effect on productivity. Users with mobile devices roughly the size of a smart phone should probably rely on a locally installed app like TeX Writer or VerbTeX. Both of these do much better with display screens ranging from 4 to 6 inches diagonally.

The load and compile times of the online services are short and definitely competitive with those the average notebook achieves. This is equally true for large documents with complex document structure.

The big advantage to online services like those discussed here is that they let you concentrate on content instead of installation. Therefore, it is possible to get started quickly in an educational environment and in a productive work environment. It

doesn't matter whether you are working alone or on a team, everything sets up and works quickly. Team members can help one another by letting knowledgeable participants deal with more complex LaTeX properties, so the remainder of the team is not slowed down or does not become discouraged. This reason alone is a big plus.

An online LaTeX editor cannot be used as a substitute for a conventional text editing system. The display in rich text mode helps bring less confident colleagues on board large TeX projects. Although the services are intended for scholars, they can also be helpful in publishing other material. For example, publishers can offer their authors a professional encoding system that helps avoid unwieldy manuscripts.

When comparing the services, you will quickly determine that each comes with both clear advantages and at least one shortcoming. Table 1 helps acquaint you with these characteristics. ∎∎∎

▮ INFO

[1] LaTeX: *https://www.latex-project.org*

[2] TeX Writer: *http://www.texwriterapp.com*

[3] VerbTeX: *https://www.verbosus.com*

[4] Papeeria: *https://papeeria.com*

[5] ShareLaTeX: *https://www.shareLatex.com*

[6] Overleaf: *https://www.overleaf.com*

[7] Fidus Writer: *http://www.fiduswriter.org*

[8] FlyLatex: *https://github.com/alabid/flyLatex*

[9] SpanDeX: *http://texwelt.de/blog/spandex-schliesst/* (in German)

[10] LaTeX Lab: *https://code.google.com/archive/p/latex-lab/*

[11] TeX Live: *http://www.tug.org/texlive/*

[12] gnuplot: *http://www.gnuplot.info*

[13] TeX-LaTeX Stack Exchange: *http://tex.stackexchange.com*

[14] ShareLaTeX developer: *https://www.shareLatex.com/about*

[15] Enago: *http://www.enago.de*

[16] Source code for ShareLaTeX: *https://github.com/shareLatex/*

[17] DataJoy: *https://www.getdatajoy.com*

[18] Zotero: *https://www.zotero.org*

[19] Mendeley: *https://www.mendeley.com*

TABLE 1: Feature Overview

Feature	Papeeria	ShareLaTeX	Overleaf
International character encoding	No	No	Yes
Syntax highlighting	Yes	Yes	Yes
Code completion	Yes	Yes	Yes
Useful editor adaptations	No	No	Yes
Rich text editing and display	No	No	Yes
Multilanguage interface	No	Yes	No
Browser compatibility	Yes	Yes	Yes
Suitable for mobile devices	No	Yes	Yes
Number of functions with free account	Limited	Sufficient	Sufficient
Adjustable print quality	No	No	No
TrueType and OpenType fonts	Yes	Yes	Yes
Management for multiple sessions	Yes	No	No
Synchronization with GitHub and Dropbox	Yes	Yes	Yes
Built-in version administration	No	No	Yes
Quality of the LaTeX installation	Good	Good	Good
Compile settings	Yes	Yes	Yes
Hidden LaTeX coding	Not possible	Not possible	Possible
Team support	Yes	Yes	Yes
Source code available	No	Yes	No
Developers available	No	Yes	Yes