

The uefcsthesis class*

Pauli Miettinen

pauli.miettinen@uef.fi

7th October 2019

Abstract

This package contains the L^AT_EX class to typeset Bachelor's and Master's theses at University of Eastern Finland's School of Computing.

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*This document corresponds to uefcsthesis v0.5.1, dated 2019/10/04.

1 Introduction

This package contains the L^AT_EX class `uefcsthesis` that is meant for typesetting Bachelor's and Master's theses at University of Eastern Finland's (UEF's) School of Computing. This documentation provides the details about the package itself; separate documentation provides examples on how to use the class to typeset the thesis, and how to use L^AT_EX in general. Thus, most students should be able to start working with their theses without reading this document first.

It is, however, recommended that everybody using this class (*students and supervisors alike*) read [Section 3](#) at some point as it provides the details of the class' features. [Section 4](#) is only needed if one wants to see how the class is implemented, perhaps to improve it or to do debug it.

The design goals of this class were to provide a class that:

1. Makes it easy for students to start writing their theses even with no prior experience on L^AT_EX.
2. Provides standard L^AT_EX interface for typesetting the document so that students learn how to use most L^AT_EX classes.
3. Supports both the more traditional pdfL^AT_EX engine as well as the more modern LuaL^AT_EX and XeL^AT_EX engines.
4. Supports both BiB_TE_X and BIBL^AT_EX.
5. Supports theses in both Finnish and English (in both American and British spelling) and facilitates the use of other languages, especially by supporting UTF-8 encoding.
6. Is easy to adapt if needed.
7. Has clean and well-documented implementation.

2 Installation

The class is normally distributed as a standard L^AT_EX `.cls` file, and it can be used by copying the `uefcsthesis.cls` file in a place where L^AT_EX will find it (e.g. in the same folder with the main `.tex` file). To compile the document, the `uef_logo.pdf` file¹ has to be in the same folder as the main `.tex` file (or in a folder defined with the `\graphicspath` command, see [\[3\]](#)).

The source code of the class and this documentation are in `uefcsthesis.dtx` file that has to be used with `uefcsthesis.ins` file. To prepare the `uefcsthesis.cls` file, run

```
latex uefcsthesis.ins
```

¹The file `uef_logo.eps` is needed if standard L^AT_EX is used instead of pdfL^AT_EX, LuaL^AT_EX, or XeL^AT_EX.

in the command line. This will also produce the `uefcsthesis.xmpd` and `uefcsthesis.bib` files that will be needed to prepare this documentation. To prepare the documentation, run the following commands in the command line:

```
pdflatex uefcsthesis.dtx
bibtex uefcsthesis
makeindex -s gind.ist -o $(PACKAGE).ind $(PACKAGE).idx
makeindex -s gglo.ist -o $(PACKAGE).gls $(PACKAGE).glo
pdflatex uefcsthesis.dtx
while ( grep -q '^LaTeX Warning: Label(s) may have changed' uefcsthesis.log )
do pdflatex uefcsthesis ; done
```

Notice that the last two lines are part of the same command, but they have to be separated with a newline.

If you have standard Unix `make` utility, you can use the package's `Makefile` and issue

```
make uefcsthesis.cls
make uefcsthesis.pdf
```

in the command line to make the class file and documentation.

The documentation depends on the following packages. They all are part of the standard L^AT_EX distributions such as MiK_TE_X and T_EX Live.

- inputenc
- fontenc
- babel
- amsmath
- microtype
- hologo
- url
- seealso
- hypdoc
- urlbst
- listings
- tabularx
- booktabs
- caption
- multicol

3 Using the Class

To use the class, give its name as a parameter for the L^AT_EX's `\documentclass` command near the begin of the main `.tex` file:

```
\documentclass{uefcsthesis}
```

The class expects that the text is encoded in UTF-8 encoding. The class also requires that some metadata must be set. An example minimal file is provided in Listing 1.

Listing 1: Minimal .tex file for uefcsthesis.cls.

```

\documentclass[mscthesi,english,oneside,biblatex]{uefcsthesis}

%% Correct the below with the name of your bibliography file
\addbibresource{minimal.bib}

%% Replace all capital text with your own information.
\title{TITLE} % Title of the thesis
\author{GIVEN NAME}{FAMILY NAME} % Your name
\date{MONTH YEAR} % The month and year of handing in your thesis
\city{CITY} % Either Kuopio or Joensuu
\firstsupervisor{GIVEN FAMILY} % Name of the first supervisor
\secondsupervisor{GIVEN FAMILY} % Name of the second supervisor, if any
\keywords{KEYWORD1\sep KEYWORD2\sep ETC} % Keywords must be separated with \sep

%% To get the ACM CCS classification, you can visit
%% https://dl.acm.org/ccs/ccs.cfm
%% There you can find a tool to generate LaTeX code for the classification
%% Copy it here. You don't need to copy the XML at the begin, though.
%% For example,
%% \ccsdesc[500]{Some Class}

\begin{document}
\maketitle
\begin{abstract}
WRITE YOUR ENGLISH ABSTRACT HERE
\end{abstract}

\frontmatter
\tableofcontents
\mainmatter

\chapter{Introduction}
\label{cha:intro}

WRITE YOUR INTRODUCTION HERE

WRITE THE REST OF THE THESIS HERE

THIS IS AN EXAMPLE OF USING CITATIONS:
Graph generators are important \citep{metzler18random}.
\citet{kalofolias18from} discuss sets of redescrptions.

%% Next comes the references
\printbibliography[heading=bibintoc]

\backmatter % Do not remove!
%% Possible appendices come here
\end{document}

```

3.1 Dependencies to Other Packages

The `uefcsthesis.cls` class depends on a number of other packages. These are listed below. The packages marked with a star might or might not be loaded, depending on the class options (see Section 3.2).

- | | |
|----------------------------|------------------------------|
| • <code>amsmath</code> | • <code>graphicx</code> |
| • <code>amsthm</code> | • <code>hyperref</code> * |
| • <code>appendix</code> | • <code>ifluatex</code> |
| • <code>array</code> | • <code>ifthen</code> |
| • <code>babel</code> * | • <code>ifxetex</code> |
| • <code>biblatex</code> * | • <code>inputenc</code> * |
| • <code>bm</code> | • <code>mathtools</code> |
| • <code>booktabs</code> | • <code>microtype</code> |
| • <code>caption</code> | • <code>natbib</code> * |
| • <code>changectr</code> * | • <code>newtxmath</code> |
| • <code>comment</code> | • <code>newtxtext</code> * |
| • <code>csquotes</code> | • <code>pdfx</code> * |
| • <code>etoolbox</code> | • <code>polyglossia</code> * |
| • <code>fancyhdr</code> | • <code>setspace</code> |
| • <code>fontenc</code> * | • <code>textcomp</code> |
| • <code>fontspec</code> * | • <code>tocbibind</code> |
| • <code>geometry</code> | • <code>xparse</code> |

3.2 Class Options

The class takes a number of options that control its behaviour. The different options are listed in Table 1.

Thesis Type The main options control the thesis type. These are `mscsthesis` and `bscsthesis`. They also have Finnish aliases, `gradu` and `kandi`. None of these options have any effect on the language of the thesis (i.e. `kandi` doesn't set the language to Finnish nor does `mscsthesis` set it to English). The `bscsthesis` (and `kandi`) option do set some other features, though: it turns the layout for one-sided printing and changes the math numbering so that math counters do not reset at the start of chapters.

Table 1: Options for loading the class. Options in the same group are mutually exclusive. The default for each group is listed first.

Group	Option	Description
Thesis type	mscthesis	Sets the thesis type to Master’s thesis
	gradu	Same as above
	bscthesis	Sets the thesis type to Bachelor’s thesis
	kandi	Same as above
Language	finnish	Sets the language to Finnish
	english	Sets the language to (US) English
	british	Sets the language to British English
Engine	polyglossia	Activates the polyglossia package instead of the babel package (using babel is the default)
Printing	oneside	Adapts the layout for one-sided printing
	twoside	Adapts the layout for two-sided printing
Finalizing	final	Produce finalized output
	draft	Produce draft output
Numbers	lining	Activates the lining figures
	osf	Activates the old-style figures
Bibliography engine	bibtex	Activates the support for the BIBTEX bibliography engine
	biblatex	Activates the support for the biblatex bibliography package with the biber engine
Citation style	authoryear	Activates the author–year citation style
	numeric	Activates the numeric citation style
Math numbering	chaptermathnum	Reset math environments’ numbering at the begin of each chapter
	runningmathnum	Keep the same numbering throughout the thesis
Theorem numbering	sharedtheoremnumbers	All theorem-like environments share the same numbering
	separatetheoremnumbers	Each theorem-like environment has its own numbering
Hyperref-package	hyperref	Load the hyperref package
	nohyperref	Do not load hyperref
PDF/A	nopdfa	Do not generate the output in PDF/A format
	pdfa	Load pdfx package and produce PDF/A output; will also load the hyperref package

Language and Engine The language options are straightforward. The `uofcsthesis` class supports Finnish, US English, and British English as pre-defined languages using options `finnish`, `english`, and `british`, respectively. Setting the language changes all pre-defined strings and sets the hyphenation correctly.

The actual language support comes from the `babel` or `polyglossia` packages, depending on whether the `polyglossia` option is given. The support is (mostly) transparent to the end user (though `polyglossia` does support more complicated cases), but it does set restrictions to the \LaTeX engine used: when using `babel`, one can use any \LaTeX engine; when using `polyglossia`, one can use either \LaTeX or \XeTeX . Notice however that as of 2019, development of `polyglossia` seems to have stalled; currently it is recommended to use `babel` unless some special features of `polyglossia` are needed.

Printing, Finalizing, and Numbers The options `oneside` and `twoside` change the layout of the thesis suitable for one-sided and two-sided output. For digital use, one-sided output is preferable.

Another option controlling the layout is the `osf` option that changes the numbers to old-style figures. Using old-style figures requires one to be careful when writing numbers in the running text: the ‘mathematical numbers’ should always be surrounded by dollar signs as their outlook is markedly different from the ‘text numbers’. The opposite of old-style figures (and the default) is `lining` figures.

The finalizing options `final` and `draft` control the layout of various things. Many standard \LaTeX -packages check the `draft` option, and change their behaviour accordingly. For example, the `graphicx` package does not print the figures when the draft option is given, and \LaTeX prints black boxes next to overflowed lines to highlight them. On the other hand, the `uofcsthesis` class catches the `draft` options to make sure that the `microtype` package keeps working even in the draft mode.

Bibliography Engine and Citation Style \LaTeX has (and `uofcsthesis` supports) two bibliographical engines: `BIB \LaTeX` and `BIB \LaTeX` with `biber`. In general, the more modern `BIB \LaTeX` package is recommended, but the more standard `BIB \LaTeX` can also be used (and is better if one wants to use the work later with commercial publishers, who do not usually support `BIB \LaTeX`). You can mix-and-match the engines and use `pdf \LaTeX` with `BIB \LaTeX` , for example.

Whichever bibliography engine is selected, `uofcsthesis` allows you to use `natbib`-like citation commands like `\citet` and `\citep`. The commands work in both author-year citation style (the default, with `auhtoryear`) and numerical citation style, which can be activated with the `numeric` option.

With `BIB \LaTeX` , the citation style is the `biblatex-apa` package [5]. With `BIB \LaTeX` , we are using the `apacite` package [6]. See their respective documentations for more information regarding the usage of the styles and various bibliography record types and fields supported.

Numbering in Mathematics There are two features of numbering of ‘mathematical objects’ that can be controlled in `uefcsthesis`. The first is whether the numbering of equations, as well as theorems, lemmas, and other theorem-like environments resets at the begin of every chapter. This is the default in Master’s theses, and these numbers are two-part, like (1.1). In Bachelor’s theses, the numbering is running throughout the thesis, and the numbers are one-part, like (1). Option `chaptermathnum` turns on the per-chapter numbering also for Bachelor’s theses and `runningmathnum` turn on the running numbering also for Master’s theses.

The other numbering feature that can be controlled considers the numbering of theorem-like environments (like `theorem`, `lemma`, `corollary`, etc.) By default (or when given the `sharedtheoremnumbers` option), these share the same counter, that is, Lemma 1 is followed by Theorem 2 which is followed by Corollary 3 and so on. Option `separatetheoremnumbers` separates the counters, and Lemma 1 is followed by Theorem 1 which is followed by Corollary 1 and so on. More information regarding the theorem-like environments is in Section 3.6

Hyperref and PDF/A The `uefcsthesis` package can automatically generate PDF/A output using the `pdfx` package. This is controlled by the `pdfa` and `nopdfa` options. By default, generation of PDF/A is turned off, as it requires a sidcar file (see Section 3.5) and as PDF/A does not allow comments, it might harm the supervisor’s ability to comment the drafts. For the final deliverable, it is recommended to use the `pdfa` option (and to read Section 3.5 before doing that).

Even when no PDF/A is being generated, `uefcsthesis` uses the `hyperref` package to turn the references into hyperlinks and to add the PDF metadata. Sometimes `hyperref` package must be loaded after some user-loaded package; in these situations, the loading of `hyperref` by `uefcsthesis` can be turned off with the `nohyperref` option.

3.3 Document Metadata, Title Page, and Abstract

The `uefcsthesis` class provides standard \LaTeX commands for entering the document metadata (title, author, etc.) and for printing the title page and abstract. To support abstracts in different languages (e.g. Finnish and English), many commands are enhances to take an optional argument that defines the language for which the metadata is set.

Entering Document Metadata

The document metadata must be entered in the document preamble, as it is needed at the begin of the document to fill in the PDF metadata.

<code>\title</code>	The title of the thesis is set by <code>\title</code> macro, which can be called as <code>\title[<i><lang></i>]{<i><title></i>}</code> . The optional <i><lang></i> parameter can be used to set title in languages other than the document’s main language. This options use with
<code>\subtitle</code>	<code>\title</code> and other macros that support it is explained in Section 3.4. If the thesis has a subtitle, it’s given with <code>\subtitle[<i><lang></i>]{<i><subtitle></i>}</code> command.
<code>\author</code>	The author name is given as <code>\author{<i><given name(s)></i>}{<i><family name></i>}</code> .

<code>\date</code>	There's no multilingual support for the author name, as of now. The date of the thesis is set as <code>\date[⟨lang⟩]{⟨date⟩}</code> . The mandatory argument <code>⟨date⟩</code> can be given as <code>\today</code> , but this prints the full date, while the standard is to have just the month and the year.
<code>\city</code>	The thesis must indicate whether it's done in Joensuu or Kuopio. This is done using the <code>\city</code> macro as <code>\city{⟨city⟩}</code> , where <code>⟨city⟩</code> is either Joensuu or Kuopio. The <code>\city</code> macro does also support the <code>⟨lang⟩</code> optional argument, but unlike the other macros, if none is given, the city name is set for all supported languages (Finnish, US English, and British English) as Joensuu and Kuopio are the same in all of them.
<code>\firstsupervisor</code>	The name of the first (primary) supervisor is given as <code>\firstsupervisor{⟨name⟩}</code> , where <code>⟨name⟩</code> is given in 'given name(s) family name' format, for instance, <code>\firstsupervisor{Pauli Miettinen}</code> . If the thesis has a second supervisor, his or her name is given with <code>\secondsupervisor</code> command in exactly the same way as the first supervisor. These two macros do not take the language as an optional argument. If the thesis has more than two supervisors, all but the last supervisors' names should be given in <code>\firstsupervisor</code> , separated with commas. The last supervisor's name is given with <code>\secondsupervisor</code> .
<code>\secondsupervisor</code>	
<code>\keywords</code>	The thesis's keywords are given with <code>\keywords[⟨lang⟩]{⟨keywords⟩}</code> command. The <code>⟨keywords⟩</code> argument must be a list of keywords separated with <code>\sep</code> command.
<code>\sep</code>	The <code>\sep</code> command creates the correct separator for different use cases (e.g. semicolon in the abstract page, comma in some metadata fields).
<code>\ccsdesc</code>	The ACM 2012 Computing Classification System's (CCS) classification is given with the <code>\ccsdesc</code> macro that has the format <code>\ccsdesc[⟨level⟩]{⟨class⟩}</code> . The <code>⟨level⟩</code> argument describes the level of importance of the <code>⟨class⟩</code> . The <code>\ccsdesc</code> commands are expected to be generated with the ACM tool at https://dl.acm.org/ccs/ccs.cfm .
<code>\numberofappendices</code>	If the thesis contains appendices, their number must be inserted with <code>\numberofappendices{⟨num⟩}</code> . The <code>\appendixpagecount{⟨pages⟩}</code> macro is used to tell the class how many pages long the appendices in total are, and it is mandatory if <code>\numberofappendices</code> macro is given a value larger than 0.
<code>\appendixpagecount</code>	

Special Pages and Document Structure

<code>\maketitle</code>	The thesis title page is printed with the (standard) <code>\maketitle</code> command. The command doesn't take any arguments.
<code>abstract</code>	The abstract of the thesis is written in the <code>abstract</code> environment, like <pre> \begin{abstract} The text of the abstract \end{abstract} </pre>

The `abstract` environment will also print the abstract page and populate it with the document metadata and page numbers.

	To print an abstract in other language, the <code>abstract</code> environment can be called with an optional argument: <code>\begin{abstract}[\langle lang \rangle]</code> . This will generate another abstract page, typeset in language $\langle lang \rangle$.
<code>\frontmatter</code>	The start of the ‘front matter’ of the thesis is indicated by the <code>\frontmatter</code> macro, which is mandatory in every document using <code>uefcsthesis</code> . The front matter has roman pages numbers and it contains at least the table of contents (generated with the <code>\tableofcontents</code> command). In addition of the table of contents, the front matter can contain the preface, that is written inside the <code>preface</code> environment, and the acknowledgements, written inside the <code>acknowledgements</code> environment. These environments do not have the language parameter, but the standard <code>\selectlanguage</code> command can be used to typeset them in other languages (see also Section 3.4).
<code>preface</code>	
<code>acknowledgements</code>	
<code>\mainmatter</code>	The body of the thesis is written after the <code>\mainmatter</code> macro, which is again mandatory. After the list of references, starts the ‘back matter’, indicated by the <code>\backmatter</code> macro. The back matter contains the appendices, if any, but it is nonetheless mandatory, even in there are no appendices, as it is used to count the total number of pages in the thesis.
<code>\backmatter</code>	
<code>appendices</code>	The (possible) appendices come after the <code>\backmatter</code> macro and they are enclosed in <code>appendices</code> environment. For example,
	<pre> \backmatter \begin{appendices} \chapter{All The Stuff That Didn't Fit to the Main Text} \end{appendices} </pre>

3.4 Multilingual Documents

The `uefcsthesis` package is designed to directly support theses written in Finnish or English, to support including text in other languages, and to be easy to extend to support especially abstract pages in other languages. It also allows to change the pre-defined strings with ease.

The main part of the multilingual support is that `uefcsthesis` assumes UTF-8 encoded input. Both `LuaATeX` and `XYLaTeX` assume that by default, and for `pdfLaTeX`, we use the `inputenc` package with `utf8` option.

Abstract in the Secondary Language

The previous section detailed how to provide the metadata and produce the abstract page in the thesis’ primary language (i.e. in the language selected in the class options). Master’s and Bachelor’s theses should also include abstract page in the secondary language (English if the thesis is written in Finnish and vice versa). To make that, the necessary metadata has to be provided in the secondary language using the optional $\langle lang \rangle$ argument. At least `\title`, possible `\subtitle`, and `\keywords` have to be given in both languages.

To produce the actual abstract, give the optional $\langle lang \rangle$ argument to the `abstract` environment. Listing 2 shows an example of a Master’s thesis in Finnish

Listing 2: Example of a Finnish MSc thesis with British abstract.

```

\begin{documentclass}[mscthesis,finnish]{uefcsthesis}
\title{Otsikko}
\title[british]{Title}
\author{Oula}{Opiskelija}
\firstsupervisor{Rauni~P.~Rohvessori}
\secondsupervisor{Toini Tutkija}
\keywords{pro gradu –tutkielma\sep tieteellinen kirjoittaminen\sep esimerkki}
\keywords[british]{MSc thesis\sep scientific writing\sep example}
\begin{document}
  \maketitle
  \begin{abstract}
    Suomenkielinen teksti
  \end{abstract}
  \begin{abstract}[british]
    English text
  \end{abstract}
  \frontmatter
  % Rest of the thesis
\end{document}

```

with British abstract.

Abstract in Other Languages and Changing Pre-Defined Strings

Students whose mother tongue is not Finnish or English might wish to include an abstract page in their mother tongue. It is recommended that $\text{Lua}\text{\LaTeX}$ or $\text{X}\text{\LaTeX}$ is used in these cases. If the language needs non-latin alphabet, the `uefcsthesis` class should be loaded with the `polyglossia` option.

Class `uefcsthesis` already loads Swedish in addition to the supported languages. To add another new language, `polyglossia`’s `\setotherlanguage` command must be called first [4, Section 2.1].

There are two ways to add an abstract in other languages. The first is to use the English abstract page and only write the text of the abstract (and potentially title and the keywords) in the other language. This can be done by calling the `abstract` environment with `english` as the optional argument and calling `polyglossia`’s `\lang` environment [4, Section 3]. For example,

```

\setotherlanguage{german}
\begin{abstract}[english]
  \begin{german}
    Kurzfassung auf Deutsch
  \end{german}
\end{abstract}

```

`\setstring` The alternative is to print the full abstract page in the target language. This

Table 2: Pre-defined strings used in the abstract page

$\langle string\ name \rangle$	$\langle string\ text \rangle$ (English)	$\langle string\ text \rangle$ (Finnish)
thesistype	Master's thesis	Pro gradu -tutkielma
field	Computer Science	Tietojenkäsittelytiede
departmentname	School of Computing	Tietojenkäsittelytieteen laitos
facultyname	Faculty of Science and Forestry	Luonnontieteiden ja metsätieteiden tiedekunta
universityname	University of Eastern Finland	Itä-Suomen yliopisto
pages	p.	s.
and	and	ja
keywordsname	Keywords	Avainsanat
supervisorname	Supervisor	Ohjaaja
supervisorsname	Supervisors	Ohjaajat
app@o	appendix	liite
app@m	appendices	liitettä

requires that the `uefcsthesis` class is told the pre-defined strings in the new language. This can be done with the `\setstring` command, that is called as follows: `\setstring[$\langle lang \rangle$]{ $\langle string\ name \rangle$ }{ $\langle string\ text \rangle$ }`. If no $\langle lang \rangle$ is given, the `\setstring` command changes the string for the document main language. The pre-defined strings that are used in the abstract page are listed in Table 2 together with their English and Finnish values.

The language-aware metadata commands (`\title` etc.) work with any language that has been added with `\setotherlanguage` (and Swedish, that is automatically included). A thesis that contains a Swedish abstract might have the following lines (among others):

```
\setstring[swedish]{universityname}{Östra Finlands universitet}
\setstring[swedish]{facultyname}{Naturvetenskapliga och forstvetenskapliga fakulteten}
\title[swedish]{Rubrik}
```

The `\setstring` command can be used to change the pre-defined strings in Finnish, English, and British, as well. If, for example, one wants to change the field of the thesis to Data Science (`datatiede`) in a Finnish MSc thesis with British abstract, that would require the following commands in the preamble:

```
\setstring{field}{Datatiede}
\setstring[british]{field}{Data Science}
```

Thanks to the UTF-8 support, `uefcsthesis` can support also non-latin alphabets, although writing systems that are not left-right are not tested or supported. The standard font does not support all fonts, though, so you might have to tell `fontspec` (assuming you're using Lua \LaTeX or Xe \LaTeX , as you should) to use

Listing 3: Default minimal .xmpdata metatdata file

```

\Title{\uef@pdf@title}
\Author{\@author}
\Keywords{\uef@keywords}
\Subject{\uef@pdf@subject}
\Publisher{\uef@s@universityname}
\endinput

```

different font for Cyrillic text. Standard L^AT_EX comes with Tempora font, that is a Cyrillic font that looks similar to Times New Roman. To use it, add the following to the document preamble:

```
\newfontfamily\russianfont[Script=Cyrillic]{Tempora}
```

3.5 PDF/A

University of Eastern Finland requires that Master’s theses are returned in PDF/A format. `uefcsthesis` allows direct generation of PDF/A output using the `pdfx` package [9]. The generation of the PDF/A output can be activated with the `pdfa` class option. To successfully generate the PDF/A file, `pdfx` requires a sidecar file containing the document metadata. To obtain the default sidecar file, *you rename the file `minimal.xmpdata` to `\thesisfile.xmpdata`*. If your theses’ main .tex file is called `opiskelija_oula_gradu.tex`, copy `minimal.xmpdata` to `opiskelija_oula_gradu.xmpdata`. The contents of the `minimal.xmpdata` file are provided in Listing 3.

In most cases, the default file will work fine. One should, however, *always check the metadata*. This can be done, e.g. in Adobe Reader, selecting **File**→**Document Properties**. If the thesis title, author name, or keywords contain (complex) L^AT_EX commands, the metadata will not look good. In these cases, one should edit the `\thesisfile.xmpdata` file. It should be necessary to edit only the contents of the macros `\Title`, `\Author`, and `\Keywords`. The current macros (e.g. `\uef@pdf@title`) can just be replaced with the actual title, author name, and keywords, all in UTF-8 encoding, and separating the keywords with `\sep`. See the documentation of `pdfx` [9] for more information.

If the document uses other fonts than the standard ones (e.g. for typesetting Russian), `pdfLATEX` might not produce compliant PDF/A documents. In these cases, it is recommended to use `LuaLATEX`. On the other hand, as `uefcsthesis` produces files for the PDF/A-1b standard, if any of the figures contain layers or CMYK colours, the resulting file is not compliant. The validity of the generated file can be checked with the free VeraPDF application.²

`\hypersetup` As `pdfx` loads `hyperref` before you can load it yourself, you have to use the `\hypersetup` to configure the parts of `hyperref` that you might want to change

²<http://verapdf.org/software/>, accessed 17 Dec 2018.

(e.g. the colouring of the links). The `uofcsthesis` guarantees that `\hypersetup` exists, but if `hyperref` is not loaded, it doesn't do anything. For more information on how to use `\hypersetup`, refer to the `hyperref` documentation [10].

3.6 Pre-Defined Commands and Environments for Mathematics

The `uofcsthesis` class facilitates the typesetting of mathematics by defining most of the standard mathematical theorem-like environments and some other helper macros.

Theorem-Like Environments

<code>theorem</code>	The class uses the <code>amsthm</code> package to build the theorem-like environments. It defines a number of standard environments. The standard for these environments is <code>theorem</code> that is used to write a theorem. It, like the other theorem-like environments, takes one optional argument, contents of which will be typeset in parentheses after the word Theorem . The theorem will be numbered using a two-part number $x.y$, where x is the chapter number and y is the theorem number, except if option <code>runningmathnum</code> is given (or the thesis is Bachelor's thesis), in which case the numbering scheme is one-part. The starred version will not print any number.
<code>lemma</code>	The other theorem-like environments are <code>lemma</code> , <code>corollary</code> , <code>proposition</code> , and <code>conjecture</code> . Their numbering scheme is the same as with <code>theorem</code> , and by default, they have the same counter (i.e. Lemma 1 is followed by Theorem 2). This can be changed with option <code>separatetheoremnumbers</code> .
<code>corollary</code>	
<code>proposition</code>	
<code>conjecture</code>	
<code>proof</code>	The environment to typeset (short) proofs, <code>proof</code> , is provided by the <code>amsthm</code> class; see its documentation [8] for further information.
<code>definition</code>	The environments <code>definition</code> , <code>problem</code> , and <code>example</code> are typeset differently, and they each have their own counters. These counters have the same format as <code>theorem</code> , though.
<code>problem</code>	
<code>example</code>	The last two environments, <code>remark</code> and <code>note</code> , have no numbers.
<code>remark</code>	
<code>note</code>	

Convenient Macros for Typesetting Math

<code>\abs</code>	The <code>uofcsthesis</code> class provides few special macros that help typesetting math. The first macro is <code>\abs</code> , used to typeset 'absolute value' (i.e., two vertical bars). It's basic form is <code>\abs[⟨size⟩]{⟨stuff⟩}</code> that will put $\langle stuff \rangle$ inside properly-spaced vertical bars. If the optional argument $\langle size \rangle$ is given, it should be one of L ^A T _E X's delimiter sizing commands, like <code>\big</code> , and it will control the size of the bars. The command also has a starred version, <code>\abs*</code> , which is equivalent of putting <code>\left</code> and <code>\right</code> around the bars.
<code>\norm</code>	Similarly to <code>\abs</code> , <code>\norm</code> produces double-vertical bars around its mandatory argument. It has similar sizing commands, so <code>\norm[\Bigg]{\frac{a}{b}}</code> will produce tall double-vertical bars.

Finnish mathematical text usually uses ‘inverted square brackets’ to indicate open end of an interval, like $]a, b[$. Notice, however, that \LaTeX typesets the space around the inverted brackets wrongly. `uefcsthesis` provides three commands to facilitate the typesetting of such intervals: `\lointerval`, `\rointerval`, and `\ointerval` for left-open intervals $]a, b[$, right-open intervals $[a, b[$, and open intervals $]a, b[$, respectively. They take the same optional argument or starred form as `\abs` and `\norm`.

`\bm` Finally, `uefcsthesis` also loads the `bm` package. It allows one to use italic bold-face fonts in math by using the command `\bm` instead of `\mathbf`. Unfortunately, `bm` can sometimes cause issues by using many \LaTeX font spots; see the manual [2] for more information, including ways to solve the issue.

3.7 Support for Other Packages

The `uefcsthesis` loads a few more packages, and provides support (mostly, Finnish translation) for further packages if they are loaded.

Tables and Figures

To insert the figures, `uefcsthesis` loads the `graphicx` package. You can use it to include your own figures and to customize the folder where you store the figures; see the package documentation [3] for more information.

To help typesetting tables, `uefcsthesis` loads `tabularx` and `booktabs` packages. Most importantly, the class allows users to use four new table column types: `C`, `L`, `R`, and `X`. Three first, `C`, `L`, and `R` create centered, left-aligned, and right-aligned columns – similar to standard `c`, `l`, and `r` – but set their contents in math mode. The math mode can be cancelled in a particular cell (e.g. in the caption) by surrounding the cell contents in dollar signs. These column types are convenient for typesetting simple tables with numbers, but see the `siunitx` package [11] for more complete approach for typesetting tables with numbers.

`tabularx` The last new column type, `X`, can only be used inside a new environment, `tabularx` and it creates a `p`-type column with automatically adjusting width. See the documentation of the `tabularx` package [1] for more information.

The `tabularx` package loads the `array` package, which provides some useful tools for defining material that will be repeated for every table cell in a column; see [7] for more information.

`\toprule` The `booktabs` package defines four macros for drawing rules in \LaTeX tables:
`\midrule` `\toprule`, `\midrule`, `\cmidrule`, and `\bottomrule`. These commands should be
`\cmidrule` used instead of old `\hline`, and *vertical rules should never be used in tables*. The
`\bottomrule` documentation for the `booktabs` package [?] explains how to design a good-looking table, and it is a recommended reading for anybody using \LaTeX .

Typesetting Algorithms

The `uefcsthesis` package does not provide any special commands for typesetting algorithms, but it supports the standard packages used to do it. Namely,

`uefcsthesis` provides Finnish translations for the floating environment names and ‘list-of-algorithms’ lists for the packages `algorithm2e` and `algorithmicx`, often used to typeset pseudo-code, and for packages `listings`, `listingsutf8`, and `fancyvrb`, often used to typeset actual program listings.

4 Implementation

Most of the code in this package is for the `uefcsthesis.cls` class file (compiled with argument `cs`), but we also include the basic `xmpdata` file for `pdfx` package (compiled with the argument `xmp`).

```
1 \<cs>
```

4.1 Package Options and Ifs

We will record all package options in `\ifs`, so we start by defining them.

`uef@mscthesis` These ifs will control the outlook of the thesis: whether it’s an MSc or BSc thesis (default: MSc); whether it’s printed one or two-sided (default: one); and whether `uef@twoside` to use old-style figures (default: not). `uef@osf`

```
2 \newif\ifuef@mscthesis\uef@mscthesistrue
3 \newif\ifuef@twoside\uef@twosidefalse
4 \newif\ifuef@osf\uef@osffalse
```

`uef@polyglossia` These ifs will control the language of the document; `uef@polyglossia` controls whether to load the `polyglossia` package or the `babel` package (default: `babel`), `uef@finnish` whether `uef@finnish` stores whether the document is in Finnish or in some other language. In any case, the name of the language is stored in `\uef@language`.

```
5 \newif\ifuef@polyglossia\uef@polyglossiafalse
6 \newif\ifuef@finnish\uef@finnishtrue
7 \newcommand{\uef@language}{finnish}
```

`uef@numbertheoremsbychapter` These ifs control the behaviour of math environment numbering. If `uef@singlemathnumber` is true it means that Theorems, Lemmas, Propositions, and Conjectures use one number; otherwise, they each have their own number.

```
8 \newif\ifuef@numbertheoremsbychapter\uef@numbertheoremsbychaptertrue
9 \newif\ifuef@singlemathnumber\uef@singlemathnumbertrue
```

`uef@biblatex` Whether to use `BIBLATEX` or `BIBTEX` (default: `BIBTEX`), and which style to use `\uef@biblatexstyle` (default: `authoryear-comp`)

```
10 \newif\ifuef@biblatex\uef@biblatexfalse
11 \newcommand{\uef@biblatexstyle}{authoryear-comp}
```

`uef@hyperref` The final if’s control whether we load the `hyperref` package and the `pdfx` package. `uef@pdfa` As `pdfx` loads `hyperref`, we don’t load the latter if the former is loaded. Sometimes it’s also useful to not load `hyperref` here, but to postpone it for later.

```
12 \newif\ifuef@hyperref\uef@hyperreftrue
13 \newif\ifuef@pdfa\uef@pdfafalse
```


Package Options

With the ifs defined, we can define the class options to set the ifs in the correct way.

<code>mscthesis</code>	The most important option is the type of the thesis. MSc theses are by default
<code>bscthesis</code>	two-sided and have their theorem counter(s) reset in every chapter, while BSc
<code>gradu</code>	theses are by default one-sided and don't reset their theorem counter(s) for every
<code>kandi</code>	chapter.
	For convenience, there's also Finnish equivalents, but they don't imply the language of the thesis.
	<pre> 14 \DeclareOption{mscthesis}{\uef@mscthesistrue} 15 \DeclareOption{bscthesis}{% 16 \uef@mscthesisfalse% 17 \uef@twosidefalse% 18 \uef@numbertheoremsbychapterfalse% 19 } 20 \DeclareOption{gradu}{\uef@mscthesistrue} 21 \DeclareOption{kandi}{% 22 \uef@mscthesisfalse% 23 \uef@twosidefalse% 24 \uef@numbertheoremsbychapterfalse% 25 } </pre>
<code>oneside</code>	These options allow one to specify one or two sided outlook.
<code>twoside</code>	<pre> 26 \DeclareOption{oneside}{\uef@twosidefalse} 27 \DeclareOption{twoside}{\uef@twosidetrue} </pre>
<code>polyglossia</code>	The <code>polyglossia</code> option activates the <code>polyglossia</code> package. Using it also means that the document must be compiled with either Lua ^A T _E X or X _Y L ^A T _E X.
	<pre> 28 \DeclareOption{polyglossia}{\uef@polyglossiatrue} </pre>
<code>finnish</code>	These options control the language of the thesis. Currently only Finnish and
<code>english</code>	English (with either US or UK spelling) are supported.
<code>british</code>	<pre> 29 \DeclareOption{finnish}{\uef@finnishtrue\renewcommand{\uef@language}{finnish}} 30 \DeclareOption{english}{\uef@finnishfalse\renewcommand{\uef@language}{english}} 31 \DeclareOption{british}{\uef@finnishfalse\renewcommand{\uef@language}{british}} </pre>
<code>osf</code>	These options control the way the figures are printed. Option <code>osf</code> turns on old-style
<code>lining</code>	figures for text, but not for math or tables. Option <code>lining</code> uses the lining figures.
	<pre> 32 \DeclareOption{osf}{\uef@osftrue} 33 \DeclareOption{lining}{\uef@osffalse} </pre>
<code>bibtex</code>	These options control the way the bibliography is done. Options <code>bibtex</code> and
<code>biblatex</code>	<code>biblatex</code> choose between Bib ^T E _X and BIB ^A T _E X, and options <code>numeric</code> and
<code>numeric</code>	<code>authoryear</code> choose between numeric and author-year citation format.
<code>authoryear</code>	<pre> 34 \DeclareOption{bibtex}{\uef@biblatexfalse} 35 \DeclareOption{biblatex}{\uef@biblatextrue} 36 \DeclareOption{numeric}{\renewcommand{\uef@biblatexstyle}{numeric-comp}} 37 \DeclareOption{authoryear}{\renewcommand{\uef@biblatexstyle}{authoryear-comp}} </pre>

`chaptermathnum` `runningmathnum` `sharedtheoremnumbers` `separatetheoremnumbers` These options control the numbering of the mathematical theorem-style environments, namely theorems, lemmas, corollaries, and propositions. Options `chaptermathnum` and `runningmathnum` control whether the counters will be reset at the begin of every chapter or not, respectively, while `sharedtheoremnumbers` and `separatetheoremnumbers` control whether all of the environments share a single counter or if there's a different counter for each environment.

```
38 \DeclareOption{chaptermathnum}{\def@numbertheoremsbychaptertrue}
39 \DeclareOption{runningmathnum}{\def@numbertheoremsbychapterfalse}
40 \DeclareOption{sharedtheoremnumbers}{\def@singlemathnumbertrue}
41 \DeclareOption{separatetheoremnumbers}{\def@singlemathnumberfalse}
```

`hyperref` `nohyperref` `pdfa` `nopdfa` Here we control whether we load the `hyperref` package and whether we should generate PDF/A format output (by loading the `pdfx` package). As `pdfx` loads `hyperref`, we will have to do all setup of `hyperref` using `\hypersetup`. We will also make sure that we won't load `hyperref` if `pdfa` option is set to true.

```
42 \DeclareOption{hyperref}{\def@hyperreftrue}
43 \DeclareOption{nohyperref}{\def@hyperreffalse}
44 \DeclareOption{pdfa}{\def@pdfatrue}
45 \DeclareOption{nopdfa}{\def@pdfafalse}
```

`draft` `final` We catch `draft` and `final` options so that we could act on them if we would want to.

```
46 \DeclareOption{draft}{\PassOptionsToClass{\CurrentOption}{book}}
47 \DeclareOption{final}{\PassOptionsToClass{\CurrentOption}{book}}
```

At this point, we can process the options.

```
48 \ProcessOptions\relax
```

This is a convenient point to print some info to log for potential debugging etc.

```
49 \ifuef@mscthis
50   \def\@tempa{Master's thesis}
51 \else
52   \def\@tempa{Bachelor's thesis}
53 \fi
54 \ifuef@twoside
55   \def\@tempb{two-sided}
56 \else
57   \def\@tempb{one-sided}
58 \fi
59 \ifuef@osf
60   \def\@tempc{old-style}
61 \else
62   \def\@tempc{lining}
63 \fi
64 \ifuef@biblatex
65   \ClassInfo{uefcsthis}{Creating a \@tempa space in \uef@language . \MessageBreak
66     Using BibLaTeX with style \uef@biblatexstyle .\MessageBreak
67     Layout is \@tempb \MessageBreak
68     and numbers \@tempc}
```

```

69 }
70 \else % BibTeX
71 \ClassInfo{uefcsthesis}{Creating a \@tempa\space in \uef@language . \MessageBreak
72 Using BibTeX with style \uef@biblatexstyle .\MessageBreak
73 Layout is \@tempb \MessageBreak
74 and numbers \@tempc
75 }
76 \fi

```

Load the standard book class this class is based on

```

77 \ifuef@twoside
78 \PassOptionsToClass{twoside}{book}
79 \else
80 \PassOptionsToClass{oneside}{book}
81 \fi
82 \LoadClass[a4paper,12pt]{book}

```

4.2 Setting Up the Outlook

We set the page geometry using the `geometry` package.

```

83 \RequirePackage[a4paper,%
84 top=3cm,%
85 left=35mm,%
86 right=30mm,%
87 bottom=20mm,%
88 head=0pt,%
89 headsep=0pt,%
90 foot=12pt,%
91 footskip=13mm,
92 ]%
93 {geometry}

```

`uef@modern` Load some helper packages to identify if we're using a modern version of L^AT_EX (i.e. LuaL^AT_EX or XeL^AT_EX). Save the knowledge at `uef@moder`, so we know it later, and load `inputenc` with UTF-8 encoding and `fontenc` if we're not modern.

```

94 \RequirePackage{ifxetex}
95 \RequirePackage{ifluatex}
96 \RequirePackage{ifthen}
97 \newif\ifuef@modern
98 \ifthenelse{\boolean{xetex}\OR\boolean{luatex}}{\uef@modertrue}{\uef@modernfalse}
99 \ifuef@modern
100 \else
101 \RequirePackage[utf8]{inputenc}
102 \RequirePackage[T1]{fontenc}
103 \fi

```

Next, load the font. We use `newtxtext` and `newtxmath`. However, the AMS packages (`amsmath` and `amsthm`) must be loaded before `newtxmath`. We load `amsthm` here, as `newtxmath` loads `amsmath`.

```

104 \RequirePackage{amsthm}

```

If we're using modern engine, we don't load newtxtext.

```

105 \ifuef@modern\else
106   \ifuef@osf
107     \RequirePackage[theoremfont,osf]{newtxtext}
108   \else
109     \RequirePackage[theoremfont]{newtxtext}
110   \fi
111 \fi

```

We will also load `textcomp` and `bm` packages to improve math fonts. And we use `varg` argument for `newtxmath` to get more distinguishable g.

```

112 \RequirePackage{textcomp}
113 \RequirePackage[varg]{newtxmath}
114 \RequirePackage{bm}

```

If we're using modern engine, we load TeX Gyre Termes as the font (with or without old style figures, depending on the options).

```

115 \ifuef@modern
116   \RequirePackage[no-math]{fontspec}
117   \ifuef@osf
118     \setmainfont[Numbers=OldStyle]{TeX Gyre Termes}
119   \else
120     \setmainfont{TeX Gyre Termes}
121   \fi
122   \DeclareSymbolFont{operators}{\encodingdefault}{\familydefault}{m}{n}
123 \fi

```

FIXME: doesn't support `newtxmath`'s `theoremfont` option

There is no indent between paragraphs, but there's extra space of 1 em that can be increased to 2 em. The spacing is set to one-and-half using the `setspace` package.

```

124 \setlength{\parindent}{0pt}
125 \setlength{\parskip}{1em \@plus 1em}
126 \RequirePackage[onehalfspacing]{setspace}[2011/12/19]

```

Next we have to load `babel` or `polyglossia` so that we get to set other language-dependant features. But before that, we have to load `csquotes`, that must come before `babel`. We always load Finnish, English, and Swedish as the languages, and set the main language according to the options. Babel must be at least 3.9c to support `main=` definition.

```

127 \RequirePackage{csquotes}
128 \ifuef@polyglossia
129   \RequirePackage{polyglossia}
130   \ifuef@finnish
131     \setdefaultlanguage{finnish}
132     \setotherlanguages{english,swedish}
133   \else
134     \ifthenelse{\equal{\uef@language}{english}}{%
135       \setdefaultlanguage{english}%
136     }{%

```

```

137     \setdefaultlanguage[british]{english}%
138   }
139   \setotherlanguages{finnish,swedish}
140   \fi % \ifuef@finnish
141 \else % using babel
142   \RequirePackage[main=\uef@language,swedish,finnish,english,british]{babel}[2013/04/07]
143 \fi % \ifuef@polyglossia

```

Load the microtype package for better typography. Use option ‘final’ to apply microtype even when the class is given ‘draft’ option and use option ‘babel’ to turn on babel integration.

```

144 \RequirePackage[final,babel]{microtype}

```

4.3 Headers, Matters, and Appendices

First we need to redefine the chapter header style to write everything in one row. The standard book class calls `\@makechapterhead` to actually print the chapterhead, so we modify that command

```

145 \def\@makechapterhead#1{%
146   \vspace*{50\p@}% some empty space
147   {\parindent \z@ \raggedright \normalfont
148     \interlinepenalty \@M
149     \Huge \bfseries \thechapter. \hspace{1ex} #1\par\nobreak
150     \vskip 40\p@
151   }%
152 }

```

Then we set the page headers using the `fancyhdr` package. In one-sided documents, we put the page number at the middle of the page, but in two-sided documents, we put it to the outer footer.

```

153 \RequirePackage{fancyhdr}
154 \ifuef@twoside
155   \fancypagestyle{plain}{%
156     \fancyhf{}}% Clear all
157   \fancyfoot[RO,LE]{\thepage}%
158 }
159 \else
160   \fancypagestyle{plain}{%
161     \fancyhf{}}% Clear all
162   \fancyfoot[C]{\thepage}%
163 }
164 \fi

```

And we also make sure that the empty pages are truly empty, and remove the rule between the header and body.

```

165 \fancypagestyle{empty}{\fancyhf{}}
166 \renewcommand{\headrulewidth}{0pt}

```

Front, Main, and Back Matter

`\frontmatter` First redefine `\frontmatter` to have roman numbering and plain pagestyle.

```

167 \renewcommand{\frontmatter}{%
168   \cleardoublepage
169   \pagenumbering{roman}
170   \pagestyle{plain}

```

`acknowledgements` Frontmatter has the special environments `acknowledgements` and `preface`. These

`preface` are just unnumbered chapters with pre-defined names.

```

171 \newenvironment{preface}{\chapter*{\uf@s@prefacename}}{}
172 \newenvironment{acknowledgements}{\chapter*{\uf@s@acknowledgementsname}}{}
173 }

```

The names of `acknowledgements` and `preface` sections are defined for Finnish, English, and British.

```

174 \addto\captionsfinnish{\def\uf@s@prefacename{Esipuhe}}
175 \addto\captionsenglish{\def\uf@s@prefacename{Preface}}
176 \addto\captionsbritish{\def\uf@s@prefacename{Preface}}
177 \addto\captionsfinnish{\def\uf@s@acknowledgementsname{Kiitokset}}
178 \addto\captionsenglish{\def\uf@s@acknowledgementsname{Acknowledgments}}
179 \addto\captionsbritish{\def\uf@s@acknowledgementsname{Acknowledgements}}

```

`\mainmatter` Next, the main matter. We use arabic numbers and plain page styles. We also print error if somebody tries to use `\preface` or `\acknowledgements` after `\mainmatter`.

```

180 \renewcommand{\mainmatter}{%
181   \cleardoublepage
182   \pagenumbering{arabic}
183   \pagestyle{plain}
184   \def\preface{\ClassError{uefcsthesis}%
185     {Environment 'preface' can only be used in preface}%
186     {You must put the environment 'preface' before the \MessageBreak
187       \noexpand\mainmatter command.}}
188   \def\acknowledgements{\ClassError{uefcsthesis}%
189     {Environment 'acknowledgements' can only be used in preface}%
190     {You must put the environment 'acknowledgements' before the \MessageBreak
191       \noexpand\mainmatter command.}}
192 }

```

`\backmatter` The `\backmatter` macro is essentially a noop for page style, but it has the important

`LastNormalPage` task of defining the label `LastNormalPage`, which will be used in the abstract page to count the number of pages excluding the appendices.

```

193 \renewcommand{\backmatter}{%
194   \label{LastNormalPage}
195   \cleardoublepage
196   \pagestyle{plain}
197 }

```

appendices The appendices are written inside the **appendices** environment that is provided by the **appendix** package. We use **titletoc** option to put the appendices to the table of contents. We also provide the Finnish translation for the strings and re-define the English string for the name of the list of appendices.

```

198 \RequirePackage[titletoc,]{appendix}
199 \ifuef@finnish
200   \renewcommand{\appendixname}{Liite}
201   \renewcommand{\appendixtocname}{Liitteet}
202   \renewcommand{\appendixpagename}{Liitteet}
203 \else
204   \renewcommand{\appendixtocname}{List of appendices}
205 \fi

```

4.4 The Bibliography

We load either **apacite** or **biblatex**, depending on what the user asked with the options. For **biblatex**, we use option **natbib=true** to activate the **natbib**-compatible citation command (**\citet**, **\citep**, etc.), **sorting=nyt** to sort using name-year-title ordering, **sortcites=true** to sort the citations inside one **\cite**-type command, and as a style we use the APA style from **biblatex-apa**. Notice that we need to have the translation of the strings available in file **finnish-apa.lbx**. This file is currently shipped separately with **uefcsthesis.cls**.

FIXME: Does not honor the **numeric** option. FIXME: The **authoryear-comp** might not be compatible with the **natbib** style

```

206 \ifuef@biblatex
207   \RequirePackage[natbib=true,
208     sorting=nyt,
209     sortcites=true,
210     style=apa,
211   ]
212   {biblatex}

```

We then update the bibliography name strings

```

213 % Update language-specific strings
214 \DefineBibliographyStrings{english}{%
215   bibliography = {References},
216   references = {References},
217 }
218 \DefineBibliographyStrings{finnish}{%
219   bibliography = {Viitteet},
220   references = {Viitteet},
221 }

```

For **apacite**, we give the **natbibapa** option in order to load the **natbib** package, too.

```

222 \else
223   \RequirePackage[natbibapa]{apacite}
224   \bibliographystyle{apacite}
225   \addto\captionsfinnish{

```

```

226 \renewcommand{\bibname}{Viitteet}
227 }
228 \addto\captionsenglish{
229 \renewcommand{\bibname}{References}
230 }

```

To translate the punctuation correct in Finnish, we must change the `\BCBT` and `\BCBL` that define the comma between two authors and comma between the penultimate and last author, if there's more than two authors, to nothing.

```

231 \addto\captionsenglish{
232 \renewcommand{\BCBT}{}
233 \renewcommand{\BCBL}{}
234 }
235 \fi % Using BibTeX

```

The `tocbibind` package adds references and other lists of to table of contents. Only works with `BIBTeX`; with `BIBLATeX` one has to give option `heading=bibintoc` to `\printbibliography`.

```

236 \RequirePackage[nottoc]{tocbibind}

```

4.5 Title and Abstract Pages and Multilingual Support

The macros in this section need to support multi-lingual interface. For consistency, this is done using an optional argument, so that `\title{X}` sets the title in the default language, and `\title[finnish]{X}` sets the title in Finnish (be that the default or not). To implement the optional arguments in a clean way, we use the `xparse` package.

```

237 \RequirePackage{xparse}

```

In principle, `xparse` could cause compatibility issues with older `LATeX` engines. If that is the case, we could use the following `\ifemptyarg` helper macro `\ifemptyarg`.³

```

\def\ifemptyarg#1{%
  \if\relax\detokenize{#1}\relax % H. Oberdiek
    \expandafter\@firstoftwo
  \else
    \expandafter\@secondoftwo
  \fi%
}

```

The usage of this macro is explained later with the `\setstring` macro.

Macros to Set and Store Thesis Metadata

`\author` Author's name is not multilingual, though, so we don't support any language option here. But we do need to separate author's given and family names; re-define `\@author@first` `\@author@family` `\@author`

³<https://tex.stackexchange.com/questions/308/different-command-definitions-with-and-without-optional-argument>

`\author` to take two arguments and store them in different macros. We also store the full name in GivenName FamilyName order to the standard `\@author`.

```

238 \gdef\@author@first{}
239 \gdef\@author@family{}
240 \renewcommand{\author}[2]{\gdef\@author@first{#1}%
241   \gdef\@author@family{#2}%
242   \gdef\@author{#1\space #2}%
243 }

```

`\uef@supervisor@first` The first supervisor's name is stored in `\uef@supervisor@first`, and we issue a warning if it's not defined.

```

244 \def\uef@supervisor@first{\ClassWarning{uefcsthesis}{First supervisor is not defined}}

```

`\uef@supervisor@second` The second supervisor's name can be left empty, and `\uef@supervisor@second` is only defined if the document calls `\secondsupervisor`.

`\firstsupervisor` Notice that it's possible to call `\secondsupervisor` without calling `\firstsupervisor`, but this is obviously not supported (what would it even mean?)

```

245 \newcommand{\firstsupervisor}[1]{\def\uef@supervisor@first{#1}}
246 \newcommand{\secondsupervisor}[1]{\def\uef@supervisor@second{#1}}

```

`\title` The title of the thesis is set with the standard `\title` macro, and we store it's value to the standard `\@title` macro. But we store it in a language-dependant way, so that activating different languages activates the different titles. The optional language parameter has to be saved as a macro so that it's expandable even if it's just a string, like `finnish`. By default, we use the document's main language from `\uef@language`, set by class options.

```

247 \DeclareDocumentCommand{\title}{ O{\uef@language} m }{
248   \def\lang{#1}
249   \expandafter\addto\csname captions\lang\endcsname{\def\@title{#2}}
250 }

```

`\@title`

`\subtitle` The (optional) subtitles are handled the same way as the titles. We collect it separately so that we can alter the layout for it and store it in metadata with proper punctuation.

```

251 \DeclareDocumentCommand{\subtitle}{ O{\uef@language} m }{
252   \def\lang{#1}
253   \expandafter\addto\csname captions\lang\endcsname{\def\@subtitle{#2}}
254 }

```

`\@subtitle`

`\date` The date of the thesis is stored with the standard `\date` macro, but this is also enhanced to take the optional language parameter.

```

255 \DeclareDocumentCommand{\date}{ O{\uef@language} m }{
256   \def\lang{#1}
257   \expandafter\addto\csname captions\lang\endcsname{\def\@date{#2}}
258 }

```

`\@date`

`\today` The default format for the date has only the month and the year, so we re-define `\today` to print just these. These are again language-dependant. FIXME: The definition is something like below, but with month names as macros. Check if babel defines macros for them.

```
\renewcommand{\today}{%
  \ifcase \month \or January\or February\or March\or %
  April\or May\or June\or July\or August\or September\or %
  October\or November\or December\fi \number \year}
```

`\keywords` The keywords are added the same way as titles, but we store them twice.
`\uef@keywords` `\uef@keywords` stores the keywords in the current language, while `\uef@all@keywords`
`\uef@all@keywords` stores all keywords given to the `\keywords` macro. This way we can list both Finnish and English keywords, for example. As a consequence, the only way to empty `\uef@all@keywords` is to redefine it to empty.

```
259 \def\uef@keywords{}
260 \def\uef@all@keywords{}
```

`\sep` The keywords must be separated with the `\sep` command. This way they stay compliant with the `pdfx` package, as it assumes keywords to be separated with `\sep`. We will re-define `\sep` to comma for the abstract page, but for other use, we'll use semicolon. `pdfx` will redefine `\sep` for its own needs.

```
261 \providecommand{\sep}{\leavevmode\unskip ;\space}
```

The actual implementation of `\keywords` is similar to other metadata macros.

```
262 \DeclareDocumentCommand{\keywords}{O{\uef@language} m }{
263   \def\lang{#1}
264   \expandafter\addto\csname captions\lang\endcsname{\def\uef@keywords{#2}}
265   \let\@tempa\uef@all@keywords
266   \def\uef@all@keywords{\@tempa \sep \uef@keywords}
267 }
```

`\city` The `\city` macro is used to set the city of the thesis. This should be either Kuopio
`\uef@city` or Joensuu (assuming UEF doesn't open new campuses). City is mandatory but easy to forget (unlike title or author name, say), so we complain if it's left empty.

```
268 \def\uef@city{\ClassError{uefcsthesis}%
269   {Thesis city is not defined}%
270   {You must define the city of the thesis (Joensuu or Kuopio)\MessageBreak
271     using \noexpand\city command}}
```

Also, both Kuopio and Joensuu are the same in Finnish and English (and in other Western European languages), so by default, we set the city name to all default languages (Finnish, English, and British). The optional argument allows for adding new languages or changing the city name for the supported languages.

```
272 \DeclareDocumentCommand{\city}{O m }{
273   \IfNoValueTF {#1} {
274     \addto\captionsfinnish{\def\uef@city{#2}}
275     \addto\captionsenglish{\def\uef@city{#2}}
```

```

276 \addto\captionsbritish{\def\uef@city{#2}}
277 }
278 {
279 \def\lang{#1}
280 \expandafter\addto\csname captions\lang\endcsname{\def\uef@city{#2}}
281 }
282 }

```

FIXME: Make metadata macros print errors if used in document body (`\AtBeginDocument`).

Pre-Defined Strings and a Macro to Change Them

`\setstring` To support the different languages, all pre-defined strings printed are macros that can be changed. The macro to change them is called `\setstring`. If the `xparse` package causes issues, the `\setstring` macro (and the metadata macros above) can be re-defined using the `\ifemptyarg` macro explained above. The non-`xparse` version of `\setstring` could be as follows:

```

\newcommand{\setstring}[3][]{%
  \ifemptyarg{#1}%
  {\set@string{\uef@lang}{#2}{#3}}%
  {\set@string{#1}{#2}{#3}}%
}

```

The `\setstring` macro takes two arguments, the string and the value, and an optional argument, the language (by default, we use the document's default language). The indirection used below is actually not needed, but is left as is to make the above example of non-`xparse` version work.

```

283 \DeclareDocumentCommand \setstring { o m m } {%
284   \IfNoValueTF {#1} {%
285     \set@string {\uef@language} {#2} {#3}%
286   }{%
287     \set@string {#1} {#2} {#3}%
288   }%
289 }

```

`\set@string` The actual string-setting work is done by `\set@string` macro that must have the language parameter. Again, we put the language in a macro to make strings work.

```

290 \newcommand{\set@string}[3] {%
291   \def\lang{#1}

```

All user-editable strings have prefix `uef@s@` to prevent the users to be able to use `\setstring` to set other macros to potentially breaking ways. The string name given to `\setstring` is the macro name without the `uef@s@` prefix.

```

292 \expandafter\addto\csname captions\lang \endcsname{%
293   \expandafter\renewcommand\csname uef@s@#2\endcsname{#3}%
294 }
295 }

```

We can now define the strings needed for the title and abstract pages. We will index them without the `uef@s@` prefix, that is, in the format given to `\setstring`.

thesistype The thesis type is set based on the class options.

```
296 \ifuef@mscthesis
297   \addto\captionsfinnish{\def\uef@s@thesistype{Pro gradu -tutkielma}}
298   \addto\captionsenglish{\def\uef@s@thesistype{Master's thesis}}
299   \addto\captionsbritish{\def\uef@s@thesistype{Master's thesis}}
300 \else
301   \addto\captionsfinnish{\def\uef@s@thesistype{Kandidaatintutkielma}}
302   \addto\captionsenglish{\def\uef@s@thesistype{Bachelor's thesis}}
303   \addto\captionsbritish{\def\uef@s@thesistype{Bachelor's thesis}}
304 \fi
```

field The field of the thesis is by default CS.

```
305 \addto\captionsfinnish{\def\uef@s@field{Tietojenkäsittelytiede}}
306 \addto\captionsenglish{\def\uef@s@field{Computer Science}}
307 \addto\captionsbritish{\def\uef@s@field{Computer Science}}
```

Currently, to change the thesis field, one has to use the `\setstring` macro. If different fields are needed, there could be a macro to change this (similar to the metadata macros, like `\title`). For slightly more changes, class option could be an option. If there's more changes than just a few strings, it could make more sense to create different class files using DocStrip's conditional extraction capabilities.

departmentname The macros `departmentname`, `facultyname`, and `universityname` store the department's, faculty's, and university's names. Probably mostly useful for theses that need abstract pages in other languages than Finnish and English.

facultyname

universityname

```
308 \addto\captionsfinnish{%
309   \def\uef@s@departmentname{Tietojenkäsittelytieteen laitos}}
310 \addto\captionsenglish{%
311   \def\uef@s@departmentname{School of Computing}}
312 \addto\captionsbritish{%
313   \def\uef@s@departmentname{School of Computing}}
314 \addto\captionsfinnish{%
315   \def\uef@s@facultyname{Luonnontieteiden ja metsätieteiden tiedekunta}}
316 \addto\captionsenglish{%
317   \def\uef@s@facultyname{Faculty of Science and Forestry}}
318 \addto\captionsbritish{%
319   \def\uef@s@facultyname{Faculty of Science and Forestry}}
320 \addto\captionsfinnish{%
321   \def\uef@s@universityname{Itä-Suomen yliopisto}}
322 \addto\captionsenglish{%
323   \def\uef@s@universityname{University of Eastern Finland}}
324 \addto\captionsbritish{%
325   \def\uef@s@universityname{University of Eastern Finland}}
```

pages The ever so useful `pages` and `and` strings are needed in many places.

and

```
326 \addto\captionsfinnish{\def\uef@s@pages{s.}}
```

```

327 \addto\captionsenglish{\def\uef@s@pages{p.}}
328 \addto\captionsbritish{\def\uef@s@pages{p.}}
329 \addto\captionsfinnish{\def\uef@s@and{ja}}
330 \addto\captionsenglish{\def\uef@s@and{and}}
331 \addto\captionsbritish{\def\uef@s@and{and}}

keywordsname And the keywordsname string stores the name of the keywords.
332 \addto\captionsfinnish{\def\uef@s@keywordsname{Avainsanat}}
333 \addto\captionsenglish{\def\uef@s@keywordsname{Keywords}}
334 \addto\captionsbritish{\def\uef@s@keywordsname{Keywords}}

\supervisorname There are different strings for theses with one or many supervisors. (There's no
\supervisorsname special support for languages with different plural form for two and three or more
cases, but in such cases, one can just re-define supervisorsname to the correct
case given the number of supervisors.)
335 \addto\captionsfinnish{\def\uef@s@supervisorname{Ohjaaja}}
336 \addto\captionsenglish{\def\uef@s@supervisorname{Supervisor}}
337 \addto\captionsbritish{\def\uef@s@supervisorname{Supervisor}}
338 \addto\captionsfinnish{\def\uef@s@supervisorsname{Ohjaajat}}
339 \addto\captionsenglish{\def\uef@s@supervisorsname{Supervisors}}
340 \addto\captionsbritish{\def\uef@s@supervisorsname{Supervisors}}

app@o The singular and plural versions of the word ‘appendix’ are stored with the @o
app@m and @m suffices. Hence, to change them inside the main document, one has to use
\makeatletter and \makeatother. This could perhaps be changed in the future.
341 \addto\captionsfinnish{\def\uef@s@app@o{liite}\def\uef@s@app@m{liitettä}}
342 \addto\captionsenglish{\def\uef@s@app@o{appendix}\def\uef@s@app@m{appendices}}
343 \addto\captionsbritish{\def\uef@s@app@o{appendix}\def\uef@s@app@m{appendices}}

\ccsname The name of the ACM Computing Classification is given in a fixed string \ccsname
with no way to change it. As the classification itself is always in English, this
should suffice.
344 \def\ccsname{ACM CCS (2012)}

\uef@logo The name of the file containing the university logo is not a string, and hence it's
not prefixed with uef@s@. To change it, one has to redefine \uef@logo. To show
the logo, we load the graphicx package.
345 \def\uef@logo{uef_logo}
346 \RequirePackage{graphicx}

```

Title and Abstract Pages

Final thing before we can define the title and abstract pages is to define a helper macro⁴ `\uef@selectlanguage`.

⁴<https://tex.stackexchange.com/questions/136659/how-to-pass-a-macro-as-the-argument-to-selectlanguage>

`\uef@selectlanguage` This is used to solve the problem that `babel` assumes that the language parameter given to `\selectlanguage` is a language name (e.g. `\selectlanguage{\english}` is equivalent to `\selectlanguage{english}`). As we need to pass the language name in a macro, we need to make sure it gets expanded before calling `\selectlanguage`.

```

347 \ifuef@polyglossia
348 \let\uef@selectlanguage=\selectlanguage

polyglossia doesn't allow macros as language names, and hence will expand the
parameter correctly.

349 \else
350 \newcommand{\uef@selectlanguage}[1]{%
351   \begingroup\edef\x{\endgroup
352     \noexpand\selectlanguage{#1}}\x
353 }
354 \fi

```

`\maketitle` The `\maketitle` macro will just set up the title page using the standard `titlepage` environment from the `book` class. We will turn off the page anchors for the title page. The `\hypersetup` command is guaranteed to exist.

```

355 \renewcommand{\maketitle}{%
356   \hypersetup{pageanchor=false}
357   \begin{titlepage}%

```

We make sure the language is the document's main language, otherwise the title page will look wrong.

```

358     \uef@selectlanguage{\uef@language}

```

For the title, we leave some space at the top, center everything, and set the title in `\LARGE` font and the subtitle, if it's given, in `\Large` font.

```

359     \null\vspace{0.5cm}
360     \begin{center}
361       {\LARGE \@title \par}
362       \ifdefined\@subtitle
363       {\Large \@subtitle \par}
364     \fi

```

There's 1.5 cm between the author and the title.

```

365     \vspace{1.5cm}
366     {\large \@author \par}

```

And thesis type, university logo, affiliation info, and date are pushed to the bottom of the page

```

367     \vfill
368     {\large \uef@s@thesistype\\
369       \vspace{1em}
370       \includegraphics[height=7cm]{\uef@logo}\\
371       \uef@s@departmentname\\
372       \uef@s@field\\
373       \@date \par}

```

```

374 \end{center}
375 \end{titlepage}%
376 \hypersetup{pageanchor=true}
377 }

```

To print the information on the abstract page, we define some helper macros.

```

\numberofappendices Currently, the number of appendices (if any) and the number of pages they have
\appendixpagecount must be specified manually. This option is good to have even if some future
uef@appendixcounter implementation allows automatically figuring this information from the LATEX
uef@appendixpages sources, as students might have to add appendices directly to the final PDF.
378 \newcounter{uef@appendixcounter}
379 \newcounter{uef@appendixpages}
380 \newcommand{\numberofappendices}[1]{\setcounter{uef@appendixcounter}{#1}}
381 \newcommand{\appendixpagecount}[1]{\setcounter{uef@appendixpages}{#1}}

```

`\uef@printappendixpagenumbers` The number of appendices, and their total page count, is printed with the `\uef@printappendixpagenumbers` helper macro.

```

382 \def\uef@printappendixpagenumbers{%
383 \ifnum\value{uef@appendixcounter}>0
384 \space
385 \ifcase\value{uef@appendixcounter}\relax

```

The counter `uef@appendixcounter` cannot be zero, as we just checked against it. If it's one, use string `\uef@s@app@o`; otherwise, use string `\uef@s@app@m`.

```

386 \or%
387 \arabic{uef@appendixcounter}~\uef@s@app@o%
388 \else
389 \arabic{uef@appendixcounter}~\uef@s@app@m%
390 \fi

```

The total number of appendix pages comes in parentheses. We assume that the string `\uef@s@pages` doesn't have to differentiate between one and many pages.

```

391 \space (\arabic{uef@appendixpages}~\uef@s@pages)
392 \fi
393 }

```

`\uef@printsupervisors` The name(s) of the supervisor are printed by `\uef@printsupervisors`. The macro checks whether there are one or two supervisors by testing if `\uef@supervisor@second` is undefined or not. To have more than two supervisors, all but the last supervisor should be listed in `\uef@supervisor@first` and the list should end with comma if thesis is in English and uses Oxford comma.

```

394 \newcommand{\uef@printsupervisors}%
395 {\ifundefined{uef@supervisor@second}%
396 {\uef@s@supervisorname :\space \uef@supervisor@first}%
397 {\uef@s@supervisorsname :\space \uef@supervisor@first\space%
398 \uef@s@and\space\uef@supervisor@second}%
399 }

```

`\ccsdesc` The ACM CCS 2012 web tool⁵ generates L^AT_EX code with command `\ccsdesc`. The
`\@concepts`

⁵<https://dl.acm.org/ccs/ccs.cfm>

code to parse it, below, is copied directly from the `acmart.cls` file (2017/01/07, v1.28), by Boris Veytsman. It uses the `comment` package to make L^AT_EX to ignore the XML that is printed first. In the future, this script could add the classification terms to the PDF metadata. The parsed concepts with the correct typesetting is stored in the `\@concepts` macro, which we will use later in the `abstract` environment.

```

400 \RequirePackage{comment}
401 \excludecomment{CCSXML}
402 \let\@concepts\@empty
403 \newcommand\ccsdesc[2][100]{%
404   \ccsdesc@parse#1~#2~}
405 %%\RequirePackage{textcomp} % already included
406 \def\ccsdesc@parse#1~#2~#3~{%
407   \expandafter\ifx\csname CCS@#2\endcsname\relax
408     \expandafter\gdef\csname CCS@#2\endcsname{\textbullet\textbf{#2} \textrightarrow }%
409     \g@addto@macro{\@concepts}{\csname CCS@#2\endcsname}\fi
410   \expandafter\g@addto@macro\expandafter{\csname CCS@#2\endcsname}{%
411     \ifnum#1>499\textbf{#3; } \else
412     \ifnum#1>299\textit{#3; } \else
413     #3; \fi\fi}}

```

abstract The abstract(s) are enclosed in the `abstract` environment that will print the whole abstract page. The environment takes the language of the page as an optional argument; if no argument is given, it uses the document default language.

```

414 \newenvironment{abstract}[1][\uef@language]{%

```

Like `\maketitle`, the `abstract` environment also uses the `titlepage` environment from the `book` class. We use the raw `\titlepage` and `\endtitlepage` commands so that the error messages report the `abstract` environment and not the (unknownst to the user) `titlepage` environment. Also similarly to `\maketitle`, we turn off the page anchors.

```

415   \hypersetup{pageanchor=false}
416   \titlepage

```

We set the language to the provided one (or the default), and set the spacing to single.

```

417   \uef@selectlanguage{#1}
418   \singlespacing

```

The university name is printed in all-caps. To make them look a bit better, we use large small caps. Alternatively, some kerning could be used to set the name properly in all-caps. Faculty and department info and thesis field follow.

```

419   \textsc{\large\MakeLowercase{\uef@s@universityname}},
420   \uef@s@facultyname , \uef@city\\
421   \uef@s@departmentname\\
422   \uef@s@field\\[2em]

```

In the abstract page, the author name is printed in FamilyName, GivenName order and the author name is separated from the title with a colon. If subtitle is given, it's separated from the main title with an en-dash and spaces.


```

423 \@author@family , \@author@first : \@title
424 \ifdefined\@subtitle\space -- \@subtitle\fi\\
We count the number of pages automatically from \mainmatter to \backmatter
using LastNormalPage label. The appendix information is printed if needed.
425 \uef@s@thesistype ,\space \pageref{LastNormalPage}~\uef@s@pages %
426 \uef@printappendixpagenumbers\\
Finally, we print the supervisor(s) name(s) and date and begin the abstract with
boldface text saying ‘abstract’ in the correct language.
427 \uef@printsupervisors\\
428 \@date \par
429 \paragraph{\abstractname :}
430 }%
At the end of the abstract page, we’ll print the keywords with a header that is
always printed, as the keywords are mandatory. If the CCS concepts are defined,
we’ll also print them. Finally, we’ll close the titlepage environment.
431 {\vspace{2em}
432 \paragraph{\uef@s@keywordsname :} \uef@keywords\par
433 \ifx\@concepts\empty\else\bgroup
434   {\paragraph{\ccsname}\mbox{}}\\ \@concepts\par }\egroup
435 \fi
436 \endtitlepage
437 \hypersetup{pageanchor=true}}

```

4.6 Commands for Mathematics

The main thing we need to do to support math is to provide the theorem-like environments in different languages and with different numbering options. Also, the class defines few conveniency macros for typesetting math properly.

Theorem-Like Environments

<p>theoremname</p> <p>lemmaname</p> <p>corollaryname</p> <p>propositionname</p> <p>conjecturename</p> <p>definitionname</p> <p>problemname</p> <p>examplename</p> <p>remarkname</p> <p>notename</p>	<p>We start by defining the theorem-like names in a way that supports babel and polyglossia. These have the same uef@s@ prefix as with other strings, and they can be changed, and new languages can be added, with the \setstring macro.</p> <pre> 438 \addto\captionsfinnish{\def\uef@s@theoremname{Lause}} 439 \addto\captionsenglish{\def\uef@s@theoremname{Theorem}} 440 \addto\captionsbritish{\def\uef@s@theoremname{Theorem}} </pre> <p>Here we use the term ‘Lause’ for Theorem in Finnish. Some authors prefer ‘Teoreema’, but this can be changed with \setstring{theoremname}{Teoreema} in Finnish theses.</p> <pre> 441 \addto\captionsfinnish{\def\uef@s@lemmaname{Lemma}} 442 \addto\captionsenglish{\def\uef@s@lemmaname{Lemma}} 443 \addto\captionsbritish{\def\uef@s@lemmaname{Lemma}} 444 \addto\captionsfinnish{\def\uef@s@corollaryname{Korollaari}} 445 \addto\captionsenglish{\def\uef@s@corollaryname{Corollary}} 446 \addto\captionsbritish{\def\uef@s@corollaryname{Corollary}} </pre>
---	--

```

447 \addto\captionsfinnish{\def\uef@s@propositionname{Propositio}}
448 \addto\captionsenglish{\def\uef@s@propositionname{Proposition}}
449 \addto\captionsbritish{\def\uef@s@propositionname{Proposition}}
450 \addto\captionsfinnish{\def\uef@s@conjecturename{Konjektuuri}}
451 \addto\captionsenglish{\def\uef@s@conjecturename{Conjecture}}
452 \addto\captionsbritish{\def\uef@s@conjecturename{Conjecture}}
453 \addto\captionsfinnish{\def\uef@s@definitionname{Määritelmä}}
454 \addto\captionsenglish{\def\uef@s@definitionname{Definition}}
455 \addto\captionsbritish{\def\uef@s@definitionname{Definition}}
456 \addto\captionsfinnish{\def\uef@s@problemname{Ongelma}}
457 \addto\captionsenglish{\def\uef@s@problemname{Problem}}
458 \addto\captionsbritish{\def\uef@s@problemname{Problem}}
459 \addto\captionsfinnish{\def\uef@s@exemplename{Esimerkki}}
460 \addto\captionsenglish{\def\uef@s@exemplename{Example}}
461 \addto\captionsbritish{\def\uef@s@exemplename{Example}}
462 \addto\captionsfinnish{\def\uef@s@remarkname{Huomautus}}
463 \addto\captionsenglish{\def\uef@s@remarkname{Remark}}
464 \addto\captionsbritish{\def\uef@s@remarkname{Remark}}
465 \addto\captionsfinnish{\def\uef@s@notename{Merkintä}}
466 \addto\captionsenglish{\def\uef@s@notename{Note}}
467 \addto\captionsbritish{\def\uef@s@notename{Note}}

```

The remaining definitions were straight forward.

Now we can define the theorem-like environments. This uses the `amsthm` package, included before the font was loaded. Theorems, Lemmas, Corollaries, Propositions, and Conjectures are in the ‘plain’ theorem style.

```

468 \theoremstyle{plain}

```

theorem We will first define `theorem`, and set it to reset with the chapter counter or not, depending on the class options.

```

469 \ifuef@numbertheoremsbychapter
470   \newtheorem{theorem}{\uef@s@theoremname}[chapter]
471 \else
472   \newtheorem{theorem}{\uef@s@theoremname}
473 \fi

```

lemma The remaining plain-style environments either follow `theorem`’s numbering or not, depending on class options.

```

corollary
proposition
conjecture
474 \ifuef@singlemathnumber
475   \newtheorem{lemma}[theorem]{\uef@s@lemmaname}
476   \newtheorem{corollary}[theorem]{\uef@s@corollaryname}
477   \newtheorem{proposition}[theorem]{\uef@s@propositionname}
478   \newtheorem{conjecture}[theorem]{\uef@s@conjecturename}
479 \else
480   \newtheorem{lemma}{\uef@s@lemmaname}
481   \newtheorem{corollary}{\uef@s@corollaryname}
482   \newtheorem{proposition}{\uef@s@propositionname}
483   \newtheorem{conjecture}{\uef@s@conjecturename}
484 \fi

```

`cor` Some lazy authors don't want to write `corollary` or `proposition`, so we let the `prop` short versions `cor` and `prop` to be aliases by re-defining the low-level commands.

```

485 \let\cor\corollary \let\endcor\endcorollary
486 \let\prop\proposition \let\endprop\endproposition

```

Environments for definitions, problems, and examples use the ‘definition’ theorem style.

```

487 \theoremstyle{definition}

```

definition Again, the numbers either follow `chapter` or not, depending on the class options.

```

problem 488 \ifuef@numbertheoremsbychapter
example 489 \newtheorem{definition}{\uef@s@definitionname}[chapter]
          490 \newtheorem{problem}{\uef@s@problemname}[chapter]
          491 \newtheorem{example}{\uef@s@examplename}[chapter]
          492 \else
          493 \newtheorem{definition}{\uef@s@definitionname}
          494 \newtheorem{problem}{\uef@s@problemname}
          495 \newtheorem{example}{\uef@s@examplename}
          496 \fi%

```

remark Finally, `remark` and `note` use the ‘remark’ style and have no numbers.

```

note 497 \theoremstyle{remark}
          498 \newtheorem*{remark}{\uef@s@remarkname}
          499 \newtheorem*{note}{\uef@s@notename}

```

By default, equation numbers are of form (ch.eq), where `ch` is the chapter number and `eq` is the equation number within the chapter. This is the correct use when numbering theorems by chapter and we don't have to do anything.

```

500 \ifuef@numbertheoremsbychapter%
501 \else

```

If the user has requested the numbering to not reset with chapters (explicitly or implicitly because this is a Bachelor's thesis), we have to turn that feature off from equations, as well. To do that, we use the `chngcntr` packages.

```

502 \RequirePackage{chngcntr}
503 \counterwithout{equation}{chapter}
504 \fi

```

Conveniency Macros

The `amsmath` package defines the vertical-bar-as-parenthesis operators `\lvert` and `\rvert` and their double-bar versions `\lVert` and `\rVert`.

`\abs` We use the `mathtools` package to provide the conveniency macros `\abs` and `\norm`

```

\norm 505 \RequirePackage{mathtools}
          506 \DeclarePairedDelimiter\abs{\lvert}{\rvert}
          507 \DeclarePairedDelimiter\norm{\lVert}{\rVert}

```

The ISO 31-11:1992 standard defines that open and half-open intervals can be typeset either as (a, b) , $(a, b]$, and $[a, b)$ or as $]a, b[$, $]a, b]$, and $[a, b[$. To support the latter notation with correct spacing (note that the spacing here is *not* correct), we have to declare ‘]’ and ‘[’ as left and right parenthesis symbols, respectively.

```
\lOpen We store the symbols as math delimiters \lOpen and \rOpen.
\rOpen 508 \DeclareMathDelimiter{\lOpen}{\mathopen}{operators}{93}{largesymbols}{3}
509 \DeclareMathDelimiter{\rOpen}{\mathclose}{operators}{91}{largesymbols}{2}

\lointerval To facilitate the use of the ‘inverted brackets’ notation, we provide macros for
\rointerval left-open, right-open, and open intervals as \lointerval, \rointerval, and
\ointerval \ointerval, respectively.
510 \DeclarePairedDelimiter\lointerval{\lOpen}{\rbrack}
511 \DeclarePairedDelimiter\rointerval{\lbrack}{\rOpen}
512 \DeclarePairedDelimiter\ointerval{\lOpen}{\rOpen}
```

4.7 Support for Other Packages

The class also supports some other often-used packages. Some of them are pre-loaded (usually to encourage their use), and for others, the support usually means translated strings.

Captions and Tables

We load the `caption` package to customize the outlook of the captions. Namely, the figure captions should be at the bottom, table captions should at the top, and the label (e.g. ‘Figure 1’ should be set in bold.

```
513 \RequirePackage[%
514   figureposition=bottom,%
515   tableposition=top,%
516   labelfont=bf,%
517 ]{caption}
```

For tables, we load the `booktabs` package, because nobody should make any tables without it,

```
518 \RequirePackage{booktabs}
```

and the `tabularx` package that allows for stretchable p-type columns denoted X.

```
519 \RequirePackage{array}
520 \RequirePackage{tabularx}
```

The `tabularx` package loads the `array` package, but we load it explicitly to indicate that we use its `\newcolumntype` to define centered, left-aligned, and right-aligned math columns C, L, and R.

```
521 \newcolumntype{C}{>{\$}c<{\$}}
522 \newcolumntype{L}{>{\$}l<{\$}}
523 \newcolumntype{R}{>{\$}r<{\$}}
```

Typesetting Algorithms

The class supports the two most popular pseudocode packages, `algorithm2e` and `algorithmicx`, as well as the `listings` package. We don't load them, but we define the necessary strings in `babel` and `polyglossia`.

In `algorithm2e`, the two strings we define are `\algorithmcfname` (the word 'Algorithm' in the label) and `\litalgorithmcfname` (the title for the list of algorithms, if used).

```
524 \addto\captionsfinnish{\def\algorithmcfname{Algoritmi}}
525 \addto\captionsenglish{\def\algorithmcfname{Algorithm}}
526 \addto\captionsbritish{\def\algorithmcfname{Algorithm}}
527 \addto\captionsfinnish{\def\litalgorithmcfname{Algoritmiluetello}}
528 \addto\captionsenglish{\def\litalgorithmcfname{List of Algorithms}}
529 \addto\captionsbritish{\def\litalgorithmcfname{List of Algorithms}}
```

The `algorithmicx` package uses the `algorithms` bundle to generate the floating `algorithm` environment. The `algorithms` bundle again uses the `float` package, which allows us to change the name of the float with `\floatname{<floatenv>}{<name>}` command. To avoid having to check if `float` is loaded, we provide a dummy command:

```
530 \providecommand{\floatname}[2]{}
```

The name of the floating environment is `algorithm`, which we re-define using the `\floatname`. The 'list of algorithms' name is `\litalgorithmname`.

```
531 \addto\captionsfinnish{\floatname{algorithm}{Algoritmi}}
532 \addto\captionsenglish{\floatname{algorithm}{Algorithm}}
533 \addto\captionsbritish{\floatname{algorithm}{Algorithm}}
534 \addto\captionsfinnish{\def\litalgorithmname{Algoritmiluetello}}
535 \addto\captionsenglish{\def\litalgorithmname{List of Algorithms}}
536 \addto\captionsbritish{\def\litalgorithmname{List of Algorithms}}
```

In `listings` (and `listingsutf8`), the two strings we define are `\lstlistingname` and `\lstlistlistingname`.

```
537 \addto\captionsfinnish{\def\lstlistingname{Listaus}}
538 \addto\captionsenglish{\def\lstlistingname{Listing}}
539 \addto\captionsbritish{\def\lstlistingname{Listing}}
540 \addto\captionsfinnish{\def\lstlistlistingname{Listausluettelo}}
541 \addto\captionsenglish{\def\lstlistlistingname{List of Listings}}
542 \addto\captionsbritish{\def\lstlistlistingname{List of Listings}}
```

4.8 PDF/A and Hyperlink Support

The PDF metadata is collected at the end of the preamble, so that the user has had time to fill it in. We use the `etoolbox` package for the `\AtEndPreamble`. The metadata commands must be defined before loading `pdfx` or `hyperref`. The correctly-formatted metadata is stored in special macros that start `uef@pdf@`.

```
543 \RequirePackage{etoolbox}
544 \AtEndPreamble{
```

`\uef@pdf@title` We separate the subtitle, if given, with standard hyphen in metadata.

```

545 \ifdefined\@subtitle
546   \def\uef@pdf@title{\@title} - \@subtitle}
547 \else
548   \def\uef@pdf@title{\@title}
549 \fi

```

`\uef@pdf@author` Author's name should always be defined, but just in case, we check for it, and store the name in Family, First order.

```

550 \ifdefined\@author@first
551   \def\uef@pdf@author{\@author@family , \@author@first}
552 \else
553   \def\uef@pdf@author{}
554 \fi

```

`\uef@pdf@subject` The PDF subject metadata field is somewhat vague. We store the thesis type, it's field, and the name of the university and the faculty. We could also store the CCS classification, but currently we don't do that.

```

555 \def\uef@pdf@subject{\uef@s@thesistype, %
556   \uef@s@field. \uef@s@universityname, %
557   \uef@s@facultyname}
558 }

```

Sample .xmpdata File

The package reads XMP metadata from a file called `\jobname.xmpdata`. For most use cases of `uefcsthesis`, this file can simply direct to the above-defined macros.

```

559 </cs>
560 <*xmp>
561 \Title{\uef@pdf@title}
562 \Author{\@author}

```

The `pdfx` package puts the contents of the `\Keywords` macro in XMP-dc:Subject field, and the contents of the `\Subject` macro in XMP-dc:Description field.⁶

```

563 \Keywords{\uef@keywords}
564 \Subject{\uef@pdf@subject}

```

As the publisher, we use just the university, as is common with theses.

```

565 \Publisher{\uef@s@universityname}
566 </xmp>
567 <*cs>

```

If the author has used complicated macros (or math) in `\author`, `\title`, or `\keywords`, this system might fail. In such situations, the author should edit the `\jobname.xmpdata` file manually.

⁶For more information, see <http://www.dublincore.org/documents/dces/>.

Loading the Packages

If the user has requested the generation of the PDF/A file, we load the `pdfx` package at the end of the preamble. That way we know that we have the metadata defined before. `pdfx` requires file called `\jobname.xmpdata`, and our default file uses the above `uef@pdf@` strings to fill in the metadata. We set the type of the PDF as PDF/A-1b. Using the 2b version would be better, as it supports layered figures, but alas, the fonts are not entirely compatible (they do not define all CID's). Also, we will make sure the language is the correct one so that we get the right extensions of the macros.

The `colorprofiles` package is loaded by `pdfx`, but MiKTeX doesn't download the package unless we specifically ask for it and `pdfx` only loads it if it exists. We also set the minimum version of `pdfx` to rather recent, and set the `pdfstartview` option of `hyperref` to empty. For these, see also <https://coursepages.uta.fi/mtta1-latex/wp-content/uploads/sites/55/2019/03/pdfa-guide.pdf>.

```
568 \ifuef@pdfa
569   \AtEndPreamble{%
570     \uef@selectlanguage{\uef@language}%
571     \RequirePackage{colorprofiles}
572     \RequirePackage[a-1b,mathxmp]{pdfx}[2018/12/22]%
573     \hypersetup{pdfstartview=}
574   }
575 \fi
```

If user did not request PDF/A, we load `hyperref` (`pdfx` loads it otherwise). `hyperref` should always be loaded at the very end, and in case there are any problems, it's loading here can be prevented.

```
576 \ifuef@hyperref
577 \ifuef@pdfa\else
578   \RequirePackage{hyperref}
```

If loaded, `pdfx` will set the PDF metadata. Here, we set it using `hyperref` as `pdfx` hasn't been loaded.

```
579   \AtBeginDocument{
580     \let\oldsep\sep
581     \def\sep{,\space}
582     \hypersetup{pdfauthor={\uef@pdf@author},
583       pdftitle={\uef@pdf@title},
584       pdfkeywords={\uef@all@keywords},
585       pdfsubject={\uef@pdf@subject}
586   }
587   \let\sep\oldsep
588   }%
589 \fi\fi % \ifhyperref\ifpdfa
```

`\hypersetup` We use the `\hypersetup` command in the title and abstract pages without checking that it exists, so to be safe, we provide a dummy command that does nothing if `\hyperref` is not loaded.

```
590 \providecommand{\hypersetup}[1]{}%
```

4.9 Last Bit

The very last thing to do is to turn the `pagestyle` to empty and end with `DocStrip`.

```
591 \pagestyle{empty}
592 \</cs>
```

4.10 Minimal Example Files

This section contains the sources for the minimal example files. We generate four files, for all combinations of

$$\{\text{classic}, \text{modern}\} \times \{\text{English}, \text{Finnish}\}.$$

These examples are all protected with the `ex` guard

```
593 \<*ex>
```

We primarily divide by language, starting with English.

```
594 \<*en>
```

```
595 %% This is a minimal example of using the uefcsthesis class.
```

```
596 %% This generates an English MSc thesis with one-sided layout.
```

The command to use to compile and the `\documentclass` command depend on the engine.

```
597 \<*modern>
```

```
598 %% To compile, use either lualatex or xelatex, for example,
```

```
599 %% $ lualatex minimal_modern.en.tex
```

```
600 %% $ biber minimal_modern.en
```

```
601 %% $ lualatex minimal_modern.en.tex
```

```
602 %% or use latexmk:
```

```
603 %% $ latexmk -lualatex minimal_modern.en.tex
```

```
604 %%
```

```
605 \documentclass[mscthesis,english,oneside,biblatex]{uefcsthesis}
```

```
606
```

```
607 %% Correct the below with the name of your bibliography file
```

```
608 \addbibresource{minimal.bib}
```

```
609 \</modern>
```

```
610 \<*classic>
```

```
611 %% To compile, use pdflatex, for example,
```

```
612 %% $ pdflatex minimal_classic.en.tex
```

```
613 %% $ bibtex minimal_classic.en
```

```
614 %% $ pdflatex minimal_classic.en.tex
```

```
615 %% or use latexmk:
```

```
616 %% $ latexmk -pdf minimal_classic.en.tex
```

```
617 %%
```

```
618 \documentclass[mscthesis,english,oneside]{uefcsthesis}
```

```
619 \</classic>
```

The metadata and main text are the same for classic and modern.

```
620
```

```
621 %% Replace all capital text with your own information.
```



```

622 \title{TITLE} % Title of the thesis
623 \author{GIVEN NAME}{FAMILY NAME} % Your name
624 \date{MONTH YEAR} % The month and year of handing in your thesis
625 \city{CITY} % Either Kuopio or Joensuu
626 \firstsupervisor{GIVEN FAMILY} % Name of the first supervisor
627 \secondsupervisor{GIVEN FAMILY} % Name of the second supervisor, if any
628 \keywords{KEYWORD1\sep KEYWORD2\sep ETC} % Keywords must be separated with \sep
629
630 %% To get the ACM CCS classification, you can visit
631 %% https://dl.acm.org/ccs/ccs.cfm
632 %% There you can find a tool to generate LaTeX code for the classification
633 %% Copy it here. You don't need to copy the XML at the begin, though.
634 %% For example,
635 %% \ccsdesc[500]{Some Class}
636
637 \begin{document}
638 \maketitle
639 \begin{abstract}
640   WRITE YOUR ENGLISH ABSTRACT HERE
641 \end{abstract}
642
643 \frontmatter
644 \tableofcontents
645 \mainmatter
646
647 \chapter{Introduction}
648 \label{cha:intro}
649
650 WRITE YOUR INTRODUCTION HERE
651
652 WRITE THE REST OF THE THESIS HERE
653
654 THIS IS AN EXAMPLE OF USING CITATIONS:
655 Graph generators are important \citep{metzler18random}.
656 \citet{kalofolias18from} discuss sets of redescrptions.
657
658 %% Next comes the references
The way the bibliography is included again depends on the engine.
659 \modern\printbibliography[heading=bibintoc]
660 \classic
661 %% Update the following with the name of your bibliography file
662 \bibliography{minimal}
663 \end{classic}
The footer is again shared.
664
665 \backmatter % Do not remove!
666 %% Possible appendices come here
667 \end{document}
668 \end{en}

```

Next, we'll generate the Finnish example files. The structure is the same as with the english ones.

```

669 \begin{document}
670 %% Tämä on yksinkertainen esimerkki uefcsthesis-luokan käytöstä.
671 %% Tämä tiedosto tuottaa pro gradu -tutkielman yksipuoleisella asettelulla.
672 \begin{modern}
673 %% Tuottaaksesi PDF-tiedoston, käytä joko lualatex- tai xelatex-ohjelmaa.
674 %% Esimerkiksi:
675 %% $ lualatex minimal_modern.fi.tex
676 %% $ biber minimal_modern.fi
677 %% $ lualatex minimal_modern.fi.tex
678 %% Vaihtoehtoisesti voit käyttää latexmk-ohjelmaa:
679 %% $ latexmk -lualatex minimal_modern.fi.tex
680 %%
681 \documentclass[mscthesi,finnish,oneside,biblatex]{uefcsthesis}
682
683 %% Korvaa seuraavasta minimal.bib lähdeviitetietokantatiedostosi nimellä.
684 \addbibresource{minimal.bib}
685 \end{modern}
686 \begin{classic}
687 %% Tuottaaksesi PDF-tiedoston, käytä pdflatex-ohjelmaa.
688 %% Esimerkiksi:
689 %% $ pdflatex minimal_classic.fi.tex
690 %% $ bibtex minimal_classic.fi
691 %% $ pdflatex minimal_classic.fi.tex
692 %% Vaihtoehtoisesti voit käyttää latexmk-ohjelmaa:
693 %% $ latexmk -pdf minimal_classic.fi.tex
694 %%
695 \documentclass[mscthesi,finnish,oneside]{uefcsthesis}
696 \end{classic}
697
698 %% Korvaa isolla kirjoitetut tekstit omilla tiedoillasi.
699 \title{OTSIKKO} % Työsi otsikko
700 \author{ETUNIMI}{SUKUNIMI} % Nimesi
701 \date{KUUKAUSI VUOSI} % Työsi valmistumiskuukausi ja -vuosi
702 \city{KAUPUNKI} % Joko Kuopio tai Joensuu
703 \firstsupervisor{ETUNIMI SUKUNIMI} % Ensimmäisen ohjaajan nimi
704 \secondsupervisor{ETUNIMI SUKUNIMI} % Toisen ohjaajan, jos on, nimi
705 \keywords{AVAINSANA1\sep AVAINSANA2\sep JNE} % Avainsanat erotetaan \sep-komennolla
706
707 %% ACM:n CCS-luokittelun LaTeX-komennot saa luotua ACM:n työkalulla osoitteessa
708 %% https://dl.acm.org/ccs/ccs.cfm
709 %% Kopioi työkalun tuottama LaTeX-koodi tähän (alun XML-koodia ei tarvitse
710 %% kopioida). Esimerkiksi:
711 %% \ccsdesc[500]{Some Class}
712
713 \begin{document}
714 \maketitle
715 \begin{abstract}

```

```

716 KIRJOITA SUOMENKIELINEN TIIVISTELMÄSI TÄHÄN
717 \end{abstract}
718
719 \frontmatter
720 \tableofcontents
721 \mainmatter
722
723 \chapter{Johdanto}
724 \label{cha:johdanto}
725
726 KIRJOITA JOHDANTOKAPPALEESI TÄHÄN
727
728 KIRJOITA LOPUT TYÖSTÄSI TÄHÄN
729
730 TÄMÄ ON ESIMERKKI VIITTAUSTEN KÄYTÖSTÄ:
731 Verkkogeneraattorit ovat hyödyllisiä \citep{metzler18random}.
732 \citet{kalofolias18from} etsivät jälleenkuvausten joukkoja.
733
734 %% Seuraavaksi tulee viiteluettelo
735 (modern)\printbibliography[heading=bibintoc]
736 (*classic)
737 %% Korvaa alta minimal oman lähdetietokantatiedostosi nimellä
738 \bibliography{minimal}
739 (/classic)
740
741 \backmatter % Älä poista!
742 %% Mahdolliset liitteet tulevat tähän
743 \end{document}
744 (/fi)

```

The minimal bib-file has only two records.

```

745 (*bib & ex)
746 @incollection{metzler18random,
747   author = {Metzler, Saskia and Miettinen, Pauli},
748   title = {Random Graph Generators for Hyperbolic Community Structures},
749   booktitle = {{Proc. 7th International Conference on Complex Networks and Their Applications}},
750   editor = {Aiello, L. and Cherifi, C. and Cherifi, H. and Lambiotte, R. and Li{\`o}, P. and R},
751   publisher = {Springer},
752   address = {Cham},
753   year = {2018},
754   pages = {680-693},
755   doi = {10.1007/978-3-030-05411-3_54},
756 }
757 @article{kalofolias18from,
758   author = {Kalofolias, Janis and Galbrun, Esther and Miettinen, Pauli},
759   title = {From sets of good redescrptions to good sets of redescrptions},
760   journal = {Knowl. Inf. Syst.},
761   volume = 57,
762   number = 1,
763   pages = {21--54},

```

```

764   year = 2018,
765   doi = {10.1007/s10115-017-1149-7},
766 }
767 </bib & ex>

```

And that finishes the minimal example files.

```

768 </ex>

```

4.11 Bibliography Records

Here are the bibliography records for the manual. We don't want to have these in the minimal examples, hence we require not to have the ex tag.

```

769 <*bib&!ex>
770 @misc{graphicx,
771   title = {Packages in the 'graphics' bundle},
772   author = {Carlisle, D. P.},
773   year = 2017,
774   url = {https://ctan.org/pkg/latex-graphics},
775   lastchecked = {6 December 2018},
776 }
777 @misc{urlbst,
778   title = {The {\textsf{urlbst}} package},
779   author = {Gray, Norman},
780   year = 2011,
781   url = {https://ctan.org/pkg/urlbst},
782   lastchecked = {6 December 2018},
783 }
784 @misc{polyglossia,
785   title= {Polyglossia: An Alternative to {Babel} for \hologo{XeLaTeX} and \hologo{LuaLaTeX}},
786   author = {Charette, Fran{\c{c}}ois and Reutenauer, Arthur},
787   year = 2018,
788   url = {https://ctan.org/pkg/polyglossia},
789   lastchecked = {9 December 2018},
790 }
791 @misc{pdfx,
792   title = {Generation of {PDF/X}- and {PDF/A}-compliant {PDFs} with \hologo{pdfTeX} -- \textsf{pdfx}},
793   author = {Radhakrishnan, C. V. and Thành, Hàn Th{\`{e}} and Moore, Ross and Selinger, Peter},
794   year = 2017,
795   url = {https://ctan.org/pkg/pdfx},
796   lastchecked = {9 December 2018},
797 }
798 @misc{amsthm,
799   title = {Using the \textsf{amsthm} Package},
800   author = {{Publications Technical Group, American Mathematical Society}},
801   year = 2017,
802   url = {https://ctan.org/pkg/amsthm},
803   lastchecked = {9 December 2018},
804 }
805 @misc{array,
806   title = {A new implementation of \hologo{LaTeX}'s \textsf{tabular} and \textsf{array} environ

```

```

807   author = {Mittelbach, Frank and Carlisle, David},
808   year = 2018,
809   url = {https://ctan.org/pkg/array},
810   lastchecked = {9 December 2018},
811 }
812 @misc{tabularx,
813   title = {The \textsf{tabularx} package},
814   author = {Carlisle, David},
815   year = 2016,
816   url = {https://ctan.org/pkg/tabularx},
817   lastchecked = {9 December 2018},
818 }
819 @misc{siunitx,
820   title = {\textsf{siunitx} --- A comprehensive (SI) units package},
821   author = {Wright, Joseph},
822   year = 2018,
823   url = {https://ctan.org/pkg/siunitx},
824   lastchecked = {9 December 2018},
825 }
826 @misc{bm,
827   title = {The \textsf{bm} package},
828   author = {Carlisle, David and Mittelbach, Frank},
829   year = 2017,
830   url = {https://ctan.org/pkg/bm},
831   lastchecked = {10 December 2018},
832 }
833 @misc{hyperref,
834   title = {Hypertext marks in \hologo{LaTeX}: a manual for \textsf{hyperref}},
835   author = {Rahtz, Sebastian and Oberdiek, Heiko},
836   year = 2017,
837   url = {https://ctan.org/pkg/hyperref},
838   lastchecked = {10 December 2018},
839 }
840 @misc{biblatex-apa,
841   title = {{APA} \Bib\hologo{LaTeX} style: Citation and References macros for \Bib\hologo{LaTeX}},
842   author = {Kime, Philip},
843   year = 2018,
844   url = {https://ctan.org/pkg/biblatex-apa},
845   lastchecked = {23 December 2018},
846 }
847 @misc{apacite,
848   title = {The apacite package: Citation and reference list with \hologo{LaTeX} and \hologo{BibTeX}},
849   author = {Meijer, Erik},
850   year = 2013,
851   url = {https://ctan.org/pkg/apacite},
852   lastchecked = {23 December 2018},
853 }
854 \bib&{ex}

```

References

- [1] D. Carlisle. The `tabularx` package, 2016. URL: <https://ctan.org/pkg/tabularx> [cited 9 December 2018].
- [2] D. Carlisle and F. Mittelbach. The `bm` package, 2017. URL: <https://ctan.org/pkg/bm> [cited 10 December 2018].
- [3] D. P. Carlisle. Packages in the ‘graphics’ bundle, 2017. URL: <https://ctan.org/pkg/latex-graphics> [cited 6 December 2018].
- [4] F. Charette and A. Reutenauer. Polyglossia: An alternative to Babel for X_YLaTeX and LuaLaTeX, 2018. URL: <https://ctan.org/pkg/polyglossia> [cited 9 December 2018].
- [5] P. Kime. APA BibLaTeX style: Citation and references macros for BibLaTeX, 2018. URL: <https://ctan.org/pkg/biblatex-apa> [cited 23 December 2018].
- [6] E. Meijer. The apacite package: Citation and reference list with LaTeX and BibTeX according to the rules of the American Psychological Association, 2013. URL: <https://ctan.org/pkg/apacite> [cited 23 December 2018].
- [7] F. Mittelbach and D. Carlisle. A new implementation of LaTeX’s `tabular` and `array` environment, 2018. URL: <https://ctan.org/pkg/array> [cited 9 December 2018].
- [8] Publications Technical Group, American Mathematical Society. Using the `amsthm` package, 2017. URL: <https://ctan.org/pkg/amsthm> [cited 9 December 2018].
- [9] C. V. Radhakrishnan, H. T. Thành, R. Moore, and P. Selinger. Generation of PDF/X- and PDF/A-compliant PDFs with pdfTeX – `pdfx.sty`, 2017. URL: <https://ctan.org/pkg/pdfx> [cited 9 December 2018].
- [10] S. Rahtz and H. Oberdiek. Hypertext marks in LaTeX: a manual for `hyperref`, 2017. URL: <https://ctan.org/pkg/hyperref> [cited 10 December 2018].
- [11] J. Wright. `siunitx` — a comprehensive (si) units package, 2018. URL: <https://ctan.org/pkg/siunitx> [cited 9 December 2018].

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