Should I Install LaTeX , MiKTeX or TexStudio?

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Abstract

In various guises, this is a common question, seemingly innocent, but actually betraying a fundamental confusion about LaTeX directory, and the levels of operation in the TeX World; concepts, distributions, distributions, variants and the TeX family and friends (i.e., users, contributors, dependent and extended language & softwares). TeX is a typesetting language developed by Donald E. Kunth, today's worldwide de facto standard for high quality document typesetting. LateX is a Tex based typesetting system and collection of macros for document compilation and publication - not a word processor. MiKTeX is a compiler and an Windows O/S based TeX/LaTeX distributions. The purpose of this read is to clear the confusion and give a comprehensive introduction to the World of LaTeX, hence provide information and technical bases for anyone, authors including academias to choose between LaTeX/Tex distributions to install given the features of the offered LaTeX engines and Compilers needed by their project or document typesetting. This fills the gaps in knowledge and literature, aside numerous plagiarized blogs , confusing articles (as learning latex itself) , confusing articles (as learning latex itself) and guidelines relating to scientific typesetting, LaTeX distributions, .tex editors, LaTeX distributions, .tex editors, Latex2e, LaTeX3 and the the LaTeX family.

Introduction

TeX is a typesetting language developed by Donald E. Kunth, today's worldwide de facto standard for high quality typesetting, designed to produce a large range of documents typeset to extremely high-quality standards. Whereas, LateX is a Tex based typesetting system and collection of macros for document compilation and publication - not a word processor.

MiKTeX is a compiler and an Windows O/S based TeX/LaTeX distributions, (i.e., a collection of TeX macros, LaTeX language structure hooked to LaTeX2e, [and LaTeX3 under development] and basic document structure/components supports like BibTex, document classes, packages, etc.) Other LaTeX distribution include MacTeX for Mac OS and Texlive for Linux and Unix. TexStudio is a GUI TeX editor dependent (not a standalone) on MikTeX Console and Mark-up language.

This article clears the confusion and give a comprehensive introduction to the World of LaTeX, from the history and evolution to the enumeration of the LaTeX/Tex directory, chosing and installing from the LaTeX distributions, etc., chosing and installing from the LaTeX distributions, etc., hence provides rich provides rich information, education and technical resources for anyone, authors including academias on LaTeX/Tex distributions to the features offered by the LaTeX engines and Compilers needed by their project or document typesetting.

History of LaTeX

TeX is a typesetting system written by Donald E. Knuth, who saîd that it is "intended for the creation of beautiful books — and especially for books that contain a lot of mathematics".

Knuth developed the first version of TeX in 1978. The idea proved popular and Knuth produced a second version (in 1982) which is the basis of what we use today. Around the same time, LaTeX , the now-widely-adopted macro package based on TeX, was first developed by Leslie Lamport , who later published its first user manual in 1986. LaTeX is a TeX based typesetting system, originally written by Leslie Lamport, that provides a document setting and compiling system.

Tex, as an engine and programming language evolved from Pascal/WEB as developed by Donald Ervin Knuth in what he called "literate programming" to CWEB(c language replacing Pascal) and to LaTeX (weakly hooked to LaTeX2e and being tried with LaTeX3). LaTeX was intended to provide a high- level, descriptive markup language (and document compiler) that maximize/exploit the power of TeX!

LaTeX allows markup to describe the structure of a document, so that the user need not think about presentation. By using document classes, preamble style descriptors and add-on packages, the same document can be produced in a variety of different layouts and journal publication specifications. Lamport's last version of LaTeX was LaTeX 2.09, last updated in 1992.

LaTeX2e and LaTeX3

ΛαΤεΞ2ε (ιντροδυςεδ βψ Λατεξ προθεςτ τεαμ ιν 1994) ις νοω τηε ονλψ ρεαδιλψ-ααιλαβλε ερσιον οφ ΛαΤεΞ, ανδ δραως τογετηερ σεεραλ τηρεαδς οφ ΛαΤεΞ δεελοπμεντ φρομ τηε λατερ δαψς οφ ΛαΤεΞ 2.09. Τηε 'ε' οφ τηε ναμε ις (ιν τηε οφφιςιαλ λογο) α σινγλε-στροκε επσιλον (ε, συπποσεδλψ ινδιςατιε οφ νο μορε τηαν α σμαλλ ςηανγε). Ιτ ηας σεεραλ ενηανςεμεντς οερ ΛαΤεΞ 2.09 βυτ ΛαΤεΞ 2ε ις νοω 'φεατυρε φροζεν'. ΛαΤεΞ 3 ωιλλ βε τηε νεξτ ερσιον ανδ ις ιν δεελοπμεντ σινςε ψεαρς. Παρτς αρε αλρεαδψ υσεδ βψ τηε ΛαΤεΞ ωε κνοω ανδ ιτς πασκαγες τοο. Αλλ δεελοπμεντ, διρεςτορψ ανδ διστριβυτιον υλτιματελψ μαναγεδ βψ τηε ΛαΤεΞ Προθεςτ Γρουπ.

Today we have high tech variants that are collections or distribution of LaTeX and family of supports including expert tools and open source macro packages. We also have variants of Bibliography editors and LaTeX editors such as user friendly TexStudio standalones like LyX (an open-source graphical interface, also WYSIWYG-type editor based on LaTeX/LaTeX2e typesetting system. LyX was developed by LaTeX group and with versions for Windows, Mac and Linux.) LaTeX distribution variants like MiKTEX and Texlive are based web2c languages and also hooked to LaTeX2e and LaTeX3 which is still under development. [wiki/Donald_Knuthwiki/Donald_Knuthwiki/Donald_Knuth]

TeX/LaTeX Commands

The TeX program has about 300 commands built in, but other commands can be defined within it. Donald Knuth wrote another 600 or so useful commands from within TeX, in a package called Plain TeX which makes some common typesetting tasks easier.

> Since the commands in TeX and Plain TeX were and are still quite basic, it isn't easy to manipulate nor do complicated things with them. To help with this, Leslie Lamport created LaTeX in the early 1980s to provide a higher level language to work in than TeX. LaTeX's set of Up are defined in terms of the underlying TeX commands, often at many many layers of abstraction. Command concepts like \usepackage{...} for loading required package, environment declaration (using \begin{environment} ... \end{environment}), and document classes (i.e., \documentclass{... }) were all introduced by Leslie Lamport in LaTeX. By creating a standardised package system for LaTeX, Leslie Lamport laid a foundation that allowed the community to grow huge. ˜

AMSTeX was an extension to the Plain TeX macros and was used by the American Mathematical Society (AMS) from 1982 to 1985. Its legacy survives in AMS-LaTeX packages which are a staple of many LaTeX documents: \usepackage{amsmath}. Really, there are a large family of tools (compilers and language extension) which are now derived from TeX, and it can look like a list of nonsense words on first sight: LaTeX, pdfTeX, XeLaTeX, LuaTeX, ConTeXt, and so on. The most important improvement of the 1990s was the creation of pdfTeX by Hàn Th Thành for his PhD thesis. The original TeX program outputs the typeset document into a custom format called DVI (DeVice Independent format), that can later be turned into a PostScript file for printing. However, the PDF format came along in 1993 and we can see today that it clearly won as the better format over PostScript.

ConTeXt is another system which was created in 1990 by Hans Hagen to support and extend typography of sections, chapters and paragraphs, etc. LaTeX aims to separate the user from having to make decisions about typography and layout (you type \section and \emph but you don't worry about what these do - that's left to the document class or layout). ˜ overleaf.com/learn/latex/Articlesoverleaf.com/learn/latex/Articlesoverleaf.com/learn/latex/Articles.

LaTeX Project Group: this is a small group of volunteers whose aim is to produce a major new document processing system based on the principles pioneered by Leslie Lamport in the current LaTeX. The new system is (provisionally) called LaTeX3; it will remain freely available and it will be fully documented at all levels.

The Philosophy is that LaTeX is not a word processor! Rather, LaTeX will encourage authors to concentrate on getting the right content than worrying (too much) about the appearance of their documents. The project shall be an open source, where macros, custom packages and technical demands are to be left with experts and developers. And, obviously LaTeX Power users.

Today, joining the advancing TeX movement are the LaTeX online services like Papeeria, Overleaf, ShareLaTeX, Datazar, and LaTeX base, offering the ability to edit, view and download LaTeX files, templates and resulting PDFs. I think Overleaf and Tectonic, (a modernized, complete, self-contained TeX/LaTeX engine, powered by XeTeX and TeXLive) are the promising future of mobile typesetting system showcasing TeX flexibility and Power.{see, tectonic-typesettingtectonic-typesettingtectonic-typesetting }.

LaTeX Distribution Repository: The normal way to obtain LaTeX distribution, (the basic version for slow Internet devices, snippets for online interfaces and the full version), is therefore not to get it from CTAN repository, but Mirrors and the particular distribution developers and maintainers' websites. However, the packages, macros and dependencies are available from CTAN repository at ctan.orgctan.orgctan.org .

Some Packages are automatically distributed as part of major TeX O/S based distributions such as TeXLive, MacTeX or MiKTeX. These distribution include core LaTeX2e kernel classes (such as article.cls, report.cls, beamer.cls, etc.) and, the kernel itself latex.ltx, and other terminals in-line embedding macros such as latex.Rnd weaving files, sweave and knitr, etc.

The Tex/Latex Family and Friends

Tex Family and Friends are better discription of the Latex Development Directory or Family tree and various levels of associates and users. And, starting at the top of the LaTeX directory:

TeX/LaTeX Distributions and Installation Suites:

A collection of basic Tex softwares(e.g LaTeX, BibTex, Pdflatex, Knuthian LaTeX, LaTeX2e, etc) and packages of LaTeX for document structures typesetting is called a distribution. This include the MiKTeX, TeX Live, W32TeX, MacTex, etc. etc.

They are the large, coherent collections of TeX-related software to be downloaded and installed to be able to use the typesetting system. When someone says "I need to install TeX on my machine", usually what that person is looking for is a distribution type which come as suite or collection of integrated basic function softwares i.e., Tex editor, TeX document output printer or compilers, etc.

Included in recent versions are other terminals' integrators (like Knitr, Pandoc and Sweave that support creating latex from both R and LaTeX end of terminals.) Hence, foundations for expert macros/ user defined macros to support the running of programming language and data analysis tools like R, Matlab and Python on LaTeX terminal/engine. Most licenced dependency packages and macros from various contributors world wide, are obtainable from Mirrors and CTAN archives.

Front-ends and Tex Editors:

There are many advanced text editors specifically dedicated to LATEX for the most popular operating systems, some of them can be downloaded for free while others are proprietary software:

- **Open Source**: AucTeX, GNU TeXmacs, Gummi, Kile, LaTeXila, MeWa, TeXShop, TeXnicCenter, Texmaker, TeXstudio, TeXworks.
- **Freeware**: LEd, WinShell, etc.
- **Proprietary/Shareware**: Inlage, Scientific WorkPlace, WinEdt, etc.
- **Online Text Projects and Template**. This is rather not well moderated field of LaTeX except for licencing. The LaTeX online services include the likes of: Papeeria {http://papeeria.com/ } , Overleaf, ShareLaTeX, {https://www.sharelatex.com/} Datazar{https://www.datazar.com/} , and LaTeX base {https://www.datazar.com/} offer the ability to edit, view and download LaTeX files and resulting PDFs.

These editors are what you use to create a document file, though you may use word processors like Ms Word or Wordpad to create batches of text and paste in LaTeX environment. Some (e.g., TeXShop) are devoted specifically to TeX, others (e.g., Emacs) can be used to edit any sort of file.

Most of the editors nowadays include quick-access icons to compile to different output formats so you don't have to actually run the commands in a system prompt. However, on Overleaf, the final compiled output is always a PDF document.

Tex Engines and Compilers

These are the executable binaries which implement different TeX variants. And, examples include pdfTeX, XeTeX, LuaTeX, etc.

For instance, **pdfTeX** implements direct PDF and tagged PDF output, along with a variety of programming and other extensions.

XeTeX does the above, and also supports Unicode natively, OpenType and TrueType fonts and, access to system fonts,etc

LuaTeX does all the above, and provides access to many internals via the embedded Lua language, thus by far the most programmable engine.

While the **[e][u]pTeX** provide full support for Japanese typesetting. There are other engines, but the above are by far the most commonly used nowadays.

The compilation of document Page Styles include LaTeX, plain TeX, OpTeX, Fancy, etc. . . These are the TeX-based languages in which one actually writes documents. When someone says "TeX is giving me a mysterious error", they usually mean a format and style conflicts or mispecification.

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TeX Typeset Output File

There are three output formats available in all TEX distribution. The description of each output format is provided below:

- (DVI) Device independent file format consists of binary data describing the visual layout of a document in a manner not reliant on any specific image format, display hardware or printer.
- (PS) PostScript file format describes text and graphics on page and it is based on vector graphics. PostScript is, until now, a standard in desktop publishing areas.
- (PDF) Portable Document Format is a file format, based on PostScript, used to represent documents in a manner independent of application software, hardware, and operating systems. It is now widely used as a file format for printing and for distribution on the Web.

TeX source files can be typeset into several different output formats, depending on the engine. Notably, the pdfTeX engine (despite its name) can output both DVI and PDF files.

TeX Packages and Macros:

These are add-ons to the basic TeX system, developed independently, providing additional typesetting features, fonts, documentation, etc. A package might or might not work with any given format and/or engine; for example, many are designed specifically for LaTeX, but there are plenty of others, too.

The CTAN sites provide access to the vast majority of packages in the TeX world. The Comprehensive TeX Archive Network (CTAN) is the central place for all kinds of material around TeX. CTAN has currently 6017 packages. 2768 contributors have contributed to it. Most of the packages are free and can be downloaded and used immediately. Christian Schenk(2021). CTAN website.website.

Basic LaTeX Installation

The 'basic distribution' is catalogued separately, at latex-base; apart from a large set of contributed packages and third-party documentation (elsewhere on the archive), the distribution includes:

1. a bunch of 'required packages', which LATEX authors are "entitled to assume" will be present on any system running LATEX. Packages which must be available (required) - are essential tools (tools), core graphics and color support (graphics), key mathematics support (amsmath); and
2. a minimal set of documentation detailing differences from the 'old' version of LATEX in the areas of user commands, font selection and control, class and package writing, font encodings, configuration options and modification of LATEX.

Making the Choice

For most users, making choices between MikTeX (with option if TexStudio) and TeX Live is largely down to 'personal opinion' or 'what you try first'!

TeX Live is designed to support multi-user systems, including being installed on a servers and used on network clients, and possibly with mixed architectures and OSes. (https://tex.stackexchange.com/questions/20036/what-are-the-advantages-of-tex-live-over-miktex.)

MikTeX supports (more or less) only windows which means that it can concentrate on windows problems and how windows "look and feel" now and the future. Apart from that:

- Miktex has both 32 bit (stable) and 64 bit (experimental). It is a pity that TeX Live for Windows is available only for 32 bit.

- MikTeX spports more packages and its packages are more complete as it doesn't restrict itself to "free software".
- Only MiKTeX can do 'on the fly' package installation, as TeX Live is more focussed on having a system that works well on multi-user systems. On-the-fly installation of missing Packages is a great feature. It updates binaries also between releases so its binaries often were newer than the one in TeXLive at a given new update (nowadays you can update binaries in TeXlive tlcontrib so it also can be the other way round.)
- Deciding the install location of your own packages and classes is easier on MiKTeX. Installing them is just as easy on TeX Live if you use one of the predefined locations. However, TeXLive is maintained by TUG, that is, by more than one person, which makes it more future-safe. It supports many platforms, not just Windows. (The first .paragraph of http://www.ctan.org/starter.ht needs update)

MikTeX and proTeXt.

proTeXt is a bundle that contains, among other things, MiKTeX, which is one of the two major TeX distributions (the other being TeXLive):

First, proTeXt adds a few independent tools to MiKTeX, notably TeXnicCenter and Ghostscript. TeXnicCenter is a LaTeX editor that works quite well with MiKTeX, Ghostscript is software for processing PostScript (*.ps) files.

The current proTeXt actually contains TeXstudio as an editor, and not TeXnicCenter anymore, but that information hasn't even reached all of their own web sites yet. Old MikTeX users usually download TexStudio as a better alternative editor to Texwork.

What makes the difference between MiKTeX's 164 MB and proTeXt's 1195 MB is the fact that MiKTeX is a Basic Installer that loads further packages on-the-fly, when necessary. The MiKTeX included in proTeXt has that ability, too, of course; however, it comes with many (all?) packages included, so it's a "full" install.

If you're completely new to LaTeX and you have a decent Internet connection, I recommend going for proTeXt because it gives you all you need for a start and offers a nice installation-flow manual.

Some Popular TeX/LaTeX Distribution

Some have become obsolete with operating system advancement. The following are sure popular and widely used:

Properties of TeX editors 3

Name	Collapsible sections	Find and replace using RegEx	Intelligent error handling	Autocompletion of LaTeX commands	Parenthesis matching	Starts up to previous state[Note 11]	Unicode support	RTL Support[Note 12]
AUCTeX	Yes	Yes	Yes	Yes	Yes	Yes[Note 13]	Yes	Yes
Authorea	No	Yes	No	No	Yes	Yes	Yes	?
Auto-Latex Equations for Google Docs	No	Yes	No	No	No	Yes	Yes	?
CoCalc	Yes	Yes	No	Yes	Yes	Yes	Yes	?
GNOME LaTeX	Planned	Yes	Yes	Yes	Yes	(just same files)	Yes	Yes
Gummi	No	No	No	No	Yes	No	Yes	?
Kile	Yes[Note 14]	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LEd	Yes	Yes	?	Yes	Yes	No (just same files)	No	?
LyX	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MeWa	No	Yes	No	No	No	No	Yes	?
Notepad++	Yes	Yes	No	Partial[Note 15]	Yes	Yes	Yes	Yes
Overleaf	Yes	Yes	Yes	Yes	Yes	Yes	Yes	?
Scientific WorkPlace	No	?	?	N/A	Yes	No	Yes	?
TexLab	No	No	Yes	Yes	Yes	Yes	Yes	No
TeXmacs	No	Yes	N/A	N/A	N/A	No	Yes	?
Texmaker	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
TeXnicCenter	since v2.0	since v2.0	Yes	Yes	Yes	Yes	since v2.0	?
TeXShop	No	Yes	Yes	Yes	Yes	Yes	Yes	?
TeXstudio	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
TeXworks	No	Yes[Note 16]	No	Yes[Note 17]	Yes	No	Yes	Yes
Verbosus	No	No	Yes	Yes	Yes	No	Yes	?
WinEdt	Yes	Yes (modified)	Yes	Yes	Yes	Yes	Yes	Yes
WinShell	Yes	Yes	Yes	Yes	Yes	No (just same files)	Yes	?
Name	Collapsible sections	Find and replace using RegEx	Intelligent error handling	Autocompletion of LaTeX commands	Parenthesis matching	Starts up to previous state[Note 18]	Unicode support	RTL Support[Note 19]

Figure 1: Properties of some TeX editors

proTeXt

proTeXt is a MiKTeX-based distribution for Windows. It aims to be an easy-to-install TeX distribution for Windows, based on MiKTeX. After downloading, a wizard (available in several languages) guides the installation.

MikTeX

MiKTeX (pronounced mick-tech) is an up-to-date implementation of TeX/LaTeX and related programs. TeX is a typesetting system written by Donald Ervin Knuth who says that it is intended for the creation of beautiful books - and especially for books that contain a lot of mathematics.

MiKTeX's integrated package manager can install missing components from the Internet, if required. Also included in the distribution package are the MiKTeX Console which helps you to keep your TeX system up-to-date by installing the latest package updates, and TeXworks, a TeX frontend which you can use it to edit and preview LaTeX documents. There are currently 4077 packages in the MiKTeX package repository as updated on 3/25/2021. For more information about MiKTEX, visit (http://miktex.org).

The TeX distribution for Windows is actively maintained by Christian Schenk. Many Windows users prefer it to TeX Live for ease of installation because it is based on a Windows Wizard. Recently it has also been ported to Linux and macOS. ˜Christian Schenk(2021).

Texstudio: LATEX make easy and comfortable.

TeXstudio is an integrated writing environment for creating LaTeX documents. The goal is to make writing LaTeX as easy and comfortable as possible, hence the highly technical, intuitively resourceful and numerous features like syntax-highlighting, integrated viewer, reference checking, tutorial playing, and various assistants.

It has built-in support for various LaTeX compilers, index, bibliography and glossary tools, Latexmk, pdflatex, and many more. The other features and benefits include:

1. Automatic detection of the need for multiple LaTeX runs and dependency for a package, consequently download the package.
2. It also has Advanced syntax highlighting, and Intelligent interface: these enables Interactive spellchecking, live interactive grammar checker and reference checker. Also, clear display of LaTeX errors and warnings (in the editor and as a list).
3. You can generate blocks of code using assistants without the need for detailed LaTeX knowledge. A UI menu which allows you choose form for table, graphics and mathematics terms and ooerators. columns with a single click. The table-autoformatter helps you align the chosen table code.
4. You can run any program you like including completely customized creation for desired complete document(style and type).
5. You can use the integrated PDF viewer with (almost) word-level syncing, live-updating inline preview for formulas and code segments to preview your project or latex document.
6. It has a Tooltip preview for included images which are inserted in \includegraphic command structure.

TeXstudio has been forked from Texmaker in 2009, because of the non-open development process of Texmaker and due to different philosophies concerning configurability and features. Originally, it was called TeXmakerX because it started off as a small set of extensions to Texmaker with the hope that they would get integrated into Texmaker someday.

While at some points you can still see that TeXstudio originates from Texmaker, significant changes in features and the code base have made it to a fully independent program. TeXstudio runs on Windows, Unix/Linux, BSD, Ubuntu, and Mac OS X. It is licensed under the GPL v2.

It does not provide LaTeX itself so the user must have to choose a distribution of LaTeX and install it first. It is written in C++ / Qt and supported on operating systems such as Unix-like , Microsoft Windows (version 3.1.1 released February 2021, size 23.7mb), macOS (42.7mb), and Linux (12-18 MB). Available in 11different languages.

TeXstudio Authors are Benito van der Zander, Jan Sundermeyer, Daniel Braun, Tim Hoffmann. See, {http://texstudio.sourceforge.net} for more information.

Overleaf

Overleaf is an online distribution and platform that support your learning and practice of LaTeX. You can generate or see collection of templates including journals' which you can use and send final project or document through Overleaf support engine to the journal submission centre or collaborators. Here are some key features to help you get the most out of the service:

- Learn LaTeX in 30 minutes{ https://www.overleaf.com/learn/latex/Learn_LaTeX_in_30_minutes?utm_source=overleaf&utm_medium=email&utm_campaign=onboarding}: In this tutorial is a quick and easy first introduction to LaTeX with no prior knowledge required. By the time you are finished, you will have written your first LaTeX document!
- Find a beautiful template:{https://www.overleaf.com/latex/templates?utm_source=overleaf&utm_medium=email&utm_campaign=onboarding} If you're looking for a template or example to get

started, we've a large selection available in our template gallery, including CVs, project reports, journal articles and more.

Free TeX implementations

Some notable TeX implementations that are entirely, or least primarily, free software:

- TeX Live is a distribution provided by most TeX user groups which supports many Unix systems, MacOSX, and Windows.
- MacTeX, TeX Live with additions and easy installation for MacOSX.
- MiKTeX, an independent distribution for Windows with a flexible package manager.
- proTeXt, MiKTeX with additions and a thorough installation guide for Windows.
- KerTeX, from Thierry Laronde, a TeX kernel system.Knoppix, a live GNU/Linux system on a bootable CD that includes TeX.
- TeX-FPC, from Wolfgang Helbig, change files for TeX to work with Free Pascal compiler, along with installation scripts.
- Wallstone Creativity Desktop, a large free software collection for dealing with documents, photos, video, project planning, and more; includes (La)TeX

LaTeX packages

We have so numerous and complementary packages by independent and group contributors aside the essential latex packages. Add-ins such as texpoint, an add-in for Microsoft PowerPoint and Word to enable use of LaTeX; IguanaTeX, a free software package for inserting LaTeX equations into PowerPoint.

How to Install LaTeX Packages

Some common packages, like amsmath, are included in most TeX distributions, but the vast majority are not. Any additional packages must be installed in order to compile the document.

1. Installation During Compiling (using MikTeX). When processing a .tex file which has packages listed in its preamble that are not yet installed, MikTeX can install those packages as part of the process of compiling the document.
2. Installationn using a Package Manager. MiKTeX and TeX Live both include package managers which will find and install a specified LaTeX package for the user. For MiKTeX, this is done using the MiKTeX Console, a program which is included when MiKTeX is installed. TeX Live (and hence MacTeX) installs packages via the command line or terminal. Installing the geometry package, for example, can be done using the following commands: tlmgr install geometry with TeX Live (Linux), sudo tlmgr install geometry with MacTeX (Mac)~wayne.edu(2021)

Packages and programes for dealing with graphics include:

- graphics and graphicx, the core LaTeX packages.
- bmpsize, Heiko Oberdiek's package for finding bitmap bounding boxes; supports most bitmap formats.
- PSTricks graphics, a widely-used graphics package, maintained by Herbert Voß.
- PGF/TikZ, a second widely-used graphics package, by Till Tantau. KtikZ, is a graphics editor for family tree of TikZ.[Read, Graphics with PGF/TikZ, an article by Andrew Mertz and William Slough using graduated examples.]
- PGFplots, LaTeX package for creating plots in two and three dimensions.
- Xy-pic graphics, a third widely-used graphics package, by Kristoffer Rose and Ross Moore, specializing in commutative diagrams.

Conclusion

We should be cleared, by now , on LaTeX family, LaTeX Distribution, Engine, Editor, and Packages. This article gives a comprehensive introduction to the World of LaTeX, hence provide information and technical bases for anyone, authors including academias to choose between LaTeX/Tex distributions to install given the features of the offered LaTeX engines and Compilers needed by their project or document typesetting.

A collection of basic LaTeX installation is called a distribution, and comes with TEX, LATEX, BibTEX, and everything else that will help you to perform TEX's magic on your computer as you get into document and project work typesetting. Each distribution, however, also comes with programs specific to your operating system and those download and settings needed in your field of research and career.

Latex Compilers are different from TeX/LaTeX distribution. Compiler settings are pdfLaTeX (the default), XeLaTeX and LuaLaTeX. Now, choosing a compiler depends not only on OS, but on each project's needs.

- LaTeX supports only .eps and .ps image formats for use with \includegraphics. If all the images in your project are .eps files, then this compiler setting is recommended.
- pdfLaTeX supports .png, .jpg, .pdf image formats and will convert .eps images to .pdf on-the-fly during compilation. Read https://www.overleaf.com/learn/latex/Choosing_a_LaTeX_Compiler#Other_compilers

Also, there are many advanced text editors specifically dedicated to LaTeX and for the most popular operating systems according to Overleaf.com. While some of them can be downloaded for free others are proprietarsoftwares. I think for Microsoft Windows OS's, TeXstudio (my number one), Textmaker and TexWork attached to MiKTeX Console are great.

NOTES AND RECOMMENDATION

I believe with all discussed, there are lesser confusion on concepts and family of Tex and LaTeX. Shifting from "should I install LaTeX , MiKTeX or TeXstudio?" to "Which LaTeX Distribution should I install?"

Please, note that the choice of distribution is not just personal preference, nor trending in your institution or region but a choice informed by the type of PC you have, the operating system, your technical a choice based on your PC device, the operating system and nature of your project needs given your field and technical skills in latex/Latex and coding skills given the needs of your project and your field. Please add the following to your criterias.

Unix-type Systems, including GNU/Linux: the best choice is TeX Live, which contains many packages and programs. It is freely available over the Internet or on disc. Note that most Unix systems have TeX as an installation option so you might already have it or be able to easily get it using your system administration package management tool: RPM, or DEB, or whatever.

This is highly maintained TeX distribution, with tens of developers with choice particular on all operating systems. Some GNU/Linux distributions provide it in their packaging framework (Debian, Fedora, Open-SUSE,. . .), but these prepackaged versions usually lag behind the basic one.

Macintosh OS: you need to get the MacTeX distribution, which is TeX Live with some Mac-specific features. Current distribution is MacTeX-2020 which consists of several packages. A custom install option allows users to select which packages to install among: GUI applications such as TeXShop , LaTeXiT, and some documentation Ghostscript 9.50 and Ghostscript libgs.

However, two programs could not be included in MacTeX because their authors have not yet notarized them. Users can retrieve them directly from their web sites: BibDesk and TeX Live Utility. For more information, (http://tug.org/mactex and http://tug.org/mactex/aboutarm.html). It is essentially the same as TeX Live, but only for Mac OS X and with added features for compatibility with the OS. The MacTeX-2020

distribution requires Mac OS 10.13, High Sierra, or higher and runs on Intel and Arm processors. To download, click MacTeX Download, http://tug.org/mactex/mactex-download.html

Microsoft Windows OS: the most popular choice here is the MiKTEX distribution, which lets you easily manage TEX packages. Many people advise beginners to get the proTEXt bundling of MiKTEX, which lets you install by using a .pdf file with links so you can read about your options and then click on the right one. And it includes other components that help you work with your projects.

For Unix systems there's essentially only TeX Live but for Windows I choose TeXstudio and MiKTeX, no regret, essentially a matter of personal preference. Interestingly both are based on Web2C. Good luck
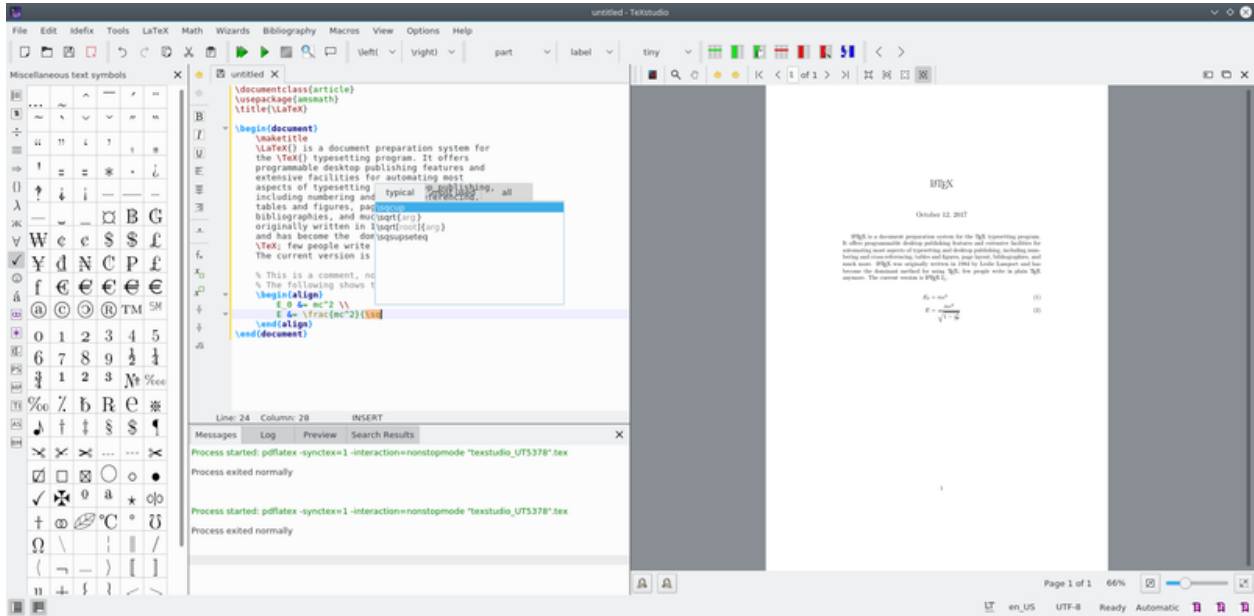

Figure 2: LaTeX Editor Family: TexStudio Screen

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