Section 1: Basic Information of This Template Class

Despite this SEU-ML-Assign class is dedicated to Southeast University as the Machine Learning assignment \LaTeX{} template both for teachers and students, it can also be used for other schools. In the near future, it will eventually become an elegant template for all assignment requirements.

<table>
<thead>
<tr>
<th>Package Class Name</th>
<th>Version</th>
<th>Description</th>
<th>Author</th>
<th>Maintainer</th>
<th>GitHub Repository</th>
<th>Issues</th>
<th>CTAN Package</th>
<th>Information Page</th>
<th>Open Source License</th>
</tr>
</thead>
</table>

You can contact me at me@tvj.one for support.

Section 2: Class Options

To use this template, put seu-ml-assign.cls file under the same directory with your main .tex file.

```latex\documentclass{seu-ml-assign} % SEU Machine Learning Assignment Template```

The page size is A4 paper. There are 8 supported options:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>solution</td>
<td>Write solutions (for students).</td>
<td>•</td>
</tr>
<tr>
<td>problem</td>
<td>Write problem sets (for instructors).</td>
<td>•</td>
</tr>
<tr>
<td>oneside</td>
<td>One-sided document.</td>
<td>•</td>
</tr>
<tr>
<td>twoside</td>
<td>Two-sided document.</td>
<td></td>
</tr>
<tr>
<td>9pt</td>
<td>Set font size as 9 points.</td>
<td></td>
</tr>
<tr>
<td>10pt</td>
<td>Set font size as 10 points.</td>
<td>•</td>
</tr>
<tr>
<td>11pt</td>
<td>Set font size as 11 points.</td>
<td></td>
</tr>
<tr>
<td>12pt</td>
<td>Set font size as 12 points.</td>
<td></td>
</tr>
</tbody>
</table>

For example, a 10pt, two-sided document for instructors to create an assignment consisting of problem sets should use

```latex\documentclass[10pt,twoside,problem]{seu-ml-assign} % The 10pt option can be omitted.```
With the `twoside` option, the header will switch style every page, as is the case in this documentation. In contrast, the sample file uses the `oneside` option.

There are several differences between the `solution` mode and `problem` mode, including the preset texts on the document (for example the student name is not shown in the `problem` mode) and some properties can only be used with the `problem` mode which will be elaborated on in §3.2.

Section 3: Document Properties

(1) Fields  There are several fields to set. The `\mainproblem{}` can be left empty. Consider the following example used in the sample file:

```
\title{Assignment} % Document Type: assignment, quiz, etc.
\author{Teddy van Jerry} % Your Name
\studentID{61520522} % Your Student ID
\instructor{TeX - LaTeX Stack Exchange} % The Name of Your Instructor
\date{\today} % The Submission or Release Date
\duedate{20:00 March 21, 2022} % The Time the Assignment is Due
\assignno{1} % Assignment Number
\semester{SEU --- 2022 Spring} % Semester
\mainproblem{Linear Algebra} % The Main Problem or Topic
```

With these fields set, you can use the command `\maketitle` to print the title. At the same time, the metadata for the PDF document is automatically set.

(2) Problem Mode Only Properties  One of the fields `\author{}` and `\instructor{}` can be omitted or set as empty provided that they are the same.

Section 4: Section Title (Problem) Settings

(1) Normal Title  The title of a problem can be set as `\problem{This is a Section Title}` or uses a lower level command `\section{This is a Section Title}`. There are two slight different between these two ways.

- The name in the table of contents (ToC) using `\problem{}` will add the section/problem number before the section/problem title name.
- The optional argument of `\section{}` will set the name in the ToC which is by default in \LaTeX in the format of `\section[<ToC Name>]{<Section Title Name>}`. By contrast, the optional argument in `\problem{}` sets the problem points as is detailed in §4.3.

```
\section[\thesection~<Title>]{<Title>} is equivalent to \problem{<Title>} or \problem[]{<Title>}.  
```

(2) Unnumbered Title  Use the `\section*{}` or `\problem*{}` to get an unnumbered section.

This is an Unnumbered Problem

This title will also not appear in the ToC or bookmarks of the PDF.

(3) Problem with Points  The points of a problem can be set using command `\problempts{xxx}` before calling the `\section{}` command. These two commands can be simplified to `\problem[xxx]{}{}`. For example, using the command `\problem[15]{This is a Problem Worth 15 Points}` will have:\(^1\)

```
Problem 1: This is a Problem Worth 15 Points (15 points)  
```

Note that if the point is an empty string, the point information will not be shown.

\(^1\)This title is actually faked in this documentation because I do not want the ToC of this documentation contaminated. But it will look the same.
(4) **Long Title Compatibility** There is also no problem if the section title is too long.²

Problem 2: I Don’t Think that Anyone Will Enjoy Themselves Seeing a Very Very Long Problem That is Worth Twenty Points in this Machine Learning Course (20 points)

(5) **Section Title Name** The name of the section (default name as `problem`) can be changed by using `\renewcommand{\sectionheadname}{Name}`.

(6) **Section Number** The number of the section can be changed, for example `\texttt{\setproblem{4}}` will make the next section number be 5. For experienced \LaTeX{} users to understand, this command actually change the section counter.

(7) **Solution Declaration** You can use `\startsolution` to declare you start writing the solution. This will reset the section number and it is especially useful when your document contains problems and solutions as two separate parts. There is an option `print` and if you use `\startsolution[print]` you will get:

**SOLUTION**

and the word SOLUTION can be changed using command `\renewcommand{\solutionname}{Other Name}`.

---

Section 5: Subsection Title (Sub Problem) Settings

(1) **Normal Title** This is a normal title using command `\subproblem{Normal Title}` or alternatively the command `\subsection{Normal Title}`. There is a slight difference between these two commands which is similar to the case stated in §4.1. The command `\subproblem{}` adds the sub problem number in ToC and bookmarks. `\subsection{[\texttt{arabic{subsection}}] <Title>}{<Title>}` is equivalent to `\subproblem{<Title>}`.

(2) Use `\subproblem{}` or `\subsection{}` if only the sub problem number is required (like this line).

(3) **Subsection Number** Similar to `\setproblem{}`, there is also `\setsubsection{}`.

(4) **Subsubsection (Sub Sub Problem)** For completeness, `\subsubsection{}` and `\subsubproblem{}` are provided. One example is §6.5.1, where `\subsubsection{[\texttt{arabic{subsubsection}}] <Title>}{<Title>}` is equivalent to `\subsubproblem{<Title>}`.

---

Section 6: Other Tools

(1) **Equation Numbering** The equation number is within the section (problem), for example

\[
\det(A) = 1 \times \begin{vmatrix} -5 & 3 \\ -4 & 4 \end{vmatrix} - (-3) \times \begin{vmatrix} 3 & 3 \\ 6 & 4 \end{vmatrix} + 3 \times \begin{vmatrix} 3 & -5 \\ 6 & -6 \end{vmatrix} = 1 \times (-2) + 3 \times (-6) + 3 \times 12 = 16,
\]

which uses the `equation` environment and can be referenced using the command `\eqref{eq:xxx}` with a corresponding `\label{eq:xxx}` in Eq. (6.1).

(2) **Maths Packages** Maths Package `mathtools`, `amssymb`, `amsthm`, `bm` and `nicematrix` are automatically loaded. The `nicematrix` package is especially powerful in terms of writing a matrix. You can find its documentation at [https://ctan.org/pkg/nicematrix](https://ctan.org/pkg/nicematrix). It is worth noting that `nccmath` can lead to potential subsection (sub problem) title indentation problem and therefore should not be loaded.

²This title is also faked.
(3) Theorem Environment  Environments \texttt{theorem}, \texttt{proposition}, \texttt{lemma}, \texttt{corollary} have been defined. For example:

\textbf{Lemma 6.1.} This is a lemma. Its numbering is within the section. You can create such environment using the code \texttt{\begin{lemma} Your lemma contents here. \end{lemma}}.

(4) Additional Math Operator  The additional math operator is listed in the table below.

<table>
<thead>
<tr>
<th>Command</th>
<th>Definition</th>
<th>Inline Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>\argmin</td>
<td>\DeclareMathOperator*{\argmin}{\arg\min}</td>
<td>$\arg\min_x (x - 2)^2 + 1$</td>
</tr>
<tr>
<td>\argmax</td>
<td>\DeclareMathOperator*{\argmax}{\arg\max}</td>
<td>$\arg\max_x f(x)$</td>
</tr>
</tbody>
</table>

Operators defined with the * after \texttt{\DeclareMathOperator} have their subscript under the operator in the \texttt{equation} mode, which can be suppressed by adding \texttt{\nolimits} before the \_.

Here is an example:

\begin{equation}
\begin{align*}
\arg\min_x (x - 2)^2 + 1, \quad \arg\max_x f(x), \quad \arg\min_{\alpha} g(\alpha)
\end{align*}
\end{equation}

(5) Shortcuts  Some shortcuts commands have been defined in this class.

1. Hint  You can easily use command \texttt{\hint{}} to show a hint to a problem. This is especially useful in the \texttt{problem} mode. (\textit{Hint: You can use \texttt{\renewcommand{\hintstyle}{<Your Style>}} to change the default one}.)

(6) Code Block  You can use code blocks in this class which is implemented by the \texttt{lstlisting} environment. Their default styles have been set and you can make changes by passing optional arguments when using the environment. For more information, please refer to \url{https://ctan.org/pkg/listings}.

(7) Fancy Box  A fancy box has been defined.

\begin{fancybox}
\end{fancybox}

You can use the following code to generate it.

\begin{fancybox}{This is a Fancy Box}
\end{fancybox}

There is also a \texttt{notice} box:

\begin{fancybox}{This is a Notice Box}
\end{fancybox}

You can use the following code to generate it.
\begin{notice}{This is a Notice Box}
\end{notice}

Appendix A: Known Issues

- The section title background height may not be accurate;

If you find more issues, please report them on https://tvj.one/ml-tex/issues.

Appendix B: Change Log

v1.1 2022/03/28 – Bug Fix and Enhancement
1. Add \mainproblem{} command;
2. Add \subsubproblem{} command;
3. Add \hint{} shortcut;
4. Support for \section*, \problem*, \subsection* and \subproblem*;
5. Fix ToC/Bookmarks problem;
6. Set footnote line style;
7. Add the twoside option.

v1.0 2022/03/19 – Initial Version
1. Initial cls file in addition to a sample file and documentation;
2. Publish at GitHub and CTAN.

Appendix C: Source Code

The source code of seu-ml-assign.cls is listed below.

\NeedsTeXFormat{LaTeX2e}
\ProvidesClass{seu-ml-assign}[2022/03/28 SEU Machine Learning Assignment Template]
\def\@@ptsize{10 pt} % font size
\DeclareOption{9 pt}{\def\@@ptsize{9 pt}}
\DeclareOption{10 pt}{\def\@@ptsize{10 pt}}
\DeclareOption{11 pt}{\def\@@ptsize{11 pt}}
\DeclareOption{12 pt}{\def\@@ptsize{12 pt}}
\def\@@solutionmode{1} % default as the solution mode
\DeclareOption{problem}{\def\@@solutionmode{0}} % solution mode
\def\@twoside{0} % default as oneside
\DeclareOption{twoside}{\def\@twoside{1}} % one-side document
\DeclareOption{oneside}{\def\@twoside{0}} % two-side document
\ProcessOptions\relax
\LoadClass[a4paper,onecolumn,\@@ptsize]{article}
\def\firstfooteradditionalheight{2 em}
hfuzz=.5 em % disable false positive of overfull \hbox
\NeedsTeXFormat{LaTeX2e}
\ProvidesClass{seu-ml-assign}[2022/03/28 SEU Machine Learning Assignment Template]
\def\@@ptsize{10 pt} % font size
\DeclareOption{9 pt}{\def\@@ptsize{9 pt}}
\DeclareOption{10 pt}{\def\@@ptsize{10 pt}}
\DeclareOption{11 pt}{\def\@@ptsize{11 pt}}
\DeclareOption{12 pt}{\def\@@ptsize{12 pt}}
\def\@@solutionmode{1} % default as the solution mode
\DeclareOption{problem}{\def\@@solutionmode{0}} % solution mode
\def\@twoside{0} % default as oneside
\DeclareOption{twoside}{\def\@twoside{1}} % one-side document
\DeclareOption{oneside}{\def\@twoside{0}} % two-side document
\ProcessOptions\relax
\LoadClass[a4paper,onecolumn,\@@ptsize]{article}
\def\firstfooteradditionalheight{2 em}
hfuzz=.5 em % disable false positive of overfull \hbox
% Page Settings
% Document Properties
\global\let\assignno\empty
\global\let\semester\empty
\global\let\studentID\empty
\global\let\instructor\empty
\global\let\duedate\empty
\global\let\author\empty
\global\let\mainproblem\empty
\newcommand{\assignno}[1]{% Assignment Number
  \gdef\assignno{#1}}
\newcommand{\semester}[1]{% Semester
  \gdef\semester{#1}}
\newcommand{\studentID}[1]{% Student ID
  \gdef\studentID{#1}}
\newcommand{\instructor}[1]{% Instructor
  \gdef\instructor{#1}}
\newcommand{\duedate}[1]{% Due Date of the Assignment
  \gdef\duedate{#1}}
\newcommand{\mainproblem}[1]{% The main problem of the
  \gdef\mainproblem{#1}}

% Fonts and Colors
\RequirePackage[T1]{fontenc}
\RequirePackage{usenames,dvipsnames}{xcolor}
% TikZ Rule
\RequirePackage{tikz}
\usetikzlibrary{fadings,calc}
\newcommand{\tikzrule}[3]{%
  \tikz{\fill[#1] (0,0) rectangle (#2,#3);}}
% Sections Settings
\RequirePackage[explicit]{titlesec}
% explained in
\url{https://tex.stackexchange.com/a/292307/234654}
\RequirePackage{suffix}
% http://mirrors.ctan.org/macros/latex/contrib/titlesec/titlesec.pdf
\pgfdeclarelayer{background}
\pgfsetlayers{background,main}
\global\let\problems\empty
\newcommand{\problems}[1]{% Points of the Problem
  \gdef\problems{#1}}
\newcommand{\problemsprint}{%
  \normalfont\small\problemsprint}
\newcommand{\sectionheadname}{Problem}\% Name for the Section (default as 'Problem')
% Reference: \url{https://tex.stackexchange.com/a/12269/234654}
\newcommand{\boxedsection}[4]{%
  \begin{tikzpicture}[inner sep=0pt, inner ysep=0.3ex]
  \node[anchor=base west] at (0,0) (counter) {#2};
  \path let \p1 = (counter.base east) in node[anchor=base west, text
  \hspace{-2.2\baselineskip}\hfill{\normalfont\small\problemsprint}]% left color=#1,right color=white let \p1=(counter.north),
  \hspace{\textwidth-\x1-#4} (content)
  at ($\p1\neq#4,0$) {#3};
  \begin{pgfonlayer}{background}
  \shade[left color=#1, right color=white] let \p1=(counter.north),
  \hspace{\textwidth-\x1-#4} (content.north) in
  (0,\max(\y1,\y2)) rectangle (content.south east);
  \end{pgfonlayer}
  \end{tikzpicture}
\newcommand{\setproblem}[1]{\ifx#1\@empty\else\setcounter{section}{#1}\fi}% force the number of problems
\newcommand{\setsubproblem}[1]{\ifx#1\@empty\else\setcounter{subsection}{#1}\fi}% force the number of subproblem
\newcommand{\setproblem}{0}% reset the section counter
\def\startsolutionprintoption{print}
\def\startsolutionprintuseroption{#1}
\ifx\startsolutionprintuseroption\startsolutionprintoption{}}%}
\titlespacing*{\section}{0em}{2.5\baselineskip}{1\baselineskip}
\titleformat{\subsection}[runin]{\large\bfseries}{(\arabic{subsection})}{0.33em}{#1}
\titleformat{\subsubsection}[runin]{\bfseries}{\arabic{subsubsection}.}{0.33em}{#1}
\newcommand{\hintstyle}{\itshape}
\newcommand{\hint}[1]{({\hintstyle Hint : #1})}
\DeclareMathOperator*{\argmin}{\arg \, \min}
\DeclareMathOperator*{\argmax}{\arg \, \max}
\RequirePackage{mathdots}
\RequirePackage{amssymb}
\RequirePackage{bm}
\RequirePackage{nicematrix}
\numberwithin{equation}{section}
\newtheorem{theorem}{Theorem}[section]
\newtheorem{proposition}{Proposition}[section]
\newtheorem{lemma}{Lemma}[section]
\newtheorem{corollary}{Corollary}[section]
\newcommand{\hintstyle}{\itshape}
\newcommand{\hint}[1]{(\hintstyle Hint: #1)}
\DeclareMathOperator*{\argmin}{\arg \min}
\DeclareMathOperator*{\argmax}{\arg \max}
\RequirePackage{listings}
\definecolor{dkgreen}{rgb}{0,0.5,0}
\definecolor{gray}{rgb}{0.5,0.5,0.5}
\definecolor{mauve}{rgb}{0.58,0,0.82}
\lstset{
numbers=left,
frame=tb,
aboveskip=3mm,
belowskip=3mm,
showstringspaces=false,
columns=fixed,
framerule=1pt,
rulecolor=\color{gray!35},
backgroundcolor=\color{gray!5},
basicstyle=\ttfamily\small,
numberstyle=\footnotesize\color{gray},
keywordstyle=\bfseries\color{MidnightBlue!95!black},
commentstyle=\color{dkgreen},
stringstyle=\color{mauve},
breaklines=true,
breakatwhitespace=true,
tabsize=2,
extendedchars=false,
postbreak=\mbox{\hfill \textcolor{purple}{$\hookrightarrow$}}
}
\% Captions Settings
\% RequirePackage[font=footnotesize,labelfont=bf]{caption}
\% Color Boxes
\% RequirePackage[many]{tcolorbox}
\% RequirePackage{varwidth}
newtcolorbox{fancybox}[2][]{enhanced,skin=enhancedlast jigsaw,
attach boxed title to top left={xshift=-4mm,yshift=-0.5mm},
fonttitle=bfseries\sffamily,\varwidth boxed title=0.7\linewidth,
colbacktitle=blue!45!white,\colframe=red!50!black,
interior style={top color=blue!10!white,bottom color=red!10!white},
boxed title style={empty,arc=0pt,boxed title style={empty,arc=0pt,
underlay boxed title={(\fill[blue!45!white] (title.north west) -- (title.north east)
-- +(\tcboxedtitleheight-1mm,-\tcboxedtitleheight+1mm)
-- (xshift=4mm,yshift=0.5mm)frame.north east) -- +(0mm,-1mm)
-- (title.south west) -- cycle;
\fill[blue!45!white!50!black] ([yshift=-0.5mm)frame.north west)
-- +(-0.4,0) -- +(0,-0.3) -- cycle;
\fill[blue!45!white!50!black] ([yshift=-0.5mm)frame.north east)
-- +(0,-0.3) -- +(0.4,0) -- cycle;},
title={#2},#1}
\% Color Boxes
\newtcolorbox{notice}[2][]{enhanced,
\colframe=blue!50!black,\colback=blue!10!white,\colbacktitle=blue!5!yellow!10!white,
fonttitle=bfseries,\coltitle=black,attach boxed title to top center=
{yshift=-0.25mm-\tcboxedtitleheight/2,yshifttext=2mm-\tcboxedtitleheight/2},
boxed title style={\boxrule=0.5mm,
frame code={\path[tcb fill frame] ([xshift=-4mm)frame.west}
-- (frame.north west) -- (frame.north east) -- ([xshift=4mm)frame.east)
-- (frame.south east) -- (frame.south west) -- cycle;},
interior code={\path[tcb fill interior] ([xshift=-2mm]interior.west)
-- (interior.north west) -- (interior.north east)
-- ([xshift=2mm]interior.east) -- (interior.south east) -- (interior.south west)
-- cycle;},
title={#2},#1}
\% Footnote Settings
\% RequirePackage[bottom]{footmisc} % glue footnote to bottom
\renewcommand{\footnoterule}{\noindent\tikzrule[SeaGreen, path
\rightarrow fading=east]{.4\textwidth}{.1em}}
\renewcommand{\footnotemargin}{1em}
\% Header and Footer
\% RequirePackage{fancyhdr}
\% RequirePackage[colorlinks=true, urlcolor=blue, linkcolor=purple, citecolor=red,
\rightarrow hyperxnames=false]{hyperref}
\setlength{\headheight}{52pt}
\setlength{\marginparwidth}{2cm}
\pagestyle{fancy}
\if@twoside0
\lhead{
\fontfamily{Linux Libertine T - OsF}\selectfont
\if@solutionmode
\textsc{\@title \@assignno} -- \@studentID \@author
\else
\textsc{Machine Learning \@title \@assignno}
\fi}
\rhead{\thepage}
\renewcommand\headrule{\vspace{\smallskipamount}\tikzrule[BrickRed, path fading = east]{.5\textwidth}{0.3mm}}
\else
\fancyhf{}
\renewcommand\headrule{\vspace{\smallskipamount}\tikzrule[BrickRed, path fading = east]{.5\textwidth}{0.3mm}}
\fi
\fancyhead[LO]{
\fontfamily{Linux Libertine T - OsF}\selectfont
\if@solutionmode
\textsc{\@title \@assignno} -- \@studentID \@author
\else
\textsc{Machine Learning \@title \@assignno}
\fi}
\renewcommand\headrule{\vspace{\smallskipamount}\tikzrule[BrickRed, path fading = east]{.5\textwidth}{0.3mm}}
\fancyhead[RE]{
\fontfamily{Linux Libertine T - OsF}\selectfont
\textsc{Machine Learning \@title \@assignno}}
\fancyhead[LE,RO]{\thepage}
\fancyfoot{}
% header and footer style for the first page
\fancypagestyle{firstpage}{
\renewcommand\headrule{}
\lhead{}
\rhead{}
\cfoot{
\fontfamily{Linux Libertine T - OsF}\selectfont
\vspace*(-\firstfooterdistance)
\vspace{-1.5em}
\tikzrule[purple, path fading = west]{.5\textwidth}{.15em}%
\tikzrule[purple, path fading = east]{.5\textwidth}{.15em}
}\footnotesize\centering
\if@solutionmode
This \MakeLowercase{\@title} is due \@duedate and the date of submission is \@date.
\else
This \MakeLowercase{\@title} is due \textbf{\@duedate} and the version of the problem set is \@date.
\fi
}% LaTeX template information
\LaTeX{} template for this \MakeLowercase{\@title{}} is open source at \href{https://tvj.one/ml-tex}{tvj.one/ml-tex} under the MIT License. E-mail \href{mailto:me@tvj.one}{me@tvj.one} for support.

\begin{minipage}{10.5cm}
\centering
\fontsize{36}{48}\selectfont
\textcolor{Plum}{\scshape Machine Learning}\\[.5 em]
\if\@@solutionmode1
\texttt{Student ID} ~\@author
\quad
\texttt{Instructor :} ~\@instructor
\fi
\end{minipage}
\begin{minipage}{5 cm}
\vspace{.7 em}
\centering
\large
\textcolor{BrickRed}{\@semester}
\vspace{2 mm}
\LARGE\@title ~\@assignno
\end{minipage}\[.3 em\]
tikzrule[cyan, path fading=east]{\textwidth}{.4 em}
\if\@mainproblem\@empty
\vspace{2 mm}
\else
\begin{center}
\vspace{-1\baselineskip}color{RoyalPurple!50!black}\LARGE\S~\@mainproblem~\S
\end{center}
\fi
i

\fontfamily{cmr}\selectfont % Computer Modern

% Set up document meta data
% Note that it should be placed here because
% by now \@author and \@title have been set.
\hypersetup{
  pdfauthor={\@author},
  pdftitle={%
    \@title-\@assignno-
    \if\@solutionmode
      \pdftitleadditionalname{}
    \fi
    - Machine Learning%}
  ,
  pdfsubject={Machine Learning},
  pdfkeywords={%
    Machine Learning, \@title%
    \ifx\@mainproblem\empty\else%
      , \@mainproblem%
    \fi%
  },
  pdfcreator={\LaTeX\ with SEU-ML-Assign class},
  pdfproducer={\LaTeX}
}
\makeatother