TikZ 代码查阅手册

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前言

本手册准备收集自己平时写过的 TikZ 代码, 主要将其中可以复用的代码提炼出来, 方便日后使用. 要正常编译所有代码, 使用:

```
\usepackage{tikz}
\usetikzlibrary{math,positioning,arrows,calc,shapes}
% 下面可以不需要, 但某些代码要
\usepackage{esvect} % shape.tex 例子中画向量需要 \vv
\usepackage{bm}
\usepackage{amsmath}
```

目录

1 导言区 – Preamble

1.1 图像较简单的情况

```
\documentclass{article}

\usepackage{ctex}
\usepackage{tikz}
\usetikzlibrary{arrows, positioning,calc}

\usepackage[active, tightpage]{preview}
\PreviewEnvironment{tikzpicture}

\definecolor{arrBlue}{HTML}{015EDF}
\newcommand{\arrcolor}{arrBlue}
\newcommand{\arrlinewidth}{6pt}

\tikzset{
        % 箭头和线条的样式, 用于 \draw
        arrStyle/.style = {->, >=stealth,
                line width=\arrlinewidth,#1},
        arrStyle/.default = {\arrcolor},
        lineStyle/.style = {line width=\arrlinewidth,
                \arrcolor},
}

\begin{document}
...
\end{document}
```

1.2 画深度学习方面的图

```
\documentclass{article}

\usepackage{ctex}
\usepackage{tikz}
\usetikzlibrary{arrows, positioning,calc}

\usepackage[active, tightpage]{preview}
\PreviewEnvironment{tikzpicture}
```

```
\pgfdeclarelayer{secbackground}
\pgfdeclarelayer{background}
\pgfdeclarelayer{foreground}
\pgfsetlayers{secbackground,background,main,foreground}

\definecolor{arrBlue}{HTML}{015EDF}
\newcommand{\arrcolor}{arrBlue}
\newcommand{\arrlinewidth}{6pt}

\tikzset{
        % 箭头和线条的样式, 用于 \draw
        arrStyle/.style = {->, >=stealth,
                line width=\arrlinewidth,#1},
        arrStyle/.default = {\arrcolor},
        lineStyle/.style = {line width=\arrlinewidth, \arrcolor},
        nodeStyle/.style = {inner sep=0pt,
                line width=\arrlinewidth,
                color=\arrcolor!50!red,
                minimum size=2cm},
}

\makeatletter
\tikzset{%
        layerStyle/.pic = {
                \tikzset{
                        /layer/.cd,
                        #1,
                }
                \coordinate (layer@O) at (0, 0, 0);
                \path[fill=\layer@color!75!white] (layer@O) --
                        ++(-\layer@depth,0,0) coordinate (layer@A) --
                        ++(0,-\layer@height,0) coordinate (layer@B) --
                        ++(\layer@depth,0,0) coordinate (layer@C)
                        -- cycle;
                \coordinate (layer@Center) at ($(layer@O)!.5!(layer@B)$);
                \node[font=\color{\layer@textcolor}
                        \bfseries\zihao{\layer@fontsize},rotate=90]
                        at (layer@Center) {\layer@content};
                \path[fill=\layer@color] (layer@O) --
                        ++(0,0,-\layer@width) coordinate (layer@D) --
```

```
                        ++(0,-\layer@height,0) coordinate (layer@E) --
                        (layer@C) -- cycle;
                \path[fill=\layer@color!55!white] (layer@O) -- (layer@A) --
                        ++(0,0,-\layer@width) coordinate (layer@F)  --
                        (layer@D) -- cycle;
        },
        /layer/.cd,
        depth/.store in=\layer@depth,
        height/.store in=\layer@height,
        width/.store in=\layer@width,
        angle/.store in=\layer@angle,
        color/.store in=\layer@color,
        content/.store in=\layer@content,
        textcolor/.store in=\layer@textcolor,
        fontsize/.store in=\layer@fontsize,
        depth=.6pt,
        height=2.2pt,
        width=1pt,
        angle=60,
        color=black!20!orange,
        content=,
        textcolor=black,
        fontsize=5,
}

\tikzset{
        contentNodeStyle/.pic = {
                \tikzset{
                        /contentNode/.cd,
                        #1
                },
                \node[shape=\content@shape,
                inner sep=\content@innersep,
                fill=\content@fill,
                font=\color{\content@textcolor}
                        \bfseries\zihao{\content@fontsize}]
                at (0 , 0)  {\content@content};
        },
        /contentNode/.cd,
        fill/.store in=\content@fill,
```

```
        textcolor/.store in=\content@textcolor,
        content/.store in=\content@content,
        inner sep/.store in=\content@innersep,
        shape/.store in=\content@shape,
        fontsize/.store in=\content@fontsize,
        fill=blue,
        textcolor=black,
        content=,
        inner sep=2pt,
        shape=circle,
        fontsize=5,
}

\makeatother

%% 主要提供下面这 3 条命令
\newcommand{\contentNode}[3]{
        \node (#1) at #2
                {\tikz\pic at (0, 0) {contentNodeStyle={#3}};}
}
\newcommand{\layerNode}[3]{
        \node (#1) at #2
                {\tikz\pic at (0, 0) {layerStyle={#3}};}
}
\newcommand{\layerNodePos}[5]{
        \node (#1)  at ([shift={#4}]#3.#2)
                {\tikz\pic at (0, 0) {layerStyle={#5}};}
}

\begin{document}
...
\end{document}
```

对于这种情况, 稍微复杂一些, 主要提供最后的 3 条命令, 使用方法可以参考**深度学习**这一节.

1.3 本文档中的写作

本文档用了方框来展示 TikZ 代码以及相应的结果. 要达到这样的效果, 需要使用如下的代码:

```
% 在导言区
\usepackage{tcolorbox}
\tcbuselibrary{documentation,minted}
```

```
\tcbset{listing engine=minted}
\tcbset{%
        docexample/.style={colframe=gray!40!white,colback=ExampleBack,
                before skip=\medskipamount,after skip=\medskipamount,
                fontlower=\footnotesize,
                documentation minted options={fontsize=\zihao{-5}},}%
}
```

之后写作的时候, 只需要将相应的 TikZ 代码放在 dispExample* 环境中, 使用带 * 的环境则必须加上环境选项, 而 dispExample 则不需要选项. 但我只用 dispExample* 环境, 以便控制显示效果. 例子如下:

左右排列:

```
\begin{dispExample*}{%
                sidebyside,
                lefthand ratio=0.7,
                halign lower=right}

\definecolor{arrBlue}{HTML}{015EDF}
\newcommand{\arrcolor}{arrBlue}
\newcommand{\arrlinewidth}{6pt}

\tikzset{
        arrStyle/.style = {->, >=stealth,
                line width=\arrlinewidth,#1},
        arrStyle/.default = {\arrcolor}
}

\begin{tikzpicture}
\newcommand{\radius}{2}
\coordinate (origin) at (0, 0);
\draw[arrStyle] (origin) -- ++(\radius, 0);
\end{tikzpicture}
\end{dispExample*}
```

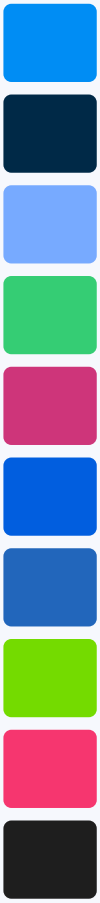
上下排列:

```
% 在 dispExample* 环境中使用 tikz 代码即可.
\begin{dispExample*}{%
                halign lower=center}
\tikzstyle{layer1} = [inner sep=0pt,minimum size=1em, outer sep=1pt]
```

```
\begin{tikzpicture}
% 输入节点
\node[layer1] (x1) {$x_1$};
\node[layer1,below=of x1, below=.5cm] (x2) {$x_2$};
\end{tikzpicture}
\end{dispExample*}
```

2 颜色 – Colors

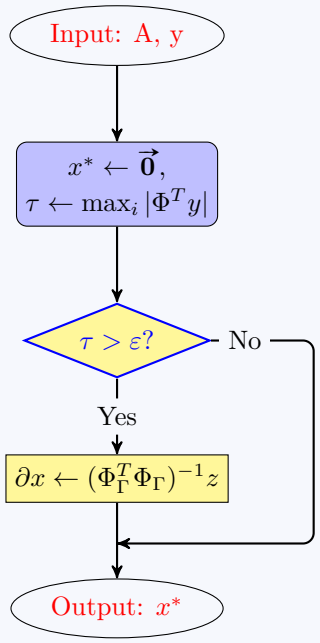
```
\begin{tikzpicture}
% 画深度学习图用过
\definecolor{convBlue}{HTML}{008DF4}
\definecolor{convDark}{HTML}{002947}
\definecolor{convGray}{HTML}{77AAFF}
\definecolor{convGreen}{HTML}{35CD74}
\definecolor{convPurple}{HTML}{CE357A}
% 画箭头用过
\definecolor{arrBlue}{HTML}{015EDF}
% GraphEmbed ppt 用过
\definecolor{axisColor}{HTML}{2266BB}
\definecolor{ballColor-Green}{HTML}{74db00}
\definecolor{ballColor-Red}{HTML}{F6366F}
% Python ppt 用过
\definecolor{codeBackground}{HTML}{1E1E1E}

\coordinate (origin) at (0, 0);
\newcommand{\relativeDis}{1.2cm}
\foreach \col[count=\num] in
        {convBlue, convDark, convGray, convGreen,
        convPurple, arrBlue, axisColor,
        ballColor-Green, ballColor-Red, codeBackground}
        \node[rectangle,fill=\col,
                text width=1cm, text height=.8cm,
                rounded corners=3pt] at
        ([shift={(0, -\num * \relativeDis)}]origin) {};
\end{tikzpicture}
```



3 图形 – Shapes

3.1 流程图

```
% 这里给出的是流程图的 shape
% 需要使用 \usetikzlibrary{arrows,shapes}
% 例子中用到 \vv 向量命令和 \bm, 需要 \usepackage{esvect}
% 和 \usepackage{bm}
\tikzstyle{start}=[ellipse,draw,text=red]
\tikzstyle{end}=[ellipse,draw,text=red]
\tikzstyle{initial}=[rectangle,draw,rounded corners=4pt,
fill=blue!25]
% 指令
\tikzstyle{instruct}=[rectangle,draw,fill=yellow!50]
% 判断
\tikzstyle{test}=[diamond, aspect=2.5,thick,
draw=blue,fill=yellow!50,text=blue]
% 箭头
\tikzstyle{suite}=[->,>=stealth',thick,rounded corners=4pt]

\begin{tikzpicture}
\coordinate (origin) at (0, 0);
\newcommand{\dis}{1cm}
\node[start](start) at (origin) {Input: A, y};
\node[initial, below=of start, below=\dis](initial)
        {\shortstack{$x^\ast\leftarrow\vv{\bm{0}}$,\\
         $\tau\leftarrow\max_i\vert\Phi^Ty\vert$}};
\node[test, below=of initial, below=\dis] (test)
         {$\tau > \varepsilon ?$};
\node[instruct,below=of test, below=\dis](instruct)
        {$\partial x\leftarrow (\Phi_\Gamma^T\Phi_\Gamma)^{-1}z$};
\node[end, below=of instruct, below=\dis] (end)
        {Output: $x^\ast$};
\draw[suite] (start) -- (initial);
\draw[suite] (initial) -- (test);
\draw[suite] (test) -- (instruct) node[midway,fill=ExampleBack]{Yes};
\draw[suite] (instruct) -- (end);
\coordinate (B) at ($(instruct)!.5!(end)$);
\coordinate (C) at ([shift={(2.6, 0)}]$(test)!.5!(B)$);
\draw[suite] (test)  -| (C|-B) -- (B) ;
\node[right=of test, right=3pt, fill=ExampleBack]{No};
\end{tikzpicture}
```

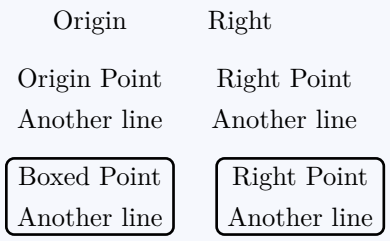


3.2 神经元

```
\tikzset{%
        neuralStyle/.style={draw, circle,
                inner sep=0pt, minimum size=2em,
                outer sep=1pt, line width=1pt, #1},
        neuralStyle/.default={orange}
}
% 不要忘了最后的分号;
% \neural{< 颜色 >}{< 名字 >}{< 位置 >};
% \neuralPos{< 颜色 >}{< 名字 >}{< 相对位置 >}{< 基准名字 >}{< 相对基准的偏移 >};
\newcommand{\neural}[3]{\node[neuralStyle=#1] (#2) at #3 {}}
\newcommand{\neuralPos}[5]{\node[neuralStyle=#1,
                #3=of #4, #3=0pt, shift={#5}] (#2) {}}
% 可以在神经元内添加文字, 前缀用 t 表示 text
\newcommand{\tneural}[4]{\node[neuralStyle=#1] (#2) at #3 {#4}}
\newcommand{\tneuralPos}[6]{\node[neuralStyle=#1,
        #3=of #4, #3=0pt, shift={#5}] (#2) {#6}}

\begin{tikzpicture}
\coordinate (origin) at (0, 0);
\neural{orange}{x}{(origin)};
\neuralPos{blue}{x1}{below}{x}{(0, -.3)};
\neuralPos{green}{x2}{below}{x1}{(0, -.3)};

% 添加文本
\tneural{orange}{x}{([shift={(1, 0)}]origin)}{$a_1^{(2)}$};
\tneuralPos{blue}{x1}{below}{x}{(0, -.3)}{$x_1$};
\tneuralPos{green}{x2}{below}{x1}{(0, -.3)}{$O_1$};
\end{tikzpicture}
```

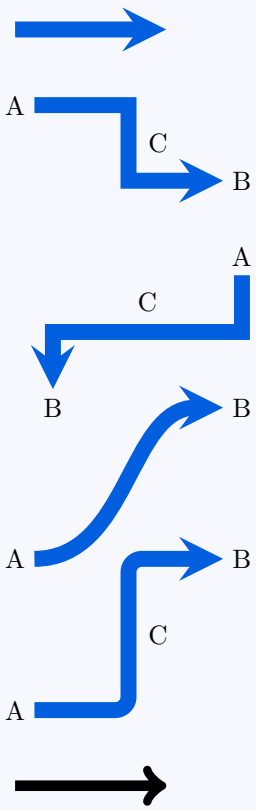
3.3 文本框

```
\tikzset{%
        textNodeStyle/.style={align=center,
                inner sep=0pt, minimum size=2em,
                outer sep=1pt, #1},
        textNodeStyle/.default={},
        boxStyle/.style={line width=1pt,%
                        rounded corners=3pt,
                }% 还可以加颜色
}

\newcommand{\tNode}[3]{\node[textNodeStyle] (#1) at #2 {#3}}
\newcommand{\tNodePos}[5]{\node[textNodeStyle,
        #2=of #3, #2=0pt, shift={#4}] (#1) {#5}}

% 多行文本
\newcommand{\mtNode}[4]{\node[textNodeStyle={text width=#2}]
        (#1) at #3 {#4}}
\newcommand{\mtNodePos}[6]{\node[textNodeStyle={text width=#2},
        #3=of #4, #3=0pt, shift={#5}] (#1) {#6}}

% 添加文本框
\newcommand{\btNode}[4]{\node[textNodeStyle={text width=#2,%
                rectangle, draw, inner sep=3pt, boxStyle}]
        (#1) at #3 {#4}}
\newcommand{\btNodePos}[6]{\node[textNodeStyle={text width=#2,%
                rectangle, draw, inner sep=3pt, boxStyle},%
                #3=of #4, #3=0pt, shift={#5}] (#1) {#6}}

\begin{tikzpicture}
\coordinate (origin) at (0, 0);
% single line text
\tNode{x}{(origin)}{Origin};
\tNodePos{x1}{right}{x}{(1, 0)}{Right};

% multiline text
\mtNode{a}{2cm}{([shift={(0, -1)}]origin)}{Origin Point\\ Another line};
\mtNodePos{a1}{2cm}{right}{a}{(.5, 0)}{Right Point\\ Another line};

% boxed text node
\btNode{b}{2cm}{([shift={(0, -2.3)}]origin)}{Boxed Point\\ Another line};
\btNodePos{b1}{2cm}{right}{b}{(.5, 0)}{Right Point\\ Another line};
\end{tikzpicture}
```



4 箭头 – Arrows

```
\definecolor{arrBlue}{HTML}{015EDF}
\newcommand{\arrcolor}{arrBlue}
\newcommand{\arrlinewidth}{6pt}

\tikzset{
arrStyle/.style = {->, >=stealth,
        line width=\arrlinewidth,#1},
arrStyle/.default = {\arrcolor}
}

\begin{tikzpicture}
\newcommand{\radius}{2}
\coordinate (origin) at (0, 0);
\draw[arrStyle] (origin) -- ++(\radius, 0);

% 连接 (A) -| -- (B)
% 先得到 (A) 和 (B) 直线连接的中间点 (C)
% 由于使用了 (C|-B), 所以还需要考虑 (C-|B) 的情况
\node (A) at ([shift={(0, -1)}]origin) {A};
\node (B) at ([shift={(3, -2)}]origin) {B};
\coordinate (C) at ($(A)!.5!(B)$) node[right=of C,right=4pt] {C};
\draw[arrStyle] (A)
        -| (C|-B) -- (B);

% 另一种情况
\node (A1) at ([shift={(3, -3)}]origin) {A};
\node (B1) at ([shift={(.5, -5)}]origin) {B};
\coordinate (C1) at ($(A1)!.5!(B1)$) node[above=of C1,above=4pt] {C};
\draw[arrStyle] (A1) |- (C1-|B1) -- (B1);

% 弯曲
\node (A2) at ([shift={(0, -7)}]origin) {A};
\node (B2) at ([shift={(3, -5)}]origin) {B};
\path[arrStyle] (A2.east) edge[out=0, in=180] (B2.west);

% rounded corners
\node (A3) at ([shift={(0, -9)}]origin) {A};
\node (B3) at ([shift={(3, -7)}]origin) {B};
\coordinate (C3) at ($(A3)!.5!(B3)$) node[right=of C3,right=4pt] {C};
\draw[arrStyle, rounded corners=5pt] (A3)
-| (C3|-B3) -- (B3);

% 换种风格
\draw[->, line width=4pt] ([shift={(0, -10)}]origin) -- ++(\radius, 0);
\end{tikzpicture}
```



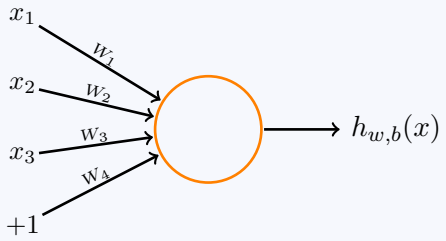
5 图像 – Figures

```
%% 不要忘记分号
%% \figNodePos{< 节点名字 >}{< 图像名字 >}{< 图像宽度 >}{< 放置位置 >}
%% \figNodePos{< 节点名字 >}{< 图像名字 >}{< 图像宽度 >}{< 相对位置 >}
%%         {< 基准名字 >}{< 相对偏移 >}
\newcommand{\figNode}[4]{\node(#1)
        at #4 {\includegraphics[width=#3,keepaspectratio]{#2}}}
\newcommand{\figNodePos}[6]{\node[#4=0pt,#4=of #5,shift={#6}](#1)
        {\includegraphics[width=#3,keepaspectratio]{#2}}}

\begin{tikzpicture}
\coordinate (origin) at (0, 0);
\figNode{f1}{teddy.jpg}{.8\textwidth}{(origin)};
\figNodePos{f2}{teddy.jpg}{.8\textwidth}{below}{f1}{(0, -.3)};
\end{tikzpicture}
```

6 深度学习 – DeepLearn

6.1 单层神经网络

```
\tikzstyle{layer1} = [inner sep=0pt,minimum size=1em, outer sep=1pt]
\tikzstyle{layer2} = [draw, circle, minimum size=4em, orange,
                              outer sep=1pt, line width=1pt]
\tikzstyle{layer3} = [minimum size=2em,outer sep=1pt]
\begin{tikzpicture}
% 输入节点
\node[layer1] (x1) {$x_1$};
\node[layer1,below=of x1, below=.5cm] (x2) {$x_2$};
\node[layer1,below=of x2, below=.5cm] (x3) {$x_3$};
\node[layer1,below=of x3, below=.5cm] (x4) {$+1$};
\node[layer2, right=of x1, right=1.5cm, yshift=-1.5cm] (L1) {};
\foreach \a in {1, 2, 3, 4}
        \draw[->, line width=1pt] (x\a) -- (L1) node[midway, sloped,
                above=-.1cm, minimum size=.5em]{\tiny $W_\a$};
% 输出节点及连线
\node[layer3,right=of L1] (output) {\small $h_{w,b}(x)$};
\draw[->,line width=1pt](L1) -- (output);
\end{tikzpicture}
```



6.2 多层神经网络

```
\tikzset{%
        layerStyle/.style={draw, circle,
                inner sep=0pt, minimum size=2em,
                outer sep=1pt, line width=1pt, #1},
        layerStyle/.default={orange}
}
\tikzstyle{outputSty} = [minimum size=2em,outer sep=1pt]
\begin{tikzpicture}
% 第一层
\node[layerStyle=blue] (x1) {$x_1$};
\node[layerStyle=blue,below=of x1, below=.5cm] (x2) {$x_2$};
\node[layerStyle=blue,below=of x2, below=.5cm] (x3) {$x_3$};
\node[layerStyle=blue,below=of x3, below=.5cm,
                label={below:Layer 1}] (x4) {$+1$};
% 第二层
\node[layerStyle=orange, right=of x1, right=1.5cm] (L1) {$a_1^{(2)}$};
\node[layerStyle=orange, below=of L1, below=.5cm] (L2) {$a_2^{(2)}$};
\node[layerStyle=orange, below=of L2, below=.5cm] (L3) {$a_3^{(2)}$};
\node[layerStyle=orange,below=of L3, below=.5cm,
                label={below:Layer 2}] (L4) {$+1$};
% 前两层连线
\foreach \a in {1, 2, 3, 4}
\foreach \b in {1, 2, 3}
\draw[->, line width=1pt] (x\a) -- (L\b);

% 第三层以及连线
\node[layerStyle=green,right=of L1, right=1.5cm,yshift=-2cm,
                label= {[yshift=-1.9cm]below:Layer 3}] (Lay3) {};
\foreach \a in {1, 2, 3, 4}
        \draw[->,line width=1pt] (L\a) -- (Lay3) node[midway,
                sloped, above=-.1cm, minimum size=.5em]{\tiny $W^{(2)}_{1\a}$};
\node[outputSty,right=of Lay3] (output){\small $h_{w,b}(x)$};
\draw[->, line width=1pt] (Lay3) -- (output);
\end{tikzpicture}
```