1819-108-W10-C1-HW

Rainers Leons Justs

April 8, 2019

1 The Functions

- The Id function

$$\phi(x) = x$$

- The sigmoid function (or logistic)

$$\phi(x) = \frac{1}{1 + exp(-x)}$$

- The hyperbolic tangent function ("tanh")

$$\phi(x) = \frac{exp(x) - exp(-x)}{exp(x) + exp(-x)} = \frac{exp(2x) - 1}{exp(2x) + 1}$$

- The hard threshold function

$$\phi_\beta(x) = 1_{x \geq \beta}$$

- The Rectified Linear Unit (ReLU) activation function

$$\phi(x) = max(0, x)$$

2 The code for my graph

```
x = -10:0.01:10;

y1 = x; % Id
y2 = 1./(1+exp(-x)); % sigmoiida
y3 = tanh(x); % tanh = (exp(2x)-1)/(exp(2x)+1)
y4 = x >= 1; % Threshold
y5 = max(0,x); % ReLu

plot(x,y1,x,y2,x,y3,x,y4,x,y5)
grid on
legend("Id","Sigmoid","tanh","Threshold","ReLu"
,"Location","northwest")
```

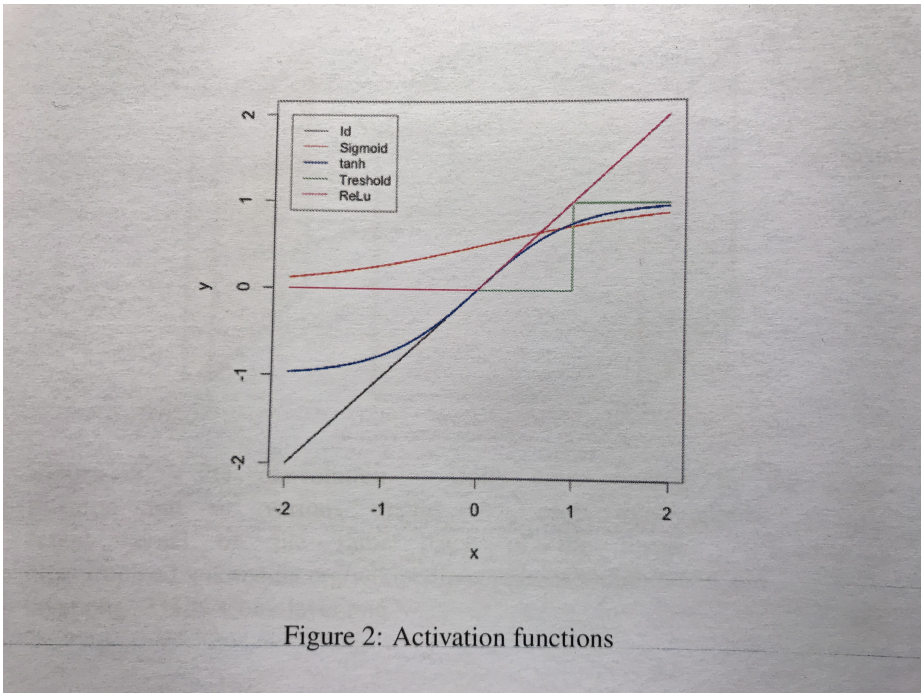

Figure 1: The original graph

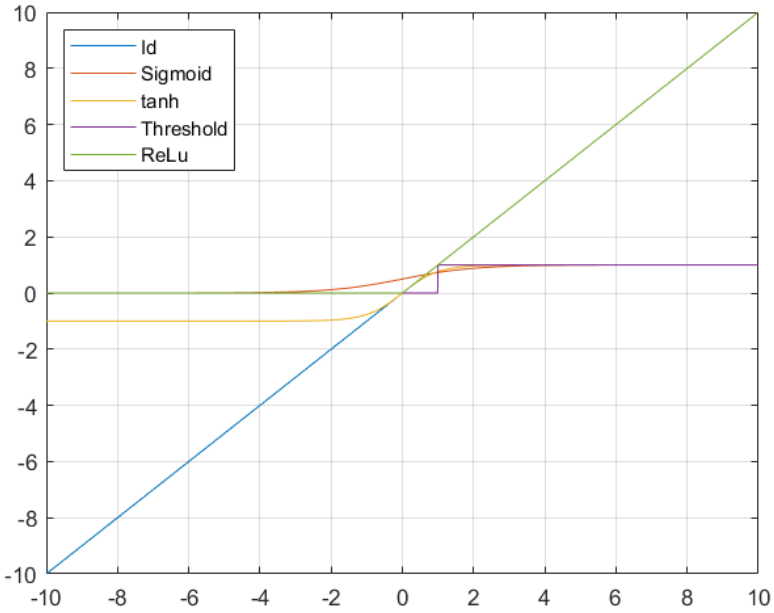

Figure 2: My graph, using MatLab

3 The code for the document

```
\documentclass{report}
\usepackage[utf8]{inputenc}
\usepackage{verbatim}
\usepackage{amsmath}
\usepackage{amssymb}
\usepackage{graphicx}

\renewcommand{\thesection}{\arabic{section}}

\title{1819-108-W10-C1-HW}
\author{Rainers Leons Justs}
\date{\today}

\begin{document}

\maketitle

\section[1]{The Functions}

\begin{itemize}
    \item The Id function

    $$\phi (x) = x$$

    \item The sigmoid function (or logistic)

    $$\phi (x) = \frac{1}{1 + exp(-x)}$$

    \item The  hyperbolic tangent function ("tanh")

    $$\phi (x) = \frac{exp(x) - exp(-x)}{exp(x) + exp(-x)}
    = \frac{exp(2x) - 1}{exp(2x) + 1}$$

    \item The hard threshold function

    $$\phi_{\beta}(x) = 1_{x \geq \beta}$$

    \item The Rectified Linear Unit (ReLU) activation function

    $$\phi (x) = max(0,x)$$
\end{itemize}

\begin{figure}
```

```
    \includegraphics[width=\linewidth]{IMG_1206.jpg}
    \caption{The original graph}
    \label{fig:my_label}
\end{figure}

\begin{figure}
    \includegraphics[width=\linewidth]{new.png}
    \caption{My graph, using MatLab}
    \label{fig:my_label}
\end{figure}

\section{The code for the graph}

\begin{verbatim}

x = -10:0.01:10;

y1 = x; % Id
y2 = 1./(1+exp(-x)); % sigmoiida
y3 = tanh(x); % tanh = (exp(2x)-1)/(exp(2x)+1)
y4 = x >= 1; % Threshold
y5 = max(0,x); % ReLu

plot(x,y1,x,y2,x,y3,x,y4,x,y5)
grid on
legend("Id","Sigmoid","tanh","Threshold",
"ReLu","Location","northwest")

/end{verbatim}

\section{The code for the document}

\begin{verbatim}
    ...
/end{verbatim}
```