Roll No: 2003037

Lab Final

Lab Task Q1

Question:

If $f(x, y)$ is a function, where f partially depends on x and y and if we differentiate f with respect to x and y then the derivatives are called the partial derivative of f. The formula for partial derivative of f with respect to x taking y as a constant is given by:

$$f_x = \frac{\partial f}{\partial x} = \lim_{h \to 0} \frac{f(x+h, y) - f(x, y)}{h}$$

And partial derivative of function f with respect y keeping x as constant, we get;

$$f_y = \frac{\partial f}{\partial y} = \lim_{h \to 0} \frac{f(x, y+h) - f(x, y)}{h}$$

Consider the following function: $f(x, y) = x^2 y$. Partial derivatives of this function are:

$$\begin{aligned} f_x &= \frac{\partial f}{\partial x} \\ &= \frac{\partial}{\partial x}(x^2 y) \\ &= 2xy \end{aligned}$$

$$\begin{aligned} f_y &= \frac{\partial f}{\partial y} \\ &= \frac{\partial}{\partial y}(x^2 y) \\ &= x^2 \end{aligned}$$

Solution (Latex Code):

```
% 2003037
% Q3a:
\documentclass[a4paper, 10pt]{book}
\usepackage{ enumerate, tabularx, asymptote, amsmath, amssymb,
amsfonts, geometry, color, setspace}
\usepackage{pdflscape, rotating, ulem}

\begin{document}
If $f(x,y)$ is a function, where $f$ partially depends on $x$ and
$y$  and if  we \\
differentiate $f$ with respect to $x$ and $y$ then the derivatives are
called the \\
partial derivative of $f$. The formula for partial derivative of $f$
with respect \\
to $x$ taking $y$ as a constant is given by:\\
\begin{equation*}
    f_x = \frac{\partial f}{\partial x} = \lim_{h \to 0}
\frac{f(x+h,y)-f(x,y)}{h}
\end{equation*}\\

And partial derivative of function $f$ with respect to $y$ keeping $x$
as a constant, \\
we get;\\
\begin{equation*}
    f_y = \frac{\partial f}{\partial y} = \lim_{h \to 0}
\frac{f(x,y+h)-f(x,y)}{h}
\end{equation*}\\
Consider the following function: $f(x,y) = x^2y$. Partial derivatives
of \\
this function are:\\
\begin{eqnarray*}
    f_x &=& \frac{\partial f}{\partial x}\\
        &=& \frac{\partial}{\partial x} (x^2y)\\
        &=& 2xy\\[5mm]
    f_y &=& \frac{\partial f}{\partial y}\\
        &=& \frac{\partial}{\partial y} (x^2y)\\
        &=& x^2\\
\end{eqnarray*}
\copyright \emph{2003037}
\end{document}
```

Output (Screen/SnapShot of Generated PDF):

If $f(x, y)$ is a function, where f partially depends on x and y and if we differentiate f with respect to x and y then the derivatives are called the partial derivative of f. The formula for partial derivative of f with respect to x taking y as a constant is given by:

$$f_x = \frac{\partial f}{\partial x} = \lim_{h \to 0} \frac{f(x+h, y) - f(x, y)}{h}$$

And partial derivative of function f with respect to y keeping x as a constant, we get;

$$f_y = \frac{\partial f}{\partial y} = \lim_{h \to 0} \frac{f(x, y+h) - f(x, y)}{h}$$

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Qus: **Q2.**

This research work is focused on detecting low-grade glioma tumorous cells in MRI images. Glioma is a common brain tumor, that exhibits properties of benign tumors[1]. We used the TCGA-LGG Segmentation dataset[2] for our research. It consists of 3929 brain tumor images and corresponding FLAIR abnormality segmentation masks obtained from 110 patients.

Table 1 lists the models used as encoder for U-Net architecture.

Table 1: Models used for U-Net encoder and trainable blocks/stages for fine-tuning.

Family	Models	Trainable Blocks
EfficientNet	EfficientNetB0 to B7	Block 30 to 32
DenseNet	DenseNet169, DenseNet201	Block 7
ResNet	ResNet18, ResNet50, ResNet101	Stage 4

References

[1] A. Wadhwa, A. Bhardwaj, and V. S. Verma, "A review on brain tumor segmentation of mri images," *Magnetic resonance imaging*, vol. 61, pp. 247–259, 2019.

[2] M. Buda, A. Saha, and M. A. Mazurowski, "Association of genomic subtypes of lower-grade gliomas with shape features automatically extracted by a deep learning algorithm," *Computers in biology and medicine*, vol. 109, pp. 218–225, 2019.

Solution:

```
\documentclass[a4paper, 10pt]{article}
\usepackage{ enumerate, tabularx, asymptote, amsmath, amssymb, amsfonts,
geometry, color, setspace}
\usepackage{pdflscape, rotating, ulem, cite}
\usepackage[numbers]{natbib}
\renewcommand{\bibname}{References}

\begin{document}
This research work is focused on detecting low-grade glioma tumorous
cells \\
in MRI images. Glioma is a common brain tumor, that exhibits properties
of \\
benign tumors\cite{wadhwa2019review}. We used the TCGA-LGG Segmentation
dataset\cite{buda2019association} for our \\
research. It consists of 3929 brain tumor images and corresponding FLAIR
\\
```

```latex
abnormality segmentation masks obtained from 110 patients. \\
\indent Table 1: lists the models used as encoder for U-net
architecture.\\

\begin{table}[h!]
    \noindent\caption{Models used for U-net encoder and trainable blocks/
stages for fine-\\tuning.}
    \vspace{2mm} % Adjust the vertical space
    \begin{tabularx}{\linewidth}{>{\centering\arraybackslash}X
>{\centering\arraybackslash}X >{\centering\arraybackslash}X}
        \hline
        \textbf{Family} & \textbf{Model} & \textbf{Trainable Blocks}\\
        \hline
        EfficientNet & EfficientNetB0 to B7 & Block 30 to 32\\
        DenseNet & DenseNet169, DenseNet201 & Block 7\\
        ResNet & ResNet18, ResNet50, ResNet101& Stage 4\\
        \hline
    \end{tabularx}
\end{table}

\bibliographystyle{ieeetr}
\bibliography{LF}
\copyright \emph{2003037}
\end{document}
```

Output:

This research work is focused on detecting low-grade glioma tumorous cells in MRI images. Glioma is a common brain tumor, that exhibits properties of benign tumors[1]. We used the TCGA-LGG Segmentation dataset[2] for our research. It consists of 3929 brain tumor images and corresponding FLAIR abnormality segmentation masks obtained from 110 patients.

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[1] A. Wadhwa, A. Bhardwaj, and V. S. Verma, "A review on brain tumor segmentation of mri images," Magnetic resonance imaging, vol. 61, pp. 247–259, 2019.

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