\begin{algorithm}

\caption{Oversampling using VAE}

\label{alg:vae}

\SetAlgoNoLine

\KwIn{A dataSet $X$,sampling rate $k$}

\KwOut{$x\_{new}$ after oversampling}

\BlankLine

$X$ $\leftarrow$ $\frac{X-\overline{X}}{s}$ \\

$X\_{train},X\_{test}$ $\leftarrow$ divide($X$) \\

\For{each feature $j$ in X}{

$nelements\_{j}$ $\leftarrow$ $\sum\_1^{N\_{+}} distinct{X\_{j}}$

}

Decide $X\_{trainvae}$ with formula (10) \\

$vae$ $\leftarrow$ trainvae($X\_{trainvae}$) \\

$X\_{ov}$ $\leftarrow$ sample($vae$) \\

Synthesize $X\_{final}$ with formula (11) \\

$X\_{new}$ $\leftarrow$ $X\_{final}\bigcup X\_{train}$ \\

return $X\_{new}$

\end{algorithm}

\begin{algorithm}

\caption{Computing the IGIR}

\label{alg:IGIR}

\SetAlgoNoLine

\KwIn{A dataSet $X$,label $Y$,number of nearest neighbors $k$ in $k$-NN}

\KwOut{IGIR}

\BlankLine

\For{$x$ in $X$ with label $y\_{x}$}{

{$M$ $\leftarrow$ the $k$ nearest neighbors of $x$} \\

$t\_{k}(x)$ $\leftarrow$ $\frac{1}{k}$ $\sum{weight\*IR(x,M)}$

}

$wei-T\_{-}$ $\leftarrow$ $\frac{1}{N\_{-}}$ $\sum t\_{k}(x)\*sgn(y\_{x}==0)$ \\

$wei-T\_{+}$ $\leftarrow$ $\frac{1}{N\_{+}}$ $\sum t\_{k}(x)\*sgn(y\_{x}==1)$ \\

IGIR $\leftarrow$ $\sqrt{wei-T\_{-}\*wei-T\_{+}}$ \\

return IGIR

\end{algorithm}