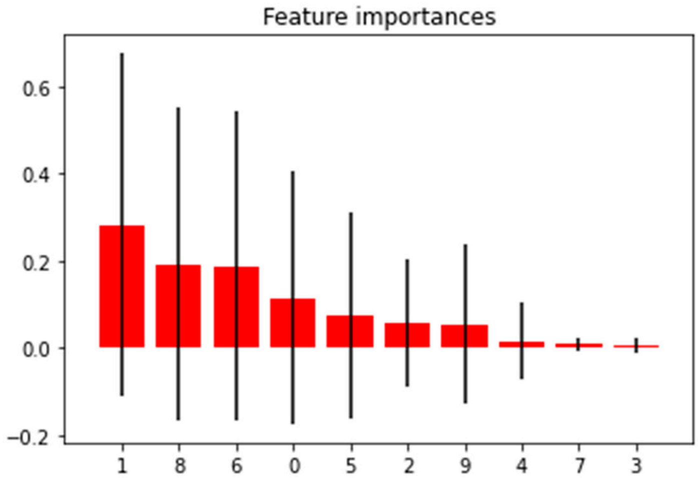

Figure S1. The feature importance of the 10 features. The feature number and corresponding names are shown in Table 1.

Feature importance is used to illustrate the importance of a feature to the model. Generally, the higher the value, the more important the feature is to the model. Here in this DNN model, the most importance feature is the feature 1 (porosity).

The model should be used under the continental shelf and slope environment with the following conditions:

$1.34\ g/cm^3<\rho<1.95\ g/cm^3$, $43.8\%<n<81.2\%$, $1\%<sand<73.8\%$, $11.9\%<silt<74.8\%$,

$6.7\%<clay<66.3\%$, $3.47\ \phi<Mz<8.51\ \phi$, $2.66\ \phi<Md<8.49\ \phi$.

Tables for exponential + linear functions of the input parameters

Table S1. The regression equations of input parameters in exponential functions.

Equations	Regression Equations	R Square
$Vp=f(\rho)$	$Vp=1198.9e^{0.1583\rho}$	0.7612
$Vp=f(n)$	$Vp=1839.5e^{-0.269n}$	0.8014
$Vp=f(sand)$	$Vp=1493.1e^{0.0013sand}$	0.7269
$Vp=f(silt)$	$Vp=1604.9e^{-0.001silt}$	0.2173
$Vp=f(clay)$	$Vp=1635.4e^{-0.002clay}$	0.6051
$Vp=f(Mz)$	$Vp=1787.7e^{-0.023Mz}$	0.7704
$Vp=f(md)$	$Vp=1725.5e^{-0.018Md}$	0.8262
$Vp=f(dis)$	$Vp=1535.5e^{-3E-06dis}$	3E-06
$Vp=f(depth)$	$Vp=1572.8e^{-3E-05depth}$	0.3434
$Vp=f(pro)$	$Vp=1103.6e^{0.0008pro}$	0.5393

Table S2. The regression equations of input parameters in linear functions.

Equations	Regression Equations	R Square
$Vp=f(\rho)$	$Vp=248\rho+1148.8$	0.7563
$Vp=f(n)$	$Vp=-421.16n+1819.6$	0.7954
$Vp=f(sand)$	$Vp=2{,}0979sand+1492.5$	0.7269
$Vp=f(silt)$	$Vp=-1.6016silt+1606.1$	0.2135
$Vp=f(clay)$	$Vp=-2{,}7965clay+1635{,}3$	0.5963

Vp=f(Mz)	Vp=-35.916mz+1775	0.7675
Vp=f(md)	Vp=-28.125md+1719.4	0.8243
Vp=f(dis)	Vp=-0.0021dis+1536.2	3E-06
Vp=f(depth)	Vp=-0.0419depth+1574	0.3543
Vp=f(pro)	Vp=1.2391pro+1019.4	0.5353

Figures for exponential + linear functions of the input parameters

From the Figure S2to S11, we can see that the all "R square" values were reduced even when using an exponential function and a linear function independently, thus we choose the quadratic relationship to compared with the machine learning method in this article.

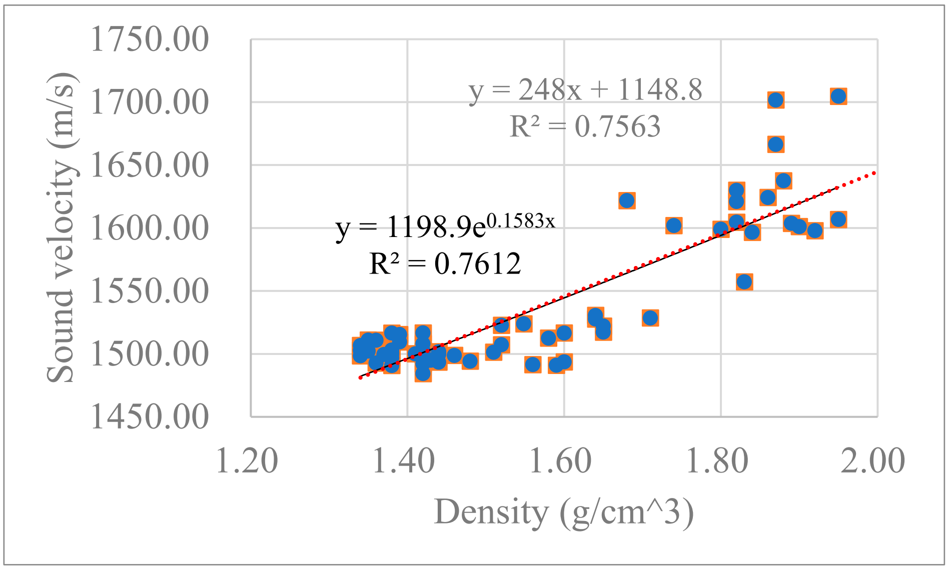

Figure S2. Exponential (black line) + linear (red line) functions of density vs sound velocity

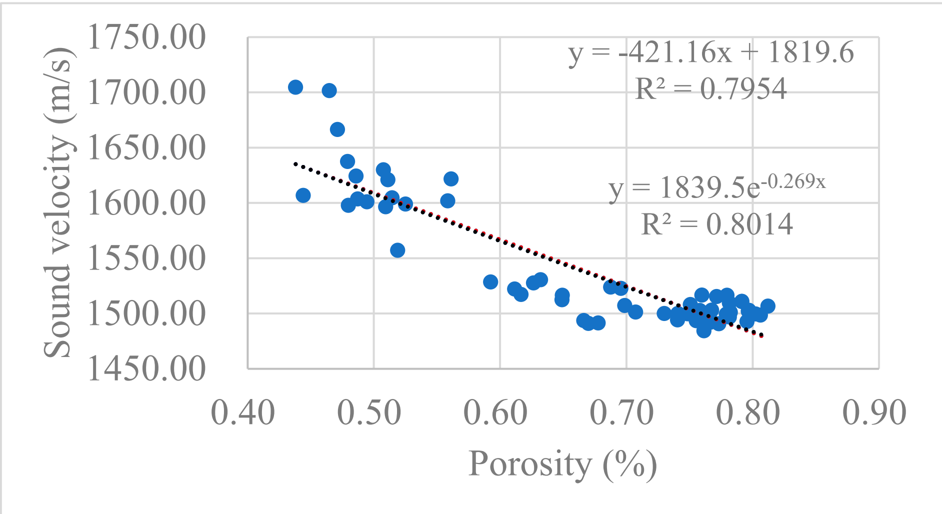

Figure S3. Exponential (black line) + linear (red line) functions of porosity vs sound velocity

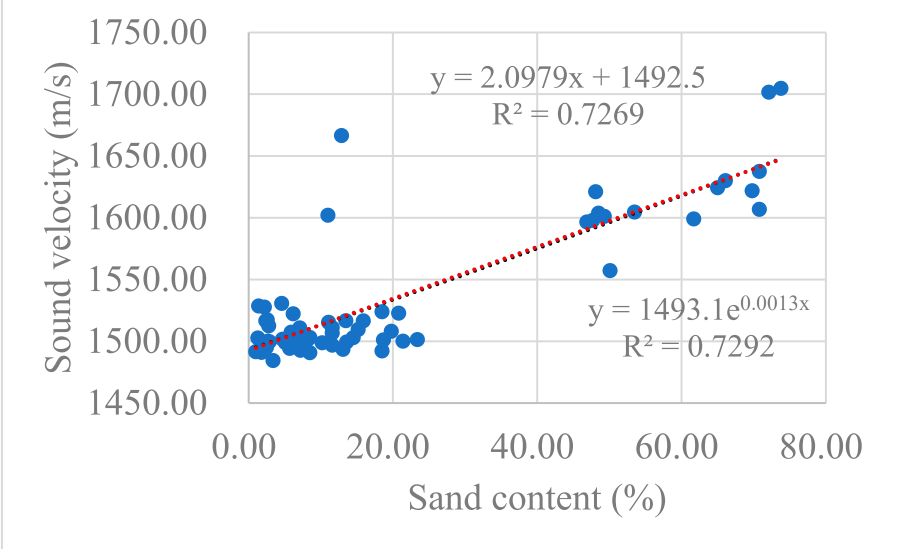

Figure S4. Exponential (black line) + linear (red line) functions of sand content vs sound velocity

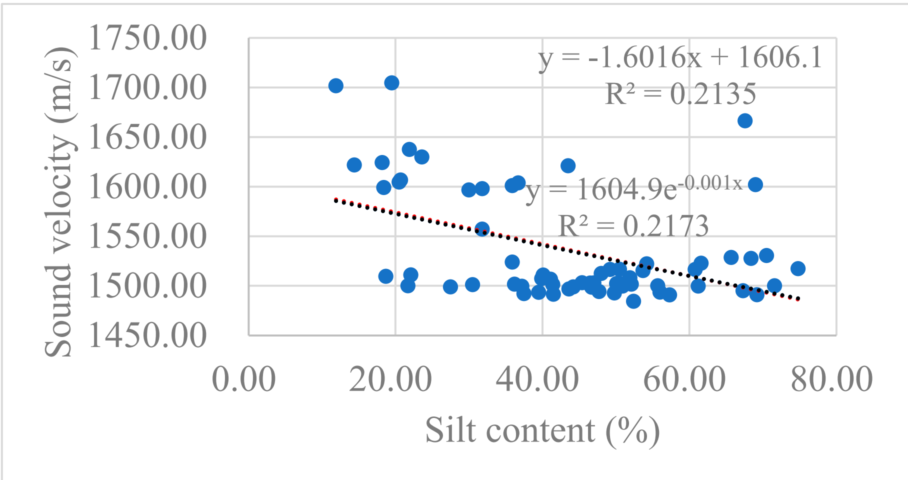

Figure S5. Exponential (black line) + linear (red line) functions of silt content vs sound velocity

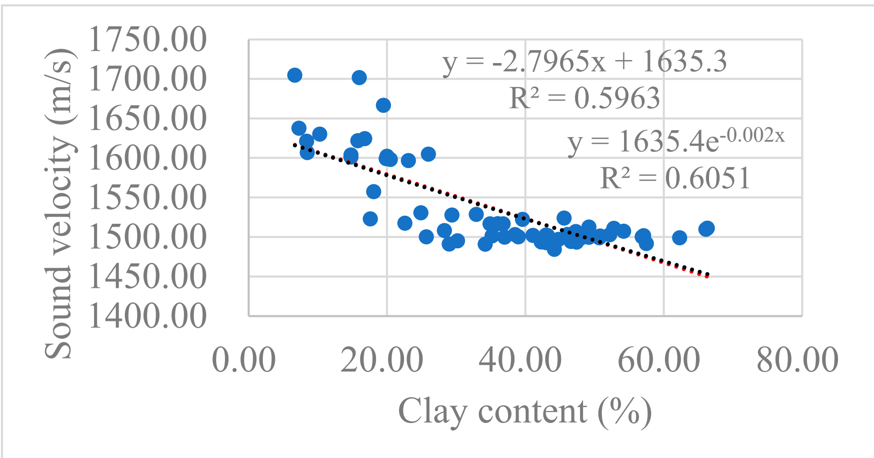

Figure S6. Exponential (black line) + linear (red line) functions of clay content vs sound velocity

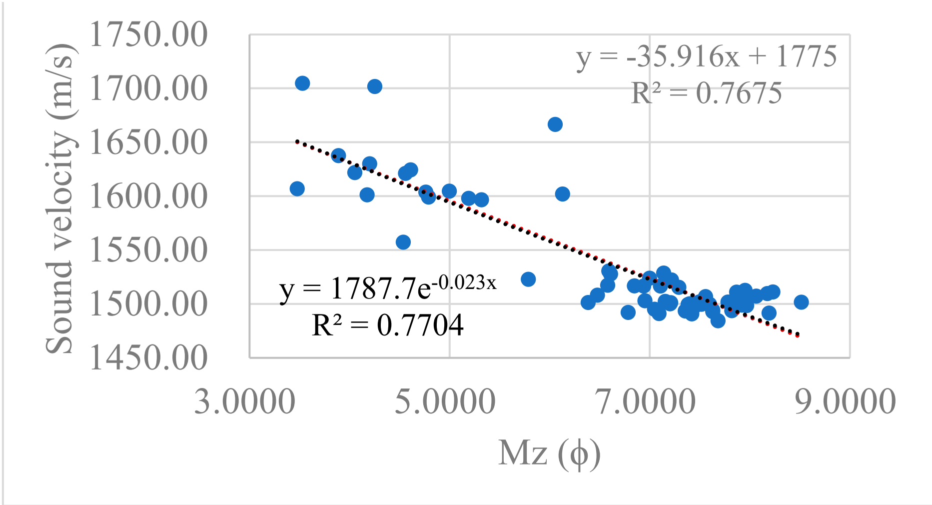

Figure S7. Exponential (black line) + linear (red line) functions of Mz vs sound velocity

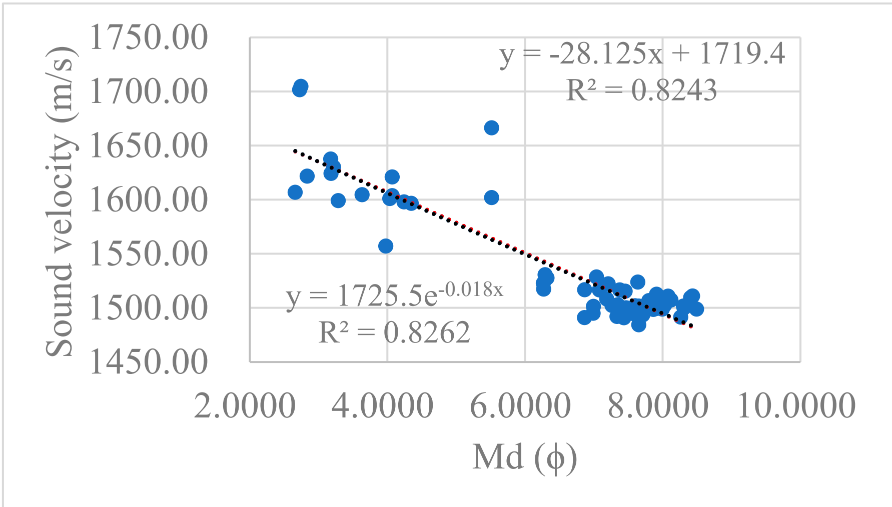

Figure S8. Exponential (black line) + linear (red line) functions of Md vs sound velocity

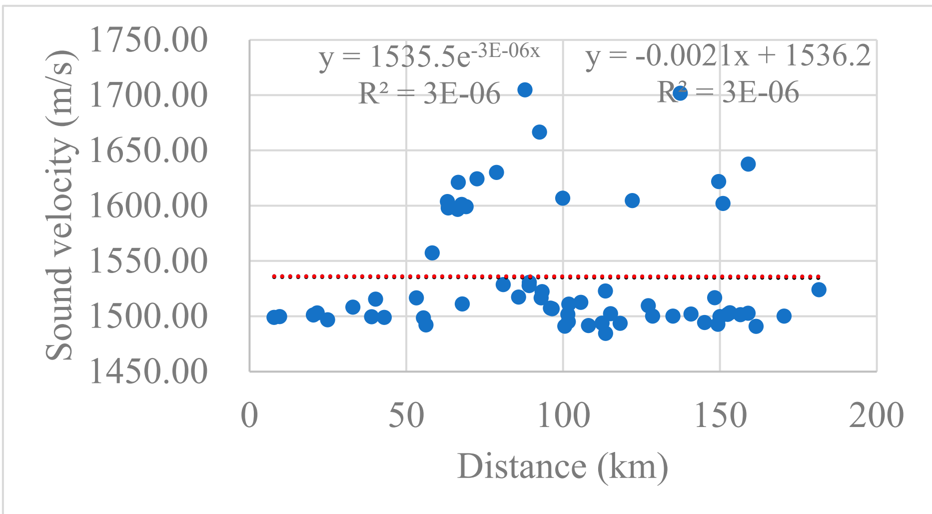

Figure S9. Exponential (black line) + linear (red line) functions of distance vs sound velocity

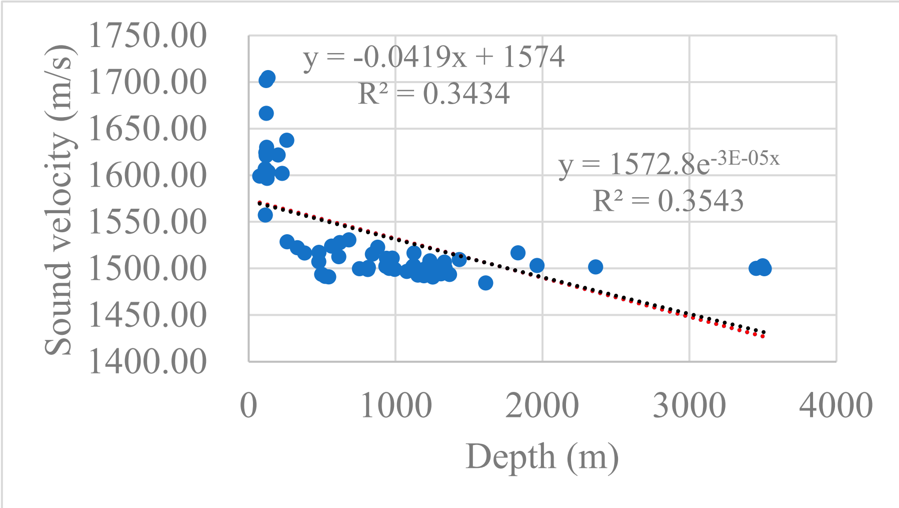

Figure S10. Exponential (black line) + linear (red line) functions of depth vs sound velocity

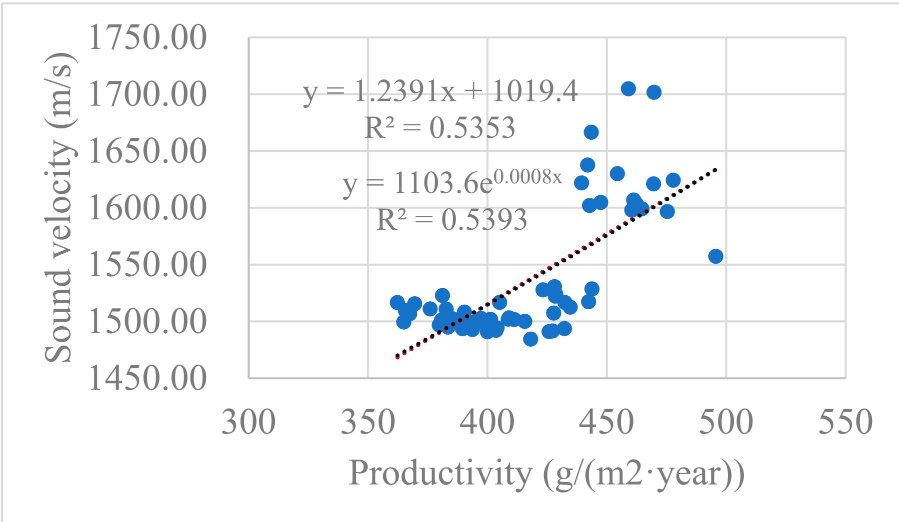

Figure S11. Exponential (black line) + linear (red line) functions of productivity vs sound velocity