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Week 4 Updated

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Previous Updated

1. Trying opening the data using Geopandas (still trial and error).
2. need to get high resolution data for sampling in GIS/python
3. open data .tif in GIS

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Result Update

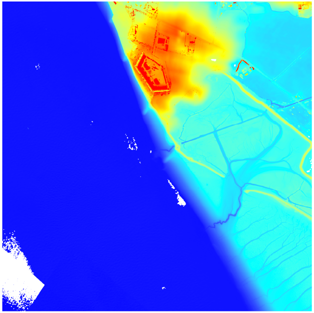

Figure 1: tif data using ArcMap

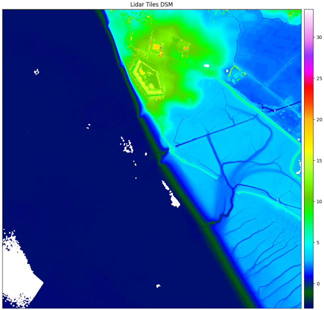

Figure 2: tif data using pandas

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What I Have Learned This Week

- Starting Literature Review in terms of Flood, Soil Embankment, Lidar Utilisation.
- Poincloud data is possibly be opened using deep learning
- Join the course of Deep Learning : Understanding types of data (supervised and unsupervised data)
- Binary Classification (Week 1)

Point Cloud

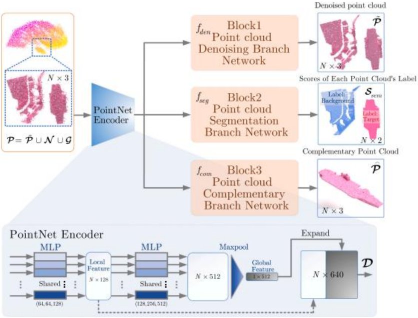

Figure 3: Concept of PointNet

Zhao et al. [1]

Neural Network

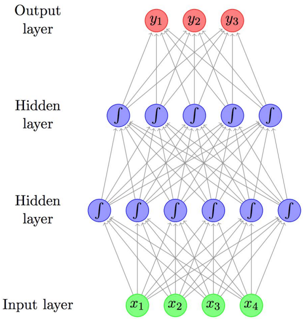

Figure 4: Neural Network Concept

Binary Classification

King [2] *For binary classification, if g_i = class 1, denote $g_i = 1$; if g_i = class 2, denote $y_i = 0$.*

$$p_1(x;\theta) = p(x;\theta) \tag{1}$$

$$p_2(x;\theta) = 1 - p_1(x;\theta) = 1 - p(x;\theta) \tag{2}$$

Since $K = 2$, we only have one linear equation and one decision boundary between two classes, the parameters $\theta = \beta_{10}, \beta_1$

1. *if* $y_i = 1$, i.e $g_i = 1$, then

$$\begin{aligned} \log\ p_{g_i}(x;\beta) &= \log\ p_1(x;\beta) \\ &= 1 \cdot \log\ p(x;\beta) \\ &= y_i \log\ p(x;\beta) \end{aligned} \tag{3}$$

1. *if* $y_i = 0$, i.e $g_i = 2$, then

$$\begin{aligned} \log\ p_{g_i}(x;\beta) &= \log\ p_2(x;\beta) \\ &= 1 \cdot \log\ (1 - p(x;\beta)) \\ &= (1 - y_i) \log\ (1 - p(x;\beta)) \end{aligned} \tag{4}$$

*S*ince either $y_i = 0$ or 1 - $y_i = 0$ we can add the two (at any time, only one of the two is nonzero) and have:

$$\log\ p_{g_i}(x;\beta) = y_i \log\ p(x;\beta) + (1 - y_i) \log\ (1 - p(x;\beta)) \tag{5}$$

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Reference

[1] Luda Zhao et al. "Robust multi-task learning network for complex LiDAR point cloud data preprocessing". In: *Expert Systems with Applications* 237 (2024), p. 121552.

[2] Jason E King. "Binary logistic regression". In: *Best practices in quantitative methods* (2008), pp. 358–384.