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PhD week 3-Read papers on machine learning and its applications

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In the last week, my work is mainly foucsed on two parts:

- Part 1: Continue reading papers on ML and learning basic terms
- Part 2: Contine thinking what I am going to do for my PhD, how to realte ML to offshore geotechnics and ICFEP

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ML terms learned this week:

- CNN (convolution neural network)/Labelled/(Un)supervised learning
- Autoencoder (encoder/decoder)
- Convolutional kernel/pooling/up-sampling/fully connected layer/hidden layer

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How to combine the ML with offshore geotechnics (ICFEP)?

The keywords are:

- machine learning
- ICFEP-FEM Monte-Carlo simulation (Deterministic analysis)
- Algorithm/Data-driven/non-parameters analysis

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What challenges in offshore geotechnics at present?

- Sparse data, such as CPT (always not enough)
- Non-stationary data, bringing challenge to kriging
- Soil spatial variability/complex loading/various soil properties
- ...

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One assumption on the PhD research:

With the uncertainties above, it is hard to:

- give a full description on the soil region with limited CPT
- explicitly consider design of similar sites, such as design parameters near the this project, which is useful
- provide a guidance on bearing capacities, buckling and long term settlement.
- directly give a reasonable pile design on pile position and pile size in the site

Our final goal is : Utilize ML tools to optimize the pile design and control the uncertainties above