A Brief Summary of Romrawin's Master Thesis

Title: *Simulation and control of drug release on microneedle using machine learning technique (TU Digital Collections)*
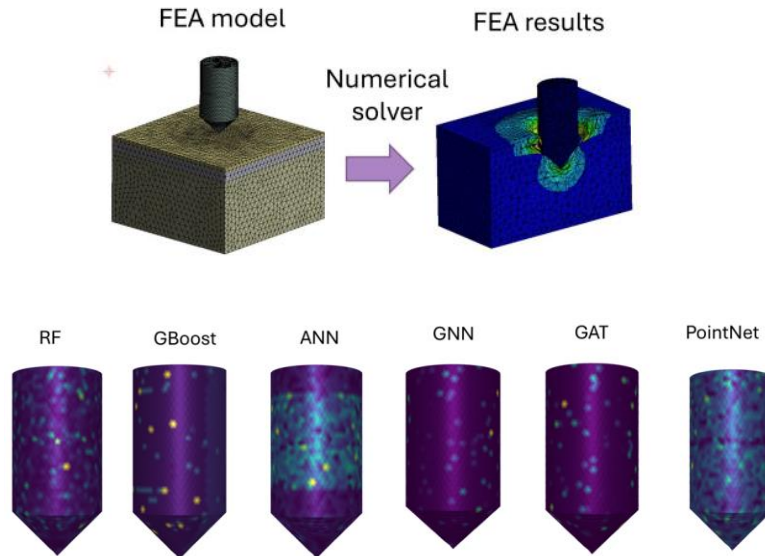

Figure 1 An overview and summary figure in the master thesis

Summary

- Study the processes of microneedle piecing into the skin.
- Simulated 21 materials of microneedle and extracted data as 3D structure time series dataset.
- Introducing machine learning type of physics-informed neural networks to predict the stress distribution.
- Experiment (Figure 1) on Random Forest (RF), Gradient Boosting (GBoost), Artificial neural networks (ANN), Graph Neural Network (GNN), Graph Attention Network (GAT), and PointNet as the traditional and modern machine learning model.
- The results show the importance of a graph-based model feature.

Expected outputs of the thesis

1. *Main result*: Physics-informed graph neural networks accelerating microneedle simulations towards novelty of micro-nano scale materials discovery (in-review) submitted to Engineering Applications of Artificial Intelligence. (Microneedle Material Discovery (romrawinjp.github.io))
2. *Dataset*: MN-SIM: Microneedle Simulation Dataset and Benchmark Models Submitted to the 37th Conference on Neural Information Processing Systems (NeurIPS 2023) Track on Datasets and Benchmarks. (Microneedle Simulation Dataset (romrawinjp.github.io))