

Unit 12 seminar preparation – Future of Machine Learning

Based on *Data fusion and machine learning for industrial prognosis: Trends and perspectives towards Industry 4.0. Information Fusion* (Diez-Olivan et al., 2019)

1. Select one from (descriptive/predictive/prescriptive) of prognostic machine learning model used in industry 4.0.

- Prescriptive models

2. Provide a rationale for your selection.

- Descriptive and predictive models are already well established and can be achieved with conventional statistical methods; prescriptive models offer the most innovative insights and are probably the closest to what one could consider “general” AI

3. Discuss the impact of your selection in an industry/sector of your choice.

- Prescriptive models in healthcare: assign best treatment choice in a given circumstance, based on the available data
- Mimics clinical decision making, currently the preserve of humans, while other actions such as description and prognosis can already be achieved by algorithms; this is possibly due to the inherent challenges in prescribing/choosing the most appropriate treatment, and also assigning accountability
- Models difficult to build due to lack of digitisation in industry (similarly in healthcare), but this is improving with electronic health records and data linkage – rise of Digital Twins
- However, causality is extremely difficult to ascertain
- Model development also depends on the performance metric used (probability of event, cost, etc)
- Some factors that determine optimal choice may be difficult to replicate in data points, e.g. clinical intuition, general aspect of a person, or “non-obvious expert knowledge” about how best to approach a given choice
- In the industrial setting, algorithms used have included those inspired by evolutionary or biological processes (e.g. genetic, ant colony)
- Interesting application using “fuzzy logic”, which allows for variability in the underlying truth that the model holds (probabilistic rather than Boolean factors)
- Example applications: theatre scheduling, medical device replacement, dosing optimisation

References:

Diez-Olivan, A., Del Ser, J., Galar, D. & Sierra, B. (2019) ‘Data fusion and machine learning for industrial prognosis: Trends and perspectives towards Industry 4.0’, *Information Fusion*, 50, pp. 92–111. Available from: <https://doi.org/10.1016/j.inffus.2018.10.005>.

