

Mahesan Niranjan

School of Electronics and Computer Science

Theory / Algorithms in Machine Learning (0.66 FTE)

Machine Learning: Data Driven Modelling

Extracting Useful Information from Large and Complex Datasets

Data	$\{\mathbf{x}_n, \mathbf{y}_n\}_{n=1}^N$ $\{\mathbf{x}_n\}_{n=1}^N$
Function Approximator	$\mathbf{y} = f(\mathbf{x}, \theta) + v$
Parameter Estimation	$E_0 = \sum_{n=1}^N \{\ \mathbf{y}_n - f(\mathbf{x}_n; \theta)\ \}^2$
Prediction	$\hat{\mathbf{y}}_{N+1} = f(\mathbf{x}_{N+1}, \hat{\theta})$
Regularization	$E_1 = \sum_{n=1}^N \{\ \mathbf{y}_n - f(\mathbf{x}_n)\ \}^2 + g(\ \theta\)$
Modelling Uncertainty	$p(\theta \{\mathbf{x}_n, \mathbf{y}_n\}_{n=1}^N)$
Probabilistic Inference	$E[g(\theta)] = \int g(\theta) p(\theta) d\theta = \frac{1}{N_s} \sum_{n=1}^{N_s} g(\theta^{(n)})$
Sequential Estimation	$\theta(n-1 n-1) \rightarrow \theta(n n-1) \rightarrow \theta(n n)$

Teaching in Machine Learning (0.66 FTE)

Foundations of ML, Advanced ML, Deep Learning, Comp. Vision, Comp. Biology, Comp. Finance, Reinforcement and Online Learning, Natural Language Processing, Causal Inference

Colleagues with Machine Learning Expertise @ECS:

A. Prugel-Bennett, S. Dasmahapatra, J. Hare, S. Mahmoodi, K. Farrahi, C. Evers, S. Middleton, X. Cai, H. Kim, J. Grundy

Practice in Machine Learning (0.66 FTE)

Getting out of bed...:

- Biological Sequence Analysis (functions / interactions)
- Inference from Imaging (medical), physiological signals
- Regulation at Transcriptome → Proteome Interface

CI on grants:

- J. Frey: EPSRC Network in AI for Scientific Discovery
- R. Wood: EPSRC grant on Tribology
- B. Mills: EPSRC grant on laser control

Currently working on:

- NIHR with T. Wilkinson *et al.* on Covid prognosis
- NIHR with Bath on immune mediated multi-morbidity
- UKRI Programme grant with UCL on Mg++ batteries
- MRC with S. Mahajan *et al.* on imaging τ in Alzheimers
- Osteoporosis with N. Fuggle *et al.*

The difference between theory and practice is more *in practice* than *in theory*