COURSE DETAILS
Course Code: B31XN
Full Course Title: Scalable Inference and Deep Learning
SCQF Level: 11
SCAF Credits: 15
Available as Elective: No

DELIVERY LEVEL
Undergraduate: No  Postgraduate Taught: Yes  Postgraduate Research: Yes
Additional Information:

COURSE AIMS
• Introduce state-of-the-art computational methods for performing inference from high dimensional data (Scalable optimisation, Deep Learning and Scalable Bayesian inference)
• Investigate applications for imaging, computer vision, machine learning, etc.

LEARNING OUTCOMES – SUBJECT MASTERY
Critical understanding of the mathematical background for scalable inference algorithms from high dimensional data. Mastery of

• Scalable Optimization and applications to imaging, machine learning, control, etc.

• Deep learning and applications to imaging, computer vision, etc.

• Scalable Bayesian inference and applications to imaging, uncertainty quantification, etc.

LEARNING OUTCOMES – PERSONAL ABILITIES
Understanding and practical knowledge of mathematical tools to solve high dimensional problems (i.e. involving large data sets)

SYLLABUS
Scalable Optimization

• Parallel and distributed algorithms

• Stochastic/randomized algorithms
B31XN Scalable Inference and Deep Learning

- Applications to high-dimensional problems (e.g. imaging, computer vision, machine learning, graph signal processing, control, etc.)

Deep learning

- Deep feed-forward networks and regularization
- Optimization algorithms for training
- State-of-the-art neural networks (e.g., convolutional and recurrent neural networks, autoencoders)
- Applications to high-dimensional problems (e.g. imaging, computer vision, pattern recognition, etc.)

Scalable Bayesian inference

- High Dimensional MCMC
- Variational Bayes
- Bayesian deep learning and generative models
- Applications (e.g. imaging, uncertainty quantification, etc.)

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