MIDTERM EXAM GUIDE

The first half the class concentrated on the following three modules:

1. Basics of Artificial Neural Networks
2. Convolutional Neural Networks
3. Recurrent Neural Networks

Hence, the midterm exam will cover all materials contained in the lectures. Topics covered in the lectures are listed in detail below:

Basics of Artificial Neural Networks
- Lecture 1: Introduction to Deep Learning
  compositionality, end-to-end learning, distributed representations

- Lecture 2: Machine Learning Overview
  linear models, loss functions, linear regression, gradient descent, overfitting and generalization, regularization, cross-validation, bias-variance tradeoff, maximum likelihood estimation

- Lecture 3: Multi-layer Perceptrons
  feed-forward neural networks, activation functions, chain rule, backpropagation, computational graph, automatic differentiation, distributed word representations

- Lecture 4: Training Deep Neural Networks
  data preprocessing, weight initialization, normalization, regularization, model ensembles, dropout, optimization methods

Convolutional Neural Networks
- Lecture 5: Convolutional Neural Networks
  convolution layer, pooling layer, evolution of depth, design guidelines, residual connections, semantic segmentation networks, object detection networks, backpropagation in CNNs

- Lecture 6: Understanding and Visualizing Convolutional Neural Networks
  transfer learning, interpretability, visualizing neuron activations, visualizing class activations, pre-images, adversarial examples, adversarial training

Recurrent Neural Networks
- Lecture 7: Recurrent Neural Networks
  sequence modeling, recurrent neural networks (RNNs), RNN applications, vanilla RNN, training RNNs, long short-term memory (LSTM), LSTM variants, gated recurrent unit (GRU)

Things to bring:
- 1 sheet of hand-written notes on A4 paper (you can use both sides of this sheet).
- Scientific calculator