ECE 364: Programming Methods for Machine Learning, Spring 2025
Skillset - Midterm 2

The first midterm will test material covered in lectures 14 through 23. Any results proved in homework assignments are also part of the material that can be tested on the midterm.

The subjects tested include (but are not limited to):

1. **Deep linear nets** — Why multi-layer linear networks work; basic structure of simple nets.

2. **Convolutional neural networks** — Convolutional layers: filters, strides, padding. Pooling layers; max vs. average pooling.

3. **Recurrent networks** — Simple RNNs, LSTMs, GRUs.

4. **Network optimizations** — Dropout, batch normalization, etc.

5. **Principal component analysis** — Computation of principal components; compression and reconstruction.

6. **K-means clustering** — General algorithm and loss function.

7. **Gaussian mixture models** — General algorithm and loss function.

8. **Generative adversarial networks** — Basic operation; saturating and non-saturating loss functions.

9. **Object detection and semantic segmentation** — Basic structure, bounding box measures (IoU), conceptual understanding of modern image bounding box tasks, mAP metric.

10. **Transformers** — Attention mechanism, tokenization, embedding, inference and training, types of transformer models, beam search.