Kyle Remmenga Independent Study Proposed Timeline

Week 1-2: Foundations of Neural Networks:

- Topics:
    - Introduction to Artificial Neural Networks
    - Feedforward Networks and Backpropagation
    - Activation Functions
    - Loss Functions
    - Optimization Algorithms (Gradient Descent)

Weeks 3-4: Sequence Models and Language Modeling

- Topics:
    - Introduction to Language Modeling and N-gram Models
    - Recurrent Neural Networks
    - Long Short-Term Memory and Gated Recurrent Units
    - Limitations of RNNs

Weeks 5-6: Attention Mechanisms

- Topics:
    - Understanding the Need for Attention
    - Introduction to Attention Mechanisms
    - Additive and Multiplicative Attention
    - Self-Attention Concept

Weeks 7-8: Transformer Architecture

- Topics:
    - "Attention Is All You Need" Paper Deep Dive (Vaswani et al., 2017)

    - Transformer Components:
        - Multi-Head Self-Attention
        - Positional Encoding
        - Layer Normalization
        - Residual Connections
    - Encoder and Decoder Structures

Weeks 9-16: Research Paper

- Finalize research and development of SLM
- Complete research paper and prepare presentation