EEL 6819 Neural Complex and Artificial Neural Networks

Credits: 3 credits

Textbook, Title, Author, and Year: P.S. Neelakanta and D. De Groff: Neural Network Modeling (CRC Press, Boca Raton, FL 1994) (Relevant Lecture Notes (in 6 Units) will be made available on the Black-Board periodically on ad hoc basis)

Reference Materials:

- Lecture Notes (in 6 Units) will be made available on the Black-Board periodically.
- S. Haykins: Neural Networks (MacMillan, 1994)
- L. Fausett: Fundamentals of Neural Networks (Prentice Hall, 1994)
- P.S. Neelakanta: Information-Theoretic Aspects of Neural Networks (CRC Press, Boca Raton, FL.1999)

Specific Course Information

Catalog Description: Introduction to real and artificial neural complex; Concepts of neuro-cybernetics and neural activity in the perspectives of statistical dynamics; neural information and conceiving artificial neural networks (ANNs)

Prerequisites: Graduate level background in physical/biological sciences and/or engineering.

Specific Goals for the Course: This course is intended to impart the concepts and practical aspects of real neural complex and extend the neural transmission considerations to realizing artificial neural networks (ANNs). Relevant neural cell characteristics and stochastic aspects of neural transmissions are taught. Principle of neural computation will be indicated. Designing ANN architectures will be explained. Computational exercises are given as a term project on individual basis.

Brief list of topics to be covered:

1. Introduction to the neural complex & ANNs
2. Mathematical neurobiology and evolution of ANNs
3. Concepts of pseudo-thermodynamics and “machine” representation of neural activity
4. Physics of neural activity: Statistical mechanics perspectives
5. Stochastic dynamics of neural activity
6. Neural field theory
7. Neurocybernetics
8. Information-theoretics of neural networks