

## ECE 449 Fall 2019 Final Exam Study Guide

Topic	Concepts	Notes	Karray	Engelbrecht	Comment
Intelligent systems	characteristics, taxonomy, application areas	4-8	3-14, 38-45, 50-51	1-12	
Fuzzy systems	characteristics, application areas	9-10	57-64	451-452	
Fuzzy sets (FS)	definition, representation, membership functions, operations on FS, comparison of FS, representation theorem	11-22	65-90	453-462	No pairwise comparison, equality index
Fuzzy relations (FR)	definition, representation, operations on FR, composition of FR (including special cases)	22-30	97-125	Toshinori 130-138	No fuzzy arithmetic
Fuzzy rule-based computing	inference, modus ponens, linguistic variables, accumulation and usage of knowledge, implication operators, fuzzy algorithm	34-40	82-83, 126-127, 35-37	465-471	
Fuzzy control	structure of fuzzy controller (FLC), fuzzification, defuzzification, numerical characteristics of FLC, Mamdani and Sugeno FLC	41-50	137-156	475-478	
Properties of FLC	completeness, continuity, consistency, FLC architectures	51-54	180-182, 164-169	N/A	
Neural networks (NN) concepts	information processing, massive parallelism, plasticity, biological and artificial neuron, activation function	55-57	226-228, 230	15-25	
NN architectures	Network structure, interconnection variations, weights	58-60	226-227	27-30, 36-44	No NN history
NN simple models	McCulloch/Pitts for simple binary problems, perceptron, ADALINE, training set, linear separability, training rule/algorithm, iteration, epoch	62-67	233-245		
Multilayer networks	MLP, Backpropagation training algorithm, Function approximation with MLP networks, Practical considerations	68-76	250-267	38-42	No data preparation

RBF networks	Distance based neuron, Exact interpolation, RBF learning (principle only), Function approximation with RBF networks	78-83	274-281	73-80	
Associative networks	Hebbian and Grossberg learning, instar and outstar, Associative memories, BAM	84-87	N/A, some at 274-281	Toshinori 40	No Hopfield network
Competitive networks	Self-organization, Competitive learning, SOM, LVQ	92-99	268-274	55-71	No dynamic (recurrent) networks
Evolutionary computing	Overview, Search and optimization, Types of EA	104- 110	365-371	125-141	
Genetic Algorithms	Concepts, Execution cycle, Operations, Schema theory	110- 121	372-387	143-174	
Genetic Programming	Terminology, program representation	122- 127	370-371	177-183	No swarm intelligence

References:

Karray, F. O., DeSilva, C., *Soft computing and intelligent systems design: theory, tools, and applications*, Pearson/Addison Wesley, 2004

Engelbrecht, A. P., *Computational intelligence: an introduction*, 2nd ed., John Wiley & Sons, 2007 (available electronically from the UofA library)

Toshinori, M., *Fundamentals of the new artificial intelligence: neural, evolutionary, fuzzy and more*, Springer, 2008 (available electronically from the UofA library)

Note: It will be helpful to review problems in all assignments and in-class exercises