CLASS 706, DATA PROCESSING - ARTIFICIAL INTELLIGENCE

SECTION I - CLASS DEFINITION

GENERAL STATEMENT OF THE CLASS SUBJECT MATTER

This is a generic class for artificial intelligence type computers and digital data processing systems and corresponding data processing methods and products for emulation of intelligence (i.e., knowledge based systems, reasoning systems, and knowledge acquisition systems); and including systems for reasoning with uncertainty (e.g., fuzzy logic systems), adaptive systems, machine learning systems, and artificial neural networks.

(1)   Note. This class includes systems having a faculty of perception or learning.

(2)   Note. This class also provides for data processing systems and corresponding data processing methods for performing automated mathematical or logic theorem proving.

(3)   Note. This class accepts combinations of an art class device, or art class method, with artificial intelligence techniques not elsewhere provided for in USPC. This can include mechanical systems, electromagnetic systems, acoustic systems, thermal systems, photonic systems, chemical systems, biological systems, nanomachines and quantum mechanical systems where data or signals are processed according to artificial intelligence methods. A searcher should also consider the relevant art classes and at least the following data processing classes 700 Data processing: generic control systems or specific applications; 701 Data processing: vehicles, navigation, and relative location; 702 Data processing: measuring, calibrating, or testing; 703 Data processing: structural design, modeling, simulation, and emulation.

(4)   Note. This class can accept combinations of data processing arts with artificial intelligence techniques not elsewhere provided for in USPC. Data processing art in combination with AI can include internet systems, intranet systems, client-server systems, database systems, computer interface systems, multi agent collaboration systems (e.g., societies of agents, groupware), groupware per se, distributed intelligent systems, multi agent systems distributed intelligences, blackboard collaborative systems, social networking methods, hacker detection (e.g., spam detection, data mining, data farming) and artificially intelligent action systems (e.g., web page ranking systems, Eigentrust systems).

When mandatory classification is in multiple classes, the ORIGINAL classification may be in a class other than where the application was assigned and examined.

A searcher should consider at least the relevant related data processing classes on a case by case basis such as: 700, Data Processing: Generic Control Systems or Specific Applications; 704, Data Processing: Speech Signal Processing, Linguistics, Language Translation, and Audio Compression/Decompression; 705, Data Processing: Financial, Business Practice, Management, or Cost/Price Determination; 707, Data Processing: Database, Data Mining, and File Management or Data Structures; 709, Electrical Computers and Digital Processing Systems: Multicomputer Data Transferring; 710, Electrical Computers and Digital Data Processing Systems: Input/Output; 712, Electrical Computers and Digital Processing Systems: Processing Architectures And Instruction Processing (e.g., Processors); 713, Electrical Computers and Digital Processing Systems: Support; 714, Error Detection/Correction and Fault Detection/Recovery; 715, Data Processing: Presentation Processing of Document, Operator Interface Processing, and Screen Saver Display Processing; 716, Data Processing: Design and Analysis of Circuit or Semiconductor Mask; 717, Data Processing: Software Development, Installation, and Management; 718, Electrical Computers and Digital Processing Systems: Virtual Machine Task or Process Management or Task Management/Control; 719, Electrical Computers and Digital Processing Systems: Interprogram Communication or Interprocess Communication (IPC); 726, Information Security.

(5)   Note. This class can accept combinations of data processing arts with artificial intelligence techniques not elsewhere provided for in USPC. Data processing art in combination with AI can include Human Computer Interface (HCI). HCI AI may include Telerobotics, Human Supervisory Control (e.g., Waypoint Navigation), Brain-Computer Neural Interfaces (e.g., Thought Controlled Devices, Brain Interfaces) and Chatbots (aka Chatterbots) (e.g., AIML).

(6)   Note. Artificial Intelligence methods include, but are not limited to: Supervised learning classifiers, unsupervised learning classifiers, reinforcement learning, statistical learning, theorem proving, boosting classifiers, dimensionality reduction, multiresolution analysis, wavelets, quantum AI systems, nanotechnology AI systems, augmented reality systems, pattern recognition systems and automated planning systems.

(7)   Note. Artificial Intelligence preprocessing methods include Dimensionality Reduction (reduced feature space, subspace) via Principal Component Analysis (PCA), Kernel Principal Component Analysis (KPCA), Nonlinear Principal component analysis, Independent component analysis (ICA), Singular Value Decomposition (SVD), Eigenface, Kernel Eigenface, Eigenvoice, Kernel Eigenvoice, Self Organizing Map (SOM), Growing Self Organizing Map, Linear Discriminant Analysis (LDA), Fisher's linear discriminant, Linear-Nonlinear Poisson (LNP) Cascade, Multifactor Dimensionality Reduction, Data fusion, Sensor fusion, Image fusion.

(8)   Note. Multiresolution Analysis methods include Wavelet transforms, Wavelet series, Wavelet packet, Fast Wavelet Transform, Pyramid generation.

(9)   Note. Artificial Intelligence Learning methods fall into three broad categories, namely, Supervised Learning, Unsupervised Learning, and Reinforcement Learning.

(10)   Note. Inventive combinations or subcombinations for Supervised Learning Classifiers that may be classified in this class include

k-Nearest Neighbor Systems, Fuzzy Logic (e.g., Possibility theory), Neural Networks, Spin Glass Analog Systems, Simulated Annealing, Boltzmann Machines, Vector Quantization, Restricted Coulomb Energy (RCE), Kohonen, Neural Gas, Growing Neural Gas, Pulsed Neural Nets, Support Vector Machines, Maximum Margin Classifiers, Hill-Climbing, Inductive Logic Systems, Bayesian Networks, Belief Networks, Dempster-Shafer Theoretic Network Systems, Gaussian Mixtures, Kriging, Petri Nets (e.g., Finite State Machines, Mealy Machines, Moore Finite State Machines) and Ensembles of Classifiers (e.g., Bagging Systems, Boosting Systems ADABOOST, Classifier trees (e.g., Perceptron trees, Support vector trees, Markov trees, Decision Tree Forests, Random Forests) and Pandemonium Models and Systems.

(11)   Note. Inventive combinations or subcombinations for Unsupervised Learning Classifiers that may be classified in this class include Evolutions strategie, Evolutionary Systems, Clustering, Blind Source Separation, Blind Signal Separation, Blind Deconvolution, Self-organizing Maps, Tabu Search.

(12)   Note. Inventive combinations or subcombinations for Reinforcement Learning Methods that may be classified in this class include Reinforcement Neural Networks.

(13)   Note. Inventive combinations or subcombinations for Artificial Intelligence Learning Hardware can include Memistors, Memristors, Transconductance amplifiers, Pulsed Neural Circuits, Artificially Intelligent Nanotechnology Systems (e.g., Autonomous nanomachines) or Artificially Intelligent Quantum Mechanical Systems (e.g., Quantum Neural Networks).

(14)   Note. Inventive combinations or subcombinations for Artificial Intelligence Automatic Pattern Recognition Systems can include Machine Vision Systems, Acoustic Recognition Systems, Handwriting Recognition Systems, Data Fusion Systems, Sensor Fusion Systems, Soft Sensors. Machine Vision Systems can also include Content Based Image Retrieval, Optical Character

Recognition, Augmented Reality, Egomotion, Tracking or Optical flow.

(15)   Note. Inventive combinations or subcombinations for Automatic Planning and Decision Support Systems can include Emergent systems, Artificially Intelligent Planning, Decision Trees, Petri Nets, Artificially Intelligent Forecasting, which may be properly classifiable in this class.

SECTION II - REFERENCES TO OTHER CLASSES

SEE OR SEARCH CLASS:
235,   Registers, appropriate subclasses for basic machines and associated indicating mechanisms for ascertaining the number of movements of various devices and machines, plus machines made from these basic machines alone (e.g., cash registers, voting machines) and in combination with various perfecting features, such as printers and recording means. In addition, search Class 235, various subclasses for data bearing record controlled systems.

326,   Electrical Digital Logic Circuitry, appropriate subclasses for generic digital logic devices, circuitry, and subcombinations thereof, wherein nonarithmetical operations are performed upon discrete electrical signals representing a value normally described by numerical digits.

340,   Communications: Electrical, subclasses 1.1 through 16.1 for controlling one or more devices to obtain a plurality of results by transmission of a designated one of plural distinctive control signals over a smaller number of communication lines or channels.

341,   Coded Data Generation or Conversion, various subclasses for electrical pulse and digit code converters (e.g., systems for originating or emitting a coded set of discrete signals or translating one code into another code wherein the meaning of the data remains the same but the formats may differ.

345,   Computer Graphics Processing and Selective Visual Display Systems, subclasses 418 through 475 for computer graphics processing.

360,   Dynamic Magnetic Information Storage or Retrieval, various subclasses for record carriers and systems wherein information is stored and retrieved by interaction with a medium and there is relative motion between a medium and a transducer.

365,   Static Information Storage and Retrieval, various subclasses for addressable static singular storage elements of plural singular elements of the same type (i.e., internal elements of memory, per se).

369,   Dynamic Information Storage or Retrieval, various subclasses for record carriers and systems wherein information is stored and retrieved by interaction with a medium and there is relative motion between a medium and a transducer.

370,   Multiplex Communications, subclasses 259 through 271 for multiplexed communications enabling three or more terminals to be included in a single call connection.

375,   Pulse or Digital Communications, various subclasses for pulse or digital communication systems and synchronization of clocking signals from input data.

377,   Electrical Pulse Counters, Pulse Dividers, or Shift Registers: Circuits and Systems, various subclasses for generic circuits for pulse counting.

379,   Telephonic Communications, various subclasses for two-way electrical communication of intelligible audio information of arbitrary content over a link including an electrical conductor.

380,   Cryptography, subclasses 3+ for stored information access or copy prevention (e.g., software program protection or virus detection) in combination with data encryption and subclasses 22 through 25 and 50 for electric signal modification.

381,   Electrical Audio Signal Processing Systems and Devices, various subclasses for wired one-way audio systems, per se.

382,   Image Analysis, subclasses 181+ for pattern recognition involving image analysis. (From Section I, CLASS DEFINITION.)

382,   Image Analysis, various subclasses for operations performed on image data with the aim of measuring a characteristic of an image, detecting variations, detecting structures, or transforming the image data, and for procedures for analyzing and categorizing patterns present in image data.

388,   Electricity: Motor Control Systems, cross-reference art collection 907.5 for computer or processor control of DC motor acceleration or speed.

452,   Butchering, subclasses 79 and 178 for a handling device (e.g., traversing hoist) which is peculiar to that art.

455, Telecommunications, appropriate subclasses for modulated carrier wave communication, per se, and subclass 26.1 for subject matter which blocks access to a signal source or otherwise limits usage of modulated carrier equipment.

700, Data Processing: Generic Control Systems or Specific Applications, subclasses 1 through 89 for generic data processing control systems, subclasses 90-306 for applications of computers in various environments, and subclasses 245-264 for data processing of robot control systems.

702, Data Processing: Measuring, Calibrating, or Testing, appropriate subclasses for applications of computers in measuring and testing.

703, Data Processing: Structural Design, Modeling, Simulation, and Emulation, appropriate subclasses.

704, Data Processing: Speech Signal Processing, Linguistics, Language Translation, and Audio Compression/Decompression, subclasses 200+ for artificial intelligence systems that process speech signals.

707, Data Processing: Database, Data Mining, and File Management or Data Structures, subclasses 600 through 606 for online analytical processing and decision support in a database environment, subclass 607 for online transactional processing, subclass 608 for collaborative document database and workflow, subclass 637 for optimizing database replication, subclass 665 for rule based database archiving, subclasses 705 through 711 for aspects or search engines in databases, subclasses 723 through 735 for various aspects of ranking search results in the database art, subclasses 736 through 740 for clustering and cataloging in the database art, subclasses 765 through 767 for query refinement and recommending or suggesting search terms, subclasses 776 through 777 for data mining and taxonomy discovery in database arts, subclass 780 for fuzzy search and comparison, subclass 794 for semantic networks, subclasses 797 through 801 for generic data structures.

709, Electrical Computers and Digital Processing Systems: Multicomputer Data Transferring, subclass 204 for computer conferencing for enabling collaborative processing of data by the computers or digital data processing systems.

711, Electrical Computers and Digital Processing Systems: Memory, subclasses 100+ for storage accessing and control in data processing systems, and subclasses 200+ for address formation.

708, Electrical Computers: Arithmetic Processing and Calculating, subclasses 1 through 9 for hybrid computers; subclasses 100-714 for calculators, digital signal processing, and arithmetical processing, per se; and subclasses 800-854 for electric analog computers.

709, Electrical Computers and Didital Processing Systems: Multicomputer Data Transferrng, appropriate subclasses for multiple computer data transferring.

710, Electrical Computers and Digital Data Processing Systems: Input/Output, subclasses 100 through 317 for intrasystem connecting, subclass 200 for access locking, subclass 220 for access polling, subclasses 240-244 for access arbitrating, and subclasses 260-269 for interrupt processing.

712, Electrical Computers and Digital Processing Systems: Processing Architectures and Instruction Processing (e.g., Processors), subclasses 1 through 43 for processing architecture.

713, Electrical Computers and Digital Processing Systems: Support, appropriate subclasses for data processing security, subclasses 300 through 340 for power control; subclasses 400 and 401 for synchronization of clock or timing signals, data, or pulses; subclasses 500-503 for clock, pulse, or timing signal generation or analysis; and subclasses 600 and 601 for clock control of data processing system, component, or data transmission.

714, Error Detection/Correction and Fault Detection/Recovery, appropriate subclasses for generic computer, or electrical pules code or pulse coded data error prevention, detection or correction.

715, Data Processing: Presentation Processing of Document, Operator Interface Processing, and Screen Saver Display Processing, subclasses 733 through 759 for concurrently established related or collaborative user interfaces including computer conferencing and computer supported cooperative work.

717, Data Processing: Software Development, Installation, and Management, appropriate subclasses.

718,   Electrical Computers and Digital Processing Systems: Virtual Machine Task or Process Management or Task Management/Control, appropriate subclasses for a task management system.

726,   Information Security, subclasses 1 through 36 for information security in computers or digital processing system.

SECTION III - GLOSSARY

The terms below have been defined for purposes of classification in this class and are shown in underline type when used in the class and subclass definitions When these terms are not underlined in the definitions, the meaning is not restricted to the glossary definitions below.

COMPUTER

A machine that inputs data, processes data,stores data and outputs data.

COMPUTER PROGRAM

An algorithm and data structures constituting a set of instructions in some computer language, intended to be executed on a computer to perform a useful task.

COMPUTER-READABLE STORAGE MEDIA

Physical material on which data bits are read and written by a computer; excluding paper and other non-computer written media.

DATA

Representation of information in a coded manner suitable for communication, interpretation or processing.

DATA PROCESSING

See PROCESSING, below

GENERAL PURPOSE DIGITAL COMPUTER

Digital computer having a single central processing unit, primarily storage, at least one input device, and a display media.

INFORMATION

Meaning that a human being assigns to data by means of conventions applied to that data.

MEMORY

A functional unit to which data can be stored and which data can be retrieved.

MODULAR NEURAL NETWORK

A system of plural neural networks, often of heterogeneous types; e.g., self-organizing network connected to a feedforward network.

NEURAL NETWORK ARCHITECTURE

Neural Network Topology and functions computed by the neuron processors.

NEURAL NETWORK TOPOLOGY

Interconnection pattern between neuron processors.

PERIPHERAL

A functional unit that transmits data to or receives data from a computer to which it is coupled

PROCESSING

Methods or apparatus performing systematic operations upon data or information exemplified by functions such as data or information transferring, merging, sorting and computing (i.e., arithmetic operations or logical operations).

   (1)   Note. In this class, the glossary term data is used to modify processing in the term data processing; whereas the term digital data processing system refers to a machine performing data processing.

PROCESSOR

A functional unit that interprets and executes instruction data.

SUBCLASSES

1   **FUZZY LOGIC HARDWARE:**
    This subclass is indented under the class definition. Subject matter comprising a specific circuit arrangement for performing approximate

reasoning where truth values and quantifiers are represented by possibility distributions.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
52,   for knowledge processing system using fuzzy logic and having no fuzzy logic hardware.
900,   for cross-reference art collection of a data processing system having fuzzy logic data processing.

SEE OR SEARCH CLASS:
326,   Electronic Digital Logic Circuitry, subclasses 59+ for logic circuits responsive to three or more logic signal states, or produces three or more different output logic signal states.

2   **Fuzzy neural network:**
This subclass is indented under subclass 1. Subject matter comprising interconnected processors that perform the approximate reasoning.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
15+,   for neural networks having no fuzzy logic hardware.

3   **Analog fuzzy computer (e.g., controller):**
This subclass is indented under subclass 1. Subject matter wherein the circuit arrangement comprises electrical components that perform arithmetic operations upon electrical signals, which are continuously varying representations of physical quantities or which are some function of quantities.

SEE OR SEARCH CLASS:
700,   Data Processing: Generic Control Systems or Specific Applications, subclass 50 for adaptive control using fuzzy logic.
701,   Data Processing: Vehicles, Navigation, and Relative Location, subclass 27 for automatic route guidance using fuzzy logic.
708,   Electrical Computers: Arithmetic Processing and Calculating, subclasses 800 through 854 for electric analog computers.

4   **Digital fuzzy computer (e.g., controller):**
This subclass is indented under subclass 1. Subject matter wherein the circuit arrangement comprises electrical components that perform calculation upon discrete electrical signals representing a value normally described by numerical digits.

SEE OR SEARCH CLASS:
708,   Electrical Computers: Arithmetic Processing and Calculating, subclasses 100 through 714 for digital calculating computers.

5   **Having function generator:**
This subclass is indented under subclass 1. Subject matter wherein the circuit arrangement contains an electrical device capable of producing one or more functions for fuzzy sets.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
7,   for fuzzy logic hardware having a function calculator.

6   **By neural network:**
This subclass is indented under subclass 5. Subject matter wherein the function generator is controlled by a parallel distributed processing processor constructed in hardware or simulated in software.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
15+,   for neural networks having no fuzzy logic hardware.

7   **Having a function calculator:**
This subclass is indented under subclass 1. Subject matter wherein the circuit arrangement contains at least a function calculator.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
5+,   for fuzzy logic hardware having a function generator.

8   **Fuzzy inference processing:**
This subclass is indented under subclass 1. Subject matter wherein a conclusion is deduced from a set of rules based on the approximate reasoning.

9   **Defuzzification processing:**
This subclass is indented under subclass 1. Subject matter wherein the circuit arrangement produces a crisp value for a conclusion.

10   **PLURAL PROCESSING SYSTEMS:**
This subclass is indented under the class definition. Subject matter comprising (1) computers that emulate intelligence connected in parallel or distributed arrangement, or (2) a compound system having as least one significant artificial intelligence system.

(1)   Note. This subclass includes (1) distributed intelligent agent architectures and cooperative distributed problem solving systems, (2) plural reasoning methods, i.e., intelligent hybrid processing systems, and (3) multi-tasking intelligent processing systems.

SEE OR SEARCH THIS CLASS, SUBCLASS:
15+,   for neural network having no fuzzy logic hardware.

SEE OR SEARCH CLASS:
712,   Electrical Computers and Digital Processing Systems: Processing Architectures and Instruction Processing (e.g., Processors), subclasses 1 through 43 for processing architecture.

11   **HAVING PARTICULAR USER INTERFACE:**
This subclass is indented under the class definition. Subject matter wherein presentation of data to a computer operator of a system contains components that enable interaction by (1) nonverbal representations or symbols or (2) statements in standard English syntax

(1)   Note. This subclass includes intelligent processing systems having a hypertext/hypermedia component, a s:graphical user interface component, a natural language component, or a speech interface component.

(2)   Note. This subclass includes interface agent systems, personal assistant systems, and intelligent help systems.

SEE OR SEARCH THIS CLASS, SUBCLASS:
61,   for modification of knowledge processing system using a tool.

SEE OR SEARCH CLASS:
345,   Computer Graphics Processing and Selective Visual Display Systems, subclasses 418 through 475 for computer graphics processing.
715,   Data Processing: Presentation Processing of Document, Operator Interface Processing, and Screen Saver Display Processing, subclasses 700 through 866 for a computer operator interface.

12   **MACHINE LEARNING:**
This subclass is indented under the class definition. Subject matter wherein a system has the capability to automatically add to its current integrated collection of facts and relationships.

(1)   Note. This subclass includes induction, deduction, applications involving learning (i.e., data mining and knowledge discovery) and statistical learning techniques.

SEE OR SEARCH THIS CLASS, SUBCLASS:
14,   for adaptive complex information processing system.
16+,   for neural network learning task.
25,   for neural network learning method

13   **Genetic algorithm and genetic programming system:**
This subclass is indented under subclass 12. Subject matter wherein a system uses a sequence of steps that (1) starts with a group of solutions to a problem, (2) represents each solution as a coded data string, (3) divides and splices a coded data string to create new solutions, and (4) determines fitness of the new solutions.

(1)   Note. This subclass includes evolutionary programming (i.e., learn-acquire knowledge, adapt-adjust).

14 ADAPTIVE SYSTEM:
This subclass is indented under the class definition. Subject matter wherein (1) a system continually adjusts its own set of rules (e.g., learns by example) or (2) a system that evolves in any way into a system which continually adjusts its own set of rules.

(1) Note. This subclass includes tuning membership functions and neural networks that continue to learn after they have been trained (i.e., relearning).

15 NEURAL NETWORK:
This subclass is indented under the class definition. Subject matter including a system which comprises a parallel process performed by a distributed architecture that learns to recognize and classify input data and is (1) constructed in hardware, (2) emulated in software, or (3) a combination of hardware construction and emulation software.

SEE OR SEARCH THIS CLASS, SUB-
CLASS:
2, for fuzzy neural network

SEE OR SEARCH CLASS:
700, Data Processing: Generic Control Systems or Specific Applications, subclass 48 for a neural network used in a control system.
704, Data Processing: Speech Signal Processing, Linguistics, Language Translation, and Audio Compression/ Decompression, subclasses 202+ for neural network in speech signal processing storage, subclasses 232+ for neural network in speech signal processing recognition and subclasses 259+ for neural network in speech signal processing synthesis.

16 Learning task:
This subclass is indented under subclass 15. Subject matter wherein the system is trained to accomplish a specific application.

SEE OR SEARCH THIS CLASS, SUB-
CLASS:
12, for machine learning.

17 Approximation:
This subclass is indented under subclass 16. Subject matter wherein the system estimates a solution to a function from input data.

(1) Note. This subclass includes transformation and function approximation.

18 Association:
This subclass is indented under subclass 16. Subject matter wherein the system learns to identify stored patterns similar to input patterns.

SEE OR SEARCH THIS CLASS, SUB-
CLASS:
20, for neural network having learning task classification or recognition.

19 Constraint optimization problem solving:
This subclass is indented under subclass 16. Subject matter wherein the system finds a best solution from specific input data.

20 Classification or recognition:
This subclass is indented under subclass 16. Subject matter wherein the system learns to categorize or identify input data.

SEE OR SEARCH THIS CLASS, SUB-
CLASS:
18, for neural network having learning task association.

21 Prediction:
This subclass is indented under subclass 16. Subject matter wherein the system learns to forecast future patterns from input patterns.

22 Signal processing (e.g., filter):
This subclass is indented under subclass 16. Subject matter wherein the system intentionally changes characteristics of a conveyer of information.

23 Control:
This subclass is indented under subclass 16. Subject matter wherein the system models, monitors, or regulates a physical system.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

903+,   for cross reference art collection of an artificial intelligence system having details of control.

SEE OR SEARCH CLASS:

700,   Data Processing: Generic Control Systems or Specific Applications, subclasses 1 through 89 for generic data processing control systems, per se.

24   **Beamforming(e.g., target location, radar):**
This subclass is indented under subclass 16. Subject matter wherein the system decides correct direction for a collection of parallel rays.

SEE OR SEARCH CLASS:

250,   Radiant Energy, various subclasses for methods and apparatus involving radiant energy.

342,   Communications: Directive Radio Wave Systems and Devices (e.g. Radar, Radio Navigation), various subclasses for transmission or reception of radio wave energy for obtaining or utilizing information.

359,   Optical: Systems and Elements, various subclasses for optical elements and optical systems not elsewhere classified.

25   **Learning method:**
This subclass is indented under subclass 15. Subject matter wherein the system acquires its internal set of rules.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

12,   for machine learning.

26   **Structure:**
This subclass is indented under subclass 15. Subject matter wherein the system contains construction details of processors or their interconnections.

SEE OR SEARCH CLASS:

326,   Electronic Digital Logic Circuitry, subclasses 36+ for threshold (e.g., majority) digital logic which may be utilizable for neural networks.

27   **Architecture:**
This subclass is indented under subclass 26. Subject matter wherein the structure (1) are organized for a specific network topology or (2) use neural processors to perform specific transform functions.

SEE OR SEARCH CLASS:

712,   Electrical Computers and Digital Processing Systems: Processing Architectures and Instruction Processing (e.g., Processors), subclasses 1 through 43 for processing architecture, in general.

28   **Modular:**
This subclass is indented under subclass 27. Subject matter wherein the architecture comprises a plurality of identical modules of neural networks.

29   **Lattice:**
This subclass is indented under subclass 27. Subject matter wherein the architecture comprises a plurality of locally interconnected neuron processors.

30   **Recurrent:**
This subclass is indented under subclass 27. Subject matter wherein the architecture comprises feedback interconnections.

31   **Multilayer feedforward:**
This subclass is indented under subclass 27. Subject matter wherein the architecture comprises two or more groups of neural processors, where at least one group of neural processors bypasses a group of neural processors.

32   **Single-layer:**
This subclass is indented under subclass 27. Subject matter wherein the architecture comprises one group of processors.

33   **Semiconductor neural network:**
This subclass is indented under subclass 26. Subject matter wherein the structure contains a solid or liquid electronic conductor in which an electrical charge carrier concentration increases with increasing temperature over a temperature range.

SEE OR SEARCH CLASS:
257,   Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), various subclasses for semiconductor devices, per se.

34   Hybrid network (i.e., analog and digital):
This subclass is indented under subclass 26. Subject matter wherein the structure contains analog and digital components.

35   Using pulse modulation:
Subject matter undersubclass 34 wherein the hybrid network uses an electrical voltage having a definite rise and decay that varies in amplitude, frequency or phase.

SEE OR SEARCH CLASS:
332,   Modulators, subclasses 106+   for pulse modulators, per se.

36   Having multiplying digital-to-analog converter:
This subclass is indented under subclass 34. Subject matter wherein the hybrid network contains a device that (1) outputs a product of a magnitude represented by two or more input signals and (2) changes pulse(bit) signals to continuous signals.

SEE OR SEARCH CLASS:
341,   Coded Data Generation or Conversion, subclasses 126+ for analog to or from digital conversion, per se.

37   Having digital weight:
This subclass is indented under subclass 34. Subject matter wherein the hybrid network comprises interconnections of bits (maintained in a binary memory) that represent a numerical value as a function of bit position code word.

38   Analog neural network:
This subclass is indented under subclass 26. Subject matter wherein the structure comprises representations of numerical quantities by means of physical variables.

39   Modifiable weight:
This subclass is indented under subclass 38. Subject matter wherein the analog neural network comprises programmable or adjustable interconnections.

40   Radiant energy neural network:
This subclass is indented under subclass 26. Subject matter wherein the structure contains at least a source or detector of radiant wave energy.

(1)   Note. This subclass includes optical neural networks.

SEE OR SEARCH CLASS:
359,   Optical: Systems and Elements, subclasses 107+ for optical computing, per se.
382,   Image Analysis, various   subclasses for subject matter wherein an image is detected and significant analysis of an image is performed.

41   Digital neural network:
This subclass is indented under subclass 26. Subject matter wherein the structure contains a processing component that can assume only two values.

42   Parallel connection:
This subclass is indented under subclass 41. Subject matter comprising an interface in which all bits of data in a given byte are transferred simultaneously, using separate data lines for each bit.

43   Digital neuron processor:
This subclass is indented under subclass 41. Subject matter wherein a node of the system comprises logic circuitry that assumes binary values.

44   Neural simulation environment:
This subclass is indented under subclass 15. Subject matter comprising an apparatus (or method) for developing substitution or testing of actual operational conditions of the system using a general purpose digital computer.

(1)   Note. This subclass includes neural network shells and tools.

SEE OR SEARCH THIS CLASS, SUBCLASS:
60,   for knowledge processing tools.

703,   Data Processing: Structural Design, Modeling, Simulation, and Emulation, appropriate subclasses.
717,   Data Processing: Software Development, Installation, and Management, subclasses 100 through 167 for software program development tools.

45   KNOWLEDGE PROCESSING SYSTEM:
This subclass is indented under the class definition. Subject matter wherein a system comprises specific domain data that (1) is integrated as a collection of facts and relationships (i.e., knowledge representation) and (2) applies a reasoning technique.

(1)   Note. This subclass and subclasses indented hereunder provide for details of (1) expert systems or (2) operation of expert systems (either stand alone expert systems or expert systems interacting with other systems).

(2)   Note. This subclass and subclasses indented hereunder provide for creation and maintenance of expert systems.

(3)   Note. This subclass array accepts combinations of an art class device, or art class method, with artificial intelligence techniques not elsewhere provided for in USPC. This can include mechanical systems, electromagnetic systems, acoustic systems, thermal systems, photonic systems, chemical systems, biological systems, nanomachines and quantum mechanical systems where data or signals are processed according to artificial intelligence methods. A searcher should also consider the relevant art classes and at least the following data processing classes: 700, Data Processing: Generic Control Systems or Specific Applications; 701, Data Processing: Vehicles, Navigation, and Relative Location; 702, Data Processing: Measuring, Calibrating, Or Testing; 703, Data Processing: Structural Design, Modeling, Simulation, and Emulation.

(4)   Note. This class can accept combinations of data processing arts with artificial intelligence techniques not elsewhere provided for in USPC. Data processing art in combination with AI can include internet systems, intranet systems, client-server systems, database systems, computer interface systems, multi agent collaboration systems (e.g., societies of agents, groupware), groupware per se, distributed intelligent systems, multi agent systems distributed intelligences, blackboard collaborative systems, social networking methods, hacker detection (e.g., spam detection, data mining, data farming) and artificially intelligent action systems (e.g., web page ranking systems, Eigentrust systems).

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A searcher should consider at least the relevant related data processing classes on a case by case basis such as: 700, Data Processing: Generic Control Systems or Specific Applications; 704, Data Processing: Speech Signal Processing, Linguistics, Language Translation, and Audio Compression/Decompression; 705, Data Processing: Financial, Business Practice, Management, or Cost/Price Determination; 707, Data Processing: Database, Data Mining, and File Management or Data Structures; 709, Electrical Computers and Digital Processing Systems: Multicomputer Data Transferring; 710, Electrical Computers and Digital Data Processing Systems: Input/Output; 712, Electrical Computers and Digital Processing Systems: Processing Architectures And Instruction Processing (e.g., Processors); 713, Electrical Computers and Digital Processing Systems: Support; 714, Error Detection/Correction and Fault Detection/Recovery; 715, Data Processing: Presentation Processing of Document, Operator Interface Processing, and Screen Saver Display Processing; 716, Data Processing: Design and Analysis of Circuit or Semiconductor Mask; 717, Data Processing: Software Development, Installation, and Management; 718, Electrical Computers and Digital Processing Systems: Virtual

Machine Task or Process Management or Task Management/Control; 719, Electrical Computers and Digital Processing Systems: Interprogram Communication or Interprocess Communication (IPC); 726, Information Security.

(5)   Note. This class can accept combinations of data processing arts with artificial intelligence techniques not elsewhere provided for in USPC. Data processing art in combination with AI can include Human Computer Interface (HCI). HCI AI may include Telerobotics, Human Supervisory Control (e.g., Waypoint Navigation), Brain-Computer Neural Interfaces (e.g., Thought Controlled Devices, Brain Interfaces) and Chatbots (aka Chatterbots) (e.g., AIML).

(6)   Note. Artificial Intelligence methods include, but are not limited to: Supervised learning classifiers, unsupervised learning classifiers, reinforcement learning, statistical learning, theorem proving, boosting classifiers, dimensionality reduction, multiresolution analysis, wavelets, quantum AI systems, nanotechnology AI systems, augmented reality systems, pattern recognition systems and automated planning systems.

(7)   Note. Artificial Intelligence preprocessing methods include Dimensionality Reduction (reduced feature space, subspace) via Principal Component Analysis (PCA), Kernel Principal Component Analysis (KPCA), Nonlinear Principal component analysis, Independent component analysis (ICA), Singular Value Decomposition (SVD), Eigenface, Kernel Eigenface, Eigenvoice, Kernel Eigenvoice, Self Organizing Map (SOM), Growing Self Organizing Map, Linear Discriminant Analysis (LDA), Fisher's linear discriminant, Linear-Nonlinear Poisson (LNP) Cascade, Multifactor Dimensionality Reduction, Data fusion, Sensor fusion, Image fusion.

(8)   Note. Multiresolution Analysis methods include Wavelet transforms, Wavelet series, Wavelet packet, Fast Wavelet Transform, Pyramid generation.

(9)   Note. Artificial Intelligence Learning methods fall into three broad categories, namely, Supervised Learning, Unsupervised Learning, and Reinforcement Learning.

(10)   Note. Inventive combinations or subcombinations for Supervised Learning Classifiers that may be classified in this class include k-Nearest Neighbor Systems, Fuzzy Logic (e.g., Possibility theory), Neural Networks, Spin Glass Analog Systems, Simulated Annealing, Boltzmann Machines, Vector Quantization, Restricted Coulomb Energy (RCE), Kohonen, Neural Gas, Growing Neural Gas, Pulsed Neural Nets, Support Vector Machines, Maximum Margin Classifiers, Hill-Climbing, Inductive Logic Systems, Bayesian Networks, Belief Networks, Dempster-Shafer Theoretic Network Systems, Gaussian Mixtures, Kriging, Petri Nets (e.g., Finite State Machines, Mealy Machines, Moore Finite State Machines) and Ensembles of Classifiers (e.g., Bagging Systems, Boosting Systems ADABOOST, Classifier trees (e.g., Perceptron trees, Support vector trees, Markov trees, Decision Tree Forests, Random Forests) and Pandemonium Models and Systems.

(11)   Note. Inventive combinations or subcombinations for Unsupervised Learning Classifiers that may be classified in this class include Evolutions strategie, Evolutionary Systems, Clustering, Blind Source Separation, Blind Signal Separation, Blind Deconvolution, Self-organizing Maps, Tabu Search.

(12)   Note. Inventive combinations or subcombinations for Reinforcement Learning Methods that may be classified in this class include Reinforcement Neural Networks.

(13)   Note. Inventive combinations or subcombinations for Artificial Intelligence Learning Hardware can include Memistors, Memristors, Transconductance amplifiers, Pulsed Neural Circuits, Artificially Intelligent Nanotechnology Sys-

tems (e.g., Autonomous nanomachines) or Artificially Intelligent Quantum Mechanical Systems (e.g., Quantum Neural Networks).

(14) Note. Inventive combinations or sub-combinations for Artificial Intelligence Automatic Pattern Recognition Systems can include Machine Vision Systems, Acoustic Recognition Systems, Hand-writing Recognition Systems, Data Fusion Systems, Sensor Fusion Systems, Soft Sensors. Machine Vision Systems can also include Content Based Image Retrieval, Optical Character Recognition, Augmented Reality, Egomotion, Tracking or Optical flow.

(15) Note. Inventive combinations or sub-combinations for Automatic Planning and Decision Support Systems can include Emergent systems, Artificially Intelligent Planning, Decision Trees, Petri Nets, Artificially Intelligent Forecasting, which may be properly classifiable in this class.

SEE OR SEARCH CLASS:
370,   Multiplex Communications, subclasses 259 through 271 for multiplexed communications enabling three or more terminals to be included in a single call connection.
700,   Data Processing: Generic Control Systems or Specific Applications, subclass 49 for a knowledge processing (e.g., an expert system) adaptive control.
707,   Data Processing: Database, Data Mining, and File Management or Data Structures, subclasses 600 through 606 for online analytical processing and decision support in a database environment, subclass 607 for online transactional processing, subclass 608 for collaborative document database and workflow, subclass 637 for optimizing database replication, subclass 665 for rule based database archiving, subclasses 705 through 711 for aspects or search engines in databases, subclasses 723 through 735 for various aspects of ranking search results in the database art, subclasses 736 through 740 for clustering and cataloging in the database art, subclasses 765 through 767 for query refinement and recommending or suggesting search terms, subclasses 776 through 777 for data mining and taxonomy discovery in database arts, subclass 780 for fuzzy search and comparison, subclass 794 for semantic networks, subclasses 797 through 801 for generic data structures.
709,   Electrical Computers and Digital Processing Systems: Multicomputer Data Transferring, subclass 204 for computer conferencing for enabling collaborative processing of data by the computers or digital data processing systems.
715,   Data Processing: Presentation Processing of Document, Operator Interface Processing, and Screen Saver Display Processing, subclasses 733 through 759 for concurrently established related or collaborative user interfaces including computer conferencing and computer supported cooperative work.

46   **Knowledge representation and reasoning technique:**
This subclass is indented under subclass 45. Subject matter wherein a process or system uses a specific (1) method or system for processing the integrated collection of facts and relationships, (2) inferencing method or system, (3) method or system for interconnecting parts of an expert system, (4) internal or external structured data accessing method or system, or (5) method or system for searching the integrated collection of facts and relationships.

47   **Rule-based reasoning system:**
This subclass is indented under subclass 46. Subject matter comprising an inferencing method or system using logic processing that (1) starts with a set of known facts and applies rules to the facts until no new facts are generated (i.e., forward chaining), or (2) starts with a goal, finds rules to fit the goal, and checks to determine if known facts fit the rules (i.e., backward chaining).

(1) Note. This subclass includes event-driven rule-based reasoning, hypotheti-

cal reasoning and rules having priority ordering.

48 Having specific pattern matching or control technique:
This subclass is indented under subclass 47. Subject matter comprising a system that (1) uses a reticular network algorithm of the collection of facts and relationships, (2) uses a hierarchy of collections (i.e., a higher level integrated collection of facts and relationships about a lower level integrated collection of facts and relationships) or (3) resolves conflicts to determine a firing order for rules.

49 Blackboard system:
This subclass is indented under subclass 46. Subject matter comprising a specific method or system for interconnecting parts of the knowledge processing system and having a special memory (i.e., blackboard) that allows data from one part of the knowledge processing system to be written so that it can be accessed by other parts of the knowledge processing system.

50 Having specific management of a knowledge base:
This subclass is indented under subclass 46. Subject matter comprising a specific data accessing method or system (such as a database management or a lookup table) to access a database containing information of the knowledge processing system (i.e., knowledge base).

(1) Note. This subclass includes storage and retrieval (e.g., KBMS, DBMS, content-addressable memory, table, etc.).

SEE OR SEARCH CLASS:
707, Data Processing: Database, Data Mining, and File Management or Data Structures, appropriate subclasses for information processing system database and file management, per se.

51 Non-monotonic reasoning system:
This subclass is indented under subclass 46. Subject matter wherein processing of the integrated collection of facts and relationships contains belief revision (tracking dependencies among propositions).

(1) Note. This subclass includes truth maintenance systems.

52 Reasoning under uncertainty (e.g., fuzzy logic):
This subclass is indented under subclass 46. Subject matter wherein the integrated collection of facts and relationships contain inexact knowledge.

(1) Note. This subclass provides for confidence factors, fuzzy logic, membership functions, qualitative reasoning, probabilistic logic, or uncertainty factors.

SEE OR SEARCH THIS CLASS, SUBCLASS:
1, for fuzzy logic hardware.
900, for cross reference art collection of a data processing system having fuzzy logic processing and no fuzzy logic hardware.

53 Frame-based reasoning system:
This subclass is indented under subclass 46. Subject matter wherein the integrated collection of facts and relationships (1) is connected in a hierarchy of levels that allow facts or relationships missing in a lower level to be inherited from a connected higher level, (2) uses a set of slots related to a specific object, each slot storing a feature of the object, (3) uses an outline (i.e., a script) of an episode of a certain type, or (4) uses a name of some item (i.e., an object) in either an object attribute-value triplet or an object-attribute pair.

SEE OR SEARCH THIS CLASS, SUBCLASS:
54, for knowledge processing system using analogical reasoning.
55, for knowledge processing system having a semantic network.

54 Analogical reasoning system:
This subclass is indented under subclass 46. Subject matter wherein the integrated collection of facts and relationships (1) is in an object having a set of attributer value pairs and (2) has retrieval based on a measure or similarity between query and stored objects.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
53,   for knowledge processing system using frame-based reasoning.

55   Semantic network (i.e., conceptual dependency, fact based structure):
This subclass is indented under subclass 46. Subject matter wherein the integrated collection of facts and relationships formalizes object and values as nodes, and connects the nodes with arcs that indicate relationships between the various nodes.

(1)   Note. This subclass includes conceptual graphs and connectionist systems.

56   Predicate logic or predicate calculus:
This subclass is indented under subclass 48. Subject matter wherein the integrated collection of facts and relationships uses a complex reasoning system formed with symbols (arguments and predicates).

(1)   Note. A notation of predicate logic is either xPy or P(x,y)

(2)   Note. Predicate logic is usually considered an extension of propositional logic.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
57,   for knowledge processing system having propositional logic.

57   Propositional logic:
This subclass is indented under subclass 46. Subject matter wherein the integrated collection of facts and relationships uses a reasoning system formed with truth values (e.g., X is a metal, if C then D) or logic connectives (e.g., and, or, not).

SEE OR SEARCH THIS CLASS, SUB-CLASS:
56,   for knowledge processing system having predicate logic or predicate calculus.

58   Temporal logic:
This subclass is indented under subclass 46. Subject matter wherein the integrated collection of facts and relationships contain data having a representation for an aspect of time.

59   Creation or modification:
This subclass is indented under subclass 45. Subject matter comprising software or hardware for initially developing or altering a knowledge processing system.

(1)   Note. This subclass includes knowledge acquisition techniques.

60   Expert system shell or tool:
Subject matter under 59 wherein the software for developing a knowledge processing system (1) provides an interface to a knowledge base or a knowledge processing system or (2) contains an inference engine, a user interface, and knowledge acquisition aids, but no knowledge base (i.e., a "tool").

SEE OR SEARCH CLASS:
715,   Data Processing: Presentation Processing of Document, Operator Interface Processing, and Screen Saver Display Processing, subclasses 700 through 866 for a computer operator interface.

61   Knowledge acquisition by a knowledge processing system:
This subclass is indented under subclass 59. Subject matter wherein the system automatically adds to its current integrated collection of facts and relationships.

(1)   Note. This subclass includes automatic generation of rules or membership functions by a knowledge processing system.

62   MISCELLANEOUS:
This subclass is indented under the class definition. Subject matter not provided for in any of the preceding subclasses.

CROSS-REFERENCE ART COLLECTIONS

900　FUZZY LOGIC:
This subclass is indented under the class definition. Subject matter comprising data processing with inexact reasoning implemented using set membership functions.

SEE OR SEARCH CLASS:
700,　Data Processing: Generic Control Systems or Specific Applications, subclass 50 for adaptive control using fuzzy logic.
701,　Data Processing: Vehicles, Navigation, and Relative Location, subclass 27 for automatic route guidance using fuzzy logic.

902　APPLICATION USING AI HAVING DETAIL OF THE AI SYSTEM:
This subclass is indented under the class definition. Subject matter comprising an expert system having a specific area of application.

903　Control:
This subclass is indented under subclass 902. Subject matter wherein the expert system provides control data.

904　Manufacturing or machine (e.g., agriculture machinery, machine tool):
This subclass is indented under subclass 903. Subject matter wherein the application is related to manufacturing or machinery.

905　Vehicle or aerospace:
This subclass is indented under subclass 903. Subject matter wherein the application is related to a vehicle or aerospace.

906　Process plant:
This subclass is indented under subclass 903. Subject matter wherein the application is related to a process plant.

907　Power plant:
This subclass is indented under subclass 906. Subject matter wherein the process plant is a power plant.

908　Electronic or computer(internal or network) circuit:
This subclass is indented under subclass 903. Subject matter wherein the application is related to an electronic circuit, or to the internal operation of a computer or its connection in a network.

909　Communication:
This subclass is indented under subclass 903. Subject matter wherein the application is related to communication.

910　Elevator:
This subclass is indented under subclass 903. Subject matter wherein the application area is related to an elevator.

911　Nonmedical diagnostics:
This subclass is indented under subclass 902. Subject matter wherein the expert system provides nonmedical diagnostic data.

912　Manufacturing or machine (e.g., agriculture machinery, machine tool):
This subclass is indented under subclass 911. Subject matter wherein the application is related to manufacturing or machinery).

913　Vehicle or aerospace:
This subclass is indented under subclass 911. Subject matter wherein the application is related to a vehicle or aerospace.

914　Process plant:
This subclass is indented under subclass 911. Subject matter wherein the application is related to a process plant.

915　Power plant:
This subclass is indented under subclass 914. Subject matter wherein the process plant is a power plant.

916　Electronic or computer (internal or network) circuit:
This subclass is indented under subclass 911. Subject matter wherein the application is related to an electronic circuit, or to the internal operation of a computer or its connection in a network.

917　Communication:
This subclass is indented under subclass 911. Subject matter wherein the application is related to communication.

918   **Elevator:**
This subclass is indented under subclass 911. Subject matter wherein the application area is related to an elevator.

919   **Designing, planning, programming, CAD, CASE:**
This subclass is indented under subclass 902. Subject matter wherein the expert system provides data related to designing of an object, plan preparation, program preparation, computer aided design (i.e., CAD), or computer aided software engineering (i.e., CASE).

920   **Simulation:**
This subclass is indented under subclass 919. Subject matter wherein the expert system provides simulation related data, e.g., three-dimensional computer simulation of a piston of a car on a computer screen.

921   **Layout (e.g., circuit, construction):**
This subclass is indented under subclass 919. Subject matter wherein the expert system provides layout related data, e.g. computer circuit layout or building layout.

922   **Computer program preparation:**
This subclass is indented under subclass 919. Subject matter wherein the expert system provides computer program preparation related data.

923   **Construction:**
This subclass is indented under subclass 919. Subject matter wherein the expert system provides data related to construction industry, e.g., building codes.

924   **Medical:**
This subclass is indented under subclass 902. Subject matter wherein the expert system provides medical related data.

925   **Business:**
This subclass is indented under subclass 902. Subject matter wherein the expert system provides business related data.

926   **Time management:**
This subclass is indented under subclass 925. Subject matter wherein the data is time management data.

927   **Education or instruction:**
This subclass is indented under subclass 902. Subject matter wherein the expert system provides education or instruction data.

928   **Earth science:**
This subclass is indented under subclass 902. Subject matter wherein the expert system provides earth related science data.

929   **Geological (e.g., seismology):**
This subclass is indented under subclass 928. Subject matter wherein the expert system provides geology related data.

930   **Environment:**
This subclass is indented under subclass 928. Subject matter wherein the expert system provides environment related data.

931   **Weather:**
This subclass is indented under subclass 930. Subject matter wherein the data is weather data.

932   **Mathematics, science, or engineering:**
This subclass is indented under subclass 902. Subject matter wherein the expert system provides mathematics, science or engineering related data.

933   **Law, law enforcement, or government:**
This subclass is indented under subclass 902. Subject matter wherein the expert system provides law, law enforcement, or government related data.

934   **Information retrieval or information management:**
This subclass is indented under subclass 902. Subject matter wherein the expert system provides information retrieval or information management related data.

FOREIGN ART COLLECTIONS

The definitions below correspond to the definitions of the abolished subclasses under Class 395 from which these collections were formed. See the Foreign Art Collections schedule for specific correspondences. [Note: The titles and definitions for indented art collections include all the details of the one(s) that are hierarchically superior.

FOR 100 ARTIFICIAL INTELLIGENCE:
Foreign art collection including subject matter wherein the system or method has the capacity to perform one or more of the functions of recognition, speech signal processing, knowledge processing (i.e., propositional logic, reasoning, learning, self-improvement), complex operations of a manipulator (e.g., robot* control), or inexact reasoning (e.g., fuzzy logic).

FOR 101 Fuzzy logic hardware:
Foreign art collection including subject matter wherein the system includes a specific circuit arrangement for performing logic with more than two levels, e.g., nonbinary or analog logic systems.

FOR 102 Knowledge processing:
Foreign art collection including subject matter wherein the system or method (1) has the capacity to process knowledge (i.e., data comprised of an integrated collection of facts and relationships), (2) has the capacity to generate its own set of rules (e.g., trainable processors), (3) structurally duplicates the human brain (e.g., neural networks), (4) functionally duplicates a law of nature (e.g., inheritance, evolution, etc.), or (5) has the capacity for solution of problems in these areas.

FOR 103 Plural processing systems:
Foreign art collection including subject matter comprising two or more systems, or methods utilizing two or more systems, wherein at least one system is a knowledge processing system.

FOR 104 Graphical or natural language user interface:
Foreign art collection including subject matter wherein presentation of data to the user of the system includes nonverbal representations or symbols, or statements in standard English language syntax.

FOR 105 Genetic algorithms:
Foreign art collection including subject matter wherein the system uses a sequence of steps that (1) starts with a group of solutions to a problem, (2) represents each solution as a coded data string, (3) divides and splices the coded numerical strings to create new solutions, and (4) determines the fitness of the new solutions.

FOR 106 Trainable (i.e., adaptive) systems:
Foreign art collection including subject matter wherein (1) the system creates its own set of rules (i.e., connection weights) (e.g., learns by example) or wherein (2) the data processing method involves in any way a system which creates its own set of such rules.

FOR 107 Neural networks:
Foreign art collection including subject matter wherein the system uses parallel distributed processing processors constructed in hardware or simulated in software. 800.01+, (see (1) Note, above).

FOR 108 Connectionist expert systems:
Foreign art collection including subject matter wherein the parallel distributed processing processors have been trained to be an expert system, that is, to process data formed by an integrated collection of facts and relationships (i.e., knowledge).

FOR 109 Training (i.e., programming or learning):
Foreign art collection including subject matter wherein a specific method or apparatus is used to adjust the rules (i.e., connection weights).

FOR 110 Structures:
Foreign art collection including details of the construction of the processing processors or their interconnections.

FOR 111 Radiant energy type (e.g., optical):
Foreign art collection including subject matter wherein the structure includes a source or detector of radiant wave energy.

FOR 112 Sequential processor:
Foreign art collection including subject matter wherein the structure comprises one or more computers that process software step-by-step.

FOR 113 Including a digital or binary element:
Foreign art collection including subject matter wherein the structure includes a process-

ing component that can assume only two values.

FOR 114   Expert systems:
Foreign art collection including subject matter comprising a system wherein the data consists of an integrated collection of facts and relationships (i.e., knowledge).

FOR 115   Deduction, control, or search techniques:
Foreign art collection including subject matter wherein a process or system uses a specific (1) method or system for processing the integrated collection of facts and relationships, (2) inferencing method or system, (3) method or system for interconnecting parts of the expert system, (4) internal or external structured data accessing method or system, or (5) method or system for searching the integrated collection of facts and relationships.

FOR 116   Forward or backward chaining:
Foreign art collection including an inferencing method or system using logic processing that starts with a set of known facts and applies rules to the facts until no new facts are generated or a goal is reached (i.e., forward chaining), or logic processing that starts with a goal and then finds rules to fit the goals and then checks to see if known facts fit the found rules (i.e., backward chaining).

FOR 117   Blackboarding:
Foreign art collection including subject matter wherein a specific method or system for interconnecting parts of the expert system uses a special memory (i.e., blackboard) where data from one part of the expert system can be written so that it can be accessed by other parts of the expert system.

FOR 118   Knowledge base accessing (e.g., DBMS, table):
Foreign art collection including subject matter wherein a specific data accessing method or system, such as a database management system or a lookup table, is used to access a database containing the knowledge of the expert system (i.e., the knowledge base).

FOR 119   Truth maintenance systems (TMS):

Foreign art collection including subject matter wherein the processing of the integrated collection of facts and relationships include belief revision by tracking dependencies among propositions and informing a user as to which propositions can be believed.

FOR 120   Knowledge representations:
Foreign art collection including subject matter wherein a process or system uses (1) a specific type of relationship in the integrated collection of facts and relationships, (2) a specific type of integrated collection of facts and relationships, or (3) a specific type of fact in the integrated collection of facts and relationships.

FOR 121   For inexact knowledge (e.g., fuzzy logic):
Foreign art collection including subject matter wherein the facts or relationships include a weight value other than 1 (e.g., 1/2, .5, 1.5, 60%).

FOR 122   Objects (i.e., object-attribute-value), frames and slots, or scripts:
Foreign art collection including subject matter wherein the specific integrated collection of facts and relationships uses (1) a set of slots (i.e., a frame) related to a specific object, each slot storing a feature of the object, (2) an outline (i.e., a script) of an episode of a certain type, or (3) the name of some item (i.e., an object) in either an object-attribute-value triplet or an object-attribute pair.

FOR 123   Semantic network (i.e., conceptual dependency, fact based structure):
Foreign art collection including subject matter wherein the specific integrated collection of facts and relationships formalizes objects and values as nodes, and connects the nodes with arcs or links that indicate the relationships between the various nodes.

FOR 124   Rete network or meta-knowledge:
Foreign art collection including subject matter which (1) uses a reticular network algorithm on the collection of facts and relationships (e.g., is formed of subcollections which are searched in parallel) or (2) includes a hierarchy of collections, i.e., a higher level integrated collection of facts and relationships about a lower level inte-

grated collection of facts and relationships (i.e., knowledge about knowledge).

FOR 125   Inheritance:
Foreign art collection including subject matter wherein the specific integrated collection of facts and relationships is connected in a hierarchy of levels which allow facts or relationships missing in a lower level to be taken (i.e., inherited) from a connected higher level where they are present.

FOR 126   Predicate logic or predicate calculus:
Foreign art collection including subject matter wherein the specific integrated collection of facts and relationships uses a complex logic system formed with arguments and predicates.

FOR 127   Propositional logic:
Foreign art collection including subject matter wherein the specific integrated collection of facts and relationships uses a simple logic formed with truth values (e.g., "X is a metal," "if C then D") or logic connectives (e.g., and, or, not).

FOR 128   History base:
Foreign art collection including subject matter wherein the specific integrated collection of facts and relationships include historical data (i.e., data collected over a period of time) about the expert system or about the area of expertise.

FOR 129   Creation or modification of an expert system:
Foreign art collection including subject matter comprising means (i.e., software or hardware) for initially developing or altering the expert system.

FOR 130   Expert system shells or tools:
Foreign art collection including subject matter wherein the software for developing an expert system (1) contains an inference engine, a user interface, and knowledge acquisition aids, but no knowledge base (i.e., a "tool") or (2) provides an interface to such a tool or an expert system (i.e., a "shell").

FOR 131   Learning or knowledge acquisition by the expert system:

Foreign art collection including subject matter wherein the existing expert system has the capability to automatically add to its current integrated collection of facts and relationships.

END