Title of the tutorial: Reinforcement and Systemic Learning for Decision-Making

Tutors:
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Abstract of the Tutorial:
In real life scenarios, perspective and in effect the requirements of data are changing dynamically. Knowing the real relevance of data with a particular context is not an easy task. This tutorial discusses learning methodologies from the systemic perspective of learning. The data that is most important from certain perspective may become irrelevant from the other perspective. The equations of data requirements and their relevance are changing with change in scenarios and context. The reinforcement learning and systemic learning methodologies try to capture this context with systemic perspective. This tutorial will cover different aspects of systemic machine learning and its use for decision-making. The learning of Adaptive and semi-supervised nature not only allows the system to learn for labeled and un-labeled data but the analysis of system and identification of leverage points can help in making learning more effective. This tutorial will cover different aspects of systemic paradigm learning along with their application.

Rationale and Objective of Presenting Tutorial:
Learning is one of the major components of all intelligent systems. Learning can make possible better data-mining and better decision-making. While doing the active research in the areas of Machine learning, AI and working with a dozen commercial products in this area for close to two decades, we realized that the major limitations of intelligent systems lies in the way they learn. The learning paradigm in most of the cases is too artificial and too much driven by the results. The real adaptive learning and the methodologies for semi-supervised learning need to be studied at greater length and depth to make intelligent decision-making possible. The machine learning systems and techniques are more like superficial and the learning methodologies beneath are to be

analyzed. The rationale of this tutorial is to take audience close to these methodologies and studies in detail the advantages and disadvantages of these methodologies. The learning techniques in many cases exist in isolation and are with a particular perspective. Providing a multi-perspective learning and a common thread among different learning methodologies with new learning paradigm can help in building a platform for Advanced Machine learning. This tutorial has a purpose to provide different learning perspective and research attempts made to make multi-perspective learning possible. The major objective of this tutorial is to introduce the new adaptive and semi-supervised learning methodologies and their significance with reference to data mining and intelligent application building. This tutorial will discuss various machine learning methods with reference to new paradigm of systemic and multi-perspective machine learning.

Target Audience and their background:
- Individuals, students, professionals and researchers working in the area of machine learning or AI
- Researchers working in the area of advanced machine learning
- Professionals working with the software products related to machine learning
- Computer science student aspirant of career in machine learning, decision-making

Short bio of the Tutors:
Dr. Parag Kulkarni:
Qualification: Ph.D., M.E., B.E., Masters Certification in Management-BLP, ADCL (Cyber Laws).

Parag Kulkarni is Chief Scientist at Capsilon Research Labs, Pune. He is an alumnus of IIT and IIM. He has completed his Ph.D. in Computer Engineering from IIT Kharagpur. He has been working in IT industry for last 18 years. He has worked as Research head, operations head, GM and was involved in bringing up two startups to speed. Under his leadership and guidance one startup grown from five employees to 50 employees and launched its product to market successfully. His research and ideas in the areas of image processing and clustering resulted in products those later became commercially successful. He has more than 80 International publications and two patents pending in US PTO. He has written two books, many research articles and his one book on Decision science is in press. He is/was member of 'IASTED technical committee', 'WSEAS working committee', board of studies of two institutes and is guiding 7 Ph.D. students. He has conducted more than 25 tutorials at various international conferences and was a keynote speaker for Six international conferences. He has given more than dozen talks in the area of Machine Learning. He is also invited as a visiting faculty to conduct special sessions at IIMs, IITs, Symbiosis, FTMS, DIAT, NICMAR Pune and Pune University. He is honored with the title of honorary professor by two prime institutes in Pune. He is an Adjunct Professor at COEP – a prime technical institute in Pune. He is mentor for Truba Group. He is involved in active research-work in the areas of mind-maps, AI, Decision systems, knowledge management and forecasting.

Author of books "Deliverance from success" and "IT strategy for Business" Parag has

more than a decade long experience of product development in the area of decision systems and forecasting. His books "Advanced Machine Learning Methodologies", and "E-Business Models" are in press His areas of research and product development include M-maps, systemic machine learning, text mining, image processing, Decision systems, forecasting, knowledge management, IT strategy, classification, distributed computing, AI and machine learning.

Mr. Shankar Lal:
Qualification: Master of Technology (M.Tech.) in Computer Science and Engineering from IIT Madras.
Shankar Lal joined Defence Research and development Organization (DRDO) at Defence Laboratory, Jodhpur in 1990 and is currently pursuing PhD in "network behaviour analysis" from Defence Institute of Advanced Technology (DIAT), Pune. He has been involved in Design and Development of various Defence related projects. His areas of interest have been "Real Time Data Acquisition", Algorithms, Networks, AI and Machine Learning. He is engaged in Teaching and R&D activities at DIAT, Pune since 2003.

Outline of the Tutorial:

Contents and Time Allocation:

1. Introduction (30 Min)
- What is Machine Learning?
- Systemic Learning
- Supervised, Unsupervised and Semi-supervised Learning
- Advances in Learning and Data Mining
- Rough Sets
- Various Leaning methods.
- Pattern Based Learning and classification
- Learning and Decision Support systems
- Learning and representation of knowledge
2. Adaptive and Reinforcement Learning (30 Min)
- What is adaptive learning?
- Behavioral patterns and Adaptive learning
- Reinforcement Learning
- Environment and target function
- Advanced semi-supervised learning
- Building knowledge
- Adaptive decision-making
- Perspective and biases
3. Role of Rough sets in learning
- Basics of Rough Sets
- Rough sets in systemic learning

- Dimension and boundary related issues
- Boundary related issues with reference to systemic learning
- Rough sets for multi-perspective learning
- Rough set applications

4. Multi-perspective learning and intelligent data mining (30 Min)
- Capturing and representing perspectives
- Un-supervised perspective based learning
- Intelligent merging of perspectives
- System Interactions
- Hybrid, multi-perspective and adaptive Learning methodologies
- New learning paradigm
- Intelligent data mining
- Distributed data mining
- Learning driven data mining

5. Systemic learning and Case studies (40 Min)
- Systemic learning
- Reinforcement Learning and Systemic Learning
- Interacting with the environment
- Tracking system behavior in dynamic scenarios
- System learning and reinforcement learning
- Industrial applications
- Knowledge Management
- Business Decision Making

6. Knowledge Management aspects of Learning and Decision-making (30 Min)
- Knowledge building in systems
- Association
- Role of decision-making in knowledge life cycle
- Impact analysis and knowledge building
- Trends and Future scope

7. Concluding remarks. (20 Min)

Approximate Length of Tutorial: 3-4 Hours