



ARTIFICIAL INTELLIGENCE (AI) IN ONCOLOGY

A 3-HOUR TALK, DISCUSSION AND Q&A

PRESENTED BY

RISK LATTE AI
(A UNIT OF RISK LATTE AMERICAS INC.)

I. **The Lay of the Land** [10 to 15 minutes]

- i. “Similarity”, one of the paths to AI
- ii. “Similarity” – the cure for Rare Cancer, Einstein’s theory of Relativity,
- iii. Similarity between Medicine and Computer Science
- iv. Birth of AI in Medicine: 1959 paper by Robert Ledley & Lee Lusted
- v. A very Brief History of AI in Medicine
- vi. Two possible ways of creating an Artificially Intelligent Doctor
- vii. In the land of Analogical AI

II. **Introduction** [15 to 20 minutes]

- i. What is Artificial Intelligence (AI)?
- ii. What is Machine Learning?
- iii. Difference between Machine Learning and AI
- iv. Why Machine Learning?
- v. Symbolic, Sub-Symbolic and Analogical AI

III. **Machine Learning Schools of Thoughts and Algorithms** [30 minutes]

[Laptop or PC Usage with Microsoft Excel]

- i. Connectionist School (Sub-Symbolic AI)
 - Backpropagation (Neural Network architecture)
 - CNN, RNN, Perceptrons, etc.
- ii. Symbolists (Symbolic AI or the GOFAI)
 - Decision Trees
 - Random Forests
- iii. Evolutionary Computing (Sub-Symbolic AI)
 - Genetic Algorithm
 - Particle Swarm Optimization
 - ABC, ACO
- iv. Analogism (Analogical AI)
 - Nearest Neighbours
 - Support Vector Machines

- v. Bayesian
 - Naïve Bayes
 - Hidden Markov Models
 - Markov Logic Networks

IV. Machine Learning in Oncology [1 hour]
Laptop or PC Usage with Microsoft Excel/VBA

- i. Classification Problem in Oncology/medicine
- ii. k-Nearest Neighbour (k-NN) Algorithm in Detail
- iii. Support Vector Machine Algorithm in Detail
- iv. Example 1: Lymphoma Prognosis using k-NN
- v. Example 2: Heart Disease using k-NN
- vi. Example 3 & 4: Breast Cancer Diagnosis using k-NN
- vii. Example 5: Breast Cancer Diagnosis using SVM

V. Beyond Supervised Learning [20 minutes]

- i. Unsupervised Learning (K-Means Clustering Algorithm)
- ii. Reinforcement Learning
- iii. The Future of Machine Learning: Meta-learning

VI. Support Vector Machines in Computational Biology [15 minutes]

- i. Revisiting Similarity and Kernels
- ii. Kernel methods in Computational Biology
- iii. Application of Support Vector Machines (Prediction along the DNA or Protein Strand, Classification of Genes and Proteins, Microarray Gene Expression Analysis, etc.)

VII. An Aside: Mathematical Oncology – Models & Algorithms [20 minutes]

- i. Formal Birth of Mathematical Oncology: Mackay-Glass Equation
- ii. Delay Differential Equations in Oncology
- iii. Branching and Moran processes
- iv. Hybrid Models in Cancer
- v. Evolutionary Game Theory in Cancer Biology
- vi. Intersection of Mathematical Oncology and Machine Learning
- vii. Mackay Glass Chaotic Time Series using Neural Networks

VIII. **Beyond Machine Learning, Towards AI** [15 minutes]

- i. Computer vision and Robotics
- ii. Knowledge Representation
- iii. Natural Language Processing – the greatest challenge!

IX. **Towards AI in Oncology** [10 minutes]

- i. Challenge of datasets
- ii. Choice and Design of Algorithms
- iii. Natural Language, Semantic Nets and UML systems
- iv. Q & A

Date & Venue

Saturday, 13th April 2019
Tata Medical Centre, Kolkata, INDIA

Speaker

Rahul Bhattacharya is the Founder and Chief Science Officer of Risk Latte AI. He is also a key shareholder of Risk Latte Americas Inc. He holds a B.Sc. (Hons) in Physics, an M.Sc. in Nuclear Physics and an MBA in Finance. He has almost 30 years' experience in financial markets; options and structured products trading, quant modelling, financial risk engineering, counter-party risk modelling, financial risk and derivatives training for senior bankers and finance professionals; designing machine learning algorithms, especially analogical machine learning (Support Vector Machines) and deep learning algorithms, for classification problems in the field of quantitative finance. His expert skills are in the fields of sub-symbolic AI, analogical machine learning algorithms, genetic algorithms and evolutionary computing, deep learning, nuclear reactor physics, neutron transport problem, numerical computing, options trading, financial derivatives trading, financial derivatives pricing, financial and catastrophic risk engineering, stochastic volatility & correlation modelling, Monte Carlo simulation and Hamiltonian Monte Carlo. He writes code in Excel/VBA, C, C++ and Fortran.

Risk Latte AI

Risk Latte AI, a unit of Risk Latte Americas Inc., is engaged in developing machine learning and AI algorithms, solutions and software for banks, financial institutions and other big corporations around the world. It is also in the business of creating content, educating and training researchers, computer scientists, programmers and engineers in the field of machine learning and AI. It is also an investor in other AI ventures.

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