PTE 586 - Intelligent and Collaborative Oilfield Systems Characterization and Management

Instructor: Dr. Fred Aminzadeh, Research Professor, Petroleum Engineering

Class Hours: Thursday, 11am to 1:40pm

Office Hours: Thursday 10 am to 11am

TA: Debotyam Maity [maity@usc.edu]

Textbook:

Neural Networks and other soft computing techniques with applications in the oil industry, -

Author: Fred Aminzadeh and Paul de Groot, Publisher: EAGE Publications BV, ISBN 90-73781-50-7

Grading:

Homework	20%
Midterm	30%
Term Project/Final	50%

Expectations for Assignments, Exams, and Projects:

Homework assignments will be given on a weekly basis [3-4 hrs/week].
The midterm   will consist of _written exam and/or project/presentation assignments_

The Final will be presentation of the results of the Term Project and submission of a report on the summary.

The Term project will be a collaborative work on applying soft computing techniques to given oil fields. More details are given below.

PTE 586 TERM PROJECT

The Term Project assignment for your team is to 1) write a proposal, and 2) give a presentation, to apply soft computing and artificial intelligence concepts to find new fields or improve the performance of the hydrocarbon production in an existing field.

Your written proposal must be about 20 pages including all figures, references etc. It must be submitted as a Word document using 11 or 12 pt. font.

Your presentation must be given "live" to the class, take no longer than 15 minutes to present. Each team member should use about one third of the time (5 minutes), focusing on their contribution to the team project. This would be followed by a 5 minute Q&A period. Your presentation must be submitted as a PowerPoint file containing about 25 slides. Your presentation will be terminated by the chairman after exactly 15 minutes whether you have completed it or not (conference style).

Your proposal must contain at least the following items:

A 1-page **Executive Summary** stating the key points of your proposal to apply soft computing and artificial intelligence concepts to find new fields or to improve the performance of the hydrocarbon production in an existing field. The Exec Summary should be about a page.

A concise **review of the field or exploration area** you have been assigned and/or you choose. Be sure to include all key aspects of the reservoir geology, fluids, production methods, wells, facilities, data, and any exploration or petroleum engineering challenges that your soft computing/AI application proposal may help address.

The role of each team member should be clearly identified in the proposal.

Your **proposal to apply** soft computing and artificial intelligence concepts to find new fields or to improve the performance of the hydrocarbon production in an existing field should include the following: What soft computing /AI method(s) you propose to use and why? What if any vendor software you have looked into and what was the basis for your final selection? Did you consider combining different soft computing techniques (or conventional ones) and why? How the particular will help to solve the problem? How will the data be collected, processed, visualized, analyzed? What decisions will be taken using the data and how will those decisions improve the performance of the reservoir? Details and specific explanations are better than generalizations. An estimated **budget** for how much the implementation of your system may cost – use realistic numbers that you will discover by your research. How much will the hardware cost? How much to deploy it? How much to operate it, including staff, on an ongoing basis. Who are the available suppliers? What is the expected value to be gained from the system in dollar terms? How does the cost of the system compare to the expected value returned?

Extra credit- It would be desirable to contact vendor(s) who have the relevant software that you can use. It would be even better if you actually use some of the existing software and / or develop your own and apply them to real data.

References. Be sure to document the sources of the facts/data used in your proposal by formally referencing the sources (papers, SPE / SEG abstracts, books, web pages, personal communications, internet links, etc.) where you obtained the information. These sources should be cited within the text at the point where you first state the information, and refer to the full formal reference listed in the Reference section located at the end of your proposal. Look at SPE or SEG papers/journals to see how to write and cite a formal reference.

You may use all the resources at your disposal to gather information for your proposal. This includes web searches, including SPE, SEG, AAPG etc. web sites, libraries, published papers, abstracts, journals, industry magazines, vendors, colleagues, friends, professors, business contacts, etc. Don't be afraid to email or call people that might have information to assist you.

Your term projects are due no later than Tuesday, November 24, 2010, 1pm PST. By that time, please email the TA Word file containing your written proposal, and the PowerPoint file containing your presentation. Your PPT file may not be changed after this date/time to be fair to all students (i.e., no additional revisions before your presentation).

Please include your name, Team# and contact info in both files.

Course Schedule

Lecture #	Date	Topic	Instructor
1	08/26/2010	Introduction to Intelligent and Collaborative Oilfield Systems Characterization and Management	F. Aminzadeh
2	09/02/2010	Fundamentals of Neural Networks and their E&P applications	F. Aminzadeh
3	09/09/2010	Introduction to Soft Computing and AI Methods for Exploration and Production Applications	Andrei Popa
4	09/16/2010	Data Fusion with Uncertain and Incomplete Information	M. Nikravesh
5	09/23/2010	Fuzzy Logic for Computational Intelligence	J. Mendel
6	09/30/2010	Overview of Genetic Algorithms and Simulated Annealing	F. Aminzadeh
7	10/07/2010	Integration of soft computing and conventional statistical approaches for oil field applications	F. Aminzadeh
8	10/14/2010	Midterm Exam	
9	10/21/2010	Remote and Collaborative Decision Making	I. Ershaghi
10	10/28/2010	Hands on work with neural networks	F. Brouwer
11	11/04/2010	Introduction to High Performance and Grid Computing applications	A. Nakano
12	11/11/2010	Integrated Asset Modeling	V. Prasanna
13	11/18/2010	Intelligent Distributed Sensor Data Fusion Networks	R. de Figueiredo
14	11/25/2010	THANKSGIVING HOLIDAY	
15	12/02/2010	Term Project Presentations	F. Aminzadeh
16	12/14/2010	Final Exam	

Statement for Students with Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

Statement on Academic Integrity

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. *Scampus,* the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A: http://www.usc.edu/dept/publications/SCAMPUS/gov/. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: http://www.usc.edu/student-affairs/SJACS/.