FERESHTEH SATTARI, Ph.D., M.Ed., B.Sc.
Post-Doctoral Fellow, University of Alberta
Chemical and Materials Engineering - Engineering Safety and Risk Management
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EDUCATION

Doctorate of Chemical and Materials Engineering – PROCESS CONTROL
University of Alberta ♦ 2016-2019.

Master of Education – LANGUAGE, CULTURE, & TEACHING
York University, Toronto♦ 2007-2009.

Bachelor of Science – CHEMISTRY
University of Arak, Iran

SUPPERVISORY AND RESEARCH SKILLS

- Developing research and engagement proposals
- Supervising and managing different research projects
- Helping to develop graduate course materials
- Supervising graduate students
- Representing Post-doctoral fellows

EXPERIMENTAL AND COMPUTIONAL SKILLS

My extensive scientific research experience has exposed me to working in a chemical lab and given me a working knowledge of the empirical approach as well as the computational approach.

Experimental Skills:
- Proton Nuclear Magnetic Resonance ($_1$HNMR)
- Fourier Transform Infrared Spectroscopy (FTIR)
- UV/Vis Spectroscopy
- Chemical Batch Reactors
- Near IR Spectroscopy
- Gas Chromatography-Mass Spectroscopy (GC-MS)
- Thermogravimetric Analysis (TGA), Centrifuge
- Diffuse Reflectance for Infrared Fourier Transform (DRIFTS)

Software Skills
- Programming with MATLAB, Phyton and R
- Words, Excel

Analytical Skills
- Principal Components Analysis (PCA)
- Data Analysis and Data Clustering
- Chemometric techniques
- Machine learning (Data fusion, Bayesian Hierarchical Clustering, and Bayesian Network)

PhD Dissertation:
The title of my research project is *The Application of Data Combination and Data Mining Techniques for Real-time Monitoring and Controlling of Biomass Thermochemical Conversion.*
Hydrothermal liquefaction (HTL) of biomass generates a complex biocrude, which can be additionally synthesized and upgraded to produce biofuel or chemicals. This research widely describes the production of chain reactions in the compounds of the biocrude. Spectroscopic techniques were used to analyze the products, while the **data fusion technique** was used to combine the acquired datasets. The major novelty of this step is that it allows for a consistent combination of absorbance across wavenumbers (variables) with demonstrable improvement in the reaction network structure. This large measure dataset (with respect to spectral variables) with a limited number of samples was used to produce a logical, statistical model utilizing machine learning techniques that create awareness of the prospective chemistry and reaction techniques. In this work, two of the **machine learning** concepts were analyzed. The first concept was employing data derived from spectral information for data clustering to generate the **Bayesian Hierarchical Clustering** (BHC), after which the **Bayesian network learning concept** (BN) was employed to create a reaction network. Three different **optimization techniques** were used to determine the optimal arrangement for the network. In order to reduce the threats posed to the deconvolution of the spectroscopic data, a **chemometric** model based on self-modeling multivariate curve resolution (SMCR-ALS) was developed in the second stage of this research.

The developed network could be useful to enhance investigation of the chemistry of the process of a complex system, such as biomass or even **bitumen conversion**. In addition, the application of self-updating the arc dependencies in the network structure makes them favorable for **real time analysis** of the process. Along with promoting a deep understanding of a **complex reaction chemistry**, this study could be beneficial for **process optimization** (by predicting the effect of interaction qualitatively and quantitatively for real time analysis of the process), and it could also be applicable for **upgrading processes** (by focusing on selectivity towards product compounds).

TEACHING AND RESEARCH EXPERIENCE

University of Alberta
Post-Doctoral Fellowship ♦ August 2019-current.

University of Alberta
Teaching Assistant, Quantitative Risk Analysis (ENGG 490) ♦ January 2020-current.

University of Alberta
Teaching Assistant, Quantitative Risk Analysis (CME 694) ♦ September 2019-December 2019.

University of Alberta
Teaching Assistant, Chemical Reactor Analysis (CHE 345) ♦ January 2019-April 2019.

Edmonton Public school
Mathematics, Chemistry, and Science Teacher ♦ 2015-2017.

TFS Private High School
Principal. Toronto ♦ 2013-2015.

TFS Private High School
Mathematics, Chemistry, and Science Lead Teacher. Toronto ♦ 2009-2012.

York University
Research Assistant. Toronto ♦ 2007-2009.

FTI International Group Inc.
Chemical Technologist. Toronto ♦ 2003-2007.

Azarab International Company
Chemical lab Manger. Iran, Tehran ♦ 2000-2001.

HONORS AND AWARDS

TFS Private High School
Nominee for GTA's Outstanding Principal, Toronto ♦ 2012.

TFS Private High School
Teacher of Year Award, Toronto ♦ 2012.

TFS Private High School
Teacher of Year Award, Toronto ♦ 2011.

FTI International Group Inc
Technology Award, Toronto ♦ 2005.

Azarab International Company
Technology Award, Iran ♦ 2001.

CERTIFICATES AND COURCES

Graduate Teaching and Learning Program, Practicum (Level 2)
University of Alberta ♦ 2019.

Certificate of Graduate Teaching and Learning Program, Foundation (Level 1)
University of Alberta ♦ 2019.

Certificate of Training Chemical Safety
University of Alberta ♦ 2017.

Certificate of Training Laboratory Safety
University of Alberta ♦ 2017.

Certificate of Workplace Hazardous Materials Information System (WHMIS)
University of Alberta ♦ 2016.

Certificate of Teaching in Public school
Edmonton Public School ♦ 2015.

Certificate of Teaching in Private school
Toronto Private School ♦ 2003.

Critical Analysis and Argument
McEwan University, Edmonton ♦ 2015.

Energy Innovation and Entrepreneurship
Ryerson University, Toronto ♦ 2013.

Project Management
Ryerson University, Toronto ♦ 2013.

Certificate of Completion of Interagency Advisory Panel on Research Ethics
York University, Toronto ♦ 2008.

ADDITIONAL LEADERSHIP & VOULENTEERS EXPERIENCE

Academic Women's Association
Post-doctoral fellows representative. University of Alberta. Edmonton ♦ 2019-current.

Poster presentation (CHE 464).
Judge. University of Alberta. Edmonton ♦ 2019.

Dean's Research Award Presentation.
Judge. University of Alberta. Edmonton ♦ 2019.

Guidelines for Acquiring E. Eng. Certificate Conference.
Host. University of Alberta. Edmonton ♦ 2019.

COAA Best Practices Conferences
Facilitator. Edmonton ♦ 2019.

CCWESTT Conferences
Volunteer. Edmonton ♦ 2018.

Non- profit Toronto Farsi School
School Board Member. Toronto ♦ 2004-Current.

Canadian Coalition of Women in Engineering, Science, Trades and Technology (CCWESTT) Conference
Volunteer. Edmonton ♦ 2018.

The 67th Canadian Chemical Engineering Conference
Volunteer. Edmonton ♦ 2017.

Science Fair
Volunteer. University of Alberta. Edmonton ♦ 2017.

Tirgan Festival
Host coordinator. Toronto ♦ 2008-2012.

PRESENTATIONS

4th Annual CCPS Canadian Regional Meeting
Sattari, Fereshteh. Using Machine Learning and Keyword Analysis to Analyze Incidents and Reduce Risk in Oil Sands Operations. Calgary ♦ September 12, 2019.

NSERC Alliance -Towards Future Interconnected Electric System
Sattari, Fereshteh. Quantitative Analysis of Incident Reports for Electrical Power Systems. Edmonton ♦ December 05, 2019.

The 68th Canadian Chemical Engineering Conference
Sattari, Fereshteh., De Klerk, Arno., & Prasad, Vinay. Machine Learning and Data Combination Methods to Understand the Chemistry of Cellulose Conversion through Hydrous Pyrolysis. Toronto ♦ October 28-31, 2018.

Women's Power & Teaching Conference
Sattari, Fereshteh. Challenges & Rewords for Immigrant Women. Toronto ♦ June 21, 2008.

Empowering Women in Science & Technology
Sattari, Fereshteh. Build Support for Women in Science. Iran ♦ May 6, 2001.

PAPERS

Sattari, Fereshteh., Macciotta, Renato., & Lefsrud, Lianne. A Process Safety Approach to Identify Opportunities for Enhancing Rail Transport Safety in Canada. Submitted to journal of *Accident Analysis & Prevention – Journal – Elsevier.*

Kurian, Daniel., Ma, Yongsheng., Lefsrud , Lianne., & **Sattari,** Fereshteh. Seeing the Forest and the Trees: Using Machine Learning to Categorize and Analyze Incident Reports for Alberta Oil Sands Operators. Submitted to Journal of *Loss Prevention in the Process Industries – Elsevier.*

Kurian, Daniel., Ma, Yongsheng., Lefsrud , Lianne., & **Sattari,** Fereshteh. Using Machine Learning and Keyword Analysis to Analyze Incidents and Reduce Risk in Oil Sands Operations. Revised and ready to submit to Journal of *Safety Science – Elsevier.*

Sattari, Fereshteh., Tefera, Dereje., & Prasad, Vinay. Monitoring the Conversion of Levoglucosan in Hydrous Pyrolysis Using Spectroscopic Data & Self-Modeling Multivariate Curve Resolution. Revised and ready to submit to journal of *Industrial & Engineering Chemistry Research.*

Sattari, Fereshteh., Tefera, Dereje., & Prasad, Vinay. The Application of Data Combination and Data Mining Techniques to Real-time Monitoring of Cellulose and Lignin Processing in Hydrous Pyrolysis Reactions. Revised and ready to submit to journal of *Industrial & Engineering Chemistry Research.*

Sattari, Fereshteh., Tefera, Dereje., & Prasad, Vinay. Real-time Monitoring of the process of a Physical Mixture of Cellulose and Lignin Conversion by Developing the Most Probable Reaction Network by Using Data Fusion, Data Mining, and Chemometric Techniques (SMCR-ALS). Revised and prepared to submit to journal of *Reaction Chemistry of Engineering (RCE).*

Sattari, Fereshteh., Tefera, Dereje., & Prasad, Vinay. Real-time Monitoring and Controlling of Biomass Hydro-thermal Conversion by Employing Data Integration and Data Mining Techniques by Using Spectroscopic Methods. Revised and prepared to submit to journal of *Reaction Chemistry of Engineering (RCE).*