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THE UNIVERSITY OF TENNESSEE KNOXVILLE

SCHOOL OF NATURAL RESOURCES

PROSPECTUS

DATA SCIENCE INSTITUTE FOR MACHINE LEARNING AND AI




Contents

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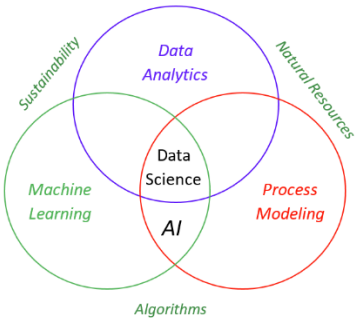
Introduction

The prospectus outlines the mission, objectives, and organization of the University of Tennessee School of Natural Resources (**UT SNR**) '**D**ata **S**cience **I**nstitute for **M**achine **L**earning and **A**I (DSIMLA)'. The UT SNR Data Science Institute for Machine Learning and AI will focus on advancing the education and research in data science for industries that grow, manage, harvest, and utilize wood and fiber resources. The impact of data science and AI will be to enhance the profitability and sustain competitiveness for businesses.

The Institute is housed within the newly established **UT SNR** and is a service-oriented organization. Applications will be **in forest management, timber harvesting, and manufacturing**. Focus areas will be:

- Training and workshops on data analytics, machine learning, and AI;
- Graduate and undergraduate student education;
- Applied research in data science, machine learning, and AI.

Members will interact with UT SNR faculty, staff, and students. Member companies will also be able to engage in confidential research projects with graduate student support on a one-on-one basis. An executive board will govern the Institute and ensure that the Institute's mission is upheld.



Current Members (alphabetical order)

Egger Wood Products	https://www.egger.com/en/?country=US
Hexion	https://www.hexion.com/en-US/
Huber Engineered Woods	https://www.huberwood.com/
Louisiana-Pacific Corp.	https://lpcorp.com/
Roseburg Forest Products	https://www.roseburg.com/

Mission

The UT SNR '**D**ata **S**cience **I**nstitute for **M**achine **L**earning and **A**I (***DSIMLA***)' aims to promote and advance the education and research of data science, machine learning, and AI for companies engaged in forest management, cellulosic fiber utilization for forest products manufacturing, and biomaterials processing. Additionally, the Institute seeks to enhance the education and research of data science, machine learning, and AI for forest business and management companies. The primary goal of the Institute is to assist companies in learning, adapting, and effectively implementing the latest data science, machine learning, and AI technologies to optimize processes, leading to improved efficiency, utilization, energy savings, and cost reduction. The Institute will function as an expansion of a company's innovation group by providing access to the most current technologies in the rapidly evolving field of data science, machine learning, and AI.

Industry graduates Oct. '22 from UT SNR 'Data Analytics and SPC' training

Education and Research Objectives

The UT SNR 'Institute for Data Science and AI' will have the following education and research objectives:

- Expand the knowledge of a company's workforce in statistical and data analytical methods as applied to manufacturing for the purpose of variation reduction;
- Enhance a company's knowledge of analytical software to support continuous improvement efforts in data analytics and variation reduction;
- Promote learning and networking with virtual webinars, in-person workshops, and an annual conference;

- Establish a **'Machine Learning (ML) Cooperative'** (ML Coop) to advance the direct application of the most contemporary ML algorithms for real-time prediction of key process parameters and product quality attributes;
    - Within the ML Coop, the core principles of Total Quality data Management (TQdM) will focus on implementing TQdM for assessing relational databases created from data fusion algorithms;

- Conduct applied research in data science, machine learning, and AI to support the enhanced optimization of forest products and sustainable biomaterials processes;

- Conduct applied research in data science, machine learning, and AI to support improved forest management for forest businesses.

Three Annual Industry Training Events

Three industry-training events will be offered starting in January 2024 under the structure of the 'Data Science Institute for Machine Learning and AI (DSIMLA)'. Timothy Young will offer the following industry-training events that have been ongoing for 20+ years at the University of Tennessee:

- An Introduction to Data Analytics and Statistical Process Control (two sessions 40 hours);[1]
- Design of Experiments for Rapid Innovation (two sessions 40 hours);[2]
- Advanced Analytics and Machine Learning (one session 32 hours).[3]

Annual Conference for Members

There will be a two-day annual conference to enhance the offerings from DSIMLA with the inaugural conference planned for the fall of 2024.

[1] 4.0 CEU credits and/or 3.0 undergraduate or graduate credit hours if current UT student
[2] 4.0 CEU credits and/or 3.0 undergraduate or graduate credit hours if current UT student
[3] 3.2 CEU credits and/or 3.0 graduate credit hours if current UT student

Conference Agenda:

- Showcase Graduate and Undergraduate Student Research and Progress
- Recruiting Opportunities;
- Keynote talks;
- Applied Research Updates;
- Machine Learning Coop breakout sessions and workshop;
- Networking dinner, tailgating and football game (depending on conference dates).

Organization

The UT SNR 'Data Science Institute for Machine Learning and AI (DSIMLA)' will be a virtual Institute where faculty, staff, and students from The University of Tennessee will support the mission and accomplish the objectives of the Institute under the direction of a Director and Executive Board. Given that machine learning technologies and software capabilities are the core element of AI and are advancing at almost an exponential rate (*e.g.,* random forests, boosted trees, Bayesian additive regression trees - BART, multivariate adaptive regressions splines – MARS, etc.), the 'ML Coop' will operate as an autonomous group within the Institute. The ML Coop will consist of a broad group of academics and industry representatives. The ML Coop will conduct highly specialized webinars, trainings, and research projects with sole purpose of ML application in manufacturing and forestry.

The education component of the UT SNR DSMILA will establish a curriculum for students and industry focused on the general aspects of data analytics, which will be a combination of well-established statistical principles and contemporary methods for continuous improvement. The academic curriculum will be structured to support the MS Forest Business program within the UT SNR. The MS Forest Business program is open to students at UT and industry personnel willing to expand their education while working full-time, and will consist of a mostly virtual curriculum. The industry curriculum for live webinars, workshops, and customized training will be heavily influenced from the guidance of the executive board.

The MS in Forest Business is a three-semester, non-thesis program that prepares students to assume leadership roles within forest industry in three separate tracks: Analytics & Data Science, Forestland Investment & Finance, and Logistics & Procurement. The program consists of a core of classes focused on accounting and finance principles, as well as an internship and final project. Students who are currently

employed in the industry can use their current work experience for the internship and project requirements. Beyond the core, students select from a suite of course within the three tracks.

The research component will focus on applying data science in forest products manufacturing and forestry. TQdM will be part of this research. The ML Coop will support research with successful applications of machine learning algorithms and AI. This research will also consist of programming languages for successful applications, *e.g.,* Python, R, SAS-JMP, Minitab, etc. Data fusion algorithms and code (e.g., SQL) will be part of the research of the ML Coop.

International Partner

The UT SNR Institute will form a strategic partnership with '***I****nstitute for* ***D****ata Sci****e****nce and* ***A****I for* ***Holz***' (**IDeA Holz**) at Salzburg University of Applied Sciences in Kuchl, Austria. The mission of the Institute at Salzburg University of Applied Sciences is almost identical to the UT SNR Institute, but will focus on European companies and have longitudinal impact with BOKU, TUM, and University of Ljubljana. Some global companies that have business operations in North America and the EU may wish to join both institutes. This strategic partnership will allow for the exchange of students, researchers, which will enhance the knowledge and applications for the Institute's clients.

FH Salzburg

The Kuchl campus is a model for the 400 students who are educated there in forest products technology and timber construction. It is Austria's first university building in passive house construction. Wood, as the academic focus at the Kuchl Campus, is omnipresent with BS and MS degree programs in Forest Products Technology and Timber Constructions.

Executive Board and Company Memberships

The Executive Board will consist of five members from industry. The five Board members will have a demonstrated record of accomplishment within industry and a breadth of knowledge to accomplish the mission of the UT SNR 'Data Science Institute for Machine Learning and AI.' The Executive Board will be selected based on willingness to be directly engaged in the Institute and serve a three-year term. The Executive Board will meet virtually every quarter and attend the annual conference at UT. Additional

benefits include review and design of DSMILA organizational structure, budget review, more contact hour opportunities with students involved in DSMILA, and setting the research and teaching agendas.

Company memberships will be open to all in industries that are involved in the growing and processing of cellulosic fiber. Company membership in the Institute will have the benefits of direct access to all non-propriety and published materials. This will include discounted fees for attending virtual webinars and training seminars. Company memberships will allow for direct confidential research projects within the Institute. There will be no limit to the number of company memberships within the Institute.

Fee Structure

Executive Board Member: $25,000/Yr

Company Member: $12,000/Yr

ML Coop Member: $ 6,000/Yr (Executive Board, or Company membership required)

Benefits for Members

Executive Board Member	Member Only	Machine Learning Coop Member
Direct organizational structure and design of institute		
Quarterly budget reviews		
Direct input in setting research agenda of institute		
Review and inputs of teaching curriculum for MS in Forest Business		
Two company liaisons to communicate directly with DSIMLA staff	One company liaison to communicate directly with DSIMLA staff	Additional company liaison assigned to machine learning staff
Monthly webinars on data science and software applications for company	Monthly webinars on data science and software applications for company	Monthly webinars on machine learning and software updates on machine learning
Analytical software review updates	Analytical software review updates	ML software review updates
10% discount on industry training programs	10% discount on industry training programs	10% discount on industry training programs
Direct support in implementing data science and analytics problems	Direct support in implementing data science and analytics problems	Direct support in implementing machine learning applications problems
		Open access to machine learning source code in Python and R by graduate students and associated universities