

TEACHING MACHINE LEARNING & AI TO MBA & EXECUTIVES

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A bit about me

- Research
- Publish in ML, AI, and business
- Co-founded Sweetch (Chronic disease prediction and intervention)
- Insights through consulting

Teaching

Developed MBA ML course in 2002-3

Full time MBA elective

Executive MBA elective

Masters in Business Analytics (MSBA)

Executive education (non-degree)

Joint Honor CS-Business undergraduate program

Undergraduate elective

Ph.D. seminar (CS, Engineering, and Business Ph.D. students)

Course goals:

Educate business leaders to identify opportunities and risks, and to make well-informed decisions about the use of and innovations with ML & AI

Need to understand fundamentals and have meaningful hands on experience

Yet, modified CS-style ML/AI courses would miss opportunities to have greater impact through education

In practice, executives leave opportunities on the table, and run with ones that are bound to fail.

We are market-driven, but we must also lead

- Meet market demand for our students to be attractive
- Yet, we ought to foresee what is necessary to succeed in the long run

Educate leaders to facilitate progress with ML & AI

ML & AI can have meaningful and positive impact on our lives

CS/Engineering academics take seriously their responsibility to ensure a future where ML and AI have positive impact

Business leaders play an important role and we have a responsibility to prepare them:

- Can facilitate progress with ML & AI or otherwise miss/delay opportunities to do so

- Business leaders may also oversee less thoughtful use of ML & AI, that can lead to a backlash and missed opportunities for progress

Our responsibility: educate leaders so they will facilitate progress with ML & AI and help materialize the opportunities waiting to happen

Quick Overview

- The landscape & fundamentals of ML/AI methods
- Understanding and appreciating challenges of the complete data science process: including careful problem formulation, data understanding/preparation & construction, data-driven (machine) learning, model evaluation, & deployment.
- Business/organization goals: Not only prediction
 - Teach ML/AI to inform decisions
 - Throughout the data science process: Problem formulation, data issues, model evaluation
- Hands-on experience to allow students to independently explore opportunities:
 - Goal is never prediction, but the decisions they inform and the business measures they aim to benefit
 - Begin with a business/organizational goals, and apply a complete data science process
- Appreciate social and ethical challenges: The consequences of perceptions about ML/AI, issues of transparency and fairness.

A focus on business/organization goals:

E.g., ML Model Evaluation In Context

Most CS & Engineering courses focus on (general-purpose) methods independently of context

- Excludes meaningful discussion on key aspects of the data science process
- For example: Evaluate models quality/performance using context-free measures

In practice, a ML model generates input into a (decision-making) process

Evaluation should aim to assess the value a ML/AI solution produces towards the business goals

In some contexts, a “highly accurate” predictive model (when measured via general-purpose measures of predictive performance) do not add value at all, while a “marginally better” model may yield tremendous value.

Evaluation should aim to reflect the impact of the model on relevant business/organizational outcomes

Appreciation for what can go wrong

- Poor problem formulation – focus on prediction, not the business/organization goals
- Change in underlying patterns over time
- Biased data
 - Business process that biases the data
- Misinterpretation of patterns: causal vs. correlation

Prepare students for the next decades:
Offer insights into the future

Introduce “advances” topics with important applications

In 2003 we taught ANN, Reinforcement Learning, Genetic Algorithms

Teach lasting principles of data science

Why is Predictive Analytics with ML a core subject for business education?

There is no business discipline or industry in which Machine Learning & AI are not already informing key decisions.

- **Marketing:** E.g., Direct targeting, CRM, personalization and recommender systems
- **Finance:** E.g., Trading and investment, credit or other type of risk prediction/assessment
- **Management:** E.g., Recruiting, employee satisfaction, retention,
- **Operations and Supply Chain:** Inventory management, scheduling, etc.
- **Accounting, audits and compliance:** E.g., fraud and non compliance detection, etc.

Impacts not only how things are done (better/faster), but what is being done: meaningfully impact and transform disciplines and industries

Business leaders ought to be competent about the nature of these technologies to critically evaluate opportunities and risks in the use of ML/AI to inform decisions and create value

Machine Learning's significance to all business disciplines is already reflected in a growing number MBA electives:

Analytics is a pillar of a growing number of business schools' branding:

ML & AI are by far the most impactful data analytics developments of recent decades

A fast-growing number of the courses across disciplines increasingly rely on or introduce machine learning methods to reflect state-of-the-art practices.

Fintech (focus on financial services and practices)

Operations: supply chain analytics,

Marketing Analytics

Social media/ User-generated content analytics

Health care analytics

People / HR analytics...

Our responsibility

- What business leaders must know (today) about business data science requires more than common core MBA courses offer
- In the immediate course of their career, our students will face decisions that demand good knowledge of business data science, importance and its interface with business practices
- We have a responsibility to educate future leaders who will be well prepared to do so

New data science/computing colleges, divisions, institutes: What are the implications for business education?

- Data science is an interdisciplinary domain
 - Breakthroughs are expected through domain-specific advances
- Teaching: Degree programs and courses will be developed to target domain-specific challenges
 - Much of core methods/algorithms are the same. Yet, challenges vary
- We need to prepare our students for this future