



Northeastern University

College of Engineering

Multidisciplinary Graduate Engineering Course Syllabus

Course Information

Course Title: Algorithmic Digital Marketing

Course Number INFO 7374

Term and Year Spring 2022 Semester

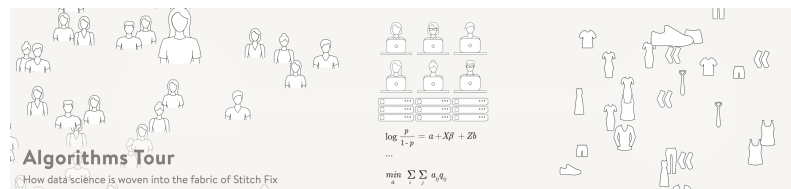
Technical/Course Materials Requirements:

- Materials and tutorials shall be provided to registered students
- You must be comfortable with Python as assignments expect you to work with Python.
- Text book: *Introduction to Algorithmic Marketing* <https://algorithmic-marketing.online/>

Course Description

Have you ever wondered

- How Wayfair does recommendations?
- How do algorithms power Stichfix? (Check out: <https://algorithms-tour.stitchfix.com/>)



At Stitch Fix, we're transforming the way people find what they love. Our clients want the perfect clothes for their individual preferences—yet without the burden of search or having to keep up with current trends. Our merchandise is curated from the market and augmented with our own designs to fill in the gaps. It's kept current and extremely vast and diverse—ensuring something for everyone. Rich data on both sides of this 'market' enables Stitch Fix to be a matchmaker, connecting clients with styles they love (and never would've found on their own).

- Why do prices keep fluctuating on Amazon or Walmart.com?
- How customer data and behavior is collected, stored and used by companies to optimize marketing decision?
- How does targeted advertising work?

Algorithmic Marketing has enabled companies to leverage various data-driven methodologies to enhance customer experience, engagement and customization options. Using Machine Learning and AI techniques, targeted promotions, advertisements, eCommerce search, recommendations, pricing, and assortment optimization are some of the key advances that

have enabled companies like Wayfair, Amazon etc. to create digital experiences that have disrupted the retail industry and has enabled companies to design and optimize strategies for increasing traffic, creating viral products and in increasing the lifetime value of a customer(LTV). However, it is important to model the data and algorithms to ensure you have the right datasets to address various analytical challenges. The volume, variety and velocity of the data calls for designing robust data modeling methodologies pioneered by the likes of Salesforce, Google etc. to build enterprise-grade systems that will set the platform for robust decision and analytics tools. In this course, we will understand the core data modeling methodologies, key metrics, and mechanisms used in marketing.

Student Learning/Course Outcomes (SLOs)

Upon completion of this course, a students should be able to:

- Understand how to design enterprise data-driven applications for marketing
- Design applications with tools like Salesforce, Snowflake, Python etc.
- Work with large datasets that drive pricing, promotion, advertising, recommendation and search applications for marketing

Instructor Information

- Full Name: Sri Krishnamurthy
- Email Address : analyticsneu@gmail.com



Sri Krishnamurthy, CFA, CAP is the founder of QuantUniversity, a data and Quantitative Analysis Company and the creator of the Analytics Certificate program (www.analyticscertificate.com) and Fintech Certificate program. Sri has more than 15 years of experience in analytics, quantitative analysis, statistical modeling and designing large-scale applications. Prior to starting QuantUniversity, Sri has had significant analytical applications at Citigroup, Endeca, MathWorks and has consulted to more than 25 customers in the financial services and energy industries. He has trained more than 1000 students in quantitative methods, analytics and big data in the industry and at Babson College, Northeastern University and Hult International Business School. Many of his students work in Data science roles at Fidelity, Santander, Wellington, GMO, State Street etc. Sri earned an MS in Computer Systems Engineering and another MS in Computer Science, both from Northeastern University and an MBA with a focus on Investments from Babson College.

Attendance Policy

You are expected to attend all lectures and participate in class. If you plan to miss a class for a genuine reason, you must email the instructor of your absence. If you miss a class, to get class participation credit, you must submit a 2- page report on the class missed. If you don't submit the report, and you are absent more than 2 classes without reasonable excuse, you will automatically lose 5% of the class participation credit.

Late Work Policy

Students must submit assignments by the deadline in the time zone noted in Canvas

Students must communicate with the faculty prior to the deadline if they anticipate work will be submitted late.

Work submitted late without prior communication with faculty will be subject to a late penalty of 10% per day.

Software:

We will use Python for exercises and to illustrate concepts, exercises and final projects. We will also introduce you to Salesforce, Snowflake, xcsv, Einstein Analytics and many other tools used in industries.

Lectures:

Lectures would include discussion and illustration of methodologies. I will be posting required and optional reading. We will also have guest lectures and in-class exercises.

Grading:

5 Case study assignments : 60% (Group);

Final Project: 25% (Group); Class Presentation: 5%;

Class participation & in-class quizzes/exercises: 10%

Case Studies:

You will work on five case studies to demonstrate your understanding of the topics covered in class. This will cover all aspects of a Data-science pipeline.

Final Project:

You will have the opportunity to choose the topic and work on an extended project. Additional information will be provided as the class progresses. Each Team is expected to build a fully functional Data-as-a-service/Model-as-a-service as a part of their final project

Class Presentation:

You will be presenting one topic and an associated example in class. You will have 20 minutes to present. A list of topics will be posted on Canvas

Class Participation:

You are expected to attend all lectures and participate in class. If you plan to miss a class for a genuine reason, you must email the instructor of your absence. If you miss a class, to get class participation credit, you must submit a 2-page report on the class missed. If you don't submit the report, and you are absent more than 2 classes without reasonable excuse, you will automatically lose 5% of the class participation credit.

Office hours:

Office hours: Saturday 12.00-1.00pm over Zoom. Schedule via www.calendly.com & by appointment

TA will hold office hours weekly. Details announced on Canvas

Course Schedule

| Week | Topic | Note |
|------|---|----------------------------------|
| 1/23 | Introduction to Algorithmic Marketing | |
| 1/30 | Data Models: <ul style="list-style-type: none">○ Scraping, price comparison, processing large scale datasets○ Storing and processing multi-dimensional datasets.○ Data preparation for marketing applications○ Working with xsv for large datasets using Criteo's dataset as an example | Case study 1 |
| 2/6 | <ul style="list-style-type: none">○ Build a Marketing Data Warehouse<ul style="list-style-type: none">▪ https://cloud.google.com/solutions/marketing-data-warehouse-on-gcp○ Working with Snowflake○ CRM tools from Salesforce<ul style="list-style-type: none">▪ https://www.salesforce.com/products/marketing-cloud/overview/ | |
| 2/13 | <ul style="list-style-type: none">○ Key metrics used in Marketing analytics○ Dashboards for decision making | Case study 1 due Case study 2 |

| | | |
|-------------|--|----------------------------------|
| | <ul style="list-style-type: none"> ○ Descriptive, Predictive, and Prescriptive Analytics in Marketing ○ Leveraging Analytics for decision making (https://www.salesforce.com/products/einstein-analytics/) | |
| 2/20 | <ul style="list-style-type: none"> ○ Data science and Machine Learning in Marketing applications | |
| 2/27 | <ul style="list-style-type: none"> ○ Promotions and Advertising in Marketing <ul style="list-style-type: none"> ▪ Building an advertising platform ▪ Targeting and Attribution | Case study 2 due Case study 3 |
| 3/6 | <ul style="list-style-type: none"> ○ Optimization methods in Marketing | |
| 3/13 | <ul style="list-style-type: none"> ○ A/B Testing and Experimentation | |
| 3/20 | <ul style="list-style-type: none"> ○ Search <ul style="list-style-type: none"> ▪ Placement, matching, customization ▪ Use of Elastic Search | Case study 3 due Case study 4 |
| 3/27 | <ul style="list-style-type: none"> ○ Recommendation systems <ul style="list-style-type: none"> ▪ Content-based & Collaborative filtering ▪ Association rule mining | |
| 4/3 | <ul style="list-style-type: none"> ○ Advanced Recommendation systems <ul style="list-style-type: none"> ▪ https://github.com/microsoft/recommenders | Case study 4 due Case study 5 |
| 4/10 | <ul style="list-style-type: none"> ○ Pricing and Promotions <ul style="list-style-type: none"> ▪ Dynamic pricing, Off-peak pricing, ▪ Bundling ▪ Revenue management | |
| 4/17 | Building and designing production-grade Marketing analytics systems. | Case study 5 due |
| 4/24 | Frontier topics: AI in marketing, personalization, leveraging geo-spatial information, loyalty, marketing platforms and SAAS for marketing | Final Project Proposal Due |
| 4/31 | Final Project presentations | |

Note: No spring break in Spring 2021. Course starts on Jan 23rd.

Academic Integrity

A commitment to the principles of academic integrity is essential to the mission of Northeastern University. The promotion of independent and original scholarship ensures that students derive the most from their educational experience and their pursuit of knowledge. Academic dishonesty violates the most fundamental values of an intellectual community and undermines the achievements of the entire University.

As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, examinations of whatever kind, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Students are responsible for learning the conventions of documentation and acknowledgment of sources in their fields. Northeastern University expects students to complete all examinations, tests, papers, creative projects, and assignments of any kind according to the highest ethical standards, as set forth either explicitly or implicitly in this Code or by the direction of instructors.

Go to <http://www.northeastern.edu/osccr/academic-integrity-policy/> to access the full academic integrity policy.

Student Accommodations

Northeastern University and the Disability Resource Center (DRC) are committed to providing disability services that enable students who qualify under Section 504 of the Rehabilitation Act and the Americans with Disabilities Act Amendments Act (ADAAA) to participate fully in the activities of the university. To receive accommodations through the DRC, students must provide appropriate documentation that demonstrates a current substantially limiting disability.

For more information, visit <http://www.northeastern.edu/drc/getting-started-with-the-drc/>.

Library Services

The Northeastern University Library is at the hub of campus intellectual life. Resources include over 900,000 print volumes, 206,500 e-books, and 70,225 electronic journals.

For more information and for Education specific resources, visit <http://subjectguides.lib.neu.edu/edresearch>.

Diversity and Inclusion

Northeastern University is committed to equal opportunity, affirmative action, diversity and social justice while building a climate of inclusion on and beyond campus. In the classroom, member of the University community work to cultivate an inclusive environment that denounces discrimination through innovation, collaboration and an awareness of global perspectives on social justice.

Please visit <http://www.northeastern.edu/oid/> for complete information on Diversity and Inclusion

TITLE IX

Title IX of the Education Amendments of 1972 protects individuals from sex or gender-based discrimination, including discrimination based on gender-identity, in educational programs and activities that receive federal financial assistance.

Northeastern's Title IX Policy prohibits Prohibited Offenses, which are defined as sexual harassment, sexual assault, relationship or domestic violence, and stalking. The Title IX Policy applies to the entire community, including male, female, transgender students, faculty and staff.

In case of an emergency, please call 911.

Please visit www.northeastern.edu/titleix for a complete list of reporting options and resources both on- and off-campus.