MIT
MANAGEMENT
EXECUTIVE EDUCATION

ARTIFICIAL INTELLIGENCE IN PHARMA AND BIOTECH

ONLINE SHORT COURSE

Delve into machine learning technologies and discover why they're at the heart of pharmaceutical and biotech innovation.

DELIVERED IN COLLABORATION WITH getsmarter™

ABOUT THIS COURSE

Disruption has arrived in the pharmaceutical and biotech industry. Driven by artificial intelligence (AI) and machine learning (ML) technologies, new possibilities include everything from molecular design to predictive patient reaction models. However, despite a clear connection between the science of drug discovery, ML, and business decision making, there is a disconnect between the tools that exist and the specialists utilizing them. It's only by bridging this gap that the full potential of this technology will be realized.

In the Artificial Intelligence in Pharma and Biotech online short course from MIT Sloan School of Management, you'll discover the benefits and challenges of AI tools within this sector. Over six weeks, gain insight into the current state of technology in the industry and explore ways that it can be applied to the drug discovery and distribution processes. You'll learn how AI can be utilized in biological and generative modeling, and examine the impact of ML on the design and management of clinical trials. With insights into the relevance, practical implications, and business impact of these technologies, you'll be able to position yourself ahead of the curve as innovation reshapes the industry.

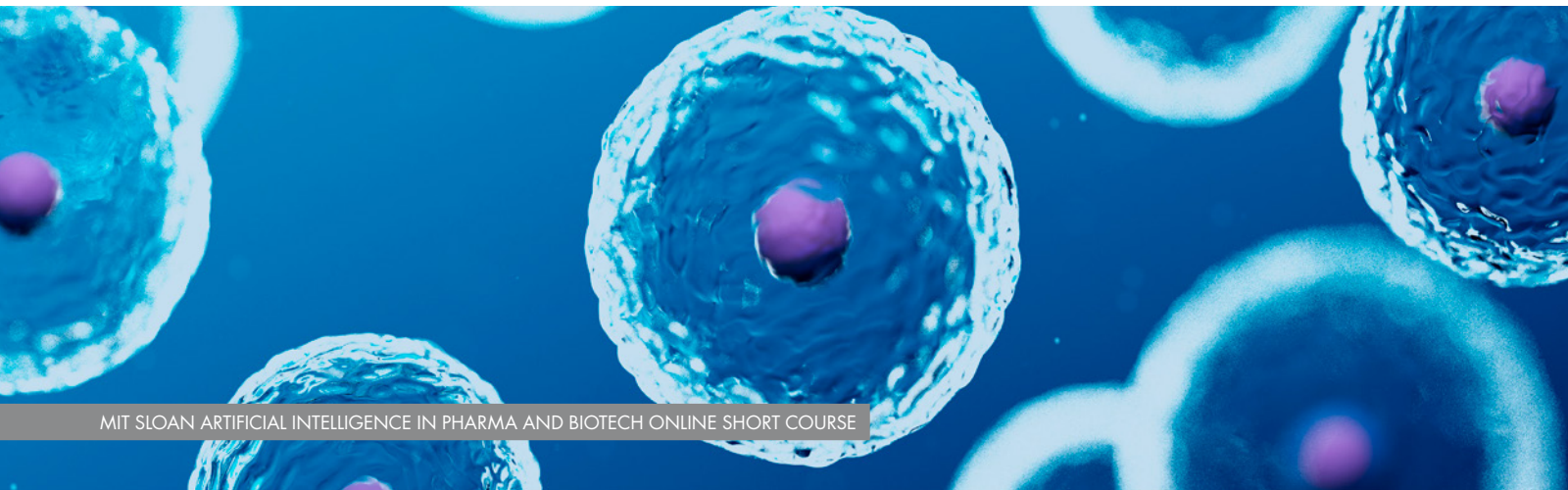
WHAT THIS PROGRAM COVERS

Over the course of six weeks, dive into the existing and potential applications of AI and ML in the pharmaceutical and biotech industry. Guided by expert MIT faculty, you'll gain insight into the optimal AI tools for this industry and explore how they can be leveraged for early drug discovery. Unpack AI's potential to help promote research efforts into biology and diseases on a cellular level, and how it can assist with tasks like biomarker identification and disease tracking. Finally, you'll investigate the impact of new AI modalities on patient stratification, and assess the limitations and promises of using ML in the design and management of clinical trials. You'll walk away from the program with an understanding of AI's broader business implications for the pharma and biotech industry.

$2,800

6 weeks, excluding
1 week orientation.

6–8 hours of self-paced learning per week, entirely online.



THIS PROGRAM IS FOR YOU IF YOU WANT TO:

HARNESS AI FOR BUSINESS
Understand how AI and ML can be applied across pharma and biotech organizations.

MAKE OPTIMAL DECISIONS
Make more informed decisions using ML processes in the science of drug discovery.

LEVERAGE NEW TECHNOLOGY
Learn to use ML in the early stages of drug discovery, identifying molecules, designing clinical trials, and selling pharmaceuticals.

DRIVE INDUSTRY INNOVATION
Uncover the infinite applications of AI in biotech and discover how they can be applied in your business context.

WHO SHOULD TAKE THIS COURSE?

This program is designed for business leaders in pharmaceutical science and other scientific fields who want to understand how AI can be integrated into their organization. The program is ideal for professionals who are interested in the various AI and ML tools available, and want to learn how to apply them in their research and work. Researchers, specialists, data scientists, software developers and analysts working for a pharmaceutical company will also benefit from the course as they learn the broader business implications of AI applications in pharma and biotech, and how these technologies can be introduced within their context.

"At MIT Sloan Executive Education, we are focused on bridging the energy, engagement, and idea flow of physical in-person teaching and learning into online experiences. We aim to positively modify individual and collective behaviors that participants will take back to their teams and propagate throughout their organizations."

PAUL MCDONAGH-SMITH, SENIOR LECTURER (IT GROUP) AND DIGITAL CAPABILITY LEADER, MIT SLOAN SCHOOL OF MANAGEMENT

WHAT YOU'LL LEARN

ORIENTATION MODULE

WELCOME TO YOUR ONLINE CAMPUS

You'll be welcomed to the program and begin connecting with fellow participants, while exploring the navigation and tools of your Online Campus. Be alerted to key milestones in the learning path, and review how your results will be calculated and distributed.

You'll be required to complete your participant profile, and submit a digital copy of your passport/identity document.

Please note that module titles and their contents are subject to change during program development.

MODULE 1

THE LANDSCAPE OF ARTIFICIAL INTELLIGENCE (AI) IN THE PHARMACEUTICAL INDUSTRY

Gain insight into the present state of machine learning (ML) within the pharmaceutical industry.

- Outline what ML is and how it can be applied within the pharmaceutical industry context
- Explain how supervised ML and neural networks work
- Articulate the diversity of the applications of AI to drug discovery and distribution
- Reflect on the limitations of ML techniques and the common pitfalls encountered when first implementing them

"[Machine learning] shouldn't be viewed as the answer. It should be viewed as a tool and a process that brings you more information and insight to interrogate. And then, use the power of both your knowledge and machine learning to advance understanding."

PHILLIP SHARP, INSTITUTE PROFESSOR AND PROFESSOR OF BIOLOGY, MIT; MEMBER, KOCH INSTITUTE FOR INTEGRATIVE CANCER RESEARCH AT MIT

MODULE 2

USING AI FOR EARLY DRUG DISCOVERY: FROM SMALL MOLECULES TO BIOLOGICS

Explore the molecular basis and biologic applications of ML for early drug discovery.

- Explain the key differences between small molecules and biologics in pharma
- Articulate how neural networks are used to model small molecular properties
- Discuss the effectiveness of generative models for molecular design
- Illustrate how generative models can be used for biologics
- Analyze how biology can be infused into molecular models
- Recommend approaches for incorporating and investing in AI tools in your organization

MODULE 3

MODELING THE BIOLOGICAL UNDERPINNING OF DISEASE

Learn about a common representation of biology and disease on a cellular level using AI.

- Review how perturbational data can be used for drug discovery
- Discuss how to effectively utilize single cell technology
- Articulate the importance of target identification and transcriptomics for modeling diseases and therapeutic effects
- Determine the process of cell imaging with AI
- Analyze how to use existing data to reduce the failure rate of translation to humans
- Recommend on translating across biological dimensions

WHAT IS MIT SLOAN?

Learn more about

THE MIT SLOAN SCHOOL OF MANAGEMENT

MODULE 4

BIOMARKERS, DISCOVERY, AND PATIENT STRATIFICATION

Consider how AI can assist with identifying biomarkers, disease tracking, and patient stratification.

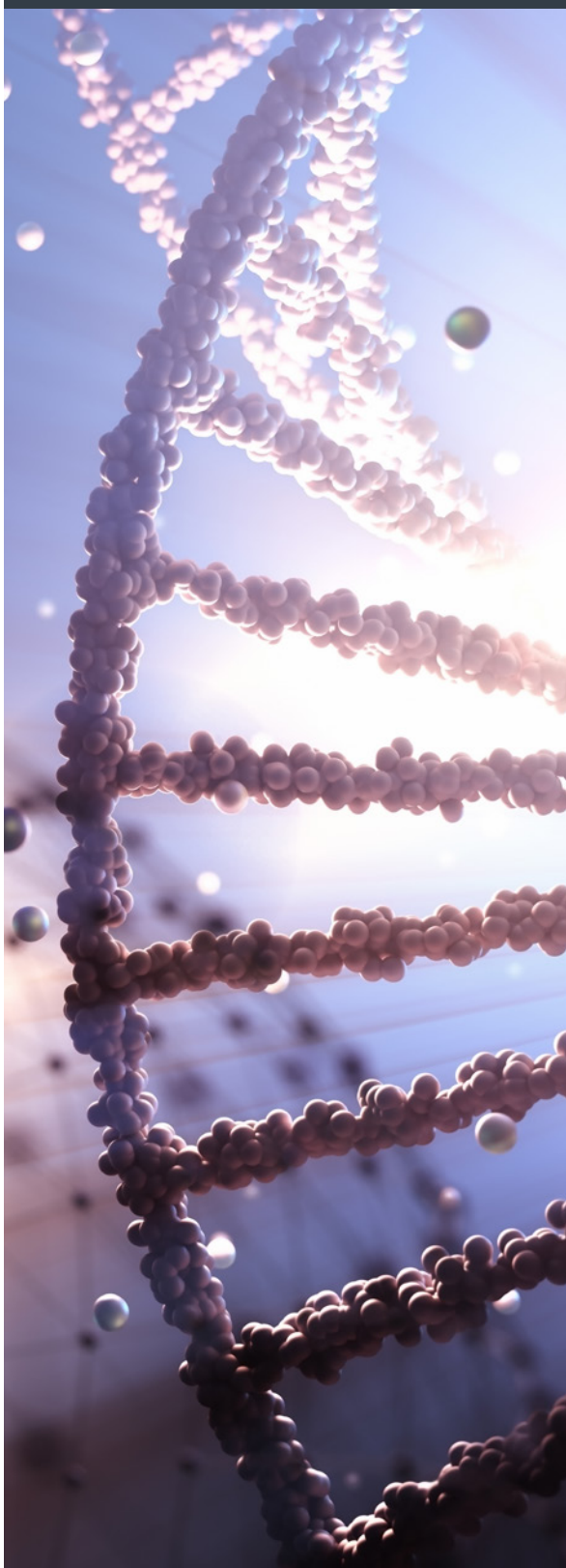
- Describe the relationship between digital biomarkers and drug discovery
- Articulate how ML can be used on real-world data to identify new therapeutic targets
- Investigate how novel modalities are used to monitor patient health and provide insights into the therapeutic effect of drugs
- Analyze how AI can help identify patients that would benefit from a drug and predict their responses
- Recommend ways in which new AI modalities could help your organization better understand disease progression and make drug distribution more equitable
- Assess the impact of new AI modalities on pharmaceutical processes in your organization

MODULE 5

DESIGN AND MANAGEMENT OF CLINICAL TRIALS

Explore the impact of ML on the design and management of clinical trials.

- Outline how ML can be used in the design and management of clinical trials
- Articulate how ML can help identify both promising recruiting sites for trials and future disease areas
- Analyze the process and potential benefits of using synthetic control methods
- Reflect on the use of ML tools in Johnson & Johnson's Janssen COVID-19 vaccine trial
- Recommend additional aspects of clinical trial design that could be automated with ML



MODULE 6

BUSINESS AND INNOVATION IN PHARMA

Consider the business implications of AI in pharma and biotech.

- Articulate the business and financial impacts of applying ML in pharma
- Analyze how pharmaceutical organizations should optimally allocate and manage resources
- Evaluate how to best measure the success of incorporating ML into a particular stage of drug discovery
- Compare the business impacts of implementing new vs. existing ML tools
- Create a business strategy that incorporates ML technologies into your organization

WHO YOU'LL LEARN FROM

This subject matter expert from MIT Sloan guides the course design and appears in a number of program videos, along with a variety of industry professionals.

YOUR FACULTY DIRECTOR

REGINA BARZILAY

School of Engineering Distinguished Professor for AI and Health, MIT Center for Machine Learning in Health; AI Faculty Lead, Jameel Clinic

Barzilay received her PhD in computer science from Columbia University. Her research focuses on machine learning for molecular modeling with applications to drug discovery and clinical AI. She also works with natural language processing. Barzilay is a recipient of various awards, including the National Science Foundation Career Award, the *MIT Technology Review* TR-35 Award, and several Best Paper Awards from the North American Chapter of the Association for Computational Linguistics and Association of Computational Linguistics. In 2017, she received a MacArthur fellowship, an ACL fellowship, and an Association for the Advancement of Artificial Intelligence fellowship. In 2020, she won the Squirrel AI Award for Artificial Intelligence for the Benefit of Humanity.

MIT FACULTY EXPERTS

CAROLINE UHLER
Henry L. and Grace Doherty Associate Professor, Electrical Engineering and Computer Science, MIT

DIMITRI BERTSIMAS
Boeing Leaders for Global Operations Professor of Management, Professor of Operations Research, and Associate Dean for Business Analytics, MIT

DINA KATABI
Thuan and Nicole Pham Professor, MacArthur Fellow, Leader of the NETMIT Research Group, and Director of the MIT Center for Wireless Networks and Mobile Computing, MIT CSAIL

ERNEST FRAENKEL
Professor of Biological Engineering, MIT

MARZYEH GHASSEMI
Herman L. F. von Helmholtz Career Development Professor, Assistant Professor of Electrical Engineering and Computer Science and Institute for Medical Engineering and Science, MIT; CIFAR AI Chair, Vector Institute

PHILLIP SHARP
Institute Professor and Professor of Biology, MIT; Member, Koch Institute for Integrative Cancer Research at MIT

TOMMI S. JAAKKOLA
Thomas Siebel Professor of Electrical Engineering and Computer Science and the Institute for Data, Systems, and Society, MIT

YOUR SUCCESS TEAM

GetSmarter, with whom MIT Sloan is collaborating to deliver this online program, provides a personalized approach to online education that ensures you're supported throughout your learning journey.

HEAD LEARNING FACILITATOR
A subject expert from GetSmarter, approved by the University, will guide you through your learning journey.

SUCCESS ADVISER
Your one-on-one support at GetSmarter, available during University hours (9a.m.–5p.m. EST) to address technical or administrative questions.

GLOBAL SUCCESS TEAM
This team from GetSmarter is available 24/7 to solve your tech-related queries and concerns.

A POWERFUL COLLABORATION

The MIT Sloan School of Management is collaborating with online education provider, GetSmarter, to create a new class of learning experience — one that is high-touch, intimate, and personalized for the working professional.

ABOUT MIT SLOAN

The MIT Sloan School of Management is one of the world's leading business schools, emphasizing innovation in practice and research, with a mission to develop principled, innovative leaders who improve the world, and to generate ideas that advance management practice. The school's focus on action learning means that students are able to apply concepts learned in the classroom to real-world business settings. Through its collaborative spirit, MIT Sloan welcomes and celebrates diverse viewpoints, creating an environment where new ideas grow and thrive.

WHAT IS MIT SLOAN EXECUTIVE EDUCATION?

MIT Sloan Executive Education offers nondegree executive programs led by MIT Sloan faculty to provide business professionals from around the world with a targeted and flexible means to advance their career development goals and position their organizations for future growth. By collaborating with GetSmarter, a leader in online education, MIT Sloan Executive Education is able to deliver its executive programs through a dynamic, interactive, digital learning platform.

ABOUT GETSMARTER

GetSmarter, a 2U, Inc. brand, collaborates with the world's leading universities and institutions to select, design, and deliver premium online short courses with a data-driven focus on learning gain.

Technology meets academic rigor in GetSmarter's people-mediated model, which enables lifelong learners across the globe to obtain industry-relevant skills that are recognized by the world's most reputable academic institutions.

ABOUT THE CERTIFICATE

This program offers you the opportunity to earn a digital certificate of completion from one of the world's leading business schools — the MIT Sloan School of Management. This program also counts toward an MIT Sloan Executive Certificate, which you can earn upon completion of four programs where at least three of the four come from your chosen certificate track and at least one is completed in person. Find full details here.

Completion is based on a series of practical online assignments. In order to be issued with a digital certificate you'll need to meet the requirements outlined in the course handbook. The handbook will be made available to you as soon as you begin the program.

Your certificate will be issued in your legal name and sent to you digitally upon successful completion of the program, as per the stipulated requirements.

HOW YOU'LL LEARN

Every course is broken down into manageable, weekly modules designed to accelerate your learning process through diverse activities:

- Work through your downloadable and online instructional material
- Interact with your peers and learning facilitators through weekly class-wide forums and reviewed small group discussions
- Enjoy a wide range of interactive content, including video lectures, infographics, live polls, and more
- Investigate rich, real-world case studies
- Apply what you learn each week to quizzes and ongoing project submissions, culminating in the ability to connect AI, drug development, and business decision making

TECHNICAL REQUIREMENTS

BASIC REQUIREMENTS

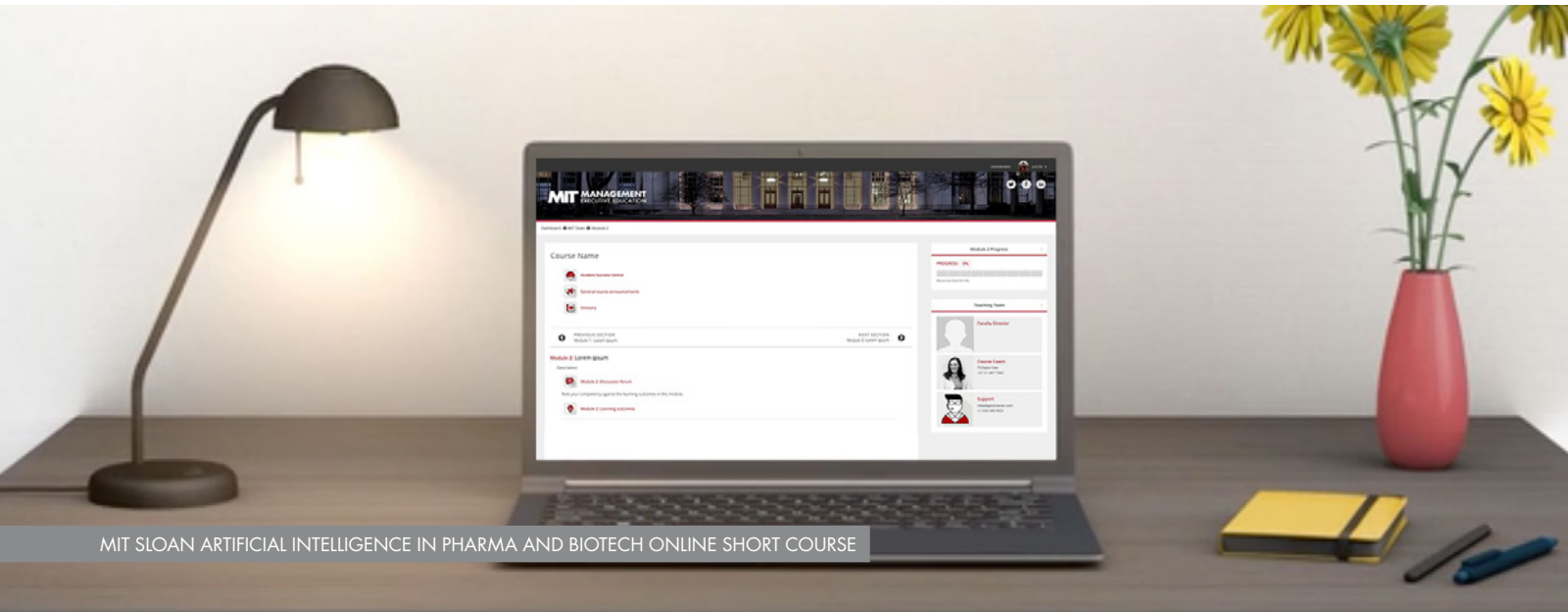
In order to complete this program you'll need a current email account and access to a computer and the internet, as well as a PDF Reader. You may need to view Microsoft PowerPoint presentations, and read and create documents in Microsoft Word or Excel.

BROWSER REQUIREMENTS

We recommend that you use Google Chrome as your internet browser when accessing the Online Campus. Although this is not a requirement, we have found that this browser performs best for ease of access to program material. This browser can be downloaded here.

ADDITIONAL REQUIREMENTS

Certain courses may require additional software and resources. These additional software and resource requirements will be communicated to you upon registration and/or at the beginning of the program. Please note that Google, Vimeo, and YouTube may be used in our course delivery, and if these services are blocked in your jurisdiction, you may have difficulty in accessing program content. Please check with an Enrollment Adviser before registering for this program if you have any concerns about this affecting your experience with the Online Campus.



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