Discover Experiential AI
Responsible AI for human-centric solutions
## Contents

### INTRODUCTION TO THE INSTITUTE
- A Message from Usama Fayyad  
- Our Commitment to Responsible AI  
- The Impact of Our Faculty Members  
- EAI Highlights  
- The Bridge Between Academia and Industry  
- Using AI to Solve Real-World Problems

### AI IN INDUSTRY
- Founder of Notable Systems: AI Works Best with Humans in the Loop  
- Experiential AI to Help Define the Next Revolution in Sound  
- Executive Leadership Perspectives on AI in Industry  
- Using Experiential AI to Produce Positive Financial Outcomes

### AI ETHICS AND RESPONSIBLE AI
- Can We Make AI Worthy of Our Trust?  
- A Philosopher in the Tech World on the Secret to Responsible AI  
- The Institute for Experiential AI Paves the Way Toward Eliminating AI Biases

### AI ACROSS DISCIPLINES
- Advancing AI Across Disciplines
  - Engineering
  - Library Studies
  - Professional Studies
  - Law
# Contents

- **Art and Design** 22
- **Computer Science** 22
- **Humanities** 23
- **Health** 24
- **Science** 25
- **Business** 25

## AI IN HEALTH AND LIFE SCIENCES

- High Stakes and Hard Choices: Life Science Leaders on the Intersection of Health and AI 26
- World-Renowned Leader in Computation Medicine: AI Will Join the Health Care Team 28

## EXPERIENTIAL AI FOR SOCIETAL IMPACT

- A Glimpse Into How AI Can Improve the World 30
  - Feeding Those in Need 31
  - Predicting Climate Change 32
  - Finding a Cure 33
  - Developmental Disorders and Drone Design 34
  - Stopping Cyber Attacks 35

## CONCLUSION

- Key Takeaways 36

## APPENDIX

- Additional Event Videos 37
- EAI in the Press 38
Welcome to the Institute for Experiential AI at Northeastern University! On April 6, 2022, we celebrated the launch of our institute in Boston with a series of keynote speakers, expert panels, an AI career fair, and research poster sessions for the AI projects supervised by our faculty. More than 700 people attended in-person and virtually. Several reputable publications such as The Wall Street Journal, Boston Business Journal, and Datanami chose to cover the event. You can find a complete list of videos from the event and related articles in the Appendix section of this e-book.

What is Experiential AI? It is human-centric AI that leverages human intervention and feedback and focuses on making solutions work in real settings. We believe the advancement of AI as a science will be driven by understanding what works and what does not work in real applications dealing with imperfect inputs and conditions. We believe that understanding the art of the practice of AI is a great way to drive the research agenda, including the basic research agenda in the field of AI in meaningful and impactful ways.

The Institute for Experiential AI drives AI research, applications, and education across Northeastern University campuses internationally to advance the science and practice of Experiential AI. We work with partner companies, public institutions, and academia on problems that deliver value through applied solutions and support education at the undergraduate, graduate, and professional levels by coupling supervised apprenticeships and experiential education in the context of real-world AI-solution delivery.

Emphasizing AI ethics and Responsible AI through multi-disciplinary approaches to high-impact business and societal problems, we help partners build a foundation of responsible and ethical use of AI in industry, government, society, and academia. This is one of the important ways to advance the issue of trust in AI—a proper combination of actual solutions that work with a lot of attention to make sure this practice is done responsibly.

Our AI Solutions Hub develops value-driven solutions for partners by focusing on their pressing data and AI challenges. This delivers value directly by developing innovative working solutions. Through our Responsible AI Advisory Service, we co-develop and implement a framework for practicing Responsible AI, with services including algorithmic audits, ethical risk assessment, and an independent, virtual AI Ethics Board. And by providing data science leadership, we work hand in hand with industry partners to create an applied action plan to unlock the value of data and deliver innovative training to generate a top-quality talent pipeline and by continuously supporting the lifelong education goals through upskilling existing employees.

One of the early projects that demonstrated the success of this new model is our collaboration with Sun Life, a partner at the Roux Institute. Not only did we work with Sun Life on creating a catalog of opportunities for AI in their business, but we also worked on solving the highest priority project in this catalog at the AI Solutions Hub, and in parallel, we ran a practicum course built around this problem by bringing together learners from Northeastern University with learners from Sun Life. This project created a very successful illustration of the various parts of the model.

We invite you to explore the impact of Experiential AI, our institute, and the work of our amazing faculty members in the following pages, and we look forward to working with you in the future.

Usama Fayyad
Executive Director, Institute for Experiential AI
INTRODUCTION TO THE INSTITUTE

Our Commitment to Responsible AI

The Institute for Experiential AI provides Responsible AI research and services to produce AI systems that benefit individuals, institutions, society, and nature at large. It encompasses all the ethical, legal, and technical aspects of developing and deploying beneficial AI technologies, ensuring that AI systems do not cause harm, interfere with human agency, discriminate, or waste resources, among other things.

As part of these services, we have formed a unique worldwide AI Ethics Board (AIEB) to provide top-level and independent guidance to help organizations develop and deploy AI responsibly. Composed of experts in multiple disciplines from academia and across industries, the AIEB aims to ensure diversity on multiple dimensions, including gender and nationality. Our list of board members includes a core group of Northeastern University faculty and a majority of experts from other organizations.

We look forward to helping you incorporate AI Ethics into your AI strategy and governance goals and build an innovative responsible AI practice.

Ricardo Baeza-Yates, Ph.D.
Director of Research
Institute for Experiential AI

The Impact of Our Faculty Members

The Institute for Experiential AI includes a diverse team of more than 90 faculty members from all Northeastern University colleges—and we continue to grow. The Institute is comprised of faculty across colleges from computer science, engineering, statistics, math, business, to social science, psychology, ethics, and law. The collaborative spirit and cross-disciplinary approach is a core strength of the Institute for Experiential EAI.

Together with our sister Northeastern institutes, such as the Roux Institute, the Ethics Institute, Network Science, Cybersecurity & Privacy, Wireless IoT, and Experiential Robotics institutes, our multidisciplinary faculty works to generate relevant research rooted in real solutions to real-world problems. We’re also leading initiatives across the university in AI + health, AI + life sciences, and AI + climate and sustainability. In addition to our focus on research areas in AI, we’re working to make AI trustworthy and responsible by taking humans into account in our models. Jointly, we can maximize our impact, advance the science of AI, and tackle grand societal challenges.

I am incredibly excited about Northeastern University’s commitment to AI and the many amazing projects now and in the future.

Jennifer Dy
Director of AI Faculty
Institute for Experiential AI
EAI Highlights

93
- total faculty members representing all 9 colleges at Northeastern University (62 core members and 31 affiliate members)

$50M
- in active grant funding for core members

2.9K+
- university-wide corporate partners

20
- current EAI postdocs

2.75K+
- registrations at 20 seminars and 2 conferences (May ’21-’22)

Northeastern Global Network
*EAI Hub

Discover Experiential AI Event Attendance:

438
- NU-affiliated (faculty, students, staff, etc)

157
- external partners at the inaugural event

130+
- job seekers at career fair
INTRODUCTION TO THE INSTITUTE

The Bridge Between Academia and Industry

Northeastern University President Joseph E. Aoun and David Roux, managing partner at BayPine, began the event with a discussion about the opportunity to create impact and shift the higher education model to one that gives enterprises and companies a seat at the table from the start.

“You need people in the loop at design time, at testing time, and at governance and oversight time.”

David Roux
Managing Partner, BayPine

“Industry now is generating research that is equal, and in some domains, superior to, what is happening in higher education.”

Joseph E. Aoun
President, Northeastern University

Using AI to Solve Real-World Problems

“If we are going to maximize our positive impact in the world, we need to be deep and broad in AI... You don’t solve problems in the world with technology alone. It takes a university and its partners to solve problems.”

David Madigan
Provost, Northeastern University
It’s tempting to think of artificial intelligence (AI) as some boundless frontier of pure possibility, but AI’s true potential lies in the way humans and machines complement each other.

This is clear in the era of Big Data, where the abundance of digital devices produces too much information for humans to process. Similarly, the machines we’ve employed to make sense of that data are ill-equipped for creative or context-sensitive uses. For Steve Johnson, founder and co-director of Notable Systems, context and creativity fall under the umbrella of “human judgment.”

It’s Johnson’s opinion that software that artfully blends machine work with human judgment can solve complex problems better than purely artificial ones. Uses of AI such as driverless vehicles, document analysis, customer service, and medical diagnosis all work best with a human in the loop.

Johnson’s company uses AI to automate and capture valuable bits of information from innumerable documents—a typically costly process. He feels a more automated approach could cut costs up to 90 percent while liberating human creativity to focus on more pressing tasks.

“Systems developers who insist on keeping humans out of the loop are limiting the imaginable capabilities, or, worse, they’re consigned to committing errors that are actually avoidable.”

Steve Johnson
Founder and Co-director of Notable Systems

Humans better recognize the contexts behind algorithmic tasks. They can alter inputs to account for ethical considerations and physical details, like the idiosyncrasies of handwriting, which computers are notoriously bad at deciphering.

Reserving more creative, context-sensitive decisions for humans—such as spotting new applications or designing for better performance—gives AI practitioners and downstream users the best of both worlds.
Experiential AI to Help Define the Next Revolution in Sound

For an audio innovator like Bose, the AI revolution is only possible because of the digital one that preceded it. In fact, AI may turn out to be every bit as transformative as the iPod, streaming music, or wireless speakers.

Powered by reams of digital data, AI enables new kinds of listening experiences uniquely attuned to your environment. And with a human in the loop, developers can uncover new insights that were almost impossible to see in the digital era. As Bose CEO Lila Snyder explained in her keynote speech at Discover Experiential AI, it’s all about using data to create new experiences that are enjoyable and useful.

Noise-cancelling technology is a prime example. The technology has been around for a few decades, stuck in a binary state: You can either turn it on or off.

Bose’s AI-powered Active Sense technology can monitor a listener’s environment to trigger noise cancellation only when appropriate, tuning out racket and tuning in important sounds like sirens and nearby voices. The same tech can potentially override volume...
knobs on home audio systems automatically—a blessing to anyone who hates having to turn the volume up to hear dialogue. Other applications are limited only by one’s imagination.

The secret truth about audio is that it’s not usually heard how musicians and engineers intend. Fine details like listener position, speaker distance, room acoustics, and sound system fidelity make for wildly different experiences. But AI allows engineers to disaggregate sound data to emulate ideal environments, transforming a humble living room into a symphony hall.

For Snyder, the next revolution in audio is all about hearing what you want to hear. “But,” she said, “we can’t do that without AI and without data.”