Message from the Director

It is my honor to share with you this report outlining the Mobility Initiative's activities in its first year of existence. What started as a vision in early 2020 has now become an established and burgeoning institution.

Over the course of our first ten months, we have engaged more than 50 transportation faculty members in developing the Initiative’s intellectual framework, built the Mobility Forum for knowledge exchange (with an average of 130 attendees per week for 14 weeks), designed the Initiative's website as a platform for communication, established our funding ‘rules of engagement’, engaged industry experts in our Entrepreneurship Dialog series, and re-invigorated the transportation education system through a new curriculum design and greater faculty participation, resulting in a doubling of applicants for the 2021 cycle. And we are just getting started.

The Initiative is a direct response to societal needs. The world of mobility is changing rapidly with new technologies, new players, new needs, and, significantly, new values. We believe that there is a gap in academic leadership in the field of mobility; and we seek to fill that gap by shaping the conversation and offering new innovations that could transform the system.

MIT is in a unique position to do exactly that by harnessing the knowledge power that already exists at the Institute through cross-disciplinary research projects and initiatives targeted at the field’s core needs. We are a knowledge generator and a center for knowledge exchange.

As we look forward, we are eager to expand the Initiative’s reach in our second year with new research projects, increased civic engagement, and a re-invigorated education program. We had the privilege of surveying the mobility landscape and working to understand both its challenges and its needs in our first year. Now, at the precipice of year two, we are rolling up our sleeves and getting to work.

Sincerely,

Jinhua Zhao
Executive Director, MIT Mobility Initiative
Edward and Joyce Linde Associate Professor of City and Transportation Planning
Mobility and transportation are at the dawn of the most profound changes with an unprecedented combination of new technologies (autonomy, electrification, computation, and AI) meeting new and evolving priorities and objectives (decarbonization, public health, and social justice). And the timeframe for these changes—decarbonization in particular—is short in a system with massive amounts of fixed, long-life assets and entrenched behaviors and cultures. It’s this combination of new technologies, new purposes, and urgent timeframes that makes an MIT-led Mobility Initiative critical at this moment.

The MIT Mobility Initiative (MMI) is a 30-year effort designed to effect fundamental changes in the long-term trajectory of sustainable mobility development in pursuit of a mobility system that is safe, clean, and accessible. MMI coalesces all mobility and transportation activities at MIT, knitting together the efforts on research, education, entrepreneurship, and civic engagement at the Institute into a greater whole. That includes both strengthening research opportunities through cross-disciplinary coordination and filling key society gaps through knowledge development and exchange.

We convene and connect individuals across levels, sectors, and disciplines, coalescing insights and developing a research agenda to catalyze large-scale changes across the mobility landscape.

The profound changes roiling the world of mobility require balanced and informed leadership—leadership that can reach across a diverse array of sectors to inform and shape outcomes. The MIT Mobility Initiative is designed to fill that gap.

“MIT has a long and proud history in transportation research and education—and strong, multi-disciplinary leadership in the field is perhaps more essential than ever as communities and cities are uncertain about their mobility future.”
Our Value

Weaving together developments in data, technology, and values to create a whole with a greater impact than the sum of its parts

**DATA**
- Computing/AI: CSAIL, MIT-IBM, SCoC
- Operations: CTL, CEE, Sloan, OR
- Big Data: Media Lab, CTL, IDSS
- Demand Modeling: CEE, MechE, DUSP

**TECHNOLOGY**
- Energy/Environment: MITEI, DUSP, IDSS
- 5G & V2X: EECS, CSAIL, SCoC
- Aeronautics: ACL, EAI, ESL, ICAT
- Automation: AVT, EECS, MechE

**VALUES**
- Behavior: DUSP, CEEPR, Sloan
- Justice: DUSP, CoLab, Arch
- Design: Arch, DUSP, Sloan
- Sustainability: IDSS, MITEI, Sloan

AVT: Advanced Vehicle Technology Consortium; CEE: Civil and Environmental Engineering; CSAIL: Computer Science & Artificial Intelligence Laboratory; CTL: Center for Transportation and Logistics; DUSP: Department of Urban Studies and Planning; EECS: Electrical Engineering & Computer Science; MechE: Mechanical Engineering; OR: Operations Research; SCoC: Schwarzman College of Computing
Core Pillars

**RESEARCH**
Intellectual coordination across the Institute & management of cross-disciplinary research projects

**EDUCATION**
Management and renovation of MIT’s storied transportation education programs and initiatives

**ENTREPRENEURSHIP**
Home to MIT’s mobility innovation ecosystem and network of entrepreneurs

**CIVIC ENGAGEMENT**
Offering leadership in efforts to drive social & environmental changes in the world of mobility
Intellectual Structure

MIT’s wide array of research addresses the systems-level challenges as well as the myriad different transport phenomena and their interactions that promise to define our mobility system for generations to come.

Developments in computation and analytics are allowing us to better understand and optimize systems and flows to better serve needs and to improve efficiency—opening the door for a new conceptualization of mobility itself.

The timeframe for addressing the challenges of integrating new technology with new values is short in a system with fixed assets. MIT researchers are leading the way in innovative economic, policy, and design strategies to help shape and adapt these critical systems.
At a Glance

The Mobility Initiative’s first year by the numbers

134
average attendees of the MIT Mobility Forum (across 14 total sessions)

9,770
unique visitors to the MMI website since its launch in late June

68
MIT faculty or researchers who are participants in the Initiative

19
companies that have expressed interest or attended targeted events

23
CEOs or company founders who participated in the Entrepreneurship Dialogue series

25
research labs that are affiliated with and participants in the Initiative

110
alumni who have expressed interest in being involved

21
number of events held in the Initiative’s first 8 months

13
number of research clusters at the Institute
Event Series

Events help us to fulfill our many functions, offering opportunities to exchange research, to educate, to bring entrepreneurs into the fold, and to inform and support the public and non-profit sectors.

MOBILITY FORUM

A weekly seminar series, the MIT Mobility Forum offers an opportunity to showcase the groundbreaking transportation research occurring across the Institute, faculty members present their latest insights, ideas, and innovations, followed by a lively discussion. Attendees averaged 134 individuals per event, including MIT faculty, students, alumni, and affiliates. Speakers ranged from the MIT MediaLab's Sandy Pentland to IDSS professor Jessika Trancik.

“I feel honored for being able to attend. It has become a positive highlight at the end of my work week and has consistently given me good food for thought.”

Mobility Forum participant

ENTREPRENEURSHIP DIALOGUES

A series of dialogues between entrepreneurs and mobility industry experts to offer insights into the mobility landscape, the experience of being an entrepreneur and opportunities for innovation. Offered as part of MIT’s new Mobility Ventures course, the events were open to the wider MIT community. Speakers included Hyper-loops Jay Walder, Aptiv's Karl Iagnemma, MTA’s Mark Dowd, and Rivian’s RJ Scaringe, among many other distinguished guests.

MIT MOBILITY SUMMIT

To be launched in Fall 2021, MIT’s yearly Summit will showcase the latest research and innovation in the realm of transportation. It will convene leaders and thinkers from across the globe representing the public, private, and non-profit sectors to encourage cross-sector collaboration in setting a research agenda and driving innovation to create a transportation system that is more sustainable, equitable, and efficient.
Mobility Forum Events

Introducing the MIT Mobility Initiative
Jinhua Zhao
Director, MIT Mobility Initiative; Associate Professor of Transportation and City Planning
September 11, 2020

The Social Consequences of Mobility Systems
Sandy Pentland
Director, MIT Human Dynamics Laboratory and MIT Media Lab Entrepreneurship Program
September 18, 2020

Autonomous Vehicles, Mobility, and Employment Policy
John Leonard
Samuel C. Collins Professor of Mechanical & Ocean Engineering, Department of Mechanical Engineering
September 25, 2020

Microlocation in Transit: The New York City Subway System
David Mindell
Professor of the History of Engineering; Manufacturing Professor of Aeronautics and Astronautics
October 2, 2020

The Edge of Optimization: Large Scale Transportation Systems
Dimitris Bertsimas
Boeing Leaders for Global Operations Professor of Management
October 9, 2020

Reducing GHG Emissions: Technical Options & Societal Choices
Bill Green
Hoyt C. Hotte Professor in Chemical Engineering
October 16, 2020

The Inefficiency of Dynamic Pricing in Ridehailing Systems
Daniel Freund
Assistant Professor of Operations Management at the MIT Sloan School of Management
October 23, 2020
Mobility Forum Events contd

Mobility Services Without Carbon Emissions
Jessika Trancik
Associate Professor of Energy Studies, Institute for Data, Systems, and Society
November 6, 2020

Transportation Systems Resilience
Saurabh Amin
Robert N. Noyce Assistant Professor, Department of Civil & Environmental Engineering
November 13, 2020

The Global Rise of Platform Firms in Urban Mobility Markets
Jason Jackson
Ford Career Development Assistant Professor in Political Economy and Urban Planning
November 20, 2020

On-Demand Urban Aerial Mobility Planning
Alexandre Jacquillat
Assistant Professor of Operations Research and Statistics at the MIT Sloan School of Management
December 4, 2020

Value of Time: Evidence from Auctioned Cab Rides
Tobias Salz
Castle Krob Career Development Assistant Professor of Economics, Department of Economics
December 13, 2020
Entrepreneurship Dialogues
A Snapshot

Karl Iagnemma, President and CEO at Motional

Reilly Brennan, Founding General Partner at Trucks & Lecturer at Stanford

Julia Steyn, Chief Executive Officer at Bolt Mobility

Mary Chan, Managing Partner at VectoIQ

Jay Walder, CEO at Virgin Hyperloop

Regina Savage, Managing Director at Morgan Stanley

Seleta Reynolds, General Manager at LADOT

Mark Dowd, Chief Innovation Officer at New York MTA

Michael Hurwitz, Director of Transport Innovation, Transport for London

Kate Fichter, Assistant Secretary for Policy Coordination, MA DOT

RJ Scaringe, Founder & Chief Executive Officer of Rivian

Tiffany Chu, CEO and Co-founder at Remix

James Womack, Founder and Senior Advisor of Lean Enterprise Institute

December 2, 2020

September 9, 2020

October 21, 2020

November 6, 2020

December 9, 2020
As a core competence of the Mobility Initiative, we have worked over the course of our first year to develop a research agenda and create a framework for large-scale, high-impact research engagements with external actors and internal partners. We have identified four core areas of value for which we are designing a series of expert roundtables as funded by participants to support MIT faculty research projects. The Mobility Initiative serves as a key platform through which to instigate cross-disciplinary, multi-faculty projects and to connect academic research with on-the-ground needs in the public and private sectors.

Ongoing projects range from a partnership with the US Department of Energy to develop innovative transit operation planning and control strategies using machine learning techniques to a collaboration with the Boston-based Barr Foundation on transit stigmatization following the COVID-19 pandemic to incentivize sustainable travel choices.

**Knowledge Exchange**

*Goal:* Develop a platform for dynamic intellectual exchanges at MIT

*Method:* Cutting-edge event series and faculty engagement across projects

**Knowledge Development**

*Goal:* Attract, manage, and conduct high-impact projects and reports.

*Method:* Public and private sector engagement to support key research projects

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**Research Spotlight**

The Initiative has partnered with the Chicago Transit Authority during the COVID-19 pandemic to create a council of the largest US transit agencies in order to support transit recovery through insights into ridership trends and efforts to optimize revenue projections.

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**NEXT STEPS**

- Solidify industry engagement plan for expert roundtables
- Secure funding for targeted research projects
- Identify areas of priority for faculty researchers
Executive Roundtables

MOBILITY & DATA
Optimizing data exchange, collection, and collaboration to facilitate system integration

Faculty Lead: Sandy Pentland
Director, MIT Human Dynamics Laboratory and MIT Media Lab Entrepreneurship Program

MOBILITY & 5G/V2X
Establishing a framework for technological and regulatory advancements in 5G and sensors

Faculty Lead: Sanjay Sarma
Vice President, MIT Open Learning and Fred Fort Flowers and Daniel Fort Flowers Professor of Mechanical Engineering

MOBILITY & ELECTRIFICATION
Identifying & shaping a pathway towards widespread electrification

Faculty Lead: Bill Green
Hoyt C. Hottel Professor in Chemical Engineering

MOBILITY & PUBLIC TRANSIT
Developing more resilient transit networks & supporting a post-pandemic recovery

Faculty Lead: Jinhua Zhao
Director, MIT Mobility Initiative and Associate Professor of City and Transportation Planning
EDUCATION

MIT boasts a long-standing, storied, cross-disciplinary graduate program in transportation. Students choose from a wide range of introductory and advanced transportation-related subjects to build an education that prepares them to be the leaders of tomorrow’s transportation system. The MIT Mobility Initiative is redesigning and expanding the education curriculum, incorporating more faculty advisors, and working to attract a wide range of candidates from diverse backgrounds. MIT has long been a leader in the field of transportation research and recent changes serve to solidify that reputation and to fill a global gap in cross-disciplinary transportation-focused education. More details on curriculum updates can be found in the appendix.

Manage existing programs

Goal: Centralize and optimize program management and improve student experience

Highlights:
Attracted double the applicants as compared to 2019 through improved outreach, including website redesign, webinar, and stakeholder engagement

Enhance the curriculum

Goal: Expand mobility-related coursework and incorporate new disciplines

Highlights:
Incorporated new coursework into the curriculum, and updated MST and PhD program requirements

Design new degrees

Goal: Introduce new degrees for easier integration across disciplines

Highlights:
Initiated approval process for updates to existing degrees and additions of new degrees and formats, including X+T

Education Spotlight

The Initiative is pleased to announce it is accepting applications for the Dan Roos Fellowship for transportation dissertations, awarded annually to the strongest transportation-related dissertation at the Institute.

NEXT STEPS

- Finalize MST and PhD curriculum redesign
- Complete internal MIT approval process
- Introduce new X+T program
- Review applications and report to faculty on applicants
Graduate Programs

TRANSPORTATION

Led by MIT’s Mobility Initiative, the Institute’s cross-disciplinary graduate program in transportation provides a variety of graduate degrees for students interested in transportation studies and research. Students choose from a wide range of introductory and advanced subjects related to transportation and engage with real-world projects and challenges to build an education that prepares them to be the leaders of tomorrow’s transportation system.

Master of Science in Transportation

The Master of Science in Transportation (M.S.T.) degree program emphasizes the complexity of transportation, lying at the intersection of technology, operations, planning, management, and policy-making. The program is interdepartmental, drawing on coursework, faculty, and research staff from across MIT. During the two-year program, students work closely with a research advisor to select an individually-designed area of focus within the realm of transportation. Requirements include coursework across different aspects of transportation, as well as specialized work in the designated area of choice.

Interdepartmental Doctoral Program in Transportation

The interdepartmental doctoral program in transportation provides a structured and follow-on doctoral program for students enrolled in MIT’s Master of Science in Transportation program or other transportation-related masters degree programs at MIT or elsewhere. The interdepartmental structure of the program allows students greater flexibility in developing individual programs of study that cross both disciplinary and departmental lines. The program is administered by the Transportation Education Committee, a faculty committee responsible for admissions and oversight of program requirements.

To apply, visit mmi.mit.edu/education

Mobility and transportation are at the dawn of profound change with an unprecedented combination of new technologies meeting new—and evolving—priorities. The newly founded MIT Mobility Initiative (MMI) serves to unite mobility-related research across MIT to help drive these necessary changes in the long-term trajectory of sustainable mobility development. As part of the Initiative, MIT’s storied transportation education program offers opportunities to address the major challenges facing transportation today, through real-world partnerships, hands-on projects, entrepreneurship and more.

CONTACT US

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mobility-info@mit.edu
www.mmi.mit.edu

13 Research Clusters
25 Research Labs
50 Faculty Members
Innovation has existed in the genes of MIT since its very founding. As one of the nation’s first land-grant colleges, the Institute was designed to deliver a practical education—one that emphasizes learning by doing and prioritizes developing solutions to complex (yet invariably compelling) problems. This year, the Mobility Initiative developed coursework related to entrepreneurship, engaged MIT’s impressive cadre of alumni who are transportation entrepreneurs, and established a framework for cultivating a new mobility-focused entrepreneurial community within the Institute.

**Expansion coursework**

**Goal:** Encourage & cultivate student innovation

**Method:** Fall 2020 has marked the first iteration of the MIT Mobility Ventures course, co-taught by industry expert John Moavenzadeh, instigating student innovation in the field of mobility.

**Strengthen the ecosystem**

**Goal:** Tap into existing entrepreneurship resources at MIT and expand mobility-related venture opportunities

**Engage experts**

**Goal:** Incorporate the voices of alumni, industry experts, and the public sector to help educate students and inform research

### Partnership Spotlight

The Initiative has been actively working with the Martin Trust Center for Entrepreneurship and MIT DesignX to both develop new coursework and mobility-related venture support.

**NEXT STEPS**

- Expand Entrepreneurship Dialogue Series
- Establish the Mobility Venture Prize
- Expand internal MIT entrepreneurship-related network and relationships

RJ Scaringe, Founder & CEO of Rivian

November 6, 2020

MIT Entrepreneurship Dialogue
CIVIC ENGAGEMENT

At MIT, we work to offer cutting edge analysis, research, and innovation in service to society. This involves working with governments, organizations, and students to build a better world through social, environmental, and technological changes. As part of that mission, the Mobility Initiative strives to support cities and communities across the globe in better understand the challenges facing them and to offer platforms and solutions to address their needs.

Knowledge dissemination

Goal: Communicate pertinent research findings clearly & effectively

Method: Public events, navigable platforms, and convening individuals with overlapping interests

Highlight: The Mobility Initiative has teamed up with the Sasaki Foundation to organize a mobility equity symposium in Spring 2021 to help drive the dialogue around mobility equity and establish a shared research agenda.

Knowledge generation

Goal: Engage in research with social and environmental impacts

Identifying a pathway to zero carbon mobility by 2050

Developing and catalyzing innovative policy frameworks for technology deployment

Establishing a framework for mobility equity & universal accessibility

NEXT STEPS

- Organize Equity Symposium (Spring 2021)
- Finalize civic-oriented research agenda
- Incorporate community voices into pertinent roundtables and research projects

Tamika Butler
Mobility Equity Expert
October 14, 2020
MIT Mobility Forum
## Financial Strategy

Engaging on multiple fronts to establish a firm basis

| Membership Model | A model for industry engagement based on MITEI's and CSAIL's industrial membership models. Companies can select from three membership tiers: founding (targeted, sponsored research), affiliate (group-based seed research funding), and associate (access to MMI activities, research, and events). |
| Executive Roundtables | A targeted iteration of the associate membership model, we have identified four areas of value where MIT can serve as a convener and thought leader around which we intend to build a series of expert roundtables. Members pay to participate, identifying priority areas for faculty research and selecting competing faculty projects for funding. |
| Foundation Support | In addition to industrial engagement, we have identified several subject areas for which there might not be industrial support, but for which there is a gap in societal value. We have embarked on a number of proposals within those fields to engage in research and diversify the Initiative’s financial backing. |
| Endowment | Fulfilling our vision of leading the transformation of a sustainable mobility system requires a degree of financial independence. We are thus partnering with key financial actors at MIT to identify opportunities for endowed funding in addition to industrial, foundation, and non-profit engagement. |
External Projects & Events

In addition to the financial support outlined on the previous page, the Mobility Initiative is also committed to knowledge development. This notably includes research projects and events with a wide range of partners. Currently, the Initiative is working with the **World Business Council for Sustainable Development**, the **Barr Foundation**, and the **Chicago Transit Authority**, among others on a wide array of research projects within the realm of mobility. We have also presented as part of **CoMotion**, led commuting behavior change workshops, and lectured widely.

Timeline

- **April 2020**
  Deans Chandrakasan and Sarkis announce the Mobility Initiative

- **June 2020**
  MMI Governing Board and Academic Advisory Committee established

- **August 2020**
  Membership model and research priorities developed

- **October 2020**
  Seed funding grant from MIT Engineering and SA+P

- **October 2021**
  Expand MMI team to support membership growth

- **March 2021**
  Launch first executive roundtable & secure first industrial member

- **January 2021**
  Governing board meeting to approve Mobility Initiative model

- **January 2022**
  Launch second and third executive roundtables

- **March 2022**
  Financially self-sustaining
Partnerships

Building a strong foundation through internal and external networks

Partnerships serve as the platform for the Mobility Initiative's very existence. At its core a multi-disciplinary effort, the Mobility Initiative is grateful to have been able to draw on key support from Anantha Chandrakasan with the School of Engineering and from Hashim Sarkis with the School of Architecture and Planning as well as key partnerships with the Schwarzman College of Computing and the Sloan School of Management. Looking forward to our second year, we seek to strengthen and deepen these collaborations.

The MIT Energy Initiative has also served as a key partner in the Mobility Initiative's first year of existence. As an organization with complementary interests, the MMI has been working with MITEI on a number of fronts, including events (a joint forum, and a joint R&D conference), a membership model, and research itself (decarbonization).
We have developed an active and dynamic relationship with MIT’s ILP office, offering MMI/ILP webinars, engaging in roundtables with ILP’s executive members, and conducting meetings with a number of ILP member companies. ILP membership is included in our membership model.

We have also had extensive interactions with MIT’s foundations and alumni teams to better broadcast the Mobility Initiative’s efforts to alumni and to better engage foundations as part of our research and outreach efforts. Both offices have been active event participants.

The OGC has offered extensive support both in strategic advising for our membership model development and in anticipating alliance management. We will continue to actively engage with the team to finalize the membership and engagement structure.

We have worked to re-invigorate student groups and to include student voices in the program’s redesign. Students will be helping to drive forward mobility equity initiatives in the coming months.

As the lynchpin of the Initiative, the MMI has been actively working with faculty members to identify core areas of research, to expand the education program, and to instigate entrepreneurship. Over 60 faculty members have signed on to the Initiative.

As a key intellectual resource, alumni have been actively invited to participate in MMI events and were surveyed as part of the launch to help shape the Initiative’s intellectual direction. The results from the survey can be found in the appendix.
Communication

Introducing the Mobility Initiative to the world

Communication has served as one of our primary areas of effort in our first year. That includes designing platforms for communication with the worlds both inside and outside of MIT, establishing a brand, and, significantly, communicating with our key stakeholders.

The Initiative engages not only in knowledge development, but also in knowledge dissemination and in convening key stakeholders across the mobility landscape.

From a tactical perspective, we have thus designed and launched a website, established a social media presence, and developed a brand and copy that serve to communicate the Initiative's goals and efforts.

We consider it essential that we clearly and consistently communicate with all individuals involved in the Initiative, and that we offer portals of all shapes and sizes for individuals to learn more about who we are and what we do.
Next Steps: Our Core Pillars

**RESEARCH**
- Solidify industry engagement plan for expert roundtables
- Secure funding for targeted research projects
- Identify areas of priority for faculty researchers

**EDUCATION**
- Finalize MST and PhD curriculum redesign
- Complete internal MIT approval process
- Introduce new X+T program

**ENTREPRENEURSHIP**
- Expand Entrepreneurship Dialogue Series
- Secure funding for Mobility Venture Prize
- Expand internal MIT entrepreneurship-related network and relationships

**CIVIC ENGAGEMENT**
- Organize Equity Symposium (Spring 2021)
- Finalize civic-oriented research agenda
- Incorporate community voices in pertinent roundtables and research projects

**Goals**

<table>
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<th>December 2023</th>
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<td>3 company members</td>
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<td>3 targeted research projects</td>
</tr>
<tr>
<td>2 topic area stakeholder roundtables</td>
<td>4 topic area stakeholder roundtables</td>
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Jinhua Zhao is the Associate Professor of City and Transportation Planning at the Massachusetts Institute of Technology (MIT). Prof. Zhao brings behavioral science and transportation technology together to shape travel behavior, design mobility system, and reform urban policies. He develops methods to sense, predict, nudge, and regulate travel behavior and designs multimodal mobility systems that integrate automated and shared mobility with public transport. He sees transportation as a language to describe a person, characterize a city, and understand an institution.

Prof. Zhao directs the JTL Urban Mobility Lab and Transit Lab at MIT and leads long-term research collaborations with major transportation authorities and operators worldwide, including London, Chicago, Hong Kong, and Singapore. He is the co-director of the Mobility Systems Center of the MIT Energy Initiative, and the director of the MIT Mobility Initiative. He very much enjoys working with students.

Anne is the program manager for MIT’s Mobility Initiative. Her research focuses on preparing cities for next-generation transportation technologies. Prior to her time at MIT, she worked as an energy policy analyst and researcher at the Center for Strategic and International Studies in Washington DC, honing an expertise on energy transitions in Europe as well as ‘frontier’ energy innovations. She has also worked in communications for a wide variety of urban mobility clients, ranging from car-sharing company Zipcar to bike-sharing company Zagster. She received dual masters degrees from MIT in Urban Planning and Transportation Science and her bachelors in World Politics and German Literature from Hamilton College.
Governing Board

CYTHIA BARNHART
Chancellor, Ford Professor of Engineering

ANANTHA CHANDRAKASAN
Dean, MIT School of Engineering

DAN HUTTENLOCHER
Dean, MIT Schwarzman College of Computing

HASHIM SARKIS
Dean, MIT School of Architecture and Planning

SANJAY SARMA
Vice President, MIT Open Learning

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John C Head III Dean, MIT Sloan School of Management
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Professor of Aeronautics and Astronautics

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Chrysler Leaders for Global Operations Professor of Management

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DANIELA RUS
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YOSSI SHEFFI
Director of the MIT Center for Transportation & Logistics
Advisory Committee continued

NIGEL WILSON
Professor Emeritus, Civil and Environmental Engineering

CHRIS ZEGRAS
Professor of Transportation and Urban Planning
Acknowledgements

We would like to thank many individuals for their contributions of all shapes and sizes to the Initiative, including first and foremost Dean Anantha Chandrakasan and Dean Hashim Sarkis for their crucial support, as well as our Governing Board and our Academic Advisory Committee, comprised of many faculty members who have supported us both in re-envisioning MIT’s transportation education program (including Saurabh Amin, Cindy Barnhart, Dimitris Bertsimas, Moshe Ben-Akiva, Patrick Jaillet, Chris Knittel, Amedeo Odoni, Georgia Perakis, Yossi Sheffi, Nigel Wilson, and Cathy Wu) and in developing the Initiative’s overall strategy (including Eran Ben-Joseph, Charlie Fine, Thomas Magnanti, David Mindell, Sandy Pentland, and Daniel Roos, Daniela Rus, Fred Salvucci, Sanjay Sarma, and Yossi Sheffi).

Many Institute leaders and departments have been immensely supportive of the Initiative’s journey, including Maria Zuber, Richard Lester, Marty Schmidt, Bob Armstrong, Chris Zegras, and Ali Jadbabaie.

The Initiative notably would not exist today without the tireless support of a number of key advisors, who have routinely offered their time, ideas, and insights to the Initiative and its many efforts. We would like to thank John Moavenzadeh and Jim Womack in particular, as well as our cadre of insightful experts including Stephen Zoepf, Andrew Salzberg and David Block-Schachter.

Finally, we would be loath to omit the many individuals who have invested time in supporting our activities, including the ILP team (Karl Koster, Todd Glickman, and José Ramos), the SA+P team (Ken Goldsmith and Karen Yegian), the CEE team (Kiley Clapper and Max Marriott), and the OGC team (Meghan Fenno, Adi Gottumukkula, Grace Leung, and Julie Kukharenko) and the SA+P team (Barbara Feldman and Nicholas Marmor), as well as advisors Bill Aulet, Will Sanchez, and Svafa Gronfeldt among many others. And we have been lucky to have a fantastic support cast of students, as well, including Nick Caros and Yunhan Zheng.
APPENDIX
Mobility Forum: Spring 2021

Chris Knittel
George P. Shultz Professor of Applied Economics
Friday, February 12, 2021

Cathy Wu
Gilbert W. Winslow Career Development Assistant Professor, Civil and Environmental Engineering
Friday, February 19, 2021

Joe Coughlin
Founder and Director, MIT AgeLab
Friday, February 26, 2021

Yossi Sheffi
Elisha Gray II Professor of Engineering Systems
Friday, March 12, 2021

Steve Graves
Abraham J. Siegal Professor of Management
Friday, April 2, 2021

Moshe Ben-Akiva
Edmund K. Turner Professor in Civil and Environmental Engineering
Friday, April 9, 2021

Sanjay Sarma
Vice President for Open Learning and Fred Fort Flowers and Daniel Fort Flowers Professor of Mechanical Engineering
Friday, April 16, 2021

Patrick Jaillet
Dugald C. Jackson Professor of Electrical Engineering and Computer Science
Friday, April 23, 2021

Chandra Bhat
Editor, Transportation Research Part B: Director, US DOT Center on Data-Supported Transportation Operations and Planning (D-STOP)
Friday, April 30, 2021

David Simchi-Levi
Professor of Civil and Environmental Engineering and Director, MIT Data Science Lab
Friday, May 7, 2021

Elisabetta Cherchi
Co-Editor in Chief Transportation Research Part A: Policy and Practice; Professor of Transport, Newcastle University, UK
Juan de Dios Ortúzar
Co-Editor in Chief Transportation Research Part A: Policy and Practice; Emeritus Professor, Department of Transport Engineering and Logistics, Pontificia Universidad Catolica de Chile
Friday, May 14, 2021

Yafeng Yin
Editor-in-Chief, Transportation Research Part C: Emerging Technologies; Professor and Associate Department Chair of Graduate Programs, Department of Civil and Environmental Engineering, University of Michigan
Friday, May 21, 2021
Entrepreneurship Dialogues

Karl Iagnemma, President and CEO at Motional

September 9, 2020

Julia Steyn, Chief Executive Officer at Bolt Mobility

September 9, 2020

Jay Walder, CEO at Virgin Hyperloop

September 9, 2020

Jascha Franklin-Hodge, Executive Director at Open Mobility Foundation

Regina Clewlow, CEO & Co-founder at Populus

Stephen Smyth, Co-founder and CEO at Coord

October 13, 2020

Michael Ableson, CEO Arrival Automotive

Peter Kunsch, Head of Audi Tech Intelligence Boston

October 21, 2020

Thomas Andrae, Mobility Investor

October 21, 2020

Seleta Reynolds, General Manager at LADOT

Michael Hurwitz, Director of Transport Innovation, Transport for London

November 6, 2020

Clara Fain, Chief Financial Officer at Via

Rasheed Zarif, Managing Director & Future of Mobility Tech Leader at Deloitte

November 6, 2020

RJ Scaringe, Founder & Chief Executive Officer of Rivian

James Womack, Founder and Senior Advisor of Lean Enterprise Institute
Dialogues continued

November 16, 2020

Anna Dietrich, Co Executive Director of the Community Air Mobility Initiative

Assaf Biderman, Founder and CEO of Superpedestrian

December 2, 2020

Reilly Brennan, Founding General Partner at Trucks & Lecturer at Stanford

Mary Chan, Managing Partner at VectolQ

Regina Savage, Managing Director at Morgan Stanley

December 9, 2020

Mark Dowd, Chief Innovation Officer at New York Metropolitan Transportation Authority

Kate Fichter, Assistant Secretary for Policy Coordination at Massachusetts Department of Transportation

Tiffany Chu, CEO and Co-founder at Remix
Participating Faculty

Saurabh Amin
Robert N. Noyce Career Development Associate Professor

Jim Aloisi
Lecturer of Transportation Policy and Planning

John Attanucci
Lecturer, Research Associate and Manager of the MIT Transit Research Program

Bill Aulet
Professor, Sloan School; Managing Director, Martin Trust Center, MIT

Hamsa Balakrishnan
Professor of Aeronautics and Astronautics

Hari Balakrishnan
Fujitsu Chair Professor in the EECS Department

George Barbastathis
Professor of Mechanical Engineering

Cynthia Barnhart
Chancellor, Ford Professor of Engineering

Steven Barrett
Director, Laboratory for Aviation and the Environment

Peter Belobaba
Principal Research Scientist

Moshe Ben-Akiva
Edmund K. Turner Professor in Civil Engineering

Eran Ben-Joseph
Professor of Landscape Architecture and Urban Planning

Dimitris Bertsimas
Professor of Management and Operations Research, Associate Dean of Business Analytics

Chris Caplice
Executive Director, MIT Center for Transportation & Logistics

Joseph F. Coughlin
Director, MIT AgeLab

Fábio Duarte
Principal Research Scientist and Lecturer of Transportation Policy and Planning

Olivier de Weck
Professor of Aeronautics and Astronautics and Engineering Systems

Joseph Ferreira
Professor of Urban Studies & Planning
<table>
<thead>
<tr>
<th>Name</th>
<th>Title and Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randall Field</td>
<td>Executive Director, MIT Energy Initiative's Mobility Systems Center</td>
</tr>
<tr>
<td>Charlie Fine</td>
<td>Chrysler Leaders for Global Operations Professor of Management</td>
</tr>
<tr>
<td>Daniel Freund</td>
<td>Assistant Professor of Operations Management</td>
</tr>
<tr>
<td>Robert Freund</td>
<td>Theresa Seley Professor in Management Science at the Sloan School of Management at MIT</td>
</tr>
<tr>
<td>Stephen Graves</td>
<td>Abraham J. Siegel Professor of Management and Professor of Operations Management</td>
</tr>
<tr>
<td>Bill Green</td>
<td>Hoyt C. Hottel Professor in Chemical Engineering</td>
</tr>
<tr>
<td>John Hansman</td>
<td>T. Wilson (1953) Professor of Aeronautics and Astronautics</td>
</tr>
<tr>
<td>John Heywood</td>
<td>Professor of Mechanical Engineering</td>
</tr>
<tr>
<td>Jonathan How</td>
<td>Richard Cockburn Maclaurin Professor of Aeronautics and Astronautics</td>
</tr>
<tr>
<td>Jason Jackson</td>
<td>Ford Career Development Assistant Professor of Political Economy</td>
</tr>
<tr>
<td>Alexandre Jacquillat</td>
<td>Assistant Professor, Operations Research and Statistics</td>
</tr>
<tr>
<td>Ali Jadbabaie</td>
<td>JR East Professor of Engineering</td>
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<tr>
<td>Patrick Jaillet</td>
<td>Dugald C. Jackson Professor in EECS, Co-Director of the Operations Research Center</td>
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<tr>
<td>Valerie Karplus</td>
<td>Assistant Professor of Global Economics and Management</td>
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<tr>
<td>Sertac Karaman</td>
<td>Associate Professor of Aeronautics and Astronautics</td>
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<tr>
<td>David Keith</td>
<td>Assistant Professor, System Dynamics</td>
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<tr>
<td>Chris Knittel</td>
<td>George P. Shultz Professor of Applied Economics</td>
</tr>
<tr>
<td>Jing Li</td>
<td>William Barton Rogers Career Development Professor of Energy Economics</td>
</tr>
</tbody>
</table>
Faculty continued

Kent Larson  
Principal Research Scientist

John Leonard  
Samuel C. Collins Professor of Mechanical and Ocean Engineering

Thomas Magnanti  
Institute Professor & Professor of Operations Research

David Mindell  
Dibner Professor of the History of Engineering and Manufacturing, Professor of Aeronautics & Astronautics

Joanna Moody  
Research Program Manager for the MIT Energy Initiative’s Mobility Systems Center

Amedeo Odoni  
T. Wilson Chair Professor Emeritus of Aeronautics and Astronautics

James B. Orlin  
E. Pennell Brooks (1917) Professor in Management

Carolina Osorio  
Visiting Associate Professor

Asu Ozdaglar  
Distinguished Professor and Department Head, EECS; Deputy Dean of Academics, SCoC

Sergey Paltsev  
Deputy Director of the MIT Joint Program on the Science and Policy of Global Change

Toshiba Professor of Media Arts & Science

Georg P. F. Perakis  
William F. Pounds Professor of Management, EMBA Faculty Director, Operations Research Center Co-Director

Carlo Ratti  
Professor of Urban Technologies and Planning, SENSEable City Lab Director

Sandy Pentland  
Toshiba Professor of Media Arts & Science

Nick Roy  
Professor of Aeronautics and Astronautics

Daniela Rus  
Andrew (1956) and Erna Viterbi Professor of Electrical Engineering and Computer Science

Sanjay Sarma  
Vice President for Open Learning at MIT

Fred Salvucci  
Senior Lecturer and Senior Research Associate
Faculty continued

**Tobias Salz**  
*Castle Krob Career Development Assistant Professor of Economics*

**Andres Sevtsuk**  
*Charles and Ann Spaulding Career Development Associate Professor of Urban Science and Planning*

**Yossi Sheffi**  
*Director of the MIT Center for Transportation & Logistics*

**David Simchi-Levi**  
*Professor of Civil and Environmental Engineering*

**Anson Stewart**  
*Research Scientist*

**Kathleen Thelen**  
*Ford Professor of Political Science*

**Jessika Trancik**  
*Associate Professor of Energy Studies*

**Chintan Vaishnav**  
*Senior Lecturer, Operations Management*

**Andrew Whittle**  
*Edmund K. Turner Professor of Civil & Environmental Engineering*

**Sarah Williams**  
*Associate Professor of Technology and Urban Planning*

**Nigel Wilson**  
*Professor Emeritus*

**Matthias Winkenbach**  
*Director of the MIT Megacity Logistics Lab; Director of the MIT CAVE Lab*

**Cathy Wu**  
*Gilbert W. Winslow (1937) Career Development Assistant Professor*

**Chris Zegras**  
*Professor of Transportation and Urban Planning*

**Jinhua Zhao**  
*Edward H. and Joyce Linde Associate Professor of Transportation and City Planning*

**Siqi Zheng**  
*Samuel Tak Lee Professor, CRE, DUSP and SA+P*
Participating Labs
Mobility and transportation are at the dawn of the most profound changes with an unprecedented combination of new technologies (autonomy, electrification, computation and A.I.) meeting new and evolving priorities and objectives (de-carbonization, public health, and social justice). And the timeframe for these changes is short in a system with massive amounts of fixed, long-life assets and entrenched behaviors and cultures. It's this combination of new technologies, new purposes, and urgent timeframes that makes an MIT-led Mobility Initiative critical at this moment.

The Mobility Initiative (MMI) is designed to effect fundamental changes in the long-term trajectory of mobility development. It serves to coalesce all mobility and transportation activities at MIT, knitting together our efforts on research, education, entrepreneurship, and civic engagement at the Institute into a greater whole. MIT researchers are poised to deliver high-impact projects in a wide variety of areas, including AI, autonomy, low-carbon technologies, just cities, new mobility, aviation, supply chains, computation, data innovation, and more.
VALUE PROPOSITION

Real-time access to MIT’s latest insights, innovations & research

Connections and partnerships with leaders in government & industry

Opportunities to structure & shape academic transportation-related research

AFFILIATE MEMBER

ACCESS TO MIT RESEARCH AND INSIGHTS. $75K.

The MMI Affiliate Membership serves as the foundation for all engagement with the Initiative. Members receive access to research, technology, faculty, students, and start-ups across the Initiative’s 30+ labs and research groups. The MMI helps members efficiently navigate the on-going research projects at the Institute and to build strong relationships with MIT’s many mobility-related researchers. The MMI also helps Affiliate Members develop a research agenda for future research engagements.

Benefits include:

- Access to MIT thought leadership
- Access to student resumes and areas of focus
- Annual MIT Mobility Summit
- MIT Mobility Forum
- Participation in MI-sponsored symposia, colloquia, and seminars
- Invitations to innovation and entrepreneurship programming
ASSOCIATE MEMBER

SUPPLEMENTING AND BUILDING ON ON-GOING EFFORTS. $400K.

MMI Associate Membership allows for a deeper level of engagement with on-going transportation research at the Institute. In addition to access to MIT’s thought leadership, Associate Members help steer research through seed funding, determining pertinent research challenges and reviewing faculty-proposed projects.

Benefits include:

• Participation on Research Advisory Board
• Facilitation of next-generation research through seed funding
• Access to MIT thought leadership
• Access to student resumes and areas of focus
• Membership to MIT’s Industrial Liaison Program (ILP) and start-up exchange
• Fellowship support for graduate students
• Annual MIT Mobility Summit
• MIT Mobility Forum
• Participation in MI-sponsored symposia, colloquia, and seminars
• Invitations to innovation and entrepreneurship programming

FOUNDING MEMBER

STRUCTURING & SUPPORTING NEXT-GENERATION RESEARCH. $1M.

The deepest and most extensive form of engagement with the MMI, Founding Members support next-generation mobility research, helping to drive the development of mobility technologies and innovation forward for the benefit of both industry and society. In addition to receiving extensive access to research, faculty, and students, Founding Members instigate ‘flagship’ research projects, provide seed funding for early-stage research, and support the Institute’s Mobility Fellows.

Benefits include:

• Targeted, ‘flagship’ research programs
• Access to MIT thought leadership
• Participation on Research Advisory Board
• Facilitation of next-generation research through seed funding
• Membership to MIT’s Industrial Liaison Program (ILP) and start-up exchange
• Branded fellowships for graduate students
• Access to student resumes and areas of focus
• Annual MIT Mobility Summit
• MIT Mobility Forum
• Participation in MI-sponsored symposia, colloquia, and seminars
• Invitations to innovation and entrepreneurship programming
## BENEFITS

**BRINGING RESEARCHERS AND INDUSTRY TOGETHER TO SOLVE TODAY’S MOST PRESSING CHALLENGES**

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Founding</th>
<th>Associate</th>
<th>Affiliate</th>
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<tbody>
<tr>
<td>Targeted, flagship research programs</td>
<td>X</td>
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<tr>
<td>Seed research participation</td>
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<tr>
<td>Annual MIT Mobility Summit</td>
<td>X</td>
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<td>Education engagement</td>
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<tr>
<td>Innovation &amp; entrepreneurship programming</td>
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What are the most important transportation and mobility challenges facing the world that the MIT Mobility Initiative should tackle?

35% of respondents expressed concerns about the impact of COVID-19 on public health, transit ridership, transport finance, and governance. How can the public transportation systems be made clean to protect public health? How to bring back transit riders? How can cities and their transit systems remain financially viable during the pandemic? How do we reshape regulatory structures so our transportation systems are governed by enforceable regulations?

41% of respondents highlighted equity issues. Improving transportation access to people with physical and/or social disabilities, ethnic minorities, older adults, children and women is of crucial importance. To many, the failure to address longstanding systemic racism is one of the biggest crises in the country, and we should work on making transportation systems more inclusive.

24% of respondents emphasized climate change as a critical challenge, 21% mentioned decarbonization and 12% mentioned sustainability. Individuals proposed a number of priorities, including improving air quality, reducing noise, and storm water management. Many emphasized the importance of efforts to encourage active and alternative modes of travel, including walking, cycling, and using informal or public transport.

26% of respondents thought incorporating new mobility technologies presents an immense challenge. It is imperative to find the appropriate role for autonomy while evaluating the promise of other new transportation technologies & concepts, ranging from the Hyperloop to micro-mobility to high-speed intercity rail. We should also make sure advances in technology don't make the world worse than it already is, requiring investigations into their potential adverse impacts.

24% of respondents mentioned transportation infrastructure funding. Emphasis was placed on finding funds to equitably implement, sustain, and adapt transportation solutions in the short, medium, and long terms, including providing stable living wage jobs for transportation sector workers; identifying stable revenue sources that accommodate natural differences in cost growth over time between labor- and capital-intensive methods for transportation service delivery; and training future generations of transportation professionals.

- Respondents also highlighted political barriers as a major challenge. Political gridlock can prevent bold and decisive action.
- Data management emerged as a crucial concern. Who owns the data and how can be build a bridge between the public and private sectors?
What are MIT’s strengths in tackling these challenges?

**People**
- Diverse & elevated talents and areas of expertise
- Diversity of ideas
- Commitment to tackling complex challenges

**Education**
- Multi-disciplinary and cross-departmental perspectives
- Effective online platform

**Research**
- High levels of academic freedom and integrity
- Data-driven research capabilities and large computing power

**Network**
- Ties with other top research universities
- Vast alumni network
- Broad-ranging connections with industry and government

How should the MIT Mobility Initiative contribute?

“Give importance to traditionally smaller subjects such as pedestrian safety and micro-mobility.”

“Focus not only on technology problems, but also systems-level problems, on public policy changes and human behaviors.”

“Provide technical know-how through partnerships with actual agencies—transportation agencies, cities, states to generate new research and scale up effective solutions to these challenges.”

“Bring students that think about different dimensions of the problem into the same classroom: urban planners, economists, business researchers, political scientists, and engineers.”

Recommendations for improving transportation education at MIT?

**Content**
- More practical experiences that address real-world problems
- A wider perspective and more case studies
- Prioritization of sustainability and diversity
- More analytical tools and methods
- Keep public transportation coursework and build out biking/walking related courses

**People**
- Hire more professors
- Build a broader collaborative experience across different labs and departments
- Highlight traditionally under-represented viewpoints
- Invite more transportation professionals to restore the professional focus of the program
MST Curriculum Updates

CORE

• 1.200 Transportation: foundations and methods (12 credits)
• Select one of the four (12 credits)
  1.202 Demand Modeling  1.208 Resilient Networks
  1.260 Logistics Systems  11.478 Beh. Sci. and Urban Mobility
• 11.S953 Frontier of Transportation Research (3 credits): Fall + Spring

COMPUTATION/ANALYTICS
(select one)

• 6.439/IDS.131 Statistics, Computation and Applications
• 6.482 Modeling with Machine Learning: from Algorithms to Applications (subsuming 1.224 Machine Learning for Sustainable Systems)
• 6.860 Statistical Learning Theory and Applications
• 6.867 Machine Learning
• 15.727 The Analytics Edge

POLICY

• Students required to take one policy-related course

TECHNOLOGY

• Students encouraged to take one technology-related course

ELECTIVES

• 1 to 2 individually-designed subjects
PhD Curriculum Updates

MST REQUIREMENT

GENERAL EXAM

Part 1: Core Knowledge
Base: Transportation System Analysis + Five areas of focus
1. Demand
Part 2: Research Aptitude
2. Performance and Optimization
3. Planning and Policy
4. Networks
5. Logistics

SPECIALIZATION
Three subjects individually designed for specialization

General Exam Part 1: Core Knowledge

Requirement:
Base + One of the Five Areas of Focus

Base:
Transportation System Analysis (the same as MST core)
1.200 + one of (1.202, 1.208, 1.260 and 11.478)

Five areas of focus:
1. Demand
2. Performance and Optimization
3. Planning and Policy
4. Networks
5. Logistics

General Exam Part 2: Research Aptitude

Three components:
• A research paper completed by the student
• A review of a relevant publication chosen by the advisor
• Oral presentation and questioning (1.5 hours)
  30~45 min presentation
  45~60 min committee questions