



Massachusetts  
Institute of  
Technology



# **FinTech@CSAIL**

## MEMBER ORIENTATION PACKET

# MESSAGE from the DIRECTOR

## Welcome to FinTech@CSAIL!

On July 18, 2018 CSAIL launched its newest initiative, FinTech@CSAIL, led by renowned researchers Prof. Andrew Lo, Prof. Shafi Goldwasser and Prof. Silvio Micali. As part of this initiative, you will be connected to cutting edge research, new technologies, top talent and innovative new FinTech startups.

CSAIL is the largest lab at MIT with almost 1200 people and over 900 active projects. By connecting with CSAIL, you are connecting to all 5 schools and 11 different departments across MIT. This diversity and spirit of collaboration makes CSAIL a unique, visionary and entrepreneurial lab with new approaches and technologies that will impact the financial sector in the years to come.

As a member of FinTech@CSAIL, your company is represented on the Executive Board which will work with researchers to craft problem statements of current challenges and vote on selecting projects for funding. Additionally, members of your organization may attend the lectures, workshops and general meetings of the other initiatives (SystemsThatLearn@CSAIL and Cybersecurity@CSAIL). There will be opportunities for lab visits, tech talks, start-up showcases and more.

We are in the process of confirming all the speakers for the FinTech@CSAIL lecture series for the 2018-2019 academic year. All of the lectures are taped and made available to members via our member-only website.

The Alliances team is here to help you make connections across the lab. Being part of FinTech@CSAIL is being part of the CSAIL community. We encourage you to share this material with others in your institution to enable your organization to take full advantage of all CSAIL has to offer.

I look forward to working with you and if you have any questions or comments, please do not hesitate to contact me.

Sincerely,



Lori Glover J.D.  
Managing Director-Alliances MIT Computer Science and Artificial Intelligence Laboratory  
Executive Director FinTech@CSAIL  
Executive Director CyberSecurity@CSAIL  
Executive Director SystemsThatLearn@CSAIL



# MEMBER MODEL and BENEFITS

## LEVERAGED RESOURCES: EXISTING PROJECTS

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Member companies will have access to research and testing opportunities in several current projects at CSAIL, as well as provide guidance for new seed projects as part of the collaborative initiative.

## THE MEMBERSHIP MODEL

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Through initiatives, member companies engage in close interactions with researchers and students in the space. Member companies will have the opportunity to interact with multiple research projects that span the full spectrum of machine learning/pattern recognition, risk management, and financial policy. We will collaborate closely with industry to provide real-world applications and drive impact. Our team of world-class researchers covers the full spectrum of research in systems and machine learning.

FinTech@CSAIL industry partners will:

- Participate in the FinTech@CSAIL Advisory Board. Each member company will have one (1) representative on the board. The board will advise the initiative on industry needs, provide feedback on existing research and advise future research direction through seed projects. This board will help shape the priorities of the initiative.
- Access in-depth exploration of CSAIL research in AI, machine learning, and data analytics. As part of this initiative, we will leverage the work of 15+ existing research projects. Members will have unprecedented access to the research and the research teams.
- Test application of tools developed to real-world situations and explore new projects.
- Access tools created as part of the initiative via MIT open source license through the CSAIL Technology Application Portal.
- Participate in in-depth interactions and shared learning on topics of particular interest to each company. Close interaction with the researchers engaged in what matters most to your company.
- Members will be invited to attend one (1) FinTech@CSAIL Annual Meeting per year and may send up to 10 representatives to enable broad exposure to teams who are working on these issues. Members will also be invited to participate in the FinTech@CSAIL lecture series and workshops held throughout the year.
- Access additional research groups, researchers, and students within MIT's Computer Science and Artificial Intelligence Laboratory through CSAIL's Alliance Program (CAP) at the Affiliate level. Details include: Access to the lab-wide annual 2-day member only Annual Meeting held in May/June each year in addition to FinTech@CSAIL Annual Meeting.
- Connect with the latest CSAIL research from across the groups: Big Data, Wireless, Robotics, HCI, Computer Vision, Security/Crypto, Natural Language, Computational Biology, Algorithms, Architecture, Theory, Artificial Intelligence, and Machine Learning.
- Access technical talks from our world-renowned researchers and visiting researchers held on campus each month both live and virtually.
- A "Student Profile Book" containing resumes and research summaries of current CSAIL students published each year.
- Advertise open position announcements within CSAIL

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# MEMBER MODEL and BENEFITS

## THE MEMBERSHIP MODEL *(cont.)*

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FinTech@CSAIL industry partners will be able to:

- Have two tech talks/info sessions per academic year.
- Have your company logo included on CSAIL Alliances site and in conference material
- Have members of your company visit CSAIL for a private lab visit and meet with faculty/researchers (1 per year).
- Network with faculty, students, and other members at both FinTech and Alliances networking events throughout the year.
- Access the member-only site with searchable research papers, student projects, resume book, research, tech talk and seminar videos, demos, conference slides, business use cases and more
- Obtain a 10% discount on professional education classes through MIT school of Engineering.
- Obtain a 15% discount on open enrollment executive education courses with MIT Sloan School of Management.
- Obtain a 20% discount on CSAIL-taught courses through our education partners.
- Receive research briefings and/or research summaries highlighting the latest CSAIL research 3-4 times per year.

## OPTIONAL ADDITIONAL ENGAGEMENTS

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In addition to accessing the existing research and shared learning on specific topics of interest, each member company may also enter into company-specific activities such as:

- **Sponsored Research**  
If a member company becomes interested in a particular research project and wants to sponsor future development of that project, we can work with members to scope the project and additional funding required. All sponsored research is handled through MIT's Office of Sponsored Programs.
- **Visiting Industry Researcher (with or without sponsored research)**  
Member companies will be able to leverage the CSAIL Visiting Industry Researcher Program to embed a researcher within a specific research group. The visiting researcher remains an employee of the member-company and works alongside the researchers and students in a specific area at CSAIL. In addition, the visiting researcher is connected to CSAIL/MIT with a customized schedule of lectures, workshops, classes, meetings, and events. CSAIL Alliances coordinates this effort and meets monthly with all industry visitors.
- **Consulting**  
Researchers may be available for consulting opportunities with our industry partners. Consulting agreements are arranged between the researcher and the member-company directly.
- **Technology Licensing**  
Member companies interested in licensing developed software and patentable inventions may work with our MIT Technology Licensing Office (TLO) for licensing agreements and options.

# MEMBER MODEL and BENEFITS

## INTELLECTUAL PROPERTY

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The goal of FinTech@CSAIL is to conduct fundamental research that will significantly impact the field of artificial intelligence and machine learning over the next decade and beyond.

### **Publication**

The majority of the research results will be broadly disseminated via publication. We realize that confidentiality is a particular concern to our partners and we have standard practices to ensure no partner's proprietary information will be released in any publication. Papers generated from this research initiative will be available to our partners BEFORE any publication and in parallel with conference submission.

### **Open-Source and licensing**

Members will be able to utilize software tools developed through this initiative for research testing internally. Additionally, we anticipate that some of the software tools developed will be released as open source and available for use by member companies via MIT's open source license.

### **Member Intellectual Property**

All pre-existing IP owned by the member coming into this initiative will remain the member's intellectual property.

### **Creation of Joint Intellectual property**

If member representatives work with MIT researchers on projects to invent and/or author inventions and software, US laws and rules with regard to joint-ownership of patents and copyrights will be applied. Please note, however, if members make significant use of MIT resources, funds, and/or facilities or invent in area outside the scope of initiative projects, their IP rights will be assigned to MIT.





# GOVERNING BOARD



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**Philip Arsenault**  
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FinTech@CSAIL  
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# GOVERNING BOARD BIOS



## **Sandeep Arora**

COO, Citi Markets and Securities Services

Sandeep Arora is the COO for Citi Markets and Securities Services, a position he had held since 2008. Sandeep's responsibilities have evolved over this period, and currently his primary focus is leading the Electronification program for Citi Markets. Sandeep is also responsible for implementation of major programs like Mifid, Brexit, Volcker etc.

As part of Electronification, Sandeep is responsible for Citi Markets' strategy on eTrading, Data/ Analytics including CitiVelocity.com, Communication systems etc. Sandeep has also been responsible for the Citi Markets FinTech Investments portfolio, for the last 10 years, which provides a unique source of information on evolving cutting-edge technology trends.

Sandeep has held prior COO roles for FICC and EM Sales & Trading since 2002. Sandeep joined Citi in 1988, in the Associate program. Sandeep lives in New York City, with his wife and two daughters.



## **Linda Bernardi**

Global Head of Strategy, ConsenSys

Linda Bernardi is a mindful and bold technology disruptor. In all her endeavors she seeks to help companies disrupt mindfully in order to innovate meaningfully. Her passion is 'data'.

Currently, Linda is the Global Head of Strategy at ConsenSys, a 1200-person US and Switzerland based company, focused on enabling comprehensive blockchain deployment. ConsenSys is a constellation of over 50 startups around its core, building the infrastructure, applications, and practices that enable a decentralized world. In 2017 Linda published her 2nd book, The Inversion Factor (MIT Press) focusing on IoT, AI, Blockchain and discusses the necessity of inversion from a Product-Mindset to a Needs/Experience-Mindset, leveraging deep understanding of data. The Inversion Factor received the Axiom Bronze award in Business Theory in 2018. Previously, she served as IBM's Chief Innovation Officer for IoT, Cloud and Cognitive, working to help disrupt and innovate IBM's Fortune 100 customers.

Her first startup, ConnecTerra Inc, Cambridge MA (2001), introduced RFID (foundation of today's IoT) to enterprises [sold to Oracle Corporation in 2006]. Her second startup disrupted SQL with NoSQL [sold to IBM in 2014]. In 2011 she published her first book ProVoke, discussing the necessity and methodology for mindful disruption & bold innovation.

Linda has a graduate degree in Applied Mathematics from UCLA. She started her career at BBN (think tank) in Cambridge. She is one of the founding members of the Anita Borg Institute for Women and Technology and Emeritus Board member at the SEIT Institute for the study of astronomy and astrobiology.



CONSENSYS



## **Andrew Brown**

Sr. Director of Data Science and AI Research, Enterprise Analytics

Andrew Brown is the Sr. Director of Data Science and AI Research in the Enterprise Analytics group at CIBC, overseeing data science projects across many areas of the bank as well as managing academic and research partnerships. He has previously held roles doing quantitative analytics in Treasury ALM and Risk.

He received a PhD in machine learning from the University of Toronto under the supervision of Prof. Geoffrey Hinton.



# GOVERNING BOARD BIOS



## **Chris Corrado**

CIO/COO, London Stock Exchange Group

Chris Corrado was appointed London Stock Exchange Group COO and Group CIO in November 2015. He was previously Managing Director at MSCI, CIO/CTO, responsible for technology, data services and program management from 2013. Chris has more than thirty years of global experience in managing technology platforms and transformational change in the financial

services industry.

Prior to joining MSCI, Chris held a variety of senior CTO roles in leading banks, including Morgan Stanley, Deutsche Bank, Merrill Lynch and UBS. He has also worked for high growth technology companies as CTO at eBay, CIO at AT&T Wireless, and SVP of Technology, Strategic Initiatives and Business Architecture at Asurion, the mobile technology protection company. He began his career at IBM and graduated with a B.S. in Management Information Systems & Business Administration from the University of New York at Albany.



**London**  
Stock Exchange



## **Tom Fay**

Senior Vice President of Enterprise Architecture, Nasdaq

Tom Fay is Senior Vice President of Enterprise Architecture at Nasdaq. In this multi-disciplinary role, Mr. Fay is responsible for the architecture, design, and performance of critical technology solutions across the company.

Since rejoining Nasdaq in 2010, Mr. Fay has also led the System Performance and Engineering Group, which was responsible for increasing performance of the US based exchanges. Under his leadership, the responsibilities of the group expanded to include FPGA development, Capacity Management, Platform development and R&D, leading to the formal creation of the Enterprise Architecture Group in 2014.

Mr. Fay's experience spans over thirty years and he has held senior technology positions in a variety of industries including telecommunications, defense and financial services.

From 2008 to 2010, Mr. Fay was Chief Technology Officer for Virtu Financial and was responsible for the Firm's trading system including network infrastructure, proprietary software development and back office database systems.

Mr. Fay originally joined Nasdaq as part of the company's acquisition of INET in 2005. During this time, he was responsible for the consolidation of multiple trading platforms into the current INET technology based single book system, the development of Nasdaq's US Equities Clearing System, and creation of an automated regression test framework to verify functional changes to the trading systems.

Mr. Fay is a graduate of Stevens Institute of Technology.



## **Jayme Fishman**

President, Ryan LLC

Jayme Fishman, Esq. – is the President of Ryan' Software Division. He is a graduate of Northeastern University and the Louisiana State University Law School and holds degrees in Business Administration and Law. Prior to joining Ryan, Mr. Fishman was CEO of Second Decimal, LLC – a software company with a full suite of sales and use tax applications that was

acquired by Ryan in February 2015. He also served as the Senior Vice President of Sales, Marketing, and Business Development for one of the other major sales/use tax software vendors. He brings over seventeen years of experience in the tax technology vertical and has served numerous clients with a broad range of technologies.





# GOVERNING BOARD BIOS



## Eduardo Hruschka

Head of Advanced Analytics and Data Science, Itaú-Unibanco

Eduardo Hruschka is the head of Advanced Analytics and Data Science at Itaú-Unibanco. From 2013 to 2016, he was chief data scientist of the startup “Big Data”. Prior to that, he had an academic career. He received his Ph.D. degree in Computational Systems from COPPE/Federal University of Rio de Janeiro in 2001. Then he worked for some private universities until 2007, when he joined the University of São Paulo (USP), where he is currently part-time associate professor. From 2010 to 2012, he worked as a postdoctoral researcher at the University of Texas at Austin. In his academic career, he has published over than 100 scientific papers on data science, machine learning, and artificial intelligence.



## Jin Li

Senior Director, AI Platform, Ant Financial

Jin Li, Senior Director of Ant Financial Services Group, currently General Management for Global Technology Partnership and Development. Graduated from Artificial Intelligence Lab at Tsinghua University Computer Science Department. 20 years veteran in research & development at both Microsoft headquarter and Asian subsidiary, leading variety of R&D groups from Operating System (Win95, Win2000), Enterprise Servers (BizTalk Server, Commerce Server), Online Services and Search Engine (MSDN, Bing, Ads) etc. Joined Alibaba Group in 2014, CTO of Alibaba O2O BU (prior to Alibaba New Retail), joined Ant Financial at the end of 2015, General Manager of Alipay Mobile Intelligence, Senior Director of AI Platform, etc.



## Vipin Mayar

Head of Customer Knowledge & Strategic Insights (CKSI); Fidelity Investments

Vipin Mayar leads a central team providing Artificial Intelligence solutions, Big Data/Advanced Analytics Platforms, Business Analytics and Consumer Research/Insights

Previously, Vipin was the global head of McCann Worldgroup’s data and analytics practice consisting of over 300 professionals. He was a member of the McCann Global Board. Vipin was selected in the 2010 iMedia Top 25, an annual list of 25 thought leaders in the field of digital marketing. He has been an elected member to the Advertising Research Federation’s (ARF) Board of Directors whose mission is to improve the practice of advertising, marketing, and research globally. In 2011, Vipin was selected ‘Top 100 under 50’ diversity leaders by DiversityMBA Magazine. He has authored a book, published by Wiley & Co on driving measurable ROI through all major digital channels.

Vipin’s experience spans the client, consulting and agency side. He has been a service provider to AARP, Department of Defense, US Army and several Fortune 500 Companies that include Dell, Microsoft, Intel, Verizon, Time Warner Cable, Coke, J&J, MasterCard, American Airlines, Nestle, General Mills, iShares, AT&T, Showtime, General Motors, Kohl’s, BMS, Whirlpool, PACCAR and Exxon Mobil.

Vipin has been a keynote speaker at industry conferences including the American Management Association, OMMA, Retail Financial Services Best Practices Conferences, and the Marketing Services Institute. He graduated magna cum laude with an MBA in Finance and Marketing from Tulane University and an undergraduate in Chemical Engineering from the Indian Institutes of Technology (IIT), Delhi.



# GOVERNING BOARD BIOS



## **Evan Schwartz**

Engineer and Co-Inventor of the Interledger Protocol, **Ripple Labs, Inc.**

Evan Schwartz is the co-inventor of Interledger and an engineer at Ripple. Interledger is an open protocol that streams packets of money across blockchains and payment networks like the Internet routes packets of information. Previously, Evan was also co-inventor of the Codius smart contracts platform.



## **Beth Sullivan**

Senior Vice President, Global Technology Services, **State Street Corporation**

Beth Sullivan is Senior Vice President and a strategy leader in the Global Technology Services (GTS) organization at State Street Corporation. Beth is responsible for strategic planning of enterprise emerging technologies, driving architecture standards across the firm and communicating technology innovation to clients and employees. Her current role includes management of Fintech partnerships, Technology Research and University Relations.

Prior to her role in GTS, she was a Senior Vice President within the Alternatives Investments Group at State Street, where she was responsible for business transformation and strategic technology initiatives.

Beth served as a Senior Director at Capital Group Companies, 2007-2013. As a Director in the Information Technology Group; she was responsible for Application Development for accounting, trade operations and investment compliance functions. In this capacity she led the planning and delivery efforts for many strategic initiatives and business transformation programs to stream-line accounting, reference data and information delivery functions. She also held leadership roles in risk management, quality assurance and compliance business functions during her time at Capital Group.

Prior to Capital Group; Beth spent nineteen years in different leadership roles at Investor's Bank & Trust and State Street Bank. She was responsible for Client Technology management functions, including: client onboarding, technology support and quality assurance functions. During this period, she was responsible for a number of business development programs such as client portal development, middle office and alternatives product strategy. Mrs. Sullivan has 30 years of experience in the financial services industry.



# FINTECH@CSAIL RESEARCHERS

Access in-depth exploration of CSAIL research in AI, machine learning and data analytics. As part of this initiative, we will leverage the work of 15+ existing research projects. Members will have unprecedented access to the research and the research teams.

## FACULTY DIRECTORS



**Shafi Goldwasser**  
Professor, MIT CSAIL

Impact Areas: Algorithms+ Theory, Systems+ Networking, Secure Multiparty Computation, Cybersecurity



**Silvio Micali**  
Professor, MIT CSAIL

Impact Areas: Cryptography, Secure Protocols, Zero Knowledge



**Andrew Lo**  
Professor, MIT CSAIL

Impact Areas: Big Data, Healthcare Finance, AI + Machine Learning, Financial Technology



**Hal Abelson**  
Professor, MIT CSAIL

Impact Areas: Internet Policy Research Initiative (IPRI), Education, Transportation



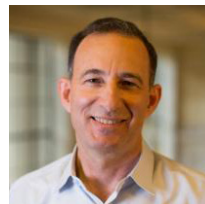
**Michael Stonebraker**  
Adjunct Professor, MIT CSAIL

Impact Areas: Big Data, Systems + Networking



**Lalana Kagal**  
Principal Research Scientist, MIT CSAIL

Impact Areas: Big Data, Cybersecurity, AI+ML, Systems + Networking



**Bruce Tidor**  
Professor, MIT CSAIL

Impact Areas: Computational Biology, Molecular Biology, Healthcare, Systems + Networking



**John Leonard**  
Professor, MIT CSAIL

Impact Areas: Robotics (land, sea), Navigation/Mapping, and Autonomous Vehicles



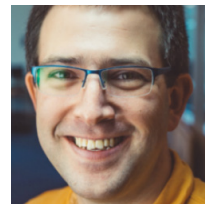
**Vinod Vaikuntanathan**  
Associate Professor, MIT CSAIL

Impact Areas: Cryptography, Homomorphic Encryption, Cybersecurity



**Aleksander Madry**  
Associate Professor, MIT CSAIL

Impact Areas: Theory of Computation Group, Machine Learning, Algorithms, Optimization, security



**Nickolai Zeldovich**  
Associate Professor, MIT CSAIL

Impact Areas: Cybersecurity, Computer Architecture, Cryptography, Systems + Networking



**Una-May O'Reilly**  
Principal Research Scientist, MIT CSAIL

Impact Areas: AI + Machine Learning, Security + Cryptography, Education, Healthcare

For more information, please visit:

**Researchers:** [bit.ly/FinTechCSAILResearchers](http://bit.ly/FinTechCSAILResearchers)

**Papers:** [cap.csail.mit.edu/fintech\\_papers](http://cap.csail.mit.edu/fintech_papers)

## Shafi Goldwasser

Faculty Co-Director, FinTech@CSAIL

Population Stability: Regulating Size in the Presence of an Adversary



Practical Accountability of Secret Processes



Practical Accountability vs Secret Laws: Can They Co-Exist?



Splinter: Practical Private Queries in Public Data



The Hunting of the SNARK



## Silvio Micali

Faculty Co-Director, FinTech@CSAIL

Algorand Agreement: Super Fast and Partition Resilient Byzantine Agreement



Collusion, Efficiency, and Dominant Strategies



Very Simple and Efficient Byzantine Agreement



Algorand: Scaling Byzantine Agreement to Cryptocurrencies



Auction Revenue in the General Spiteful-Utility Model



## Andrew Lo

Faculty Co-Director, FinTech@CSAIL

Privacy-Preserving Methods for Sharing Financial Risk Exposures



Risk and Risk Management in the Credit Card Industry



Group Selection as Behavioral Adaptation to Systematic Risk



Moore's Law Vs Murphy's Law in the Financial System: Who's Winning?



The Wisdom of Twitter Crowds: Predicting Stock Market Reactions to FOMC Meetings via Twitter Feeds



## Hal Abelson

Researcher, FinTech@CSAIL

Keys under Doormats



Skill Progression in MIT App Inventor



Measuring the Usability and Capability of App Inventor to Create Mobile Applications



No Technical Understanding Required: Helping Users Make Informed Choices About Access to Their Personal Data





## Lalana Kagal

Researcher, FinTech@CSAIL

Enforceable Data Sharing Agreements  
Using Smart Contracts



Explaining Explanations: An Approach  
to Evaluating Interpretability of Machine  
Learning



Shade: A Differentially-Private Wrapper for  
Enterprise Big Data



A Privacy Protection Procedure for Large-  
Scale Individual Level Data



## Aleksander Madry

Researcher, FinTech@CSAIL

Adversarially Robust Generalization  
Requires More Data



Prior Convictions: Black-Box Adversarial  
Attacks with Bandits and Priors



Towards Deep Learning Models Resistant  
to Adversarial Attacks



Towards Understanding the Dynamics of  
Generative Adversarial Networks



## John Leonard

Researcher, FinTech@CSAIL

Visual Place Recognition - A Survey



A Parallel Autonomy Research Platform



Duckietown: An Open, Inexpensive and  
Flexible Platform for Autonomy Education  
and Research



## Una-May O'Reilly

Researcher, FinTech@CSAIL

Adversarial Co-Evolution of Attack and  
Defense in a Segmented Computer  
Network Environment



Machine Learning or Discrete Choice  
Models for Car Ownership Demand  
Estimation and Prediction



Detecting Tax Evasion: A Co-Evolutionary  
Approach



Adversarial Deep Learning for Robust  
Detection of Binary Encoded Malware



## Michael Stonebraker

Researcher, FinTech@CSAIL

Beagle: Automated Extraction and Interpretation of Visualizations from the Web



The Data Civilizer System



Entity Consolidation: The Golden Record Problem



Splinter: Practical Private Queries in Public Data



Data Integration: The Current Status and Way Forward



## Vinod Vaikuntanathan

Researcher, FinTech@CSAIL

Gazelle: A Low Latency Framework for Secure Neural Network Inference



Multikey Fully Homomorphic Encryption and Applications



Zero knowledge Proofs of Proximity



Improvements to Secure Computation with Penalties



New Protocols for Conditional Disclosure of Secrets



## Nickolai Zeldovich

Researcher, FinTech@CSAIL

Veil: Private Browsing Semantics Without Browser-side Assistance



Vault: Fast Bootstrapping for Cryptocurrencies



Certifying a File System using Crash Hoare Logic: Correctness in the Presence of Crashes



Stadium: A Distributed Metadata-Private Messaging System



Sieve: Cryptographically Enforced Access Control for User Data in Untrusted Clouds





# **FinTech@CSAIL**

[cap.csail.mit.edu/FinTechCSAIL](http://cap.csail.mit.edu/FinTechCSAIL) | [fintech.csail.mit.edu](http://fintech.csail.mit.edu)