# Disruptive Technology & Digital Cities
## Corporate Affiliate Program



## 2018-2019 Annual Program Guide

The Stanford GPC **Disruptive Technology & Digital Cities Program** was created in 2017 to change the way commercial companies transform and monetize disruptive technology for their urban markets. Our goal is to identify early stage technologies that can create commercial opportunity, while also looking at new ways of thinking about company and industry business models, governance, sustainability, competitive advantage, and technology adoption.

For 2018-2019, we are greatly expanding our program to build off the work of 2017-2018:

- **Stanford Technology Lab Portfolio:** we have created the first-ever catalogue of ALL Stanford Technology Labs and projects – numbering over 400 labs and 4,000 pre-commercial projects. We will match your annual plan to the disruptive technologies being developed at Stanford. New for 2018-2019.

- **New Member Networking Program:** we will help members hook up with each other to do JV explorations and solve common problems. We will also open our own network to some 4,000 executives and 1200 companies globally.

- **SRI International:** this world-class commercial lab and now member is famous for its Siri spin-out to Apple among other things is opening up its labs to program members as an additional resource. New for 2018-2019.

- **$30M Diamond Venture Fund:** GPC affiliate, Diamond Ventures, has raised $30M for venture investing available to our members and Stanford labs for startup funding. New for 2018-2019.

- **Visual Modeling Platform:** we funded this core research program to create the world's first digital city modeling system that can do "What if" predictive analytics. We will explore how we can gain insight when real-time data crosses commercial city data layers. We expect to see fundamental new insights on consumer behavior. We have formed the research team under the leadership of Ram Rajagopal and his post-doc Herman Donner. Expanded in 2018-2019.

We will continue to expand upon your Annual Plan from 2017 to match up your needs with our access to disruptive technology. We will also create an expanded Joint Venture program to connect your interests with other members. We will schedule a physical meeting of all members on December 11 of this year and the annual digital cities summit June 3.

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**Executive Director**
*Disruptive Technology & Digital Cities*
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*Former SVP PARC*

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# Program Description



## Transform Disruptive Technology into Revenue Growth

**Stanford's Disruptive Technology & Digital Cities Program** is one of the first of its kind in the United States. Our program will focus on four core categories of activities: **Research**, **Innovation, Business Strategy, and Education**. We harness focused research crossing over 400 Stanford labs, work at SRI, and Silicon Valley startups to create new commercial opportunity, and ways of thinking about corporate innovation, R&D, urban commercial market growth, and long-term sustainability. Why urban centers?

- 80% of the R&D of the top 5 Silicon Valley tech companies is spent on products and services targeted at urban markets.
- In the last 50 years, the world's urban population has grown from 1 to 3.5 billion.
- In the next 50 years, urban populations will double again with 70% living in urban locations.
- 23 mega-cities* contribute 10% global growth
- London generates 22% of total UK GDP with 12.5% of the population
- 80% of U.S. population in large cities, 60% Europe
- 84% of U.S. GDP generated by large cities in last decade - 65% in Europe

### Digital City Definition
We challenge the use of the term "Smart City," believing that this term is a misnomer. In our view, digital cities will be developed by private enterprises growing their own commercial markets in urban centers by leveraging disruptive technology. These are the core premises:

- City GDP growth together with networked population density defines market opportunity while motivating commercial investment
- Enterprises transform disruptive technology into digital infrastructure and apps for urban citizens
- Data becomes underlying least common denominator
- Higher quality of life - will be delivered by both private and public stakeholders not government alone

## GLOBAL PROJECTS CENTER

Our program is part of The Global Projects Center - an interdisciplinary research center at Stanford. GPC facilitates understanding of financing, development, and governance of critical infrastructure worldwide. GPC also conducts early-stage research, facilitates engagement among academic and industry leaders, and educates future leaders at the doctoral level.



## PROGRAM BENEFITS AT A GLANCE

- **One-Stop Stanford Clearing House** on disruptive technologies and new business models for growth of urban tech across industries: healthcare, financial services, transportation, construction, sustainability, energy, and advanced materials, and data analytics
- **Access to world-class faculty and Ph.D.'s** managing over 150 Stanford labs and Valley startups
- **Facilitated access to venture capital to fund startups**
- **Early insights** about emerging Technologies including data analytics, AI machine intelligence, robotics, autonomous vehicles, Lidar, and more
- **Opportunity for specialized research, IP licensing**, joint ventures, and business model development
- **Access to expertise via CodeX/LST at Law School**
- **Common Member funded initiatives** on breakthrough technologies chosen by the members

## Introduction

Stanford offers members an opportunity to fund seed programs that will explore a given area of research - many times defined by the members themselves to explore a possible area of interest. Seed projects can lead to a more in-depth, sponsored project that can generate intellectual property that is transferable to the sponsor. This fall, we will bring together members December 11 to solicit and review both Stanford faculty and members to submit ideas. We then schedule a time for members to evaluate what they see. Here are some of the ideas for seed.

- Neuro-morphic chip technology for computing on the edge
- Robotics and Stretchable Materials for low-cost sensors
- Human behavioral dynamics
- Predictive Analytics underlying all platforms
- Applied Artificial Intelligence for big data

## Robotics

Professors Khatib is exploring new ways to enable robots to make autonomous decisions as they move throughout a physical environment. Haptics are used to create a new kind if interface that allows robotics to manipulate extremely delicate objects. This application can be applied ranging from manufacturing to harvesting of crops. Our goal is to understand how we can accelerate robotic autonomy while also reducing the overall cost of deploying robotics into the work environment.

## Predictive Analytics

Predictive Analytics and the use of AI is a critical element of every platform – from the Visual Modeling System to work on advanced material sciences. How do we develop a framework to use this data to create new insights and opportunities? What should we consider as we develop these platforms? How does data create insight?

## Venture Fund

For the first time, the program will offer facilitated access to $30M in venture funding for use in developing early stage startup opportunities with member involvement.

## New Financial Platforms

New financial platforms are a disruptive force for the financial services and commercial real estate. As we begin to look at new financial platforms, what can we expect in terms of disruption to existing business models? How will financial transactions evolve as autonomous vehicles emerge as networked mobile platforms creating a new data layer in cities that will be continuously connected? As companies like Amazon begin to do transactions crossing data from the home, the smartphone, and now the car; what will be the future model of transactions?

## Stretchable Materials

Dr. Chang has developed a radical new approach to advanced materials that makes it possible to create sensors that are fully integratable with wireless networks embedded in a wide range of materials. One of his first projects has been to build robotic skin - making it possible for a robotic arm to feel its way in its environment giving autonomy and freeing it from human management.

In another area, he is using stretchable materials for aerospace and battery applications. He has created a aircraft wing that is intelligent enough to detect stress, identify cracks in the wing, and manage the data coming off the sensors embedded in the metal. He has also created a composite material with stretchable materials to dramatically increase the life of a battery while decreasing its overall size and weight while not losing the energy generated.

## Stanford Technology Labs Portfolio

This year we will introduce a complete catalogue of all Stanford technology labs that will be used to "Match Up" member annual plan goals to specific labs where IP is commercially transferable.

## Advanced Materials

Advances in material sciences are changing everything from IoT sensors, low-cost semi-conductor fabrication, to new ways to deal with reducing temperature by leveraging the physics of materials for roofing applications. New beam-directing radar can now map city buildings – making it possible to see foundations and wear and tear. We can see business model potential to drive opportunities for commercial development. Data captured from these materials enables new insights on how buildings within a city function - buildings covered by these new materials can  "self-report" wear and tear.

## Mobility Study

We are undertaking a major study exploring mobility within cities ranging from autonomous vehicle applications to new financial transaction applications.

## Stanford Law CodeX/LST

The scope and complexity of legal and regulatory challenges presents a hurdle to harnessing the full potential of emerging technology, at a time when the velocity of technological transformation is unprecedented and unrelenting. The Stanford Center for Legal Informatics (CodeX), a pioneer in applying engineering approaches to these challenges, brings strengths well aligned with the program mission, as does its umbrella program, the Stanford Program in Law, Science & Technology (LST)  with a focus on law and policy related to emerging technology. With deep roots in Silicon Valley and robust networks globally, CodeX/LST provides access to unique strategic, multidisciplinary expertise and novel research, education, and collaboration opportunities in emerging domains such as digital cities, AI, robotics, IoT, autonomous vehicles, data security and privacy, and block chain, expanding options for corporate affiliates navigating legal and regulatory challenges at the speed of disruption.

# RESEARCH MOVING TO INNOVATION

## Sponsored Projects Initiatives 2018-2019

## CUSTOM RESEARCH & STARTUPS FOR THE COMING YEAR



## Affiliate Member Planning

**In 2017,** we conducted calls and meetings with each member to set the annual plan. During these conference calls, we worked with each individual member to understand in more detail the strategic problems they are facing and what they want to accomplish with their membership in the corporate affiliate program. We captured valuable information and formed an annual affiliate plan to help us identify opportunities in research, collaboration, and sponsored research that might provide a member insights, and/or a path to a solution.

**In 2018-2019**, we will expand this process to include Stanford's technology labs, our venture fund, and the Keynote offered. Members can participate not just in program activities but also in their own proprietary research projects, including selective sponsored research. We have already started the identification of several major game-changing projects that promise impact to urban digitalization of commercial markets for some of our members.

## Sponsored Research Leads to Innovation

As our members begin to explore our program offerings for the coming year, there may arise an opportunity for a member to do a sponsored research project. Generally, this process involves identifying a specific area where an affiliate member wants to engage Stanford faculty and graduate expertise to explore one avenue that could lead to a new application or business model leveraging Intellectual Property "IP". As an example, a pre-commercial seed research project may lead down a path where a member may want to do more in-depth work to create specific IP which is owned by the member. These are what we refer to as sponsored projects. There are rich areas that can be explored in predictive analytics, artificial intelligence, robotics, *what if* visual modeling, sustainability, or convergence of technologies (example IoT).

## New Innovation Workshop to Train Organizations on How To Monetize Disruptive Technology

We are now exploring a seed project and workshop training innovation organizations inside of member companies to plan, execute, and transition disruptive technology into their organizations. We are providing tools and processes to help member companies overcome issues around technology awareness, acquiring employee expertise, developing sound processes to overcome cultural legacy, and tools for technology road-mapping and business modeling.

Transforming Disruptive Technology into new business models is a complex and difficult process that must take into consideration how a company internalizes innovation into its culture. Our new innovation workshop examines existing corporate cultures and offers processes and approaches to overcome obstacles to technology transfer. Our goal is to ensure the long-term success of the company's innovation strategy in a real and practical way. (Workshop cost is in addition to membership fee.)

## Sponsored Projects and Early Stage Startups

We expect a number of projects will leverage the work of startup companies or perhaps offer a member an opportunity for an acquisition as part of the sponsored project work and Intellectual Property. In all of these cases, our Stanford team will work with each member to assist them in understanding how technology can play a role in creating new growth opportunity.

Sponsored projects go beyond the basic program and offer the member an opportunity to create and own technology tailored to their own needs in a cost-effective way.

In 2017, we saw Meta-Wave and One-Point-One funded as early stage startups. Meta-Wave produces high-resolution radar, and One-Point-One a new kind of robotic-enabled urban farm. Sponsored project scope and cost is negotiated with the faculty Principal Investigator of the sponsored project.
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# INNOVATION
## STANFORD'S GPC RESEARCH INITIATIVES

The Global Projects Center is an interdisciplinary research center at Stanford University. We seek to facilitate understanding of the financing, development, and governance of critical infrastructure worldwide. We conduct interdisciplinary research, facilitate engagement among academic and industry leaders, and educate future leaders within the infrastructure finance and development space. The Digital Cities initiative is part of GPC.

## Stanford | Global Projects Center

### Stanford Engineering Department and Civil and Environmental Engineering

### P3 FLIPS Program

- Project Risk Paper Series - Toll Road Revenue Risk: Series of case studies on US toll roads that experienced revenue risk during the start of the great recession. We are examining project outcomes based on how it was financed and the governance of the institutions managing it.

- Deferred Maintenance Research Initiative: Joint GPC and CIFE research program on deferred maintenance in public buildings and other infrastructure. The initiative will include a study of the future costs of deferred maintenance, active asset management, and accounting standards.

- Municipal P3 Program Development: Study of the institutional changes necessary to implement smart city projects or alternative procurements at the state or local level. This research includes a study of the structuring options available in municipal asset classes such as public buildings and educational facilities.

- New Sector Study: Policy paper on Fiber-to-the-Home network development and risk allocation under a P3 procurement structure.

### Long-term Investor Research Program

- Pensions and Infrastructure Paper Series: Three case-based papers on direct investments by public pension funds in public infrastructure projects. Cases include the N33 project in the Netherlands, Queensland Motorway in Australia, and the CDPQ Infrastructure program in Canada (in development).

- Institutional Fintech Research Program: Study of the financial technologies and their applicability to improve risk management and portfolio allocations for institutional investors.

- Investment Vehicle Fee Research: This is a study to quantify the aggregate fees of various pooled investment fund structures.

### Infrastructure Development Research Program

- US and Chinese Infrastructure Investment Abroad: Series of case studies on the practices of bilateral and multilateral lending institutions and their effectiveness in financing urban and rural infrastructure projects in developing economies.

# STANFORD VISUAL MODELING PLATFORM
## WHAT IF MODELING OF CITY COMMERCIAL MARKETS

### 2018

# INNOVATION

## Visual Modeling Platform - Open to All Members

Stanford is developing a ground-breaking new visual modeling platform - making it possible to visualize and ask "What If" questions of an entire city. The platform accurately depicts the entire city infrastructure including buildings, roads, infrastructure and transportation. But in addition to this, it is possible to attach physical data to the model including earthquake, flooding, energy flow, financial transactions, commuting data, sensors information, demographics, and a wide range of other information. When this data is applied to the model, the model will display the impact of the data on the city environment and commercial markets.

For the first time, we also will be able to understand consumer behavior within a city. We expect to be able to create insights on how people behave, spend, and go about their daily activities within the city. We can also see how mobility technology is likely to impact commercial opportunities across all commercial markets.

The platform will also makes it possible to develop vertical applications crossing every major industry sector. Our goal is to take this platform and develop the ability to predictive future outcomes with a high degree of reliability. It will also be possible to develop vertical applications leveraging the platform to enable companies in specific industries to leverage the insights - commercial real estate decisions, ROI, disaster scenarios, autonomous vehicle impact, and climate change.

All members can participate in working with the platform. Our first application will be commercial real estate lead by Herman Donner. City Zenith is partnering with Stanford and our corporate affiliate members to provide platform tools.

- Powerful city-wide "what if" visual modeling of urban markets that can show impact of building projects, financial transactions, demographic trends, etc.
- Model allows for the attachment of real-time physics and data sets
- Powerful software applications can be built off the model platform
- Long-term vision to create an real-time time lapse of economic and social activity including physical events – floods and earthquakes
- Predictive analytics model to forecast impact with high reliability of outcome
- City Zenith is an open architecture company for visual modeling that has tools and API's immediately available
- Data sets provided by multiple partners for multiple city environments
- **Stanford Team:** Professor Ram Rajagopal, Lead; Dr. Rishee Jain, Professor Martin Fischer, Ph.D. Candidate Jiafan Yu; Marc Ramsay, and Herman Donner

**Business Model Implications:** a visual modeling platform is designed for commercial market development. We can add and evaluate real-time data for healthcare, financial transactions, services, transportation companies, autonomous vehicles, IoT sensors, and a vast array of demographic information as well. We expect our members will find their own application for the platform which could lead to new monetization models. Members will be able to license IP to develop their own applications.

- **Visual Platform** can be developed for other cities
- **Visual Model:** two-way "*What If*" analysis with data driving visuals and visuals generating impact data
- **Commercial Markets:** First time we can look at an entire city and see commercial market opportunities
- **Supports IoT:** possible to gather data from sensors and also decide how to program sensors effectively
- **Financial Impact of Decisions Before They are Made:** what would happen if we modeled different scenarios on return on investment for commercial projects?
- **Predictive Analytics:** next step is to predict outcome with a high degree of certainly versus looking only at static or real time data
- **Data Sets:** from public and private sources

**2018-2019:** Expansion of the project with goal of building out first application off the platform in commercial real estate.

# BUSINESS MODEL STRATEGY

## Networking End Access to Technology Intelligence

Our corporate affiliate members have access to some of the most valued expertise in disruptive technology and human behavior. Aside from the direct program benefits, members may use the program leadership to understand how to find the right expertise or people to discuss a wide range of topics including:

## Business Models & Strategy

We are also exploring new business models that could leverage autonomous vehicles as mobile network scanning platforms. For the first time, we can acquire images ranging from infrastructure to human activities transmitting daily data feeds to powerful cloud-based systems for analysis.

In other areas, we will explore how financial transactions are likely to change, from Block Chain to transactions conducted in the car and transmitted via mobile networks to the cloud. How will business models of financial services companies change with these new platforms?

In 2018, we will be expanding pro-active networking to connect each member with whatever resources are needed to drive a new strategy or simply learn about a new domain. Please fell compelled to connect with us as you find a need. As we work together in 2018-2019, we will learn about each other's businesses, organization, and needs. Let's find a way to make leverage this for our mutual benefit.

- Finding technical and technically-Savy business talent
- Developing effective innovation organizations
- Learning how to leverage partnerships and joint ventures
- Developing networking skills brining it to a leadership level
- Accessing foreign partners and market expertise
- Finding the right expert in Articificial Intelligence or Robotics or Pick One
- Finding the right executive in one of 1500 Fortune Group companies to engage in a discussion
- Accessing the Silicon Valley Community
- Understanding how to develop a low-cost way to become aware of disruptive technology
- Learning more about IP rights
- Understanding privacy
- Learning about venture-backed startup models
- Understanding how VC's strategize and operate
- Access and hire unaccessible talent
- Create effective innovation processes inside the company
- Learn where to invest in future technologies
- And many more...

**Michael J.T. Steep**
*Executive Director & Adjunct Professor,*
*Stanford Former Senior Vice President PARC*

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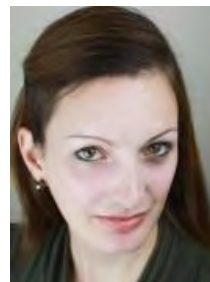
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# 2018-2019 Program Calendar

**Two key meetings:** Dec 11, 2018 Member Meeting at Stanford Engineering AND Digital Cities Conference at Stanford Alumni Center on June 3 & 4 in 2019

| Notation | Quarter 1 | | | Quarter 2 | | |
|---|---|---|---|---|---|---|
| | Sept | Oct | Nov | Dec | Jan | Feb |
| Major Events | Program/Q1 Kickoff Call | Research Presentations & Member Meeting at Stanford | Member Meeting at Stanford | **Member meeting on Dec 11** | Q2 Conference Call | |
| Updates/Seminar/Whitepaper | Program/Q1 Kickoff Call | Introducing SRI | Kwabana Boahen, Prof. Noromorphic Technologies | Introducing Global Logic | | Dr. Chang- Robotic Skin |
| Stanford Transform Disruption Keynotes | Cananda Members | 2 Accounts | 2 Accounts | 2 Accounts | 2 Accounts | 2 Accounts |
| Sponsored/Research Projects | Program/Q1 Kickoff Call | Visual Modeling Platform Launch | 2018-2019 Project Review and Selection for Members | Announcement of 2018-2019 All Member Research Project | Mobility Platform | Review of Visual Modling Program |
| Stanford Lab/Member Match | Launch and introduction of the Stanford Technology Labs Portfolio | | Selection of first seed projects from proftolio matching exercise | | Selection of first sponsored projects | |
| Member Joint Venture Matching | Individual discussions | | | | | |
| Faculty Ph.D. Coffee Meetings | | | First coffee meeting with Ph.D.'s from selected labs | | | Winter coffee meeting with Ph.D.'s from selected labs |

| Notation | Quarter 3 | | | Quarter 4 | | |
|---|---|---|---|---|---|---|
| | March | April | May | June | July | August |
| Major Events | EU Mini Conference | Q3 Conference Call | 2019 Summit Preparation | Digital Cities Summit at Stanford | Q4 Conference Call | Summer Break |
| Updates/Seminar/Whitepaper | OnePoinOne Update | Dr. Katlb- Robotic Touch | | Ram- AI Computer Learning | | Summer Break |
| Stanford Transform Disruption Keynotes | 2 Accounts | 2 Accounts | 2 Accounts | 2 Accounts | 2 Accounts | 2 Accounts |
| Sponsored/Research Projects | | New Seed Projects Underway | | | | Summer Break |
| Stanford Lab/Member Match | Exeution of Seed Projects | | Execution of first Sponsored Projects | | | Summer Break |
| Member Joint Venture Matching | | | | | | Summer Break |
| Faculty Ph.D. Coffee Meetings | | | Spring coffee meeting with Ph.D.'s from selected labs | | | Summer Break |

# Stanford Faculty with Research Related to Digital Cities

## Craig Criddle

*Professor of Civil and Environmental Engineering and Senior Fellow, by courtesy, at the Woods Institute for the Environment*

Craig Criddle is Professor of Civil and Environmental Engineering at Stanford University. He is also Director of the Stanford Codiga Resource Recovery Center and Senior Fellow (by Courtesy) in the Woods Institute for the Environment at Stanford. His research interests are biotechnology for recovery of clean water, renewable energy, nutrients, and safe biomaterials.

## Catherine Gorlé

*Assistant Professor of Civil and Environmental Engineering*

Catherine Gorlé's research interest is the development of predictive flow simulations of the natural and built environment to support sustainable design and policy decisions. She focuses more specifically on coupling large- and small-scale models and experiments to quantify uncertainties related to the variability of boundary conditions, and developing uncertainty quantification methods for low-fidelity models using high-fidelity data.

## Rishee Jain

*Assistant Professor of Civil and Environmental Engineering*

Rishee's research focuses on the development of data-driven and socio-technical solutions to sustainability problems facing the urban built environment. His work lies at the intersection of civil engineering, data analytics and social science. Recently, his research has focused on understanding the socio-spatial dynamics of commercial building energy usage, conducting data-driven benchmarking and sustainability planning of urban buildings and characterizing the coupled dynamics of urban systems using data science and micro-experimentation.

## Mike Lepech

*Associate Professor of Civil and Environmental Engineering and Senior Fellow at the Woods Institute for the Environment*

Lepech's research focuses on the integration of sustainability indicators into engineering design, ranging from materials design, structural design, system design, to operations management. Recently his research has focused on the design of sustainable high performance fiber-reinforced cementitious composites (HPFRCCs) and fiber-reinforced polymers (FRPs), the impacts of sustainable materials on building and infrastructure design and operation, and the development of new life cycle assessment (LCA) applications for building systems, transportation systems, water systems, and consumer products.

### Michelle Anderson

*Professor of Law*

Michelle is a public law scholar and practitioner focused on state and local government, including urban policy, city planning, local democracy, and public finance. Her work combines legal analysis with the details of human experience to understand the local governance of high poverty areas, both urban and rural, and the legal causes of concentrated poverty and fiscal crisis. Her current research explores legal restructuring for cities and counties in distress. Prior to joining Stanford Law School in 2014, Anderson was an assistant professor of law at Berkeley Law School.

### Philip Levis

*Associate Professor of Computer Science and of Electrical Engineering*

Phillip is an Associate Professor in the Computer Science and Electrical Engineering Departments of Stanford University. He heads the Stanford Information Networking Group (SING), co-directs the Secure Internet of Things Project, and holds the Fletcher Jones Faculty Development Chair. His research focuses on the design and implementation of efficient software systems for embedded wireless sensor networks; embedded network sensor architecture and design; systems programming and software engineering.
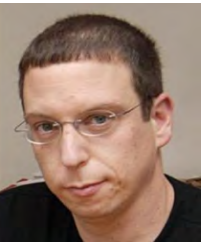
### Dan Boneh

*Rajeev Motwani Professor in the School of Engineering and Professor of Electrical Engineering*

Professor Boneh's main research area is applied cryptography and network security. His focus is on building security mechanisms that are easy to use and deploy. He has developed new mechanisms for improving web security, file system security, and copyright protection. He contributed to the security and performance of the RSA cryptosystem and contributed to the study of cryptographic watermarking.

### Jure Leskovec

*Associate Professor of Computer Science*

Jure is assistant professor of Computer Science at Stanford University where he is a member of the InfoLab and the AI lab. He joined the department in September 2009. In 2008/09 he was a postdoctoral researcher at Cornell University working with Jon Kleinberg and Dan Huttenlocher. Jure completed his Ph.D. in Machine Learning Department, School of Computer Science at Carnegie Mellon University under the supervision of Christos Faloutsos in September 2008.

## Oussama Khatib

*Professor of Computer Science*

Oussama Khatib received his Doctorate degree in Electrical Engineering from Sup'Aero, Toulouse, France, in 1980. He is a Professor of Computer Science at Stanford University. His work on advanced robotics focuses on methodologies and technologies in human-centered robotics including humanoid control architectures, human motion synthesis, interactive dynamic simulation, haptics, and human-friendly robot design. He is Co-Editor of the Springer Tracts in Advanced Robotics series, and has served on the Editorial Boards of several journals as well as the Chair or Co-chair of numerous international conferences. He co-edited the Springer Handbook of Robotics, which received the PROSE Award. He is a Fellow of IEEE and has served as a Distinguished Lecturer. He is the President of the International Foundation of Robotics Research

## Marco Pavone

*Assistant Professor of Aeronautics and Astronautics*

Dr. Marco Pavone is an Assistant Professor of Aeronautics and Astronautics at Stanford University, where he is the Director of the Autonomous Systems Laboratory. Before joining Stanford, he was a Research Technologist within the Robotics Section at the NASA Jet Propulsion Laboratory. He received a Ph.D. degree in Aeronautics and Astronautics from the Massachusetts Institute of Technology in 2010. His main research interests are in the development of methodologies for the analysis, design, and control of autonomous systems, with an emphasis on autonomous aerospace vehicles and large-scale robotic networks. He is a recipient of a PECASE Award, an ONR YIP Award, an NSF CAREER Award, a NASA Early Career Faculty Award, a Hellman Faculty Scholar Award, and was named NASA NIAC Fellow in 2011.

## Ram Rajagopal

*Assistant Professor of Civil and Environmental Engineering*

Professor Ram Rajagopal is Assistant Professor of Civil and Environmental Engineering and by Courtesy, of Electric Engineering. Rajagopal's primary research focus is on advancing the design, optimization and data-driven modelling of electric power systems. His work involves creating novel sensing and control platforms, robust data processing algorithms and dynamical statistical decisions Methods. He has also worked extensively on sensing infrastructure systems and transportation networks.

## Silvio Savarese

*Associate Professor (with Tenure) of Computer Science*

Silvio Savarese is an Associate Professor (with tenure) of Computer Science at Stanford University and director of the SAIL-Toyota Center for AI Research at Stanford. He earned his Ph.D. in Electrical Engineering from the California Institute of Technology in 2005 and was a Beckman Institute Fellow at the University of Illinois at Urbana-Champaign from 2005 2008. He joined Stanford in 2013 after being Assistant and then Associate Professor of Electrical and Computer Engineering at the University of Michigan, Ann Arbor, from 2008 to 2013. His research interests include computer vision, robotic perception and machine learning. He is recipient of several awards including a Best Student Paper Award at CVPR 2016, the James R. Croes Medal in 2013, a TRW Automotive Endowed Research Award in 2012, an NSF Career Award in 2011 and Google Research Award in 2010.

# 2018-2019 Corporate Affiliate Members

- AGC
- Amazon
- Ananda
- Azcende
- Bechtel
- Blue Cross Blue Shield Association
- Carsales.com
- Cbus
- Cushman & Wakefield
- Cintra
- Daikin US
- DeGroote School of Business together with the School of Engineering at McMaster University Canada
- Diamond Ventures ($30M Fund)
- Hitachi
- Idaho Forest Group
- LiteOn
- Microsoft
- Prologis
- QIC
- Railpen
- Royal Bank of Canada
- SRI International
- Urban Venture Labs
- Visa
- Wilo