

## **mediaX 2016 Conference Augments Personal Intelligence**

### Conference Summary

With recent research presentations and hands-on cutting edge demos, the mediaX 2016 Conference held on May 17 delved into the present and future of augmenting personal intelligence. “Augmenting Personal Intelligence” refers to the technologies, design and systems that enhance individual capacity. Researchers and industry experts shared their insights on how this frontier is revolutionizing learning, communication, entertainment and business. From using virtual reality to train NFL quarterbacks, to exploring the science of remembering, to improving political decision making with deep machine learning, the conference explored advances into this emerging approach.

Fusing perspectives from both human sciences and information technology, accomplished Stanford researchers and private sector leaders from the mediaX community gathered on Tuesday, May 17 at the Arrillaga Alumni Center for the one-day conference, featuring five plenary talks and five panels, as well as a dozen demos and exhibits.

### **Better comprehension for future goals**

The augmenting personal intelligence paradigm is an integrated personal data ecology in which human learning and machine learning are interdependent, explained mediaX Executive Director Martha Russell as she kicked off the event. “For a smart world, we need smart people,” she said. This requires “life-wide and lifelong learning in a networked world,” continued Roy Pea, David Jacks Professor of Education and Faculty Director of mediaX at Stanford University and the H-STAR Institute. Artificial intelligence can play an enabling role in unlocking human potential. “The human brain hasn’t had an upgrade for 50,000 years”, declared Neil Jacobstein as he gave the conference’s first presentation. Jacobstein chairs the Artificial Intelligence and Robotics Track at Singularity University and is a Distinguished Visiting Scholar with mediaX.

“Our brain has limitations and built-in bugs, and they affect our decision making every day,” he said. At the same time, technologies like deep machine learning and robotics are improving rapidly in ways that increase social opportunities. “AI is more than game-changing, it’s disrupting the entire landscape,” said Jacobstein. Sharing examples like IBM Watson or Google’s AlphaGo, he showed how AI is already disrupting a growing number of fields from design and diagnosis to risk management. For Jacobstein, the Augmentation Imperative is about the transformation from opinion based to evidence based decision making. “We need better comprehension for better solutions,” he said.



Political decision-making was the main topic of one of the first panels, entitled “Crowdsourcing Democracy and Governance,” and moderated by Allison Berke, Executive Director at the Stanford Cyber Initiative. Susan Athey, Economics of Technology Professor at Stanford Graduate School of Business, described her research on the economics of the internet and the news media with a focus on news aggregators and social networks. “The way you present information online has an enormous impact on what people read and what they do,” she explained. Her work shows that the supply of news provided by news aggregators like Google News is beneficial to consumer perspective, but diminishes investment in traditional news outlets. Athey’s work also shows that social networks can increase the users’ political biases and lead to a filter bubble. “In today’s political environment, we should be concerned about how people are getting their information, and about the declining role of the news outlets as a curator,” she declared. “At least, they were trying to be more neutral than the kind of information people are reading on social media.”

James Fishkin, Professor of Communication and Janet M. Peck Chair in International Communication, spoke about the method of deliberative polling that combines random sampling with in depth discussion. For him, this method has produced policy impacts in countries around the world and could provide a form of augmented collective intelligence. After giving several examples from different countries, Fishkin concluded: “If you convince people that their voices matters, it’s amazing what you can learn from the public.” Ashish Goel, Professor of Management Science and Engineering, spoke about political decision making at scale from an engineering angle and explained his team’s research on algorithmic approaches towards large scale decision making.

During the morning sessions, another panel moderated by Stanford PBL Lab Founding Director Renate Fruchter discussed “Augmenting Team Intelligence and Performance.” Takao Shudo, Senior Manager at Konica Minolta, spoke about the challenges of remote collaboration and the applications in his company of smart tools such as interactive connected whiteboards. “We needed an intuitive platform to share the information together,” Shudo said. Karen Kocher, Chief Learning Officer for global health services company Cigna, explained how her company is leveraging technology to drive collaboration and higher performance, using gamification and social learning boot camps. “We adopted a developer mindset,” said Kocher. “We could understand who the high performers were and what made them so influential, articulated those strengths, and have developed those skills in others.”

Sábia Experience, a Brazilian social and technology innovation company, uses immersive learning environments to enhance team intelligence in a diverse array of companies. According to Marcelo Guimarães, Co-founder and Chief Innovation Officer at Sábia, as five different generations of workers are now coexisting in the 21<sup>st</sup> century workplace,



it's important to have “a common language for them to work together.” That's why Sábía proposes authentic case-based stories and interactive games for workers to build and share knowledge together. For Maria Frank, Ph.D. Candidate in Stanford Department of Civil and Environmental Engineering, augmenting personal intelligence involves improving emotional intelligence, our ability to read other people, and to adjust to our surroundings. She described new sensor environments – motion tracking or voice recognition devices, for instance – that allow the evaluation of engagement to be automated. “We can teach machines to look for all those signals,” Frank added. The same data could also be used in the near future for human beings to better inform technology, with applications like smart offices and displays.

### **“Transcend the moment”**

Anthony Wagner, Professor of Psychology and Neuroscience at Stanford – where he directs the Stanford Memory Laboratory, spoke about the science of remembering. “Memory allows us to transcend the present moment,” said Wagner. The ability to remember the past is critical for many aspects of human behavior, from day-to-day behaviors, such as remembering to take medications or recognizing previously encountered people, to other complex behaviors, such as navigating to spatial goals. During the conference, Wagner shared new insights into how memory is organized and supported by the mind and brain. Recent advances in functional brain imaging combined with virtual reality and machine learning provide a new window onto how the brain supports memory-guided thinking and action. “We tend to think that memory is about mental travel back in time, when in fact it is fundamentally about reaching future goals,” he explained.

As virtual reality (VR) has become more accessible, it now has rich applications in the field. Born from the Stanford Virtual Human Interaction Lab (VHIL) research, programs at STRIVR Labs are using this immersive technology to train NFL quarterbacks. The company uses 360 degree cameras to capture the vantage point of a specific player during practice, explained Andrew Wasserman, STRIVR General Manager. When put into a VR headset, these views allow players to re-experience these practice repetitions as if they were on the field. To prepare for upcoming games, quarterbacks usually practice against a scout defense, which emulates their upcoming opponent. With their practice enhanced by VR, they learn more effectively and make decisions more quickly on game day. According to Wasserman, with this application in football training, “we're just scratching the surface on how we can use VR to improve decision making.”

Juho Kim, visiting Assistant Professor of Computer Science and Brown Fellow at Stanford University, gave a talk about multimedia for personal narratives. Personal archives represent a person's lifetime of ideas, narratives, and vision, which are captured in various forms of media – texts, graphics, videos etc., explained Kim. To him, the



challenge is in how we can connect these resources with overarching keywords, people or objects. “The idea is to combine all these media in a way that they tell an interesting story,” said Kim. For a case study, he and Maneesh Argawal, Stanford Computer Science professor, are working with the Doug Engelbart Institute to design an interactive online archive of the computing pioneer’s collection. Kim is building semi-automated tools for converting the Engelbart collection into a digital archive that lets users fluidly browse, skim, and annotate multimedia resources. “These tools are a way to enhance the collective intelligence,” concluded Kim.

### **Revolutionizing Education**

In the afternoon, three concurrent panels explored educational futures. One of them, entitled “Augmenting Intelligence for Thinking and Perception,” was moderated by Keith Devlin, Executive Director of Stanford’s H-STAR Institute. Among the panelists were Emily Schneider, a PhD Student at the Stanford Graduate School of Education and the Director of Research and Pedagogy at the Lacuna Project, a platform for social annotation of digital texts. Schneider shared how students at Stanford and Foothill Community College have been experiencing Lacuna. “In a social environment, annotations are like having someone reading over your shoulder,” Schneider said. “The students generally feel that they understand the text better because they can learn from their peers.” René Kizilcec, a PhD Candidate in Communication and Co-founder of the Stanford Lytics Lab, spoke about his research on peer effects in social media like Facebook. “The initial and continued use of social networks depends on peer directed feedback,” said Kizilcec.

The more comments a user receives, the more she or he is likely to post comments. It’s a virtuous circle that explains how the size of a social network increases. Holly Pope, Doctoral Candidate in Education, described how digital math games can be used to augment learning. According to Pope, despite the multitude of math games available, few highlight mathematical thinking and problem solving. Similarly, not much research has focused on digital game-based learning beyond speed and basic math facts. She presented a framework for evaluating digital games for children, and discussed the results of a pilot study. Esther Wojcicki, Founder of the Palo Alto High School Media Lab and a mediaX Distinguished Visiting Scholar, discussed the concept of 20% time in the classroom and how education can be revolutionized with a change of mindset. “Kids don’t learn when they are lectured to,” declared Wojcicki. “They learn through experience.” According to her, 20% time at school should be used to help students develop 21st century skills: communication, collaboration, creativity and critical thinking.

Another afternoon panel, introduced by Karina Alexanyan, Postdoctoral Scholar from mediaX, features two of Forbes “30 under 30” and a researcher from Fujitsu Labs,



sharing ideas and insights about universal access and “Augmenting Abilities.” Civil Rights Advocate and White House Champion of Change Haben Girma highlighted how technology has the potential to facilitate the creation of communities and increase opportunities for education, employment, and self-growth. She also pointed out that designing with universal access in mind will ensure that people with disabilities can also harness the opportunities offered through technology. “Disabilities don't hold people back. Barriers do,” she said. Cong Chen, researcher at Fujitsu Laboratories of America described how smart toys could be used for behavior assessment. With his group, he developed Guided Play, a technology that uses instrumented games or toys as sensors to assess early behavioral markers of Autism Spectrum Disorder. Also working on the field of autism, Stanford student entrepreneur Catalin Voss introduced the Stanford Autism Glass Project, a wearable technology to augment expression recognition. His team has developed a system using machine learning and artificial intelligence to automate facial expression recognition that runs on wearable glasses and delivers real-time social cues.

A third panel was dedicated to “Augmenting Intelligence at Scale” and was led by Steve Sims, Chief Design Officer at business gamification company Badgeville, and a mediaX Distinguished Visiting Scholar. Jeanne Beliveau-Dunn, Chief Knowledge Officer at Cisco and President of the Internet of Things Talent Consortium, discussed the future workforce and how artificial intelligence and augmented learning will create new opportunities for innovation that will benefit business and education. “AI needs people,” said Beliveau-Dunn. The idea is to “leverage automation to help human beings make better decisions.” Kerry Hearn-Smith, Vice President in Learning Strategy and Global Solutions at Xerox Learning, explained how Xerox Services University (XSU) was developed as an intuitive and easy learning environment. One of XSU platforms, for instance, works like a Google search bar, with an algorithm that curates the content, and enables workers to learn in the moment. “It’s really about the employee experience,” said Hearn-Smith.

Candace Thille, Assistant Professor of Education at Stanford, discussed the impact of online platforms on higher education. With increased access and convenience, the power of simulations and the capacity for connection and collaboration, open web-based learning environments are meant to play a bigger and bigger role. “We have to design these interfaces with which the students are going to interact, so that we can observe how they are learning,” explained Thille. “With that data, we can build predictive and explanatory models, and drive powerful feedback loops.” In a pre-recorded video presentation, Ida Sirolli, head of Research & Education within Telecom Italia (TIM)’s People Value Department, described the development of the TIM Academy



– a corporate university designed as an innovative training platform for company employees.

**“Like building-up a muscle”**

For the mediaX 2016 conference final presentation, Carl Wieman, Professor of Physics and of Education at Stanford, talked about “Measuring Where Learning Happens.” Wieman, a 2001 Nobelist in Physics, shared recent research about understanding the teaching and learning of science, engineering and technology at the post-secondary level. The goal: how to teach people to make decisions like experts. For him, experts have not only knowledge but also a specific way to organize this knowledge. “The key to developing expertise resides in brain rewiring,” Wieman said. “It’s like building-up a muscle: an effective teacher is like the counterpart of a good athletic coach.” She or he is a cognitive coach: they design suitable practice tasks, provide timely guiding feedback and motivation. A good teacher also has to possess a high level of content mastery. Wieman’s study results showed that classes learning from a physics postdoc trained in principles and methods of effective learning had better results than those taught by a highly experienced professor in a standard lecture class. Wieman then explained how this research could connect with broader cognitive psychology research, and how it also had the potential to dramatically improve the effectiveness of higher education and adult learning.

Alongside the series of presentation and panels at the mediaX 2016 conference, exhibits showcased technologies for Augmenting Personal Intelligence. Sábía Experience introduced its new product, Sábios Odyssey, a market place platform that brings together immersive education content providers and learners addressing professional issues and knowledge gaps. Fujitsu Laboratories of America demonstrated Guided Play, a technology that evaluates and improves children’s play behavior, especially for those with autism. uSens startup presented its VR and AR technology that includes built-in hand tracking. Also on exhibit: the Autism Glass Project, a therapeutic tool for children with autism, a machine learning software that can detect and recognize facial expressions and provides feedback through a Google Glass and an android phone. Jean Baptiste Boin and his team demoed Art++, an augmented reality learning experience for museum galleries that overlays content directly on paintings and engravings through the viewfinder of a smartphone or tablet device. Cisco showed its digital online learning platform that includes gamification mechanisms. The EchoPixel company demonstrated True 3D, an advanced medical visualization software solution that allows the users (physicians) to interact with patient tissues and organs in an open 3D space. Finally, Telecom Italia’s People Value Department displayed a video presenting TIM Academy, the company’s Corporate University.





mediaX at Stanford University is a member-supported interdisciplinary affiliate program to the H-STAR Institute in the Graduate School of Education. mediaX helps members explore how the thoughtful use of technology can impact a range of fields, from entertainment to learning to commerce. Together, we're researching innovative ways for people to collaborate, communicate, and interact with the information, products, and industries of tomorrow. We explore the use of information technology to improve the human experience



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210 Panama Street • Stanford, CA 94305 • <http://mediax.stanford.edu>