

OFFICIAL PROGRAM

JUNE 23 - 24, 2017
WESTIN ST. FRANCIS, SAN FRANCISCO



ACM'S CELEBRATION OF
50 YEARS
OF THE A.M. TURING AWARD

WELCOME TO ACM'S CELEBRATION OF 50 YEARS OF THE A.M. TURING AWARD

Just over 50 years ago, ACM awarded its first A.M. Turing Award to Alan Perlis for his work on advanced programming techniques and compiler construction. Since then, the award has been given annually, with the 50th Turing Award presented last June to Whitfield Diffie and Martin Hellman for conceiving public key encryption. In total, 64 people from around the world have received the Turing Award, recognizing work that laid the foundations of modern computing. And on June 24, we will have the great honor of presenting the 51st Turing Award to Sir Tim Berners-Lee for inventing the World Wide Web.

This event celebrates the first 50 years of the Turing Award and the visionaries who have received it. There are 22 Turing Laureates attending, and during this conference, we will hear from many of them. All attendees, including students and early career members of the computing community, will have opportunities to meet and converse with the Laureates.

I would like to extend a special thank you to ACM SIG sponsors (SIGARCH, SIGCHI, SIGCOMM, SIGGRAPH, SIGHPC, SIGIR, SIGKDD, SIGMM, SIGMOD, SIGPLAN and SIGSOFT) and supporters (SIGACCESS, SIGAI, SIGEVO and SIGITE) of this event, including funding for SIG students to attend. I would also like to thank our corporate sponsors: Google, Microsoft, Amazon, Oracle and IBM. The generosity of our sponsors has certainly helped make this conference possible, but has also enabled us to capture this event to video and livestream the discussions on ACM's website.

This conference would also not have been possible without the tireless efforts of our distinguished Program Committee. I extend a warm thank you to Program Chair Craig Partridge, Deputy Program Chair Fahad Dogar, and committee members Karen Breitman, Vint Cerf, Jeff Dean, Joan Feigenbaum, Wendy Hall, Joseph Konstan and David Patterson, who guided the choice of topics, moderators and panelists. The outstanding series of panels they have organized promises to achieve our goal of making this celebration a catalyst for the next generation to invent and dream.

On behalf of ACM, welcome to ACM's Celebration of 50 Years of the Turing Award.



VICKI L. HANSON

PRESIDENT

ASSOCIATION FOR COMPUTING MACHINERY

A handwritten signature in black ink that reads "Vicki L. Hanson". The signature is written in a cursive, flowing style.

WELCOME TO ACM'S CELEBRATION OF 50 YEARS OF THE A.M. TURING AWARD PROGRAM

Many might expect a conference celebrating 50 Years of the A.M. Turing Award to focus on past achievements in computing. But the Program Committee, Deputy Program Chair Fahad Dogar, and I thought it was important to both review the evolution of computing and explore where the field is headed.

The panels that we have organized promise lively moderated discussions on a variety of topics of current interest to both those in the profession and to society at large:

- **Advances in Deep Neural Networks** – How are deep neural networks changing our world and our jobs, and what breakthroughs may we imagine going forward?
- **Restoring Personal Privacy without Compromising National Security** – Can computing technology promote both personal privacy and national security?
- **Moore's Law Is Really Dead: What's Next?** – What old doors will this seismic change close and what new doors will it open?
- **Quantum Computing: Far Away? Around the Corner? Or Maybe Both at the Same Time?** – For both theory and practice, where we are headed, and what quantum skills might be needed by future computing professionals?
- **Challenges in Ethics and Computing** – How do we recognize and address ethical issues that arise with advances in technology?
- **Preserving Our Past for the Future** – How do we archive our electronic artifacts to ensure that we can read data and documents in both the near and distant future?
- **Augmented Reality: From Gaming to Cognitive Aids and Beyond** – How can the sensing and sensory display technologies of augmented reality empower individuals and communities?

We are especially proud (and humbled) that the outstanding panelists and moderators, gathered from around the world, have graciously agreed to participate in this conference. They include Turing Laureates, ACM award winners, and others involved in shaping the direction of computing. We would like to thank ACM President Vicki Hanson for her instrumental role in enlisting panelists and moderators, and for her leadership of ACM.

On behalf of the Program Committee, welcome to ACM's Celebration of 50 Years of the A.M. Turing Award, which we all believe will be a unique and memorable event.



CRAIG PARTRIDGE

PROGRAM COMMITTEE CHAIR

CELEBRATION OF 50 YEARS OF THE A.M. TURING AWARD

A handwritten signature in black ink, appearing to read "C. Partridge".

PROGRAM

MASTER OF CEREMONIES



DAME WENDY HALL
UNIVERSITY OF SOUTHAMPTON

DAY 1, FRIDAY

JUNE 23, 2017
8:30 - 20:15

INTRODUCTION/WELCOME

08:30 - 08:35



VICKI HANSON
ACM PRESIDENT



CRAIG PARTRIDGE
PROGRAM CHAIR

TURING LAUREATES INTRODUCTION

08:35 - 08:55

IMPACT OF TURING RECIPIENTS' WORK

08:55 - 09:15



BARBARA LISKOV
(2008 TURING LAUREATE)
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

ADVANCES IN DEEP NEURAL NETWORKS

09:15 - 10:30

MODERATOR



JUDEA PEARL
(2011 TURING LAUREATE)
UNIVERSITY OF CALIFORNIA, LOS ANGELES

PANELISTS



MICHAEL I. JORDAN
UNIVERSITY OF CALIFORNIA, BERKELEY



ILYA SUTSKEVER
OPENAI



FEI-FEI LI
STANFORD UNIVERSITY



RAQUEL URTASUN
UNIVERSITY OF TORONTO
and UBER ATG



STUART RUSSELL
UNIVERSITY OF CALIFORNIA, BERKELEY

Deep neural networks can be trained with relatively modest amounts of information and then successfully be applied to large quantities of unstructured data. Deep learning techniques have been applied with great success to areas such as speech recognition, image recognition, natural language processing, drug discovery and toxicology, customer relationship management, recommendation systems, and biomedical informatics. The capabilities of deep neural networks, in some domains, have proven to rival those of human beings. Panelists will explore how deep neural networks are changing our world and our jobs. They will also discuss how things may further change going forward.

BREAK

10:30 - 11:00

**VIDEO – TURING LAUREATES 1966 TO 1990:
A RETROSPECTIVE CELEBRATING THE ACHIEVEMENTS
OF THE EARLIEST TURING LAUREATES**

11:00 - 11:10

**RESTORING PERSONAL PRIVACY WITHOUT COMPROMISING
NATIONAL SECURITY**

11:10 - 12:25

MODERATOR**JOAN FEIGENBAUM**
YALE UNIVERSITY**PANELISTS****WHITFIELD DIFFIE**
(2015 TURING LAUREATE)
STANFORD UNIVERSITY**NADIA HENINGER**
UNIVERSITY OF
PENNSYLVANIA**BRYAN FORD**
EPFL (SWISS FEDERAL
INSTITUTE OF TECHNOLOGY)**PAUL SYVERSON**
U.S. NAVAL RESEARCH
LABORATORY

We live in an era of mass surveillance. Private companies monitor our comings and goings, and ad-supported cloud services record and mine our online activities. At the same time, governments have been conducting extensive surveillance in the name of national security. To a large extent, citizens and lawmakers have accepted loss of privacy in exchange for increased security. Can computing technology promote both personal privacy and national security? Panelists will explore how state-of-the-art cryptography, security, networked systems, and data-management technology might enable government agencies to acquire actionable, useful information about legitimate targets of investigation without intruding upon the electronic activity of innocent parties. They will also address the need to use laws and policies in conjunction with technology to hold government agencies accountable for proper use of private information.

LUNCH WITH TURING LAUREATES

12:25 - 13:30

(TABLES TO BE DESIGNATED FOR ACM DIGNITARIES)

**VIDEO – A REFLECTION: TURING LAUREATES
TAKE A BRIEF LOOK BACK ON THEIR CAREERS AND
SHARE SOME THOUGHTS ON THE FUTURE**

13:30 - 13:45

PRESERVING OUR PAST FOR THE FUTURE

13:45 - 15:00

MODERATOR**CRAIG PARTRIDGE**
RAYTHEON BBN TECHNOLOGIES**PANELISTS****VINTON G. CERF**
(2004 TURING LAUREATE)
GOOGLE**MAHADEV SATYANARAYANAN**
CARNEGIE MELLON UNIVERSITY**BREWSTER KAHLE**
INTERNET ARCHIVE**W. BRENT SEALES**
UNIVERSITY OF KENTUCKY**NATASA MILIC-FRAYLING**
UNIVERSITY OF NOTTINGHAM

We live in a world of electronic communication where an increasing amount of information is created and retained only in electronic form. As systems and data formats constantly evolve, there is increasing interest today in how to better preserve our electronic artifacts. This is an urgent problem for a number of fields that use computing as a resource. Panelists will explore questions such as: How can we be sure we can read data and documents created decades ago? In a world where software changes monthly, how can we repeat experiments properly? Who pays to maintain our ability to access artifacts? What does the PDF/A experience tell us?

BREAK

15:00 - 15:30

VIDEO – ON METHODOLOGY: TURING LAUREATES DISCUSS THEIR APPROACH TO WORK AND SHARE ADVICE FOR THOSE WHO ASPIRE TO FOLLOW IN THEIR FOOTSTEPS

15:30 - 15:45

MOORE'S LAW IS REALLY DEAD: WHAT'S NEXT?

15:45 - 17:00

MODERATOR**JOHN HENNESSY**
STANFORD UNIVERSITY**PANELISTS****DOUG BURGER**
MICROSOFT RESEARCH**MARGARET MARTONOSI**
GOOGLE**NORMAN P. JOUppi**
GOOGLE**BUTLER LAMPSON**
(1992 TURING LAUREATE)
MICROSOFT and MIT

The 50-year reign of Moore's Law, which delivered a billion-fold increase in transistors per chip, is finally over. Given that transistors are no longer getting much better, that the power budgets of microprocessors are not increasing, and that we've already replaced the single power-hungry processor with several energy-efficient ones, the only path to improve energy-performance-cost is specialized hardware. Microprocessors of the future will include special-purpose processors that do one class of computation much better than general-purpose processors. Accelerators for deep neural networks are but one of many potential targets. Panelists will discuss what old doors this seismic change will close and what new doors it will open.

CHALLENGES IN ETHICS AND COMPUTING

17:00 - 18:15

MODERATOR**DEIRDRE K. MULLIGAN**
UNIVERSITY OF CALIFORNIA, BERKELEY**PANELISTS****JENNIFER T. CHAYES**
MICROSOFT RESEARCH**RAJ REDDY**
(1994 TURING LAUREATE)
CARNEGIE MELLON
UNIVERSITY**HELEN NISSENBAUM**
CORNELL TECH and
NEW YORK UNIVERSITY**NOEL SHARKEY**
UNIVERSITY OF SHEFFIELD
and FOUNDATION FOR
RESPONSIBLE ROBOTICS

Recently the computing and ethics communities have come to realize that computing ethics (a topic of interest to ACM since the 1950s) is more complicated than we thought, and that there are a wide range of ethical challenges prompted by recent innovations. Algorithms may have unintended biases, with considerable social impact. Autonomous vehicles have to make ethical decisions (whether to protect the pedestrian or the passenger) formerly left to human drivers. Seemingly harmless research experiments on computing systems can harm humans. Panelists will explore how we can address these issues, especially in a world where we push to deliver systems and products at an ever-quicker pace.

TURING CELEBRATION RECEPTION

18:15 - 20:15

DAY 2, SATURDAYJUNE 24, 2017
09:00 - 12:30**WELCOME BACK**

09:00 - 09:05

COMPUTER SCIENCE AS A MAJOR BODY OF ACCUMULATED KNOWLEDGE 09:05 - 09:20**DONALD KNUTH**
(1974 TURING LAUREATE)
STANFORD UNIVERSITY

CONTINUED ON NEXT PAGE

**QUANTUM COMPUTING: FAR AWAY? AROUND THE CORNER?
OR MAYBE BOTH AT THE SAME TIME?**

09:20 - 10:35

MODERATOR**UMESH VAZIRANI**
UNIVERSITY OF CALIFORNIA, BERKELEY**PANELISTS****DORIT AHARONOV**
HEBREW UNIVERSITY OF
JERUSALEM**JOHN MARTINIS**
GOOGLE and UNIVERSITY
OF CALIFORNIA,
SANTA BARBARA**JAY M. GAMBETTA**
IBM TJ WATSON RESEARCH
CENTER**ANDREW
CHI-CHIH YAO**
(2000 TURING LAUREATE)
TSINGHUA UNIVERSITY

Quantum computing holds the promise to enormously increase computing performance in areas including cryptography, optimization, search, quantum chemistry, materials science, artificial intelligence, machine learning, personalized medicine and drug discovery. Quantum computing hardware is maturing swiftly. Depending on the expert you talk with, quantum computing is around the corner or a few years away. Concurrently, research on algorithms that take advantage of quantum computing is also moving briskly. In this discussion, panelists will look at where we are in both theory and practice, where we are headed, and what quantum skills the average computer scientist will eventually need.

BREAK

10:35 - 11:05

AUGMENTED REALITY: FROM GAMING TO COGNITIVE AIDS AND BEYOND

11:05 - 12:20

MODERATOR**BLAIR MACINTYRE**
GEORGIA INSTITUTE OF TECHNOLOGY AND MOZILLA CORPORATION**PANELISTS****FREDERICK P.
BROOKS, JR.**
(1999 TURING LAUREATE)
UNIVERSITY OF NORTH
CAROLINA AT CHAPEL HILL**YVONNE ROGERS**
UNIVERSITY COLLEGE
LONDON**PETER LEE**
MICROSOFT AI and
RESEARCH**IVAN SUTHERLAND**
(1988 TURING LAUREATE)
PORTLAND STATE
UNIVERSITY

Augmented reality—the overlay of contextually-relevant digital information onto the real world—has captivated our imaginations both in fiction and in practice. In recent years we have seen everything from excitement and concern over the potential of worn displays such as Google Glass to the convergence of hordes of Pokémon-catching smartphone users in public parks and spaces. In addition to gaming and entertainment, promising applications of augmented reality include navigation, sightseeing, military heads-up and head-mounted displays, maintenance and repair and medicine. In this panel, we look forward and explore how the sensing and sensory display technologies of augmented reality can empower individuals and communities.

CLOSING REMARKS

12:20 - 12:30

**DAME WENDY HALL**
UNIVERSITY OF SOUTHAMPTON

PROGRAM COMMITTEE



CRAIG PARTRIDGE
Program Chair



FAHAD DOGAR
Deputy Program Chair



KARIN BREITMAN



VINT CERF
2004 Turing Laureate



JEFF DEAN



JOAN FEIGENBAUM



WENDY HALL



JOSEPH KONSTAN



DAVID PATTERSON

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SIGITE

BROADCAST PARTNER

FACEBOOK

*Special thanks to TOM and GRANT MACKENZIE
for their bronze bust of Alan Turing.*

A.M. TURING LAUREATES

YEAR	RECIPIENT
1966	ALAN J. PERLIS
1967	MAURICE WILKES
1968	RICHARD HAMMING
1969	MARVIN MINSKY
1970	JAMES H. WILKINSON
1971	JOHN MCCARTHY
1972	EDSGER W. DIJKSTRA
1973	CHARLES W. BACHMAN
1974	DONALD E. KNUTH
1975	ALLEN NEWELL and HERBERT A. SIMON
1976	MICHAEL O. RABIN and DANA S. SCOTT
1977	JOHN BACKUS
1978	ROBERT W. FLOYD
1979	KENNETH E. IVERSON
1980	TONY HOARE
1981	EDGAR F. CODD
1982	STEPHEN A. COOK
1983	KEN THOMPSON and DENNIS M. RITCHIE
1984	NIKLAUS WIRTH
1985	RICHARD M. KARP
1986	JOHN HOPCROFT and ROBERT TARJAN
1987	JOHN COCKE
1988	IVAN SUTHERLAND
1989	WILLIAM KAHAN
1990	FERNANDO J. CORBATÓ
1991	ROBIN MILNER
1992	BUTLER W. LAMPSON
1993	JURIS HARTMANIS and RICHARD E. STEARNS
1994	EDWARD FEIGENBAUM and RAJ REDDY
1995	MANUEL BLUM
1996	AMIR PNUELI
1997	DOUGLAS ENGELBART
1998	JIM GRAY
1999	FREDERICK P. BROOKS, JR.
2000	ANDREW CHI-CHIH YAO
2001	OLE-JOHAN DAHL and KRISTEN NYGAARD
2002	RONALD L. RIVEST, ADI SHAMIR and LEONARD M. ADLEMAN
2003	ALAN KAY
2004	VINTON G. CERF and ROBERT E. KAHN
2005	PETER NAUR
2006	FRANCES E. ALLEN
2007	EDMUND M. CLARKE, E. ALLEN EMERSON and JOSEPH SIFAKIS
2008	BARBARA LISKOV
2009	CHARLES P. THACKER
2010	LESLIE G. VALIANT
2011	JUDEA PEARL
2012	SHAFI GOLDWASSER and SILVIO MICALI
2013	LESLIE LAMPSON
2014	MICHAEL STONEBRAKER
2015	MARTIN E. HELLMAN and WHITFIELD DIFFIE
2016	TIM BERNERS-LEE

“This is only a foretaste of what is to come, and only the shadow of what is going to be. We have to have some experience with the machine before we really know its capabilities. It may take years before we settle down to the new possibilities, but I do not see why it should not enter into any one of the fields normally covered by the human intellect, and eventually on equal terms.”



Alan M. Turing

JUNE 1949



Association for
Computing Machinery

Advancing Computing as a Science & Profession