Joseph P. Campbell, PhD, LFIEEE
Lincoln Laboratory
Massachusetts Institute of Technology
Lexington, MA 02421

EDUCATION

Ph.D., Electrical Engineering, Oklahoma State University, December 1992
- Thesis: "Features and Measures for Speaker Recognition"
- Advisor: Dr. Rao Yarlagadda
- Committee: Drs. Keith Teague, James Baker, Ronald Rhoten, Arthur Pentz, Thomas Collins
- Scholarship: National Security Agency Fellowship
- Award: Graduate Research Award, President John Campbell

M.S., Electrical Engineering, Johns Hopkins University, May 1986
B.S., Electrical Engineering, Rensselaer Polytechnic Institute, May 1979

PROFESSIONAL EXPERIENCE

MIT Lincoln Laboratory (2001–present)
- Laboratory Fellow (Director's Office) 10/2023–present
- Group Leader, Group 52 (AI Technology & Systems Group) 02/2019–09/2023
- Group Leader, Group 52 (Human Language Technology Group) 11/2016–01/2019
- Assoc Group Leader, Group 52 (Human Language Technology Group) 01/2013–10/2016
- Assoc Group Leader, Group 62 (Human Language Technology Group) 06/2011–12/2012
- Asst Group Leader, Group 62 (Human Language Technology Group) 04/2010–05/2011
- Senior Staff, Group 62 (Information Systems Technology Group) 07/2001

Johns Hopkins University (1991–2001)
- Instructor, Speech Processing (525.747, highest graduate-level speech course) 1991–2001

National Security Agency (1979–2001)
- Section Leader, R523 (Speech Processing Branch) 1994–2001
- Senior Electronic Engineer, R221 (ID and Authentication Research Branch) 1990–1994
- Electronic Engineer, R163/R556 (Narrowband Secure Voice Tech Branch) 1979–1990

MAJOR RESEARCH AREAS OF INTEREST

- Algorithms, technologies, and systems for extracting information from multimedia data in adverse conditions
- Speech, speaker, and language recognition technologies
- Human-network AI technologies that extract information automatically from speech, text, image, and video data combined with network communications and activities
- Developing and transferring AI technologies for government applications and operationally relevant evaluations

RESEARCH EXPERIENCE

- Real-Time Communication over Telephone Networks
  - Development of secure-voice communication systems for government and military
  - Development of speech-compression technologies that became the foundation for modern cellular and voice-over-IP communication systems
- Biometrics
  - Pioneered algorithms and systems for investigative forensic speaker recognition
  - Developed standoff-biometrics algorithms for room-audio speaker recognition and long-distance iris recognition
- Human Language Technology
  - Issued a US Patent for inventing the Phonetic Refraction method of automatic speaker recognition to analyze speakers through the lenses of multiple languages
  - Developed algorithms with a team of 20 researchers at the SuperSID Workshop at JHU using the multimodal properties of speech (speaker, gender, language, accent, dialect, prosody, idiolectal word choices, etc.) leveraging various multimodal channels in speech

    - Designed corpora that drove international research evaluations and, thus, set the international research agenda in automatic speaker and language recognition
- Big Data Analytics, the Dark Web, and New Counter Human Trafficking
    - Launched new line of effort and led MIT LL's efforts for the Obama White House's 2012 Big Data Initiative under DARPA's XDATA and Memex programs
    - Developed next-generation search and counter human-trafficking technologies contributing to Program Manager Chris White being featured on *60 Minutes* (2015) and receiving the *Presidential Award for Extraordinary Efforts to Combat Trafficking in Persons* (2016)
- Artificial Intelligence and Machine Learning
    - Architected the new AI Technology and Systems Group at MIT LL to continue creating world-class human-language technologies and advance multimedia technologies, while using the group's incredibly successful AI technology development and transition model to advance Cyber analytics and Influence Operations
    - Leading the charge in deep learning AI methods, which are revolutionizing the performance of human-language technologies and most others
- Staff Development, the Lincoln-MIT Campus Relationship, and Professional Societies Activities
    - Leadership and commitment to staff development and mentoring; advancing technical excellence, integrity, collaboration, diversity, equity, and innovation; and enhancing the MIT Campus-Lincoln Laboratory relationship
    - Promoting professional society activities, membership growth and elevation, and championing IEEE Milestone Awards for MIT LL, including three awards on 02/02/24
        - Mode S Air Traffic Control Radar Beacon System, 1969–1995
        - Development of 193-nm Projection Photolithography, 1984–1996
        - Semiconductor Laser, 1962

RECENT RELEVANT PUBLICATIONS

H-index 40, authored or co-authored more than 120 unclassified technical book chapters, proceedings papers, journal articles, patents, and keynote presentations with a total of over 8,100 citations (ORCiD: 0000-0003-2023-6187, Scopus Author ID: 55470020600, Google Scholar). Highlights:

- Joseph P. Campbell and Danelle Shah, "Combating Misinformation," Keynote Presentation, #HLTCon Human Language Technology Conference, 17 March 2021
- Charlie K. Dagli, William M. Campbell, Lin Li, Jennifer Williams, Kelly Geyer, Gordon Vidaver, Joel Acevedo-Aviles, Esther Wolf, Jonathan Taylor, Joseph P. Campbell, "LLTools: Machine Learning for Human Language Processing." In *Proceedings of Neural Information Processing Systems (NIPS) Workshop on Machine Learning Systems,* Barcelona, Spain, 10 December 2016. (Documents MIT LL's contributions to the DARPA XDATA and Memex programs aimed at next-generation search and counter human trafficking under PM Chris White.)
- Joseph P. Campbell, "Speaker Recognition for Forensic Applications," Keynote Presentation, Odyssey 2014: The Speaker and Language Recognition Workshop, Joensuu, Finland, 16 June 2014
- National Research Council (Campbell, et al.), "Biometric Recognition: Challenges and Opportunities," Washington, DC: National Academies Press, 2010, ISBN: 978-0-309-14207-6
- Joseph P Campbell, Wade Shen, William M Campbell, Reva Schwartz, Jean-François Bonastre, Driss Matrouf, "Forensic Speaker Recognition: A Need for Caution," *IEEE Signal Processing Magazine,* Volume 26, Issue 2, p. 95-103, March 2009. [Cited by 233.]
- Joseph P. Campbell, William M. Campbell, Alan V. McCree, Scott M. Lewandowski, Clifford J. Weinstein, "Cognitive Services for the User," Chapter 10, In Bruce A. Fette, ed, *Cognitive Radio Technology, 2e,* Academic Press (Elsevier), p. 305-324, 2009, ISBN: 9780123745354
- William M Campbell, Joseph P Campbell, Douglas A Reynolds, Elliot Singer, Pedro A Torres-Carrasquillo, "Support Vector Machines for Speaker and Language Recognition," In *Computer Speech and Language*, 20 (2006) 210–229, 2006. [Cited by 775.]
- Douglas Reynolds, Walter Andrews, Joseph Campbell, Jiri Navratil, Barbara Peskin, Andre Adami, Qin Jin, David Klusacek, Joy Abramson, Radu Mihaescu, Jack Godfrey, Doug Jones, Bing Xiang, "The SuperSID Project: Exploiting High-level Information for High-accuracy

Speaker Recognition," In *Proceedings IEEE International Conference on Acoustics, Speech, and Signal Processing* (ICASSP '03), Volume 4, p. IV-784, 2003. [Cited by 353.]

- Mary Antoinette Kohler, Walter Doyle Andrews, III, Joseph Paul Campbell, Jr., "Method of and Device for Phone Based Speaker Recognition," US Patent 6,618,702 B1, Issued 9 Sep 2003
- Joseph P. Campbell, Jr., "Speaker Recognition: A Tutorial," *Proceedings of the IEEE 85 (9),* p. 1437-1462, September 1997. [Invited paper, cited by 2,675.]
- Joseph P. Campbell, Jr., Thomas E. Tremain, Vanoy C. Welch, "The Federal Standard 1016 4800 bps CELP Voice Coder," *Digital Signal Processing,* Volume 1, Number 3, p. 145-155, 1991. (Written to satisfy the graduation requirements of Oklahoma State University as an Independent Research Project under Regents Professor Rao Yarlagadda, which later became the seminal reference for FED-STD-1016.) [Cited by 117.]
- (Joseph P. Campbell, Jr., Vanoy C. Welch, Thomas E. Tremain, et al.,) "Telecommunications: Analog to Digital Conversion of Radio Voice by 4,800 bit/second Code Excited Linear Prediction (CELP)," Federal Standard: FED-STD-1016, 14 February 1991
- (Thomas E. Tremain, Joseph P. Campbell, Jr., et al.,) "Analog to Digital Conversion of Voice by 2,400 bit/second Linear Predictive Coding," Federal Standard: FED-STD-1015, 28 November 1984. (Reissued as "Federal Information Processing Standard Publication 137." Also issued by NATO as "STANAG 4198 Parameters and Coding Characteristics that must be Common to Assure Interoperability of 2400 BPS Linear Predictive Encoded Digital Speech.")

SELECTED RELEVANT PROFESSIONAL ACTIVITIES AND SERVICE

- Chair, Advisory Committee, Human Language Technology Center of Excellence, Johns Hopkins
- Co-chair, Speaker and Language Characterization Special Interest Group of ISCA
- Co-chair, MIT Lincoln Laboratory Professional Societies Committee
- Co-Chair, Recent Advances in AI for National Security Workshop (RAAINS), MIT LL
- Co-Chair, Human Language Technology Applications Workshop (HLTA), MIT LL
- Chair, Speaker Recognition Subcommittee of the NIST Organization of Scientific Area Committees (2016–2017)
- Vice Chair, IEEE Awards Board's Awards Planning and Policy Committee (2016–2017)
- Member, IEEE Medals Council (2012–2013)
- Chair, IEEE Jack S. Kilby Signal Processing Medal Committee (2012–2013)
- Chair, IEEE Biometrics Council's Technical Committee (2011–2013)
- Vice Chair, Acoustical Society of America's Forensic Acoustics Subcommittee (2011–2013)
- Vice President of Technical Activities, IEEE Biometrics Council (2008–2011)
- Member, National Research Council's National Academy of Sciences' "Whither Biometrics?" Committee that produced the book "Biometric Recognition: Challenges and Opportunities," The National Academies Press, 2010, ISBN: 978-0-309-14207-6 (2004–2010)
- Member, IEEE Signal Processing Society's Fellow Reference Committee (2007–2010)
- Member, IEEE Information Forensics Security Technical Committee (2005–2009)
- Co-editor, *Digital Signal Processing* journal (1998–2005)
- Member, IEEE Signal Processing Society's Board of Governors (2002–2004)
- Distinguished Lecturer, IEEE Signal Processing Society (2001–2002)
- Associate Editor, IEEE Transactions on Speech and Audio Processing (1991–1999)
- Chair, Biometric Consortium (known today as FedID, the AFCEA Federal ID Forum and Expo), the U.S. government's focal point for research, development, test, evaluation, and application of biometric-based personal identification and verification technology (1994–1998)
- Member, IEEE Speech Technical Committee (1989–1992)
- Member, Association for the Advancement of Artificial Intelligence (AAAI)
- Senior Member, American Institute of Aeronautics and Astronautics (AIAA)
- Member, International Speech Communication Association (ISCA)
- Member, Boston Audio Society
- Member, Acoustical Society of America (ASA)
- Member, Audio Engineering Society (AES)
- Institute of Electrical and Electronics Engineers (IEEE): S'76–M'92–SM'97–F'05–LF'21

HONORS, AWARDS AND LISTINGS

- IEEE HKN Professional Member, Eta Chapter of the IEEE-HKN Board of Governors, 2024
- Fellow, Asia-Pacific Artificial Intelligence Association (AAIA), 2023
- Technical Excellence Award, MIT Lincoln Laboratory's highest technical award, 2022
- Life Fellow, IEEE, 2021
- Wall of Distinction, Oneonta High School, Oneonta, NY, 2012
- Fellow, IEEE "for leadership in biometrics, speech systems, and government applications," 2005
- Graduate Research Award, Oklahoma State University for best dissertation across all the colleges, "Features and Measures for Speaker Recognition," Thesis Advisor: Professor Rao Yarlagadda, awarded by President John R. Campbell, December 1992
- Emeritus Member, Sigma Xi, the scientific research honor society (ΣΞ)

BIOGRAPHICAL SUMMARY

Dr. Joseph P. Campbell joined MIT Lincoln Laboratory (MIT LL) in 2001 as senior staff in the Information Systems Technology Group. He became assistant leader, associate leader, and leader of this group, renamed Human Language Technology (HLT), in 2010, 2011, and 2016, respectively. In 2019, the group became Artificial Intelligence Technology and Systems, and Campbell began rearchitecting it to continue creating world-class HLT and advance deep learning methods for cyber analytics and counterinfluence operations. He specializes in developing and transferring AI technologies for government applications and operationally relevant evaluation to achieve tremendous mission impact. In 2023, Campbell was appointed as Laboratory Fellow, a position that recognizes MIT LL's strongest technical talent for their sustained outstanding contributions to both MIT LL and national-level programs.

Early on, Campbell led the development of forensic speaker-comparison technology for the U.S. Secret Service, MIT LL's first U.S. Department of Homeland Security project, and the Federal Bureau of Investigation. With the resulting software, federal forensic examiners performed many high-stakes comparisons of voice recordings. He invented the phonetic refraction method of automatic speaker recognition and used multimodal properties of speech to excel in National Institute of Standards and Technology annual speaker-recognition evaluations. He initiated MIT LL's first Intelligence Advanced Research Projects Activity effort, the Biometrics Exploitation Science and Technology project, resulting in the transition of stand-off biometric technology such as room-audio speaker recognition and long-distance iris recognition. Campbell later led major research innovations in big data analytics, dark web analytics, and counter–human trafficking technology under the Defense Advanced Research Project Agency's XDATA and Memex projects.

Previously, Campbell taught speech processing at Johns Hopkins University (JHU) and served 22 years at the National Security Agency (NSA). At NSA, he and his teammates developed the first DSP-chip software modem and he launched the Biometric Consortium (AFCEA Federal ID Forum and Expo). Jointly with Bell Laboratories, he conducted pioneering work in real-time speech communication over telephone networks, creating Federal Standard 1016 that provided improved voice quality in the government's STU-III secure telephones and the foundations for both digital cellular and voice-over-Internet protocol systems.

Campbell has authored or co-authored more than 120 technical book chapters, proceedings papers, and journal articles, with a total of over 8,000 citations. He holds one U.S. patent and led two U.S. Federal Standards, one Federal Information Processing Standard, and one NATO Standardization Agreement. He chairs the advisory committee of JHU's Human Language Technology Center of Excellence, organizes MIT LL's Recent Advances in AI for National Security Workshops, and co-chairs MIT LL's Professional Societies Committee. He was a distinguished lecturer, an editor, and an officer of four positions in the Institute of Electrical and Electronics Engineers (IEEE), and he held two officer positions in the International Speech and Communication Association. Campbell is an IEEE Life Fellow "for leadership in biometrics, speech systems, and government applications." He earned MIT LL's highest award, the Technical Excellence Award, "for his outstanding contributions and leadership in human-language technology, pioneering developments in speech processing, expertise in biometrics, innovations in machine learning, and effective technology transition to government, which have significantly impacted the nation's intelligence, warfighting, and law-enforcement capabilities."

Campbell earned BS, MS, and PhD degrees in electrical engineering from Rensselaer Polytechnic Institute, JHU, and Oklahoma State University (OSU), respectively. For his dissertation, "Features and Measures for Speaker Recognition," he received OSU's Graduate Research Award, recognizing it as the best dissertation across all of OSU's colleges.