Curriculum Vitæ

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Updated: *March 23, 2023*

Samsung v. Cerence
IPR2025-00457
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Education

Columbia University, *New York, NY*

Feb 1991 — Doctor of Engineering Science
Defended 9/1990 — Major: Mechanical Engineering
Thesis: Neural Network Learning and Learning Control Through Optimization Techniques

May 1985 — Master of Science
Major: Mechanical Engineering
Kinematics, Dynamics, and Control Systems

May 1984 — Bachelor of Science
Major: Mechanical Engineering
Machine Design

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Employment

Department of Mechanical Engineering, Columbia University

Jan. 2025-Present — *Professor of Professional Practice*
Joint Appointment between two departments of Mechanical and Electrical Engineering.
Teaching and research in Control, Signal Processing, and Data Science

Department of Electrical Engineering, Columbia University

Jan. 2025-Present — *Professor of Professional Practice*
Joint Appointment between two departments of Mechanical and Electrical Engineering.
Teaching and research in Control, Signal Processing, and Data Science

Recognition Technologies, Inc.

Jan. 2025-Present — *Head of Research and Development*

Jul. 2003-Dec. 2024 — *Chief Executive Officer and President*

Duties:
Research and Development of Human Biometric systems and Human Language Technologies.
Architecture design and implementation of the research results into practical systems including engines and applications.
Consulting:
Expert evaluations on legal and forensic cases involving speaker identities and speech related topics for many legal entities and patent agencies.
Products:

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Exclusive design and implementation of several recognition engines, fully developed in-house (containing over 5 million lines of original C^{++} code, written personally over the past 23 years – 20 years of research and development on code which was from 3 years of research at Internet Server Connections, Inc. and 3 years at Applied Mathematics Research)

RecoMadeEasy® Speaker Recognition Engine

Winner of the 2011 Frost & Sullivan North American Speaker Verification Biometrics, New Product Innovation Award

RecoMadeEasy® Large Vocabulary Speech Recognition Engine
RecoMadeEasy® Face Recognition Engine
RecoMadeEasy® Audiovisual Recognition Engine
RecoMadeEasy® Automatic Language Proficiency Rating Engine
RecoMadeEasy® Interactive Voice Response (IVR)
RecoMadeEasy® Signature Compression and Verification Engine
RecoMadeEasy® Online Handwriting Recognition Engine
RecoMadeEasy® Keystroke Recognition Engine

Department of Computer Science, Columbia University

Jan. 2012-Dec. 2024 *Adjunct Professor*

Multidisciplinary Graduate Courses:

COMS-E6998 (Fundamentals of Speech Recognition)

Overall Instructor Evaluations by Students:

2022 Spring : *5.0/5.0*
2021 Spring - Fall : *4.5/5.0 - 5.0/5.0*
2020 Spring - Fall : *4.1/5.0 - 5.0/5.0*
2019: *5.0/5.0*
2018: *4.0/5.0*
2017: *4.8/5.0*
2016: *4.9/5.0*
2015: *4.6/5.0*
2014: *4.13/5.0*

See Detailed Evaluations and Students' Comments

COMS-W4995 (Mathematics of Machine Learning and Signal Recognition)

COMS-E6998 (Fundamentals of Speaker Recognition)

Overall Instructor Evaluations by Students:

2014: *4.9/5.0*
2013: *4.6/5.0*
2012: *5.0/5.0*

See Detailed Evaluations and Students' Comments

Department of Mechanical Engineering, Columbia University

Jan. 2003-Present *Adjunct Professor*

Multidisciplinary course:

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MECE-E6620 (Applied Signal Recognition)
2020 Spring : *5.0/5.0*
2019 Spring : *4.0/5.0*

Cross-listed course across mechanical and electrical engineering:
EEME-E4601 (Digital Control Systems)
Overall Instructor Evaluations by Students:
2019 Spring : *4.0/5.0*

Department of Electrical Engineering, Columbia University

1995 and 1996 *Adjunct Assistant Professor*
EE-E6820 (Speech and Handwriting Recognition)

Internet Server Connections, Inc.

Feb. 2000-Present *Vice President and Chief Technology Officer*
Complete technical operation of Internet Server Connections.
Duties include:
- Research and development related to customized products and services for customized hosting and networking clients.
- Design and implementation of complex networks using Cisco® (as a certified Cisco® vendor) and customized Linux routers using BGP4 and other IP routing, load and redundancy optimization.
- Network and IP resource management, telephony network design and implementation based on Dialogic T1/E1 telephony cards and the RecoMadeEasy® IVR engine.

Projects include:
- Portfolio Optimization algorithm development for Merrill-Lynch Research (Real-time, constrained non-linear optimization problem of over 38,000 variables)
- The complete creation, cross-referencing, indexing, specialized search (specialized Unicode alphabet) and management of the digital libraries related to the Encyclopædia Iranica, a thirty five year old scholarship endeavor at the Center for Iranian Studies at Columbia University
- Projects with over 180 other Corporate clients in telecommunications, including customized in-house design, implementation, and hosting services in our dedicated data center with customers, some of which receive an average of over a million hits per day.

Feb. 1991- Feb. 2001 **IBM T.J. Watson Research Center**
Research Staff Member

Feb. 1997- Human Language Technologies
Research in the fields of Speaker Recognition (Verification and Identification) and Speech Recognition and Automatic Segmentation. Developed algorithms for the IBM Research Speaker Verification and Identification Engine which is now being used in an array of different

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products while conducting research for improving its performance. This system is completely Text Independent and is in addition Language Independent.

Feb. 1991-
Feb. 1997

Pen Technologies
Principal Investigator and Project Leader for Pen-Based Music Editor. Research in on-line Handwriting Recognition: Developed and implemented Handwriting Recognition Algorithms in every area related to the topic. These areas include: Research and development of the Front-End, Search, and Language Models for Cursive and Unconstrained Recognition systems as well as Discrete and Run-on versions. System architect for IBM Unconstrained Recognition system.

Developed a model of handwriting and a model of human hand-dynamics for application in recognition of Cursive and Natural writing. Combined the above models in a Hidden Markov Model (HMM) framework. Developed a set of normalization, desloping and deslanting schemes for application to cursive handwriting recognition. Conducted research and developed on-line training capabilities for the IBM cursive recognizer.

Research in optimal clustering techniques and Neural Network Models of Handwriting. Responsible for a major part of search and language models in the IBM product ThinkWrite^{TM}.

Department of Mechanical Engineering, Columbia University

Jan. 1997-
Dec. 2003

Adjunct Associate Professor
Cross-listed course between mechanical and electrical engineering:
EEME-E4601 (Digital Control Systems)

Department of Electrical Engineering, Columbia University

Sep. 1995-
Dec. 1996

Adjunct Assistant Professor
Graduate course EE-E6820 (Speech and Handriting Recognition)
The first session was also made available through the Columbia Video Network, with an additional 10 students remotely connected through satellite connection.

Applied Mathematics Research, *Sole Proprietorship*

Jul. 1993-
Jul. 1996

Software Development
Wrote the first Matlab® to C^{++} translator. Wrote all internal matrix functions of Matlab® in C^{++}. Wrote a Matlab® parser and a C^{++} code generator to produce C^{++} code, translating any Matlab® code to 100% C^{++} code. This project entailed optimal implementation of complex numerical matrix manipulation functions. The code libraries were later inherited by Internet Server Connections, Inc.

Center for Telecommunication Research, Columbia University

Oct 1990-
Feb 1991

Research Specialist
Research in digital image coding, image data compression and transmission.

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Developed and implemented schemes for lossless image compression and transmission, and ultra-fast methods of image display through low-level hardware control.

Department of Mechanical Engineering, Columbia University

Dec 1987-
Sep 1990

Research Assistant
Doctoral Research in the field of Learning-Adaptive Control and Neural Network Learning – Research abstract enclosed.
Advisers: Prof. C. James Li and Prof. Richard W. Longman.

Jun 1989-
Dec 1990

Research Assistant
Fault detection of mechanical systems and machine health prognosis, funded by the U.S. Navy and supervised by Prof. C. James Li.
Developed practical signal processing techniques for the health prognosis of mechanical components such as bearings, gears, cutting tools, etc. This project included the design and implementation of the sensors and the data acquisition apparatus, as well extensive pattern recognition algorithm design and implementation for the automatic detection of faults in different components.

Sep 1988-
May 1989

Teaching Assistant
Instruction of Mechanical Engineering Laboratory (E3018, E3028, E3038).

Jan 1986-
Sep 1986

Research Assistant
Worked with the late Prof. Ferdinand Freudenstein on a generalization theory on Kinematic Analysis of commonly used linkages
Publication: (Freudenstein and Beigi 1986).

Sep 1985-
Jan 1986

Departmental Research Assistant and Teaching Assistant
Laboratory Consultant for Computer Aided Design (MECE E3408).
Teaching assistance in the lectures and laboratory instruction for a graduate level course entitled Introduction to Robotics (MECE-E4602).

Sep 1984-
May 1985

Research Assistant
Digital image processing applied to fluid mechanics for the analysis of lubricants' behavior in zero gravity – An experiment conducted in conjunction with the first NASA Spacelab project – STS-9.
Designed and created the digitization platform using a sonic digitizer and wrote drivers for the digitizer in C, on an IBM PC platform. Digitized frames of 24-fps film taken of the spreading of fluids with different viscosities by the crew of the Columbia Shuttle in the Spacelab module. This data was used by Prof. Coda Pan to formulate the equations that describe the spreading characteristics of fluids on different smooth surfaces in zero gravity.

Computer Skills

Extensive experience in Linux and other Unix-like operating systems, Android, Windows, VM, VMS, OS2, and many other operating systems.
In excess of 40 years of experience with many languages such as C, C^{++},

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FORTRAN77, Java, JavaScript, HTML, PHP, XML, ASSEMBLY, LaTeX, and several shell scripting languages such as AWK, tcsh and csh, ksh, Bourne shell, etc.

Network Design, TCP/IP, BGP4, Load Balancing, Telephony Network design, Cisco® Operating System, Zebra and Quagga Routing, GateD routing.

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Awards and Honors

Sep. 2023 — *Nominations by 14 Columbia University Alumni for the 2024 Egleston Medal for Distinguished Engineering Achievements*
The results will be announced in May of 2024.

Feb. 2023 — *Finalist for Columbia University Presidential Awards for Outstanding Teaching*
One of only 11 finalists for 5 Presidential Awards for Outstanding Teahching across the entire Columbia University faculty.

Jan. 2021 — *IMAC Best Paper Award: Dynamics of Civil Structures*
"Transfer Learning from Audio Domains a Valuable Tool for Structural Health Monitoring"

Jan. 2012 — *2011 Frost & Sullivan North American Speaker Verification Biometrics, New Product Innovation Award* – For RecoMadeEasy® Speaker Recognition

2003 — *IBM Research Top* 10% *Valuable Patent*
Patent Number 6,421,645 was recognized by IBM Research as one of top 10% Valuable Patents.

2002 — *Best of Show Award*
The Internet World Show, held at the Jacob Javits Center in New York City In the E-Commerce category for the CommerceMadeEasy® software engine

Oct. 25, 2002 — *The Linux Journal Product of the Day Award*
For the CommerceMadeEasy® software engine

2001 — *Third Plateau Invention Award*, IBM Research
presented to an individual with 12 accepted patent disclosures

April 1999 — *Adventurous System & Software Research (ASSR) Award*, *IBM Research*
2nd Extension of the ASSR award for further features of the speaker recognition engine

1999 — *Second Plateau Invention Award*, IBM Research
presented to an individual with 8 accepted patent disclosures

April 1998 — *Adventurous System & Software Research (ASSR) Award*, *IBM Research*
Extension of the ASSR award for improving the speaker recognition engine

1998	*Research Division Award*, IBM Research For the creation of the Virage transcription system
1998	*First Plateau Invention Award*, IBM Research presented to an individual with 4 accepted patent disclosures
April 1997	*Adventurous System & Software Research (ASSR) Award*, *IBM Research* ASSR award for creating a speaker recognition engine for IBM Research
1997	*Research Division Award*, IBM Research For the success of the Network Vehicle (speech enabled vehicle)
1996	*Research Division External Honors Award*, IBM Research In Recognition of the honor of being elected as an Associate Editor of the Intelligent Automation and Soft Computing Journal
April 1996	*Adventurous System & Software Research (ASSR) Award*, *IBM Research* Extension of the ASSR award for another year to conduct adventurous research in the field of Handwriting Recognition for CMN (Common Music Notation).
April 1995	*Adventurous System & Software Research (ASSR) Award*, *IBM Research* The largest ASSR award ($110,000) for research in the field of Handwriting Recognition for CMN (Common Music Notation).
1995	Extraordinary Ability *Status by U.S. Immigration and Naturalization* Obtained U.S. Permanent Residence through the extremely rare Extraordinary Ability category which resulted in obtaining permanent residence in three weeks after submitting the application.
1995	*Research Division External Honors Award*, IBM Research In Recognition of the honor of being elected as The Conference Chair for the Conference on Technological Advancement in Developing Countries
1995	*Sigma Xi Scientific Research Honor Society* Elected to the Columbia University (Kappa) Chapter
March 1994	*IBM Research Division Award* For "Online Discrete Handwriting Recognition"
1993	*IBM Research Patent Award* For the Invention of "A Post-Processing Error Correction Scheme Using a Dictionary for On-Line Boxed and Run-On Handwriting Recognition"
1990	*IEEE Best Paper Award* Homayoon Beigi and C. James Li, "New Neural Network Learning Based on Gradient-Free Optimization Methods," 1990 IEEE Conf. on Neural Networks

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1990 *IEEE Best Paper Award*
Homayoon Beigi and C. James Li, "Neural Network Learning Based on Quasi-Newton Methods with Initial Scaling of Inverse Hessian Approximate," 1990 IEEE Conference on Neural Networks

1984 Scholarship Award, Mechanical Engineeing Department, Columbia University
Scholarship covering tution and fees for the last semester of the senior year.

1981 *Bausch & Lomb Science Award*
Presented for academic excellence in science, rigor of courses taken in the sciences, and SAT Math and ACT Science and Math scores.

1980 *The Maria Elena Arosemena Cup*
Trophy is given to the international student who has gained the greatest command and understanding of the English Language

1980 *The Bancroft Phinney Award*
Presented to the Student with Highest Academic Standing

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Professional Activities

2012 *VIPG Panel of Experts*
Voted into an 8-person Voice Identification Policy Group (VIPG) of the United States Embassy in Mexico for the registration of the Federal police of Mexico.

2009 - 2010 *Interoperability Committee Member*
U.S. Government Interagency Symposium for Investigatory Voice Biometrics
Federal Bureau of Investigation Interoperabiliy Committee

Sep. 2009 *Interoperability Panelist*
U.S. Government Interagency Symposium for Investigatory Biometrics

2005 *Invited Keynote Speaker*
"Challenges of Large-Scale Speaker Recognition," *Keynote Speech* at the European standards, COST275 Workshop on Biometrics on the Internet, October 27-28, 2005, Hertfordshire University, Hatfield, United Kingdom.

2003 – 2010 *Active Liaison*
Active liaison for the U.S. Delegation of ISO/SC 37 JTC 1 WG3 (Biometrics) standards development for the Common Biometric Exchange Format.

2003 – 2010 *Active Liaison and Driving Force for Speaker Recognition*
ANSI/INCITS Standards development for Biometric Data Interchange Formats.

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2003 – 2010	*Active Liaison and Driving Force* VoiceXML Forum standards development for Speaker Recognition (Speaker Biometrics) Data Format.
2002	*Guest Editor* Special issue on Learning and Repetitive Control, Volume 8, No. 2, 2002 Intelligent Automation and Soft Computing Journal
1998 – 2010	*Chief Digital Editor* Encylopaedia Iranica, Published by Columbia University, New York City, NY Managed, designed, implemented, and maintained the entire digitization and publication in digital form of the encyclopedia.
1998	*Organizer* The Pattern Recognition Division of the World Automation Congress, Alaska
1997 and 1999	*Organizer* The World Manufacturing Congress
1997	*Technical Chair* The IEEE International Conference on Robotics and Automation
1994-2013	*Associate Editor* Intelligent Automation and Soft Computing Journal
1994 - 2010	*Advisory Board Member* The Advisory Board Committee of the IEEE Spectrum Magazine on Technological Advancement in Developing Nations
1997	*Invited Keynote Speaker* Foundations of Distributed Information Systems (FDIS 97) Conference, Aspen, Colorado, Jun. 1997
1994 - 2003	*Editor* For Applications of Soft Computing to Handwriting Recognition for the Berkeley Initiative on Soft Computing (BISC)
1995	*Conference Chair* Third Annual Conference on Technological Advancement in Developing Countries, Columbia University, New York, 1995
1991-1995	*Executive Committee Member* The Society for Technological Advancement in Developing Countries
1991-1993	*Technical Chair* Mechanical, Chemical, and Industrial Engineering Division of the Society for Technological Advancement in Developing Countries

Jult 23-24, 1993 *Organizing Committee Member*
The Annual Conference on Technological Advancements in Developing Countries

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Scientific and Technical Review Committees

Journal Reviewer Public Profile

2016 - Present European Intelligence and Security Informatics Conference (EISIC)

2012 - Present IET Signal Processing Journal

2014 - Present Journal of Phonetoics

2012 - Present IEEE Interenational Conference on Acoustics, Speech, and Signal Processing
2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024

2010 - Present Parsa Wireless Communications Intellectual Property and Patent Evaluation Organization
Patent Evaluation Expert for Speech and Handwriting related patents

2009 - Present Qatar Foundation Grant Review Committee
Review of grant proposals to the Qatar Foundation, including technical correctness, budget review, and feasibility analysis

2009 - Present The Interspeech Conference – 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024

2006 - Present Pattern Recognition Journal

1991 - Present Regular reviewer for the following journals
IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI)
IEEE Transactions on Neural Networks
International Journal of Control
The American Institute of Aerospace and Avionics (AIAA) Journal

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Society Membership

2010 - Present *Member*
The New York Academy of Sciences

2000 - Present *Senior Member*

The Institute of Electrical and Electronic Engineers (IEEE)
Member, The IEEE Signal Processing Society
Member, The IEEE Control Systems Society

1988 - 2000 *Member*
The Institute of Electrical and Electronic Engineers (IEEE)

1995 - Present *Full member*
Sigma Xi Scientific Research Honor Society
Elected to the Columbia University (Kapp) Chapter

1991 - 2001 *Member*
The Canadian Society for Electrical and Computer Engineering (CSECE)

1991 - 1995 *Executive Committee Member*
The Society for Technological Advancements in Developing Countries (STADC)

1991 - 2001 *Member*
The American Society of Mechanical Engineers (ASME)

1983 - 1991 *Student Member*
The American Society of Mechanical Engineers (ASME)

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Artistic Foundations

2023 - Present *Advisory Board Member*
ArtSee Community, A free social platform to enable underprivileged artists from around the world to share their work.

2019 - Present *Founder*
Artists 4 Peace, A Non-Profit organization with a mission of promoting peace around the world, created to provide access to artists around the world who may have trouble accessing an audience. The mission is to promote worldwide peace through artistic engagement. The artists are mostly underprivileged international artists, who may have no such access otherwise. However, the organization provides free access to all artists.

2010 - Present *Founder, Composer, and Music Director*
Noavaran Ensemble, A musical ensemble, with a mission of fusion of music around the world and combining theory and practice of many genres of music in performance of innovative fusion compositions.

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Miscellaneous

Citizenship	United States of America
Languages	Native level fluency in English and Persian. Studied Japanese, up to Intermediate Level.
Hobbies	Persian Classical Musical performance in Fusion with Modern Western Music Instrumets: Tar, Kamancheh, Dotar, Tanbur, and Barbat Hobbies include Etymology and the study of Archaic Languages such as Middle English and Middle Persian.
Academics	Participated in several courses in Statistical Speech Recognition and Advanced Information Theory at IBM T.J. Watson Research Center, over many years. In theses each participant taught a topic and attended the lectures of other participants.

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Publications

Books

Homayoon Beigi, *Mathematics of Machine Learning and Signal Recognition*, Springer, New York, 2023 (Expected).

More Information: This will be a textbook with over 900 pages of material. It has been solicited by colleagues who felt that background mathematics for machine learning and pattern recognition were not easy to find in a comprehensive manner with a single source. This book is nearly complete and is set to be released in the Fall of 2022.

Homayoon Beigi, *Fundamentals of Speaker Recognition*, 2nd Edition, Springer, New York, 2022.

More Information: Due to the success of the first edition of this book and the dynamic nature of the topic, this edition will provide the original text plus coverage of many new topics and techniques. The 2nd edition will be release toward the end of 2022.

Homayoon Beigi, *Fundamentals of Speaker Recognition*, 1st Edition, Springer, New York, 2011, ISBN: 978-0-387-77591-3.

More Information: This is the first and only textbook on speaker recognition. It contains a comprehensive coverage of the subject, with an inclusive treatment of all the prerequisites in 26 chapters and about 1000 pages of material. This book has consistently ranked as the top 25% downloaded E-Book on the Springer (publisher) site. This book took 4 full years of active research and writing, at an average of 10 hours per day, to be completed. Over $90,000$ downloads have been recorded so far.

Downloads: 90,000 downloads as of September 2023 – According to Springer.com. This does not include the number of e-books and hardcopies sold. Interestingly, this book is becoming more popular every year. here are the statistics of the downloads for each year since it released:

- Downloads in 2018: **6,793**
- Downloads in 2017: **7,157**
- Downloads in 2016: **8,745**
- Downloads in 2015: **11,409**
- Downloads in 2014: **12,566**
- Downloads in 2013: **6,914**
- Downloads in 2012: **3,598**
- Downloads in 2011: **667** (only in the last 6 days of the year since it was release at the end of December, 2011)

Homayoon Beigi, "Neural Network Learning and Learning Control Through Optimization Techniques,", *Doctoral Thesis*, School of Engineering and Applied Science,

Columbia University, New York City, New York, 1991.

Book Chapters and Encyclopedia Articles

Homayoon Beigi, "Speaker Recognition", In: Jajodia S., Samarati P., Yung M. (eds) Encyclopedia of Cryptography, Security and Privacy, Third Edition, pp. 2479–2495, . Springer, Switzeland AG, 2025, ISBN: 978-030-71522-9, 10.1007/978-3-030-71522-9

Kyle L. Hom, Homayoon Beigi, and Raimondo Betti "Application of Speaker Recognition x-Vectors to Structural Health Monitoring", In: Mao, Zhu (ed), Model Validation and Uncertainty Quantification, Vol. 3, Ch. 13, pp. 139-148, isbn: 978-3-030-77348-9. Springer International Publishing, Berlin, Heidelberg, 2022, 10.1007/978-3-030-77348-9_18.

Eleonora M. Tronci, Homayoon Beigi, Maria Q. Feng, and Raimondo Betti "Transfer Learning from Audio Domains: A Valuable Tool for Structureal Health Monitoring ", In: Grimmelsman, Kirk (ed), Dynamics of Civil Structures, Vol. 2, Ch. 11, pp. 99-107, isbn: 978-3-030-77142-3. Springer International Publishing, Berlin, Heidelberg, 2022, 10.1007/978-3-030-77143-0_11.

Homayoon Beigi, "Speaker Recognition", In: Jajodia S., Samarati P., Yung M. (eds), Encyclopedia of Cryptography, Security and Privacy. Springer, Berlin, Heidelberg, 2021 10.1007/978-3-642-27739-9_747-2.

Homayoon Beigi, "Andranik Aroustamian," *invited article entry* in the Encyclopædia Iranica, Center for Iranian Studies, Columbia University, 2021.

Homayoon Beigi, "A Hybrid Approach to Automated Rating of Foreign Language Proficiency," Where Humans Meet Machines – Innovative Solutions for Knotty Natural-Language problems, Amy Neustein and Judith Markowitz (Eds.), Springer, New York, 2013, ISBN: 980-953-307-576-6.

Homayoon Beigi, "Speaker Recognition: Advancements and Challenges," New Trends and Developments in Biometrics, Jucheng Yang and Shan Juan Xie (Eds.), 2012, ISBN: 980-953-307-576-6 DOI: 10.5772/52023.
Downloads: 3,533 downloads as of Jan. 6, 2022 – According to intechopen.com.

Homayoon Beigi, "Speaker Recognition," *invited articled*, Encyclopedia of Cryptography and Security (2nd ed.), Henk C.A. van Tilborg and Sushil Jajodia (Eds.), Springer, New York, 2011, pp. 1232–1242, ISBN: 978-1-4419-5906-5, DOI: 10.1007/978-1-4419-5906-5_747.

Homayoon Beigi, "Speaker Recognition," Biometrics / Book 1, Jucheng Yang (ed.), Intech Open Access Publisher, 2011, Ch. 1, pp. 3–28, ISBN: 978-953-307-618-8.
Downloads: 3,902 downloads as of Dec. 15, 2014 – According to intechopen.com.

Homayoon Beigi, "Pre-Processing the Dynamics of On-Line Handwriting Data, Feature Extraction and Recognition," Progress in Handwriting Recognition, A.C. Downton and S. Impedovo (eds.), World Scientific Publishers, New Jersey, 1997, pp. 191–198, ISBN: 978-981-023-084-5.

T. Fujisaki, H.S.M. Beigi, C.C. Tappert, M. Ukelson, and C.G. Wolf, "Online Recognition of Unconstrained Handprinting: A Stroke-based System and Its Evaluation," From Pixels to Features III: Frontiers in Handwriting Recognition, S. Impedovo and J.C. Simon (eds.), Elsevier Science Publishers, B.V., 1992, pp.297–312, ISBN: 0-44-489665-1.

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Patents (granted)

Patent Number: US 10,042,993 B2
Homayoon Beigi, Access control through multifactor authentication with multimodal biometrics, Filed: June 23, 2015, Granted: August 7, 2018.

Patent Number: US 9,495,646 B2
Homayoon Beigi, Raimondo Betti, and Luciana Balsamo, Monitoring Health of Dynamic System Using Speaker Recognition Techniques, Filed: June 5, 2014, Provisionally filed: June 5, 2013, Granted: November 15, 2016; Joint filing between Recognition Technologies, Inc. and Columbia University.

Patent Number: US 9,064,257 B2
Homayoon Beigi, "Mobile Device Transaction using Multi-Factor Authentication," Filed: November 2, 2011, Provisionally filed: November 2, 2010, Granted: June 23, 2015.

Patent Number: US 7,474,770
Homayoon Beigi, "Method and Apparatus for Aggressive Compression, Storage and Verification of the Dynamics of Handwritten Signature Signals," Filed: June 28, 2005, Granted: January 6, 2009.

Patent Number: US 6,748,356
Homayoon Beigi and Mahesh Viswanathan, "Methods and apparatus for identifying unknown speakers using a hierarchical tree structure," Filed: June 7, 2000, Granted: June 8, 2004.

Patent Number: US 6,684,186
Homayoon Beigi, Stephane Maes, and Jeffrey Sorensen, "Speaker recognition using a hierarchical speaker model tree," Filed: January 26, 1999, Granted: January 27, 2004.

Patent Number: US 6,538,187
Homayoon Beigi, "Method and System for Writing Common Music Notation (CMN) using a Digital Pen," Filed: January 5, 2001, Granted: March 25, 2003.

Patent Number: US 6,421,645
Homayoon Beigi, Alain Trischler, and Mahesh Viswanathan, "Methods and Apparatus for Concurrent Speech Recognition, Speaker Segmentation and Speaker Classification," Filed: June 30, 1999, Granted: July 16, 2002.

Patent Number: US 6,345,252
Homayoon Beigi, Alain Trischler, and Mahesh Viswanathan, "Methods and Apparatus for

Retrieving AudioInformation using Content and Speaker Information,"
Filed: April 9, 1999, Granted: February 5, 2002.

Patent Number: US 6,253,179
Homayoon Beigi, Upendra Chaudhari, Stephane Maes, and Jeffrey Sorensen, "Method and apparatus for multi-environment speaker verification," Filed: January 29, 1999, Granted: June 26, 2001.

Patent Number: US 6,246,982
Homayoon Beigi, Stephane Maes, and Jeffrey Sorensen, "Method for measuring distance between collections of distributions," Filed, January 26, 1999, Granted, June 12, 2001.

Patent Number: US 6,219,640
Sankar Basu, Homayoon Beigi, Stephane Maes, Benoit Maison, Chalapathy Neti, and Andrew Senior, "Methods and Apparatus for Audio-Visual Speaker Recognition and Utterance Verification," Filed, August 6, 1999, Granted, April 17, 2001.

Patent Number: US 5,787,197
Homayoon Beigi, Tetsunosuke Fujisaki, William Modlin, David William and Kenneth Wenstrup, "Post-processing error correction scheme using a dictionary for on-line handwriting recognition," Filed: March 28, 1994, Granted: July 28, 1998.

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Journal Publications

Eleonora M. Tronci, Homayoon Beigi, Raimondo Betti, and Maria Q. Feng "A Damage Assessment Methodology for Structural Systems using Transfer Learning from the Audio Domain," Mechanical Systems and Signal Processing (MSSP), Vol. 195, July 15, 2023 (online: Mar. 23, 2023).

Eleonora M. Tronci, Homayoon Beigi, Maria Q. Feng, and Raimondo Betti, "A Transfer Learning SHM Strategy for Bridges Enriched by the Use of Speaker Recognition x-Vectors," , Journal of Civil Structural Health Monitoring, May 23, 2022, DOI: 10.1007/s13349-022-00591-3.

Luciana Balsamo, Raimondo Betti , and Homayoon Beigi "A structural health monitoring strategy using cepstral features," Journal of Sound and Vibration, Vol. 333, No. 19, January 2014, pp. 4526–4525.

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Homayoon Beigi, "Multimedia Diarization through Audio-Visual Recognition *(Fusion of Speaker and Face Biometrics with Speech Recognition and Natural Language Processing for achieving a Robust Diarization)*," *Invited Talk*, Philips Research, North America, Briarcliff, NY, Feb. 11, 2015.

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Products

I have designed and implemented many different engines and algorithms and in fact I have personally done all the coding related to all the products of Recogntion Technologies, Inc. and Internet Server Connections, Inc. Jsut the products at Recognition Technologies, Inc. include in excess of 5 million lines of highly optimized C^{++} code with almost no duplication. All engines have a common API standard and provide results in XML, HTML, and Text formats. All engines share the vast libraries which I been developed over the last 23 years. These libraries are listed at the bottom of this section.

RecoMadeEasy® Speaker Recognition Engine (2003 – Present)

Winner of the 2011 Forst & Sullivan North American
Speaker Verification Biometrics, New Product Innovation Award

I personally designed and wrote all the code related to this engine in C^{++}. This is a state-of-the-art language- and text-independent speaker recognition system (voice biometrics system) which has been developed to work in different environments. Large-Scale and Small-Scale versions of this speaker identification and speaker verification (SIV) engine have been developed over many years of research to work in telephone, as well as stand-alone environments.

The speaker recognition engine is the only engine in the market, capable of realtime large-scale speaker identification, handling hundreds of thousands of models in realtime. It runs on all Linux systems as well as iOS and Windows. It features its own efficient database and a very small footprint. Another very important discriminator of this product is related to the *amount of data* that is available to us in the training of the models. Having data from about 1.5 million speakers, the engine has been optimized to handle very large training samples and to allow for parallel processing in both training and testing scenarios.

This engine has been trained on the speech of about 1.5 million of distinct speakers, most of whom have more than one session of recording. Being a statistical engine, large amounts of data and ample variability among types of data are essential to its success. For over a decade, customers in the financial, education, security, and government sectors have been using this product and coming back for more licenses.

RecoMadeEasy® Large Vocabulary Speech Recognition Engine (2003 – Present)

This large vocabulary speech recognition engine was written in C^{++} and shares many libraries from the Speaker Recognition engine as well as many other mathematical libraries developed over the last 20 years. At the moment, this is the most active area of research at Recognition Technologies, Inc.

Many applications are aslo being developed in collaboration with customers who are using this engine for phrase spotting in financial applications and proficiency rating in distance learning settings, etc. The speech recognition engine shares an API with the rest of the engines at Recognition Technologies to make the job of fusion of different engines much easier.

RecoMadeEasy® Face Recognition Engine (2010 – Present)
The face recognition effort was started in 2010 to complement the speaker recognition engine, in providing an audiovisual fusion engine, as well as a standalone full-frontal face recognition engine. As with all other engines, it shares an API with all RecoMadeEasy® products and provides very robust recognition results which perform well in different lighting conditions as well as in discrepencies related to glasses and other anomalies.

RecoMadeEasy® Audiovisual Recognition Engine (2010 – Present)
Since the inception of the Face Recognition engine, it has been fused with the speaker recognition engine, as well as speech recognition engine. This engine is the most complete engine which allows for the use of speaker, face, and speech recognition. The speech recognition is used to allow for random prompts to test for liveness, as well as simple standalone speech recognition functionality. As far as I know, we are the only company which has all these engines integrated into a single engine with a shared API.

RecoMadeEasy® Access Control Engine and Android Application (2012 – Present)
The RecoMadeEasy® Audiovisual Recognition Engine which includes speaker recognition, face recognition, and speech recognition with an extra capability that allows it to communicate with different access control devices. This allows for the engine to be used to gain access to different physical or virtual locations. See video demostrations. The demonstration also shows the Android application which communicates with this engine and was also developed completely in-house at Recognition Technologies, Inc. See video demostrations.

RecoMadeEasy® Automatic Language Proficiency Rating Engine (2007 – Present)
Certain clients of Recognition Technologies, Inc., who are involved in performing enormous amounts of ratings for their own clients in over 100 languages started asking about the possiblity of rating the proficiency of an oral test, preferably independent of the language. Aside from the fact that this would save time and money for the client, there was a much more important reason for needing this service. Human raters can only provide proficiency scores up to a certain granularity. Practically, about 80% of all the rated tests would fall into a single human-rated category. I was able to provide three subratings for Intermediate Mid range which allowed for practical rating of the proficiency of over 1.5 million tests since 2007. See the related book chapter and related reports.

RecoMadeEasy® Interactive Voice Response (IVR) (2003 – Present)
The Interactive voice response application was the first product of Recognition Technologies, Inc.. It has been designed so that even a top executive who knows nothing about coding would be able to create a new IVR process using a Graph lanaguage which I wrote, specifically for defining IVR processes. It resembles C syntax, but it allows for defining nodes of a graph and the relation between nodes. It allows for very complex graphs. This product has been in use, nonstop, since 2003 and has been used to record at least $30,000,000$ minutes of conversational audio. It is capable of recording conversations in split channel settings and is fully compatible with the most popular Dialogic telephony cards.

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RecoMadeEasy® Signature Compression and Verification Engine (2005 – Present)
The signature compression product implements the content of my U.S. patent 7,474,770. This application allows for an agressive compression such that all the dynamics of a signature are compressed into less than 54 bytes. This is the number of bytes of storage which is available on the back of standard magnetic credit or debit card. Since the dynamics are preserved, the signature verification engine uses this information to match templates for users.

RecoMadeEasy® Online Handwriting Recognition Engine (2003 – Present)
The handwriting recognition engine is capable of performing unconstrained online handwriting recognition on a series of sampled points, coming back from a tablet, for example a Wacom tablet.

RecoMadeEasy® Keystroke Recognition Engine (2007 – Present)
The keystroke engine has been developed to allow for the identification of individuals based on their typing habits. It uses the timeline associated with keystrokes. It is text and language independent, although the enrollment in different languages would need to be associated with the corresponding test language in order to have higher accuracies.

CommerceMadeEasy® (2000 – Present)
Winner of the Best of Show Award at the 2002 Internet World Show, held at the Jacob Javits center, in New York City, it was also the recipient of the Product of the Day award for October 25, 2002 from the Linux Journal. CommerceMadeEasy® is a Linux-based server software, all components of which were developed in C^{++} for optimal performance and security. It is completely cookie-less and provides a secure Internet Wizard for creating new accounts. It provides services such as "Sales, Auction, Access and Contribution and now E-Learning." The Wizard may be used to quickly setup a commerce site from an existing website with advanced search, a credit card gateway, security, and many other capabilities.

CommerceMadeEasy® may be used to set up and create complex commerce sites in any industry, in a matter of days. As the package was developed entirely in-house and since it includes all components such as am optimal database interface, it permits easy customization.

Encyclopedia Digital Library (1998 – 2012)

Encyclopædia Iranica is a thirty five year old scholarship endeavor at the Center for Iranian Studies at Columbia University. Over the course of 14 years, I developed the procedure for the conversion of classically written articles into articles in Unicode-16. This included working with the editors of the encyclopedia, in detail, to design a character set based on Unicode to be able to handle hundreds of Indo-Iranian languages (modern and archaic). In addition, automation software was developed for the conversion of articles, while indexing and cross-referencing then automatically. Created search mechanisms for searching the articles in any of the many nonstandard transcription techniques used by the readers to transcribe the relevant languages, such as Persian, into the latin alphabet. The unicode mapping, unicode search, and multiple transcription style mapping are quite

complex. The indexing included automatic indexing plus keyword references created manually by editors and incorporated into the search and indexing. The product was the creation of a fully functional digital library by which the print version was and is made available online.

Portfolio Optimization (1998 – 2001)
While working at IBM Research, I was approached by a team at Merrill-Lynch Research, who had heard about my doctoral work on nonlinear optimization, to help them with a problem they had with optimizing portfolios. At the time, Merrill-Lynch was using a very expensive product, the Barra Optimizer, for portfolio optimization. To conserve funds, they requested the creation of a portfolio optimization program that would do the job of Barra, as well as providing more features. After clearing it with IBM, I took on the optimization research while at IBM and then in February of 2000, I decided to leave IBM and work on this problem fulltime. My manager asked me to reconsider and to take a one-year sabbatical instead and see whether I woulod like to return to IBM. In February 2001, I decided to continue working on this challenging optimization problem and left IBM Research.

As the VP/CTO of Internet Server Connections, Inc., I wrote an optimization program, capable of optimizing portfolios based on constrained nonlinear optimization of $35,000+$ international securities in realtime. I solved this problem using sparse nonlinear optimization techniques and was able to match the results obtained by Barra. Unfortunately, due to the unfortunate event of September 11, 2001, the Merrill-Lynch research group fell apart and the project was terminated. However, very useful optimization libraries were developed in the process and added to the Internet Server Connections mathematical libraries which were later transferred to Recognition Technologies, Inc. and made a lot of the basic functions possible for the development of the many recognition engines described above.

The very large-scale portfolios optimization project for Merrill-Lynch Research took place from 1998 to 2001.

Matlab to C^{++} Translator (1993 – 1996)
Wrote the first Matlab® to C^{++} translator. Wrote all internal matrix functions of Matlab® in C^{++}. Wrote a Matlab® parser and a C^{++} code generator to produce C^{++} code, translating any Matlab® code to 100% C^{++} code. This project entailed optimal implementation of complex numerical matrix manipulation functions. The code libraries were later inherited by Internet Server Connections, Inc. and later by Recognition Technologies, Inc.

IBM ViaVoice®
Personally wrote the first version of the IBM Speaker Recognition Engine, from scratch, which became a part of the IBM ViaVoice® line of products. I worked on this project from 1996 to 2000 until I took a one-year sabbatical to work on the portfolio optimization problem at Internet Server Connections, full-time. In the course of these four years, I created an engine which allowed for large-scale speaker identification, as well as the basic speaker verification modality. I created hierarchical algorithms for organizing speaker models, in order to be able to perform massive identifications runs by only matching a logarithmic number of models instead of matching all models, which was the norm at the time.

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During the process of creating a large-scale speaker identification product, I formulated a *directed divergence method* between collections of probability densities, which may use any classic divergence or distance between two densities.

IBM ThinkScribe®(CrossPad®) (1993 – 1996)
Contributions to the underlying algorithms of the IBM ThinkScribe® products, Compression (sole investigator and developer), Handwriting Recognition Technology (principal investigator and developer). This product offered a very robust unconstrained handwriting recognition engine with over 85% word-level accuracy, in conjunction with applications which were shipped with the CrossPad®.

IBM ThinkWrite® (1991 – 1993)
Contributions to the underlying algorithms of the IBM ThinkWrite® products, Run-On and Discrete Handwriting Recognition Technology one of the principal investigators and developers.

Wholesale Inventory and Sales Control® (1984 – 1990)
Wrote a complete inventory and sales control application, originally in BASIC and translated it to C in 1985. The more superior C version ran on the Xenix® operating system (a flavor of Unix®) and was sold to 5 wholesale carpet companies which used it for well over a decade. The product featured a colorful menu-driven interface, written using *curses*. This interface was state-of-the-art at that time. In addition, I developed drivers for a wireless pen-based barcode reader with memory which could hold up to 100 barcodes, using a serial port interface. I also used serial communication to connect dumb terminals and serial printers in the different locations of the showroom and the loading zones. I wrote the whole application entirely in *C*, with the following flow structure:

1. Salesperson accompanies client to the showroom with a barcode reading pen in his/her pocket.
2. Client chooses different carpets and salesperson swipes the barcode using the pen.
3. They go back to the office and salesperson puts pen in a pen-holder which is connected to his terminal through a serial interface.
4. The salesperson brings up the client's account in an empty invoice and the barcode numbers are loaded into the sales slip.
5. The salesperson completes the sale and prints the invoice in the office.
6. In the meanwhile a loading receipt is automatically printed in the docking area and the pieces are prepared for pickup.

The above scenario is very simple to handle with today's technology, but with the technology available in 1985, there were many hurdles to handle. The system was so stable that even as late as 1995 one of the clients was still using the system.

At the time, DOS solutions were only capable of using Novell networks with very limited capabilities, at great costs. For example, a 5-station system would have used an IBM PC for each station and would only allow peer-to-peer networking and would cost around $\$30,000$. However, this pure multiuser solution only cost $6,000$.

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Products *(Libraries written by Homayoon Beigi in the last 23 years)*

These libraries contain over 5 million lines of code and include, but are not limited to,

1. *Encryption Lirary* – Capable of doing encryption/decryption, hashing, coding, etc.
2. *Database Library* – Includes completely inclusive database design, all developed in-house. This library is capable of 64-bit addressing, advacned regular expression searches. It is fully configurable through text configuration files and allows over 25 different types including Credit Card information, passwords, hash codes, basic types, Email addresses, URLs, etc.
3. *Common Gateway Interface (CGI) Library* – This library allows for the conversion of any C^{++} application to one operating as a CGI application which would run through a web interface. This library has been under development since 1996 and has great capabilities. It natively links with the Database and Encryption libraries listed above, to create a seemless CGI interface. This library is one of the core components of the CommerceMadeEasy® product, as well as other products.
4. *Error Handling Library* – This library allows for error handling and tracking, throughout any product that links with it. It is an essential part of all products and makes interactions quite practical.
5. *Mathematics Library* – This library contains a very rich set of mathematical functions which are based on the handling of matrices in a C^{++} setting. The interface to this library is very simple and all functions have been optimized over the past 23 years to provide very fast operations. It is an integral part of all product engines.
6. *Lincensing Library* – This complete license management library provides licensing capabilities to all products. It makes the distribution of the engine possible. It is designed so that new modules may be easily configured into the license with full backward compatibility. It works in conjunction with the encyption library and it is an essential part of all products. This library supports different operating systems including Linux, Mac, and Windows, each of which require different techniques for handling the license management.
7. *RecoMadeEasy® Library* – This is a base library which is capable of handling configuration files, understands how to interact with the licensing library, includes most of the basic operations that any recognition would use. It is inherrited by all product engines with this registered trademark name.
8. *Access Library* – This library provides functionality for access-control related applications. See video demostrations.
9. *API Library* – Since all engines have a unified API, this base library, once inheritted, allows for all API functionality.
10. *Audio Library* – This most essential library handles all lower level processes related to handling different audio formats and codecs. It is used by any engine which requires an audio interface.

11. *AudioVisual Library* – This library works in conjunction with the audio and image libraries to allow the handling of a combination of these two media, including video codecs.

12. *Clustering Library* – This library handles all supervised and unsupervised clustering functionality. It is essential to all pattern recognition engines.

13. *Face Library* – This library privides all the lower level (algorithmic) functionality related to face recognition.

14. *Handwriting Library* – This library handles all handwriting and signature related functionality incuding algorithmic, capture, and feature extraction mechanisms.

15. *Image Library* – This library handles arrays of images, their representations, manipulations, algorithmic and input/output aspects. It is the analogue of the audio library in the image domain.

16. *Input Library* – This library handles all input related aspects including keyboard, tablet, etc.

17. *IVR Library* – The Interactive Voice Response (IVR) library is a complete library which includes agnostic IVR functionality as well as wrappers for popular cards such as most Dialogic cards. It uses a fully connected graph mechanism which is a part of the tree library. This is the most essential part of the IVR engine and has been in use at Recognition Technologies, more than any other library, in an intense use scenario. This library has been used to record more than $30,000,000$ minutes of conversational audio within the systems of Recognition Technologies, Inc.

18. *Language Modeling Library* – This library is capable of loading and manipulating huge language models including NGram models and grammars in highly efficient proprietary formats, in the memory. It is an essential part of the speech recognition engine.

19. *Media Library* – The media library is an intermediate library which combines and understands audio and image formats and knows how to relate them to video codecs. It is an integral part of all audiovisual engines.

20. *Memory Map Library* – This library allows for the seemless use of memory-mapped files in place of regular memory, in any type of process within the RecoMadeEasy® family of engines and products.

21. *Search Library* – This library includes the implementation of several optimal and suboptimal search algorithms which, for exampled, are used for speech and handwriting recognition engines.

22. *Speech Library* – This library provides most algorithmic functionality needed by speech recognition, which is not in common with speaker recognition.

23. *Speech Front-End Library* – This library handles all signal processing, feature extraction, and feature manipulation for speech and speaker recognition.

24. *Speech Utility Library* – This library provides a large numebr of algorithmic and manipulation functionalities for use with speech and speaker recognition.

25. *Speaker Library* – This library provides higher level speaker recognition functionality such as different speaker recognition modalities.

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26. *Transform Library* – This library provides many mathematical transformation libraries. This library is used by most recognition engines.

27. *Windows Library* – This library provides transformations in order to unify the code so that there is no need to write specific code to run on the Windows operating system. This library makes the job of maintaining a Windows engine much easier.

28. *Text IO Library* – This library provides many text manipulation and input/output functionalities which is at the heart of all other libraries. These could be parser functions for the language related to tree or graph definitions, configuration file definitions, etc.

29. *Tree Library* – This last, but by no means least library provides a very powerful set of functionalities for handling different types of trees and graphs. It has been optimized immensely through the past 23 years and it is used by most libraries, including the handling of recursive and cascaded configuration files, graph definitions for the IVR, etc.

30. *Neural Network Library* – This library contains the main deep learning algoritgms for training and decoding for many different architectures including feedforward, Time-Delay Neural Networks (TDNN), Convolutional Netral Networks (CNN), Long Short Term Memory (LSTM), Recurrent Neural Networks (RNN), Transformers, Conformers, and some proprietary architectures. This libarary has been developed over the past 23 years and includes many algorithms that I have developed over the past 4 decades.

31. *CUDA Libraries* – This library provides mathematical alternatives for the functions in the Math library to utilize the graphic processing unit (GPU) for doing highly parallel computation.

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Research Projects

The following is a non-exhaustive list of the research projects, in which I have been indulging. They include work that started as far back as when I was doing my graduate studies at Columbia University. Many of the projects are still alive and there is ongoing research in all aspects. Because of the many years of work that has been done on these research projects and due to special attention to organization and generalization of the code, a higly efficient research effort has been brewing for many years. I owe most of this to the multi-disciplinary attitude that I have had, since the inception of my research effort. I believe that nothing should be done more than once and that it is important to generalize both formulation of a problem and its implementation so that a lot of the work may be reused for other problems that may come up.

Speaker Recognition (1996 – Present)

I started working on speaker recognition by developing algorithms and creating the first version of the speaker recognition engine of IBM Research [1]. I have developed a number of successful techniques for large population speaker recognition in addition to general research and development in the field of pattern recognition with applications to Speaker Recognition (Large-Scale Identificaton and Verfication), Segmentation, hybrid systems with face recognition and text processing, large scale search techniques, etc. This work is still ongoing and has been turned into a product [2] at Recognition Technologies, Inc. which became the only winner of the 2011 Frost & Sullivan North American Speaker Verification Biometrics, New Product Innovation Award.

As a most important achievement, I wrote the first and only textbook on speaker recognition [3] and many other book chapters [4, 5, 6], journal papers, etc. I have also extended these techniques to the problem of structural health monitoring.

An important aspect, making the research results practical enough to be used in products [2] is the immense *data collection initiative* at Recognition Technologies, Inc. for the past 20 years. Due to the statistical nature of the algorithms, it is essential that large representative amounts of data are used. Due to this effort, Recognition Technologies, Inc. has the largest number of speakers recorded in natural settings with different sessions. This data has been used for the training of the speaker recognition models. This data entails over 1.5 million distinct speakers in many different settings, many of whom have been recorded in multiple sessions.

In the past few years, I have also hired an average of three interns per summer and a full time research assistant from the computer science and electrical engineering departments of Columbia University and have mentored them in conducting research and developing products in speaker [2] and speech recognition [7] engines.

Face Recognition (2010 – Present)

Developed very robust face recognition algorithms with pratical implementations, used in the identification and verification of full-frontal faces in very large pupulations with great success. This work is still ongoing and has been turned into a product [8] at Recognition Technologies, Inc. As

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with the rest of the research projects, I am reusing most of the library functions that I have used for speaker recognition, speech recognition, and other projects in the face recognition research. This is the main reason for the quick results obtained in this work, leading to product-level code.

Speech Recognition (1996 – Present)

Extensive participation in the research connected with the IBM ViaVoice product [1]. Research areas include all aspects of Large-Vocabulray speech recognition, speech segmentation, and Small-Vocabulary systems.

In 2003, I continued performing speech recognition research at Recognition Technologies, Inc. This lead to the development of several speech recognition engines [7], as well as a language proficiency rating engine [9]. The speech recognition and speaker recognition engines share as many of the libraries as possible. This allows for faster implementation of new algorithms across the two paths. Currently, most of my effort is on the improvement of the search engines and models. Currently a combination of Hidden Markov Models and Deep Belief Networks are being used in my research. The nonlinear neural network learning algorithms that I developed in the late 1980s and early 1990s are being used for the training of the networks. Also, techniques such as islands of high probabilities are being utilized for improving the search results.

Since 2012, interns from Columbia University have been helping with the large number of training and test experiments that need to be done for testing different algorithms.

Biometric Fusion and Multimedia Diarization (1997 – Present)

Speaker diarization is one of the most practical research projects which benefits any industry which archives and searches through multimedia files such as video and audio files. This has been a major focus of my work and has lead to my development of some of the first speaker segmentation [10] and large-scale speaker identification [11] systems. I have been creating the constituents of a good diarization system by working, for years, on speaker recognition, face recognition, speech recognition, and methods for combining the results. In the process, I have developed many valuable products based on fusing these systems at Recognition Tecnologies, Inc. such as RecoMadeEasy® Audiovisual Recognition Engine [12] and RecoMadeEasy® Access Control Engine [13] and many products at IBM Research.

One of my major accomplishments at IBM Research was the fusion of speaker recognition, face recognition, and speech recognition [14] engines to produce quality diarization of video files. This produced meta data based on segmenting the media according to speaker change and a change in the output of the face recognition system. This produced labels for the video content. Simultaneous transcription through the speech recognition engine provided transcribed text. The combination of these knowledge sources produced searchable meta-data which allowed for further searches on specific content by requesting segments in which a specific individual spoke about a certain topic. This work produced many journal papers and patents. One of these patents was deemed as one of the Top 10% Valuable Patents (Patent Number 6,421,645) at IBM Research.

Mechanical and Structural Health Monitoring (1989 – 1990 & 2012 – Present)

Structural Health Monitoring (2012 – Present)
Joint (multidisciplinary) research with the civil engineering department of Columbia University on the use of speaker recognition techniques for the monitoring and prognosis of the health of structures such as bridges and buildings. This work was done with Prof. Raimondo Betti of the civil engineering department and it provided the material for a full PhD thesis [15], just defended by Luciana Balsamo. This work has resulted in a PhD thesis, as well as several joint publications [16, 17, 18] with Prof. Betti and Dr. Balsamo. Prof. Betti and I are still collaborating on this project and will be conducting a lot more joint research. In addition, at Recognition Technologies, Inc. I have rekindled the research on mechanical health monitoring and will be having new products for the market, in the near future.

Mechanical Health Monitoring (Jan. 1989 – Dec. 1990)
Fault detection of mechanical systems and machine health prognosis, funded by the U.S. Navy and supervised by Prof. C. James Li. Developed practical signal processing techniques for the health prognosis of mechanical components such as bearings, gears, cutting tools, etc. This project included the design and implementation of the sensors and the data acquisition apparatus, as well extensive pattern recognition algorithm design and implementation for the automatic detection of faults in different components.

Information Theory and Language Modeling (1991 – Present)

I performed extensive research in information theory and language modeling, pertaining to usage with Text Processing, Handwriting Recognition, Speech Recognition, and Hybrid Search systems using Textual Language as well as Speaker Voice and Face information. This also evident from the extensive treatment of highly compressed dictionaries [19], statistical N-Grams [20, 21], Template Language models [22] and Decision-Tree-based Language Models.

Aside from my original work in the above topics, in my textbook on speaker recognition [3], I have given a very complete and detailed coverage to information theoretic concepts since they lie at the basis of most of the work in machine learning and pattern recognition. I have also made a lot of observations regarding different concepts that have baffled researchers in the past such as the relation between the definition of Information as presented by Wiener and Shannon in the same year (1948), along with in depth analysis of the seminal works in the field.

Education and Language Proficiency Testing (2006 – Present)

At Recognition Technologies, Inc., starting with Language Testing International (LTI, now a divsion of Samsung) and the American Council on the Teaching of Foreign Languages (ACTFL), I was asked to automate the rating of tests conducted on over 100 languages for assessing proficiency of professionals seeking to be hired by large multi-national corporations and government agencies. ACTFL is a nonprofit organization defining proficiency test procedures and LTI is a profit-oriented company administering such tests. LTI administers oral, conversational, and written tests in different capacities. In their oral tests, their best raters rate 80% of the population as Intermediate Mid level which is one of 10 possible levels (Novice Low, Novice Mid, Intermediate Low, Intermediate

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Mid, Intermediate High, Advanced Low, Advanced Mid, Advanced High, and Superior. This had presented them with the quandary of handling ratings in a more granular fashion to produce more discriminability. In addition, they rate over 1,000 tests per day for just a single site in Korea. It was very important to automate this rating process.

I worked on the problem starting in 2006 and by 2008 was able to modify our speech and speaker recognition engines to automatically rate oral tests at a rate of 10 times realtime, attaining three times the granularity of the human ratings (breaking Intermediate Mid to IM1, IM2, and IM3 levels). These granularities are not achievable by normal raters. In fact, in order to evaluate our engine's rating quality, LTI asked three of their top 1% most experienced raters to independently rate over 1000 tests at the higher granularity. Then our engine rated the same tests. For the ratings where 2 of the 3 raters agreed, the rating was over 85% correlated with our results. This was more than double the consistencies achieved by their best human raters. Also, the best their raters would do, in terms of speed, would be understandably at best realtime since they would have to listen to the whole test to mak a decision. Whereas we rated each test at ten times realtime! (See the related book chapter [23] and technical reports [24, 25].

The success of this research warranted large grants over the past 7 years from LTI, ACTFL, and the Center for Language Studies of Brigham Young University for this and other research on written and elicited oral testing. Currently, I am utilizing our RecoMadeEasy® Speech Recognition engine [7] in conjunction with our RecoMadeEasy® Automatic Language Proficiency Rating engine [9] to rate elicited responses for English and Italian.

My research in this field has attracted two more companies (an Italian company and a start-up company created by two of my ex-IBM colleagues. We are in the process of creating completely automated rating systems for students of English and Italian, to be following with other languages such as Polish.

Optimization (1986 – Present)

At the heart of most of my research, lies a strong base of optimization techniques. My doctoral thesis [26] was mostly based on the application of different nonlinear optimization techniques to the learning-control [27, 28, 29, 30, 31, 32, 33] and neural network learning [34, 35, 36, 37, 38, 39, 40, 41] problems.

In addition to the thesis, many of my other peer-reviewed publications show the use of these techniques. This was the motivation behind the Merrill Lynch research group seeking my expertise in solving a very tough constrained optimization problem with over 35,000 variables, for realtime solutions. See the related portfolio optimization product I produced, as a result of this research.

Handwriting Recognition (1991 – 1996 & 2003 – Present)

Over 6 years of research in large-vocabulary, unconstrained (any free-form combination of cursive, run-on, or discrete) handwriting recognition. Extensive work on Feature Extraction [42, 43, 44], Language Modeling, Search [45, 46, 47], Compression [48], Segmentation and Normalization [49] leading to a fully operational system [50]. I am presently, active in this area area of research through

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Recognition Technologies, Inc.

In the feature extraction area, I devised many different kinds of new features for run-on, cursive, and eventually unconstrained handwriting recognition, including the creation of new dynamic features [42, 43] based on an approximation of the hand motion with a time-variant second order differential equation and the use of the time varying paramters as truly compressed features of handwriting for each stationary part of the signal. This was complenented by the fusion of these dynamic features with static features [46, 45], as different codebooks, to increase the accuracy of recognition.

The orientation and size normalization of unconstrained handwriting is a very hard problem. I presented break-through techniques for finding and correcting the orientation of handwriting, slant correction, rotation of the handwriting to abide by principal lines and finally size normalization so that increased robustness to orientation, size, slant, and other transformations was achieved. [49]

Search was another problem that I addressed and achieved considerably great results in improvenents made to our system at IBM Research. Using the techniques that were used in speech recognition, namely beam and envelope search, and modifying them to work with unconstrained online handwriting recogniton, I made great advancement in the field. This made having unconstrained handwriting recognition possible and allowed us to leap from discrete and run-on techniques to unconstrained recognition. A very important problem that I addressed in this algorithm design and implementation was the handling of delayed strokes such as dots of "i" and "j" and the cross of "t," etc.

Another one of my very important contributions was the creation of predictive language models based on a highly compressed representation of chacater ngrams [20, 21] with extremely fast access, templates [22], predictive and postprocessing dictionaries [19], and many other aspects which mean the integration of these techniques with my advanced seach techniques.

This research has lead to many publications which have been cited considerably. In addition, it produced a few products, both at IBM and at Recognition Technologies, Inc. Since the handwriting recognition group at IBM Research was a sister department with the speech recognition group, the first 6 years of research I did were in conjunction with the speech recognition group and most of the algorithms were shared. In fact aside from the front-end and the analogy of characters in handwriting recognition to words in speech recognition, the rest was pretty much the same. I worked on all aspects of the problem and this was a great opportunity for me to get to understand the details of speech recognition as well, helping me to transit into the speech recognition group for the last few years I was at IBM.

A segment of online handwriting is an analogue of a frame in speech, but far less number of segments come up in a sentence in unconstrained handwriting recognition. This gave me the opportunity to get a better understanding and visualization of the search process than starting on the speech problem. Later, extending that experience to speech recognition helped me excel beyond other researchers who may have started directly in speech recognition.

This is yet another milestone in helping create my multi-disciplinary background.

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Neural Network Learning (1986 – Present)

One of the most important works that I presented was the tensor formulation of the problem of learning in general feedforward neural networks which enabled me to apply many different advanced nonlinear learning algorithms to learning in neural networks. This work was presented in many publications as well as my doctoral thesis [26]. This notation which I picked up from my background in mechanical engineering, namely the treatment of solid and fluid mechanics stress, strain, and energy equaations, makes the mathematical representation of the output of a neural network to its input, weights, and activation functions much more managable.

With this, I made break-throughs in highly efficient learning schemes using second order techniques in optimization for Feed-Forward Neural Network Systems, right at the onset of the subject, in fact just a year after Rumelhart's seminal paper on back-propagation. I produced serveral journal and conference papers in this field including **two IEEE Best Paper Awards** for two conference papers in the field [39, 40].

This work has been revived around 2005 and on, in the name of deep belief networks. Some of this work is using stochastic versions of well-known optimization techniqiues. My work, which were punlished in the 1990s, are now being reinvented for learning in deep believe networks. Examples were presented at the New York meeting in 2013 which were foreseeing the possibility of using nonlinear techniques for solving the multilayer neural network learning problem. However, I had published these and more complex techniques, in the 1990s, facilitated by my tensor-notation based formulation of the learning problem in multi-layered neural networks. [34, 35, 36, 37, 38, 39, 40, 41] Still many of these works have not been explored by researchers in the field, where they have already been published as part of my doctoral thesis in 1991 [26] and a few conference and journal papers, including the two that received the IEEE best paper awards listed above.

I have been working on extending the stochastic versions my learning theory for multi-layered neural networks, in order to produce much more efficient learning algorithms in deep belief networks (DBN). This work is quite useful in the training of our latest DBN-based (fused with HMM-based) speech recognition engine.

Another very important contribution to the field of neural network learning, which works well for deep belief networks is the better handling of local minima toward attaing a global direction. I handled this by creating a dynamic architecture [36] which helps reduce the chance of falling into local minima, while performing an optimaly conditioned quadratic optimization [36]. This done by adding new neurons while going through the optimization process. This adaptive architecture creates experts for part of the optimization problem as it builds the hidden layers.

Learning Adaptive Control (1986 – 2002)

I formulated, *for the first time*, learning-adaptive control [32, 33] strategies and provided solutions based on Optimization Methods [29, 26, 31], adaptive ideas [28, 30], and new parameter estimation schemes [31]. This was the first learning-adaptive control strategy ever devised. It became a major part of my doctoral thesis [26] and became a breakthrough in the field. This was especially important for manufaturing processes. In fact that is why I was invited as the guest editor of a special issue on learning and repetitive control [51].

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I also formulated a continuous learning-adaptive control system [28] with considerable improvement over existing techniques and theoretically sound control strategies based on my previous work on adaptive parameter estimation and optimization.

Another breakthrough came when for the first time, with the help of two colleagues, we extended my learning-adaptive control formulation the continuous space in the space of repetitions, using a Hilbert Space mapping [27, 30].

Pen-Based Music Editor (1995 – 1997)

I proposed the treatment of Online Common Music Notation using a Pen, while I was in the handwriting recognition group of IBM Research. This was in 1995 and was the beginning of a program called Adventurous Systems and Software Research (ASSR). The total grant allocation for the first year was $250,000 which was allotted to be distributed among 5 finalists coming from hundreds of proposals which were given from different parts of the research division of IBM. My project received $110,000 of the total and the rest ($140,000) was distributed among the next 4 winning projects.

In the first year, I was able to create a complete editor using pen gestures, capable of inputting music common notation (CMN). This lead to another $250,000 being allotted to my project in the second year. Unfortunately, since IBM decided to dissolve the online handwirting recognition group, the project was hybernated along with the rest of the handwirting recognition group. Sensing this, I had already moved to the speech group and had started working on speaker recognition.

This project is very close to my heart since I am also a musician. I have been spuriously approached by several individuals who had read an article about my project in the IBM Research Journal, written in 1996. They have shown interest in what I was doing. I believe I will try to revive that work if I get a chance.

Image Compression (1990 – 1991)

In September 1990, after defending my doctoral thesis, I was hired by the Center for Telecommunications Research for two different, but related subprojects. These were part of a project with the Library of Congress, designed to digitize and preserve works of art, at the library. Since the pieces of art were generally at museums, lossless images of them needed to be digitized and transmitted over the slow lines of 1990 to the library of congress to be preserved. This needed to be done for thousands if not millions of works of art. Speed was essential. In addition, this needed to be done on DOS with all its limitations including 640 MB RAM and lack of a windowing system.

The first thing I did was to create a lossless compression scheme based on hybrid Huffman coding which I designed so that it would be able to minimize errors due to transmission. The algorithm used multiple codebooks with the usual variable length Huffman code. The codeboos related to the different color bins available in the art piece. This was done for true-color TIFF files with 32-bit color depth. I finished the algorithm and its implementation before leaving for IBM Research in February of 1991.

In addition, I wrote drivers in C for ultra-fast rendering of the images on a super-VGA screen which had just come out. Native drivers did not exists for it or were very slow. I implemented the driver by painting the 4 levels in fragments of memory and then dumping the contents onto the screen, using proper interrupts, etc.

Signature Compression and Recognition (1991 – Present)

Some of the experience from the image compression research, with the later work on handwriting recognition provided a natural mindset of compressing signatures to fit on the back of credit and debit cards. The magnetic strip on the back of a credit card can hold 54 bytes of data. It is a natural process to expect saving the signature information in whole on the back of a credit card. Also, developing dynamic features [42, 52, 43] and segmentation for handwriting recognition provided the means for coding the dynamics of signatures into a stream of features. These features are naturally possess the shortest code-length for describing online handwriting. This is because the dynamic features, that I derived, were based on parameters of differentials equations approximating the segment of writing. Combining the two concepts, I was able to create a very aggressive compression algorithm [48] and apparatus [53] for describing all the dynamics and shape of a signature in less than 54 bytes, making it possible to store up to three dynamic signature templates on the magnetic strips on the back of credit or debit cards.

In addition, having these templates, I used statistical techniques similar to those used in speaker recognition to create useful signature verification and identification algorithms. This lead to the creation of another product at Recognition Technologies, Inc [54].

Kinematics (1984 – 1986)

My concentration in my masters program at the mechanical engineering department of Columbia University was Kinematics, Dynamics, and Control. One of the greatest researchers in the field of Kinematics, known as the father of Kinematics, the late Prof. Ferdinand Freudenstein taught me three courses in the course of this degree. After completing my masters degree I approached Prof. Freudenstein and asked whether he had any research projects for me. He came up with the task of generalizing the equation of motion for the kinematic analysis of different 4-bar linkages into one single general equation that would cover the different types of 4-bar linkages, namely, "Planar, Spherical, Skew, and a special case of planar known as the plane slider-crank." He said he was approached by the Journal of Mechanism and Machine Theory to provide original work as an invited paper for their anniversary edition. He asked whether I would be able to derive the equations and to program the equations of motions of each type of linkage with the new general equation as a comparison, before the deadline. I worked on the derivation and coding and produced my first paper [55], being a journal paper, with Prof. Freudenstein, a pleasure and a steep learning experience.

Image Processing for Fluid Mechanics Analysis (1984 – 1985)

Right at the beginning of my master program, I worked on digital image processing applied to fluid

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mechanics for the analysis of lubricants' behavior in zero gravity – An experiment conducted in conjunction with the first NASA Spacelab project – STS-9.

I designed and created a digitization platform using a sonic digitizer and wrote drivers for the digitizer in C, on an IBM PC platform. Digitized every frame of 24 frame-per-second film, taken of the spreading of fluids on different surfaces, with different viscosities, by the crew of the Columbia Shuttle in the Spacelab module. This data was used by Prof. Coda Pan to formulate the equations that describe the spreading characteristics of fluids on different smooth surfaces in zero gravity.

Doctoral Research Abstract (Jun. 1985 – Sep. 1990)

The problem of learning in general Feed-Forward Neural Networks has been formulated as a minimization problem. Several new algorithms have been developed for **learning in Feed-Forward Neural Networks** which are based on classical and modern **Quasi-Newton** minimization techniques. These methods achieve quadratic convergence by approximating the inverse of the Hessian of the objective function for neural network learning and thus providing Newton-like search directions. Benchmark simulation results have shown **two to three orders of magnitude improvement on the rate of learning** and **many orders of magnitude improvement in the accuracy** of these learning schemes when compared to the state-of-the-Art in Neural Network Learning which have previously been limited by steepest descent methods.

Due to the complexity of gradient evaluations even for a neural network of moderate size, learning algorithms requiring no gradient evaluations are called for. Learning algorithms have been developed based on **gradient-free** minimization **techniques**. These algorithms **require only the output of the network** to perform learning. Consequently, no analytical gradient expressions would have to be provided to the system, eliminating the need for a conventional computer to carry out the gradient evaluations. This makes the algorithms **independent of the architecture** of the neural network. As a result, negligible amount of computation and software/hardware is needed for learning. In addition, independence of the architecture implies that *if a neuron is damaged or a connection is severed, the learning could still be carried out to the full extent.* The result is **a more implementable network** which could *learn much more quickly and more independently.* Simulation results have shown a great reduction in the computation time and practicality of these algorithms.

The general **learning control of repetitive linear time-variant processes** (such as manufacturing processes) is formulated as a minimization problem. Many different minimization schemes have been evaluated for solving this problem. Finally, **a learning controller, which requires the theoretical minimum number of repetitions of the task for convergence**, has been developed **based on a Modified Generalized Secant method** of solving a set of linear equations. This controller has shown an **outstanding performance and robustness** when applied to the control of **nonlinear systems**. There is **no on-line computational burden** in the use of this controller.

Additionally, a **Recursive Learning Parameter Estimator** has been developed for usage in a **Learning Self-Tuning Regulator** applied to the *control of repetitive processes.* Simulation results show great improvement in the performance of conventional controllers when used with this

parameter estimator in the repetition domain. The on-line computational burden of this controller is only slightly higher than that of a PID controller.

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Standards Development

2003–2010 ***VoiceXML 3.0***

As an active liaison and driving force, helped define the speaker recognition functionality of VoiceXML 3.0.

2003–2010 ***Standard Audio Format Encapsulation (SAFE)***

Personally defined a new standard for audio format encapsulation (SAFE) which has been used by several standards committes for handling interoperability among government organizations and the private industry. This format (SAFE) was adopted by ANSI/INCITS and ISO without any modification.

ANSI/INCITS

As an active liaison and driving force of the ANSI/INCITS Standards Development for Biometric Formats, proposed SAFE to be considered as an ANSI standard. It was presented and underwent a public review. It has been incorporated into an American National Standard Institute (ANSI) standard for audio format of raw data interchange for use in speaker recognition without any opposition.

ISO

As an active liaison for the U.S. delegation of the International Organization for Standardisation (ISO), proposed SAFE to the committe. The SAFE proposal has been incorporated in the speaker recognition data interchange draft standards by the ISO/IEC JTC1/SC37 project 19794-13 (voice data).

1996–1999 ***Speaker Verification Application Programming Interface (SVAPI)***

Helped define and test SVAPI 1.0 and 2.0 as an active member and driving force representing IBM Research in the SVAPI consortium including IBM, Novell, Dialogic, ITT Industries, Motorola, Texas Instruments, T-NETIX Inc. and some U.S. Government organizations.

1996 – 1997 *SVAPI 1.0* Definition and Implementation

Implemented the SVAPI 1.0 standrd interface for the IBM Speaker Verification engine and identified missing functionality to be included in version 2.0.

1997 – 1999 *SVAPI 2.0* Definition and Implementation

Worked to define and implement the new functionality need to do identificaion and classification.

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Course Evaluation

2023

Detailed Statistics and Comments: Next 2 pages

Summary

Spring: Fundamentals of Speech Recognition (E6998)

Instructor Overall Quality Interpolated Median: 4.5/5.0

Students' Comments:

- Very committed to the course and his students. Reply email in minutes. Answers sudents' questions for hours.

Columbia University: School of Engineering
Spring 2023 SEAS Final Evaluation

Course: COMSE6998_004_2023_1 - TOPICS IN COMPUTER SCIENCE
Instructor: Homayoon Beigi *
TA: Sourya Kakarla
Response Rate: 4/10 (40.00 %)

6 - Instructor: Organization and Preparation

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		4.25
Fair	(2)	0	0.00%		
Good	(3)	1	25.00%		
Very Good	(4)	1	25.00%		
Excellent	(5)	2	50.00%		
				0 25 50 100	Question

Response Rate	Mean	STD	Median
4/10 (40.00%)	4.25	0.96	4.50

7 - Instructor: Classroom Delivery

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		3.75
Fair	(2)	1	25.00%		
Good	(3)	1	25.00%		
Very Good	(4)	0	0.00%		
Excellent	(5)	2	50.00%		
				0 25 50 100	Question

Response Rate	Mean	STD	Median
4/10 (40.00%)	3.75	1.50	4.00

8 - Instructor: Approachability

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		4.75
Fair	(2)	0	0.00%		
Good	(3)	0	0.00%		
Very Good	(4)	1	25.00%		
Excellent	(5)	3	75.00%		
				0 25 50 100	Question

Response Rate	Mean	STD	Median
4/10 (40.00%)	4.75	0.50	5.00

9 - Instructor: Overall Quality

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		4.25
Fair	(2)	0	0.00%		
Good	(3)	1	25.00%		
Very Good	(4)	1	25.00%		
Excellent	(5)	2	50.00%		
				0 25 50 100	Question

Response Rate	Mean	STD	Median
4/10 (40.00%)	4.25	0.96	4.50

Columbia University: School of Engineering
Spring 2023 SEAS Final Evaluation

Course: COMSE6998_004_2023_1 - TOPICS IN COMPUTER SCIENCE
Instructor: Homayoon Beigi *
TA: Sourya Kakarla
Response Rate: 4/10 (40.00 %)

10 - Would you nominate this professor for the SEAS Distinguished Faculty Award?

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Yes	(1)	2	66.67%		1.33
No	(2)	1	33.33%		

0 25 50 100 Question

Response Rate	Mean	STD	Median
3/10 (30.00%)	1.33	0.58	1.00

11 - If so, please explain why

Homayoon Beigi

Response Rate	1/10 (10%)

• Very committed to the course and his students. Reply email in minutes. Answer students' questions for hours.

12 - Overall Quality

Sourya Kakarla

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		4.25
Fair	(2)	0	0.00%		
Good	(3)	1	25.00%		
Very Good	(4)	1	25.00%		
Excellent	(5)	2	50.00%		

0 25 50 100 Question

Response Rate	Mean	STD	Median
4/10 (40.00%)	4.25	0.96	4.50

13 - Knowledgeability

Sourya Kakarla

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		4.25
Fair	(2)	0	0.00%		
Good	(3)	1	25.00%		
Very Good	(4)	1	25.00%		
Excellent	(5)	2	50.00%		

0 25 50 100 Question

Response Rate	Mean	STD	Median
4/10 (40.00%)	4.25	0.96	4.50

14 - Approachability

Sourya Kakarla

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		4.75
Fair	(2)	0	0.00%		
Good	(3)	0	0.00%		
Very Good	(4)	1	25.00%		
Excellent	(5)	3	75.00%		

0 25 50 100 Question

Response Rate	Mean	STD	Median
4/10 (40.00%)	4.75	0.50	5.00

Course Evaluation

2022

Detailed Statistics and Comments: Next page

Summary

Fall: Mathematics of Machine Learning and Signal Recognition (W4995)

Instructor Overall Quality Interpolated Median: 4.0/5.0

Students' Comments:

- Prof. is extremely knowledgeable, approachable and takes efforts to explain complex things in an easy way!

- Goes beyond the call of duty to inculcate complex mathematical concepts in class. I believe this will be responsible for many future careers' growth

- Incredible! A bit intense but his intellectual curiosity and brilliance is quite something, he has quite the story. I would love to keep in touch with him in future!

Columbia University: School of Engineering
Fall 2022 SEAS Final Evaluation

Course: COMSW4995_020_2022_3 - TOPICS IN COMPUTER SCIENCE
Instructor: Homayoon Beigi *
TA: Gaurav Sinha
Response Rate: 9/19 (47.37 %)

8 - Instructor: Approachability

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	1	11.11%		4.11
Fair	(2)	0	0.00%		
Good	(3)	1	11.11%		
Very Good	(4)	2	22.22%		
Excellent	(5)	5	55.56%		

0 25 50 100 Question

Response Rate	Mean	STD	Median
9/19 (47.37%)	4.11	1.36	5.00

9 - Instructor: Overall Quality

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	2	22.22%		3.56
Fair	(2)	1	11.11%		
Good	(3)	0	0.00%		
Very Good	(4)	2	22.22%		
Excellent	(5)	4	44.44%		

0 25 50 100 Question

Response Rate	Mean	STD	Median
9/19 (47.37%)	3.56	1.74	4.00

10 - Would you nominate this professor for the SEAS Distinguished Faculty Award?

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Yes	(1)	4	44.44%		1.56
No	(2)	5	55.56%		

0 25 50 100 Question

Response Rate	Mean	STD	Median
9/19 (47.37%)	1.56	0.53	2.00

11 - If so, please explain why

Homayoon Beigi

Response Rate	3/19 (15.79%)

- Prof. is extremely knowledgeable, approachable and takes efforts to explain complex things in an easy way!
- Goes beyond the call of duty to inculcate complex mathematical concepts in class. I believe this will be responsible for many future careers' growth
- Incredible! A bit intense but his intellectual curiosity and brilliance is quite something, he has quite the story. I would love to keep in touch with him in future!

Course Evaluation

2021

Detailed Statistics and Comments: Next page

Summary

Fall: Fundamentals of Speech Recognition (E6998)

Instructor Overall Quality Interpolated Median: 5.0/5.0

Students' Comments:

- Professor Beigi is really knowledgable about the subject of speech recognition and explains concepts in a very ground-up way, where he tries to cover everything necessary to understand a topic. Classes are quite comprehensive but he tries to break the topics down into chunks taht are the most important for us to learn. He also makes himself very available to his students, helping them with research project ideas and technical help.

- Beigi is a highly responsible and kind teacher.

Columbia University: School of Engineering
Fall 2021 SEAS Final Evaluation

Course: COMSE6998_011_2021_3 - TOPICS IN COMPUTER SCIENCE
Instructor: Homayoon Beigi *
TA: Tarang Jain,Yogesh Patodia,Gokul Srinivasan
Response Rate: 17/42 (40.48 %)

9 - Instructor: Overall Quality

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	1	5.88%		4.18
Fair	(2)	1	5.88%		
Good	(3)	1	5.88%		
Very Good	(4)	5	29.41%		
Excellent	(5)	9	52.94%		
				0 25 50 100	Instructor

Response Rate	Mean	STD	Median
17/42 (40.48%)	4.18	1.19	5.00

10 - Would you nominate this professor for the SEAS Distinguished Faculty Award?

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Yes	(1)	6	46.15%		1.54
No	(2)	7	53.85%		
				0 25 50 100	Instructor

Response Rate	Mean	STD	Median
13/42 (30.95%)	1.54	0.52	2.00

11 - If so, please explain why

Homayoon Beigi

Response Rate	2/42 (4.76%)

- Professor Beigi is really knowledgable about the subject of speech recognition and explains concepts in a very ground-up way, where he tries to cover everything necessary to understand a topic. Classes are quite comprehensive but he tries to break the topics down into chunks that are the most important for us to learn. He also makes himself very available to his students, helping them with research project ideas and technical help.
- Beigi is a highly responsible and kind teacher.

12 - Overall Quality

Gokul Srinivasan

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		4.00
Fair	(2)	0	0.00%		
Good	(3)	3	37.50%		
Very Good	(4)	2	25.00%		
Excellent	(5)	3	37.50%		
				0 25 50 100	TA

Response Rate	Mean	STD	Median
8/42 (19.05%)	4.00	0.93	4.00

Course Evaluation

2020

Detailed Statistics and Comments: Next 4 pages

Spring: Applied Signal Recognition (E6620)

Instructor Overall Quality Interpolated Median: 5.0/5.0

Students' Comments:

- Great!!!

Fall: Fundamentals of Speech Recognition (E6998)

Instructor Overall Quality Interpolated Median: 5.0/5.0

Students' Comments:

- One of the best professors I've had at SEAS (both undergrad and grad), extremely deep subject knowledge, Prof. Beigi is so approachable and genuinely wants the best for his students.

- Professor Beigi is an exceptional character and very knowledgeable in his field. His aim is to make sure each student is successful and understand the concept being taught. I would recommend him for any outstanding awards.

- Kind man, quick response to every question, always willing to help students

Exhibit 1003
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Columbia University: School of Engineering
Spring 2020 SEAS Midterm Evaluation

Course: MECEE6620_001_2020_1-APPLIEDSIGNALRECOGNITION: MECEE6620_001_2020_1 - APPLIED SIGNAL RECOGNITION

Instructor: Homayoon Beigi *

Response Rate: 3/6 (50.00 %)

1 - Instructor: Organization and Preparation

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		5.00
Fair	(2)	0	0.00%		
Good	(3)	0	0.00%		
Very Good	(4)	0	0.00%		
Excellent	(5)	3	100.00%		
				0 25 50 100	Question

Response Rate	Mean	STD	Median
3/6 (50.00%)	5.00	0.00	5.00

2 - Instructor: Classroom Delivery

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		5.00
Fair	(2)	0	0.00%		
Good	(3)	0	0.00%		
Very Good	(4)	0	0.00%		
Excellent	(5)	3	100.00%		
				0 25 50 100	Question

Response Rate	Mean	STD	Median
3/6 (50.00%)	5.00	0.00	5.00

3 - Instructor: Approachability

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		5.00
Fair	(2)	0	0.00%		
Good	(3)	0	0.00%		
Very Good	(4)	0	0.00%		
Excellent	(5)	3	100.00%		
				0 25 50 100	Question

Response Rate	Mean	STD	Median
3/6 (50.00%)	5.00	0.00	5.00

4 - Instructor: Overall Quality

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		5.00
Fair	(2)	0	0.00%		
Good	(3)	0	0.00%		
Very Good	(4)	0	0.00%		
Excellent	(5)	3	100.00%		
				0 25 50 100	Question

Response Rate	Mean	STD	Median
3/6 (50.00%)	5.00	0.00	5.00

Columbia University: School of Engineering
Spring 2020 SEAS Midterm Evaluation

Course: MECEE6620_001_2020_1-APPLIEDSIGNALRECOGNITION: MECEE6620_001_2020_1 - APPLIED SIGNAL RECOGNITION

Instructor: Homayoon Beigi *

Response Rate: 3/6 (50.00 %)

5 - Course: Amount Learned

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		5.00
Fair	(2)	0	0.00%		
Good	(3)	0	0.00%		
Very Good	(4)	0	0.00%		
Excellent	(5)	3	100.00%		
				0 25 50 100	Question

Response Rate	Mean	STD	Median
3/6 (50.00%)	5.00	0.00	5.00

6 - Course: Appropriateness of Workload

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		5.00
Fair	(2)	0	0.00%		
Good	(3)	0	0.00%		
Very Good	(4)	0	0.00%		
Excellent	(5)	3	100.00%		
				0 25 50 100	Question

Response Rate	Mean	STD	Median
3/6 (50.00%)	5.00	0.00	5.00

7 - Course: Fairness of Grading Process

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		5.00
Fair	(2)	0	0.00%		
Good	(3)	0	0.00%		
Very Good	(4)	0	0.00%		
Excellent	(5)	3	100.00%		
				0 25 50 100	Question

Response Rate	Mean	STD	Median
3/6 (50.00%)	5.00	0.00	5.00

8 - Course: Overall Quality

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		5.00
Fair	(2)	0	0.00%		
Good	(3)	0	0.00%		
Very Good	(4)	0	0.00%		
Excellent	(5)	3	100.00%		
				0 25 50 100	Question

Response Rate	Mean	STD	Median
3/6 (50.00%)	5.00	0.00	5.00

9 - Enter any additional comments here

Response Rate	1/6 (16.67%)

- Great!!!

Columbia University: School of Engineering
Fall 2020 SEAS Final Evaluation

Course: COMSE6998_012_2020_3 - TOPICS IN COMPUTER SCIENCE
Instructor: Homayoon Beigi *
TA: Adaeze Adigwe,Zheng Yao
Response Rate: 16/36 (44.44 %)

6 - Instructor: Organization and Preparation

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		4.38
Fair	(2)	0	0.00%		
Good	(3)	2	12.50%		
Very Good	(4)	6	37.50%		
Excellent	(5)	8	50.00%		
				0 25 50 100	Instructor

Response Rate	Mean	STD	Median
16/36 (44.44%)	4.38	0.72	4.50

7 - Instructor: Classroom Delivery

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		4.25
Fair	(2)	2	12.50%		
Good	(3)	1	6.25%		
Very Good	(4)	4	25.00%		
Excellent	(5)	9	56.25%		
				0 25 50 100	Instructor

Response Rate	Mean	STD	Median
16/36 (44.44%)	4.25	1.06	5.00

8 - Instructor: Approachability

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		4.75
Fair	(2)	0	0.00%		
Good	(3)	0	0.00%		
Very Good	(4)	4	25.00%		
Excellent	(5)	12	75.00%		
				0 25 50 100	Instructor

Response Rate	Mean	STD	Median
16/36 (44.44%)	4.75	0.45	5.00

9 - Instructor: Overall Quality

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		4.31
Fair	(2)	0	0.00%		
Good	(3)	4	25.00%		
Very Good	(4)	3	18.75%		
Excellent	(5)	9	56.25%		
				0 25 50 100	Instructor

Response Rate	Mean	STD	Median
16/36 (44.44%)	4.31	0.87	5.00

Columbia University: School of Engineering
Fall 2020 SEAS Final Evaluation

Course: COMSE6998_012_2020_3 - TOPICS IN COMPUTER SCIENCE
Instructor: Homayoon Beigi *
TA: Adaeze Adigwe,Zheng Yao
Response Rate: 16/36 (44.44 %)

10 - Would you nominate this professor for the SEAS Distinguished Faculty Award?

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Yes	(1)	9	60.00%		1.40
No	(2)	6	40.00%		

0 25 50 100 — Instructor

Response Rate	Mean	STD	Median
15/36 (41.67%)	1.40	0.51	1.00

11 - If so, please explain why

Homayoon Beigi

Response Rate	4/36 (11.11%)

- Very approachable and knowledgeable
- One of the best professors I've had at SEAS (both undergrad and grad), extremely deep subject knowledge, Prof. Beigi is so approachable and genuinely wants the best for his students.
- Professor Beigi is an exceptional character and very knowledgeable in his field. His aim is to make sure each student is successful and understand the concept being taught. I would recommend him for any outstanding awards.
- Kind man, quick response to every question, always willing to help students

12 - Overall Quality

Adaeze Adigwe

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		4.33
Fair	(2)	0	0.00%		
Good	(3)	1	11.11%		
Very Good	(4)	4	44.44%		
Excellent	(5)	4	44.44%		

0 25 50 100 — TA

Response Rate	Mean	STD	Median
9/36 (25.00%)	4.33	0.71	4.00

12 - Overall Quality

Zheng Yao

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		4.23
Fair	(2)	1	7.69%		
Good	(3)	2	15.38%		
Very Good	(4)	3	23.08%		
Excellent	(5)	7	53.85%		

0 25 50 100 — TA

Response Rate	Mean	STD	Median
13/36 (36.11%)	4.23	1.01	5.00

Course Evaluation

2019

Detailed Statistics and Comments: Next 5 pages

Summary

Spring: Digital control Systems (E4601)

Instructor Overall Quality Interpolated Median: 4.0/5.0

Students' Comments:

- Professor Beigi is knowledgable; his lecture and book cover everything in detail. I learned a lot in this course.

Applied Signal Recognition (E6620)

Instructor Overall Quality Interpolated Median: 4.0/5.0

Students' Comments:

- Prof. Beigi is super knowledgeable. He teaches the course with passion & genuinely cares about advancing knowledge of students. He also solves my questions at any time.

Fall: Fundamentals of Speech Recognition (E6998)

Instructor Overall Quality Interpolated Median: 5.0/5.0

Students' Comments:

- Superb lectures, professor solves doubts on Piazza within hours.

- He's very helpful and always answers questions very quickly even over emails.

- Professor Beigi is extremely helpful and patient. His course delivery is clear and well-paced, and the project is a lot of fun.

- Very friendly, knowledegable walking wikipedia. Quite active in Piazza.

- Very Passionate about the subject and an excellent teacher.

- Prof. Beigi is very Approachable, helpful, and is a walking encyclopedia of knowledge. My biggest complaint is he lectures too long, extending class. But I think that is overall a positive.

- Prof Beigi is one of a kind. Very very passionate about the field! I absolutely enjoyed learning from from him this semester. Wouldn't mind taking the class again!

Columbia University: School of Engineering
Spring 2019 SEAS Final Evaluation

Course: EEMEE4601_001_2019_1 - DIGITAL CONTROL SYSTEMS
Instructor: Homayoon Beigi *
TA: Ayman Ismail,Haeyeon Jang
Response Rate: 22/31 (70.97 %)

6 - Instructor: Organization and Preparation

Homayoon Beigi

Response Option	Weight	Frequency	Percent
Poor	(1)	0	0.00%
Fair	(2)	1	4.55%
Good	(3)	4	18.18%
Very Good	(4)	7	31.82%
Excellent	(5)	10	45.45%

Percent Responses: 0 25 50 100

Means: 4.18 — Instructor

Response Rate	Mean	STD	Median
22/31 (70.97%)	4.18	0.91	4.00

7 - Instructor: Classroom Delivery

Homayoon Beigi

Response Option	Weight	Frequency	Percent
Poor	(1)	1	4.55%
Fair	(2)	0	0.00%
Good	(3)	6	27.27%
Very Good	(4)	5	22.73%
Excellent	(5)	10	45.45%

Percent Responses: 0 25 50 100

Means: 4.05 — Instructor

Response Rate	Mean	STD	Median
22/31 (70.97%)	4.05	1.09	4.00

8 - Instructor: Approachability

Homayoon Beigi

Response Option	Weight	Frequency	Percent
Poor	(1)	0	0.00%
Fair	(2)	1	4.55%
Good	(3)	6	27.27%
Very Good	(4)	5	22.73%
Excellent	(5)	10	45.45%

Percent Responses: 0 25 50 100

Means: 4.09 — Instructor

Response Rate	Mean	STD	Median
22/31 (70.97%)	4.09	0.97	4.00

9 - Instructor: Overall Quality

Homayoon Beigi

Response Option	Weight	Frequency	Percent
Poor	(1)	1	4.55%
Fair	(2)	0	0.00%
Good	(3)	6	27.27%
Very Good	(4)	5	22.73%
Excellent	(5)	10	45.45%

Percent Responses: 0 25 50 100

Means: 4.05 — Instructor

Response Rate	Mean	STD	Median
22/31 (70.97%)	4.05	1.09	4.00

Columbia University: School of Engineering
Spring 2019 SEAS Final Evaluation

Course: EEMEE4601_001_2019_1 - DIGITAL CONTROL SYSTEMS
Instructor: Homayoon Beigi *
TA: Ayman Ismail,Haeyeon Jang
Response Rate: 22/31 (70.97 %)

10 - Would you nominate this professor for the SEAS Distinguished Faculty Award?

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Yes	(1)	10	55.56%		1.44
No	(2)	8	44.44%		
				0 25 50 100	Instructor

Response Rate	Mean	STD	Median
18/31 (58.06%)	1.44	0.51	1.00

11 - If so, please explain why

Homayoon Beigi

Response Rate	1/31 (3.23%)

- Professor Beigi is knowledgable; his lecture and book cover everything in detail. I learned a lot in this course.

12 - Overall Quality

Ayman Ismail

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		4.06
Fair	(2)	1	5.56%		
Good	(3)	4	22.22%		
Very Good	(4)	6	33.33%		
Excellent	(5)	7	38.89%		
				0 25 50 100	TA

Response Rate	Mean	STD	Median
18/31 (58.06%)	4.06	0.94	4.00

12 - Overall Quality

Haeyeon Jang

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		4.36
Fair	(2)	1	9.09%		
Good	(3)	1	9.09%		
Very Good	(4)	2	18.18%		
Excellent	(5)	7	63.64%		
				0 25 50 100	TA

Response Rate	Mean	STD	Median
11/31 (35.48%)	4.36	1.03	5.00

12 - Overall Quality

Ayman Ismail, Haeyeon Jang

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		4.17
Fair	(2)	2	6.90%		
Good	(3)	5	17.24%		
Very Good	(4)	8	27.59%		
Excellent	(5)	14	48.28%		
				0 25 50 100	TA

Response Rate	Mean	STD	Median
	4.17	0.97	4.00

Columbia University: School of Engineering
Spring 2019 SEAS Final Evaluation

Course: MECEE6620_001_2019_1 - APPLIED SIGNAL RECOGNITION
Instructor: Homayoon Beigi *
Response Rate: 4/7 (57.14 %)

6 - Instructor: Organization and Preparation

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		
Fair	(2)	1	25.00%		3.75
Good	(3)	1	25.00%		
Very Good	(4)	0	0.00%		
Excellent	(5)	2	50.00%		
				0 25 50 100	Question

Response Rate	Mean	STD	Median
4/7 (57.14%)	3.75	1.50	4.00

7 - Instructor: Classroom Delivery

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		
Fair	(2)	1	25.00%		3.75
Good	(3)	1	25.00%		
Very Good	(4)	0	0.00%		
Excellent	(5)	2	50.00%		
				0 25 50 100	Question

Response Rate	Mean	STD	Median
4/7 (57.14%)	3.75	1.50	4.00

8 - Instructor: Approachability

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		
Fair	(2)	0	0.00%		4.25
Good	(3)	1	25.00%		
Very Good	(4)	1	25.00%		
Excellent	(5)	2	50.00%		
				0 25 50 100	Question

Response Rate	Mean	STD	Median
4/7 (57.14%)	4.25	0.96	4.50

9 - Instructor: Overall Quality

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		
Fair	(2)	0	0.00%		4.00
Good	(3)	2	50.00%		
Very Good	(4)	0	0.00%		
Excellent	(5)	2	50.00%		
				0 25 50 100	Question

Response Rate	Mean	STD	Median
4/7 (57.14%)	4.00	1.15	4.00

Columbia University: School of Engineering
Spring 2019 SEAS Final Evaluation

Course: MECEE6620_001_2019_1 - APPLIED SIGNAL RECOGNITION
Instructor: Homayoon Beigi *
Response Rate: 4/7 (57.14 %)

10 - Would you nominate this professor for the SEAS Distinguished Faculty Award?

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Yes	(1)	2	50.00%		1.50
No	(2)	2	50.00%		
				0 25 50 100	Question

Response Rate	Mean	STD	Median
4/7 (57.14%)	1.50	0.58	1.50

11 - If so, please explain why

Homayoon Beigi

Response Rate	1/7 (14.29%)

• Prof. Beigi is super knowledgeable. He teaches the course with passion & genuinely cares about advancing the knowledge of students. He also solves my questions at any time.

12 - Overall Quality

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		
Fair	(2)	0	0.00%		
Good	(3)	0	0.00%		
Very Good	(4)	0	0.00%		
Excellent	(5)	0	0.00%		0.00
				0 25 50 100	Question

Response Rate	Mean	STD	Median
0/7 (0.00%)	0.00	0.00	0.00

13 - Knowledgeability

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		
Fair	(2)	0	0.00%		
Good	(3)	0	0.00%		
Very Good	(4)	0	0.00%		
Excellent	(5)	0	0.00%		0.00
				0 25 50 100	Question

Response Rate	Mean	STD	Median
0/7 (0.00%)	0.00	0.00	0.00

14 - Approachability

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	0	0.00%		
Fair	(2)	0	0.00%		
Good	(3)	0	0.00%		
Very Good	(4)	0	0.00%		
Excellent	(5)	0	0.00%		0.00
				0 25 50 100	Question

Response Rate	Mean	STD	Median
0/7 (0.00%)	0.00	0.00	0.00

Columbia University: School of Engineering
Fall 2019 SEAS Final Evaluation

Course: COMSE6998_007_2019_3 - TOPICS IN COMPUTER SCIENCE
Instructor: Homayoon Beigi *
TA: Luv Aggarwal,Saurav Dhakad,Avijit Shah
Response Rate: 20/40 (50.00 %)

9 - Instructor: Overall Quality

Homayoon Beigi

Response Option	Weight	Frequency	Percent
Poor	(1)	0	0.00%
Fair	(2)	1	5.00%
Good	(3)	3	15.00%
Very Good	(4)	5	25.00%
Excellent	(5)	11	55.00%

Percent Responses: 0 25 50 100

Means: 4.30 — Instructor

Response Rate	Mean	STD	Median
20/40 (50.00%)	4.30	0.92	5.00

10 - Would you nominate this professor for the SEAS Distinguished Faculty Award?

Homayoon Beigi

Response Option	Weight	Frequency	Percent
Yes	(1)	11	64.71%
No	(2)	6	35.29%

Percent Responses: 0 25 50 100

Means: 1.35 — Instructor

Response Rate	Mean	STD	Median
17/40 (42.50%)	1.35	0.49	1.00

11 - If so, please explain why

Homayoon Beigi

Response Rate	7/40 (17.5%)

- Superb lectures, professor solves doubts on Piazza within hours.
- He's very helpful and always answers questions very quickly even over emails.
- Professor Beigi is extremely helpful and patient. His course delivery is clear and well-paced, and the project is a lot of fun.
- Very friendly, knowledgeable walking wikipedia. Quite active in Piazza
- Very passionate about the subject and an excellent teacher.
- Prof. Beigi is very approachable, helpful, and is a walking encyclopedia of knowledge. My biggest complaint is he lectures too long, extending class. But I think that is overall a positive.
- Prof Beigi is one of a kind. Very very passionate about the field! I absolutely enjoyed learning from from him this semester. Wouldn't mind taking the class again!

12 - Overall Quality

Avijit Shah

Response Option	Weight	Frequency	Percent
Poor	(1)	0	0.00%
Fair	(2)	1	8.33%
Good	(3)	5	41.67%
Very Good	(4)	2	16.67%
Excellent	(5)	4	33.33%

Percent Responses: 0 25 50 100

Means: 3.75 — TA

Response Rate	Mean	STD	Median
12/40 (30.00%)	3.75	1.06	3.50

Course Evaluation

2018

Detailed Statistics and Comments: Next page

Summary

Fall: Fundamentals of Speech Recognition (E6998)

Instructor Overall Quality Interpolated Median: 4.0/5.0

Students' Comments:

- The teacher is very kind and knowledgable

- He was always ardent to deliver his knowledge to us.

- He has amazing pool of knowledge

- is fantastic for teaching and always motives me to pursue a higher level of machine leaning knowledge.

Columbia University: School of Engineering
Fall 2018 SEAS Final Evaluation

Course: Speech-COMSE6998_003_2018_3 - TOPICS IN COMPUTER SCIENCE
Instructor: Homayoon Beigi *
TA: Sidhi Adkoli,Rajath Kumar Mysore Pradeep Kumar
Response Rate: 24/37 (64.86 %)

9 - Instructor: Overall Quality

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Poor	(1)	1	4.17%		3.88
Fair	(2)	2	8.33%		
Good	(3)	4	16.67%		
Very Good	(4)	9	37.50%		
Excellent	(5)	8	33.33%		
				0 25 50 100	Question

Response Rate	Mean	STD	Median
24/37 (64.86%)	3.88	1.12	4.00

10 - Would you nominate this professor for the SEAS Distinguished Faculty Award?

Homayoon Beigi

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Yes	(1)	8	36.36%		1.64
No	(2)	14	63.64%		
				0 25 50 100	Question

Response Rate	Mean	STD	Median
22/37 (59.46%)	1.64	0.49	2.00

11 - If so, please explain why

Homayoon Beigi

Response Rate	4/37 (10.81%)

- The teacher is very kind and knowledgable
- He was always ardent to deliver his knowledge to us.
- He has amazing pool of knowledge.
- is fantastic for teaching and always motives me to pursue a higher level of machine learning knowledge.

Course Evaluation

2017

Detailed Statistics and Comments: Next 2 pages

Summary

Fall: Fundamentals of Speech Recognition (E6998)

Instructor Overall Quality Interpolated Median: 4.77/5.0

Students' Comments:
NONE

COURSEWORKS@COLUMBIA **Program Evaluation System**

Title: **Fall 2017 SEAS Midterm Evaluation** Dates: **10/09/2017 - 10/16/2017**

Course: **COMSE6998_007_2017_3 / FUND SPEECH RECOGNITION** Responses**: 16/32 - 50.00%**

Instructors: **Homayoon Beigi** Number of Participants: **32**

Enrollment of All Students: **32**

Instructor Graph Report for: **Homayoon Beigi**

1 **Instructor: Organization and Preparation** **N=16**

1	Poor	**0** (0%)
2	Fair	**0** (0%)
3	Good	**1** (6%)
4	Very Good	**5** (31%)
5	Excellent	**10** (63%)

Median **5** Interpolated Median **4.70** Mean **4.56** Std Dev **0.63**

2 **Instructor: Classroom Delivery** **N=16**

1	Poor	**0** (0%)
2	Fair	**1** (6%)
3	Good	**2** (13%)
4	Very Good	**4** (25%)
5	Excellent	**9** (56%)

Median **5** Interpolated Median **4.61** Mean **4.31** Std Dev **0.95**

3 **Instructor: Approachability** **N=16**

1	Poor	**0** (0%)
2	Fair	**0** (0%)
3	Good	**0** (0%)
4	Very Good	**1** (6%)
5	Excellent	**15** (94%)

Median **5** Interpolated Median **4.97** Mean **4.94** Std Dev **0.25**

4 **Instructor: Overall Quality** **N=16**

1	Poor	**0** (0%)
2	Fair	**0** (0%)
3	Good	**1** (6%)
4	Very Good	**4** (25%)
5	Excellent	**11** (69%)

Median **5** Interpolated Median **4.77** Mean **4.63** Std Dev **0.62**

COURSEWORKS@COLUMBIA

Program Evaluation System

Title: **Fall 2017 SEAS Midterm Evaluation**
Course: **COMSE6998_007_2017_3 / FUND SPEECH RECOGNITION**
Instructors: **Homayoon Beigi**

Dates: **10/09/2017** - **10/16/2017**
Responses: **16/32 - 50.00%**
Number of Participants: **32**
Enrollment of All Students: **32**

Instructor Concise Report for: **Homayoon Beigi**

	Poor	Fair	Good	Very Good	Excellent	# of Responses	Median IMedian	Mean St.Dev
1 Instructor: Organization and Preparation	0 0%	0 0%	1 6%	5 31%	10 63%	16	5 4.70	4.56 0.63
2 Instructor: Classroom Delivery	0 0%	1 6%	2 13%	4 25%	9 56%	16	5 4.61	4.31 0.95
3 Instructor: Approachability	0 0%	0 0%	0 0%	1 6%	15 94%	16	5 4.97	4.94 0.25
4 Instructor: Overall Quality	0 0%	0 0%	1 6%	4 25%	11 69%	16	5 4.77	4.63 0.62
							5 **4.79**	**4.61** **0.68**

Course Evaluation

2016

Detailed Statistics and Comments: Next 2 pages

Summary

Fall: Fundamentals of Speech Recognition (E6998)

Instructor Overall Quality Interpolated Median: 4.5/5.0

Students' Comments:

- Knows the material like it's his life (which it is)

- Prof. Beigi personally tends to students and is very organized and well-read.

- Very responsible professor. Taught us a lot of detailed stuff about speech recognition.

COURSEWORKS@COLUMBIA **Program Evaluation System**

Title: **Fall 2016 COMS Final Evaluation** Dates: **12/05/2016 - 12/12/2016**

Course: **COMSE6998_004_2016_3 / FUND SPEECH RECOGNITION** Responses**: 10/25 - 40.00%**

Instructors: **Homayoon Beigi** Number of Participants: **25**

Enrollment of All Students: **25**

Instructor Graph Report for: **Homayoon Beigi**

1 **Instructor: Organization and Preparation** **N=10**

1	Poor	**0** (0%)
2	Fair	**0** (0%)
3	Good	**1** (10%)
4	Very Good	**2** (20%)
5	Excellent	**7** (70%)

Median **5** Interpolated Median **4.79** Mean **4.60** Std Dev **0.70**

2 **Instructor: Classroom Delivery** **N=10**

1	Poor	**0** (0%)
2	Fair	**1** (10%)
3	Good	**0** (0%)
4	Very Good	**3** (30%)
5	Excellent	**6** (60%)

Median **5** Interpolated Median **4.67** Mean **4.40** Std Dev **0.97**

3 **Instructor: Approachability** **N=10**

1	Poor	**0** (0%)
2	Fair	**0** (0%)
3	Good	**0** (0%)
4	Very Good	**1** (10%)
5	Excellent	**9** (90%)

Median **5** Interpolated Median **4.94** Mean **4.90** Std Dev **0.32**

4 **Instructor: Overall Quality** **N=10**

1	Poor	**0** (0%)
2	Fair	**1** (10%)
3	Good	**1** (10%)
4	Very Good	**3** (30%)
5	Excellent	**5** (50%)

Median **4.5** Interpolated Median **4.50** Mean **4.20** Std Dev **1.03**

5 **Would you nominate this professor for the SEAS Distinguished Faculty Award?** **N=10**

1	Yes	**3** (30%)
2	No	**7** (70%)

Median **2** Interpolated Median **1.79**

Title: **Fall 2016 COMS Final Evaluation**
Course: **COMSE6998_004_2016_3 / FUND SPEECH RECOGNITION**
Instructors: **Homayoon Beigi**

Dates: **12/05/2016 - 12/12/2016**
Responses**: 10/25 - 40.00%**
Enrollment of Registered Students:**25**
Enrollment of All Students:**25**

Instructor Comments Report for: **Homayoon Beigi**

Q1 **If so, please explain why**

- Knows the material like it's his life (which it is)
- Prof. Beigi personally tends to students and is very organized and well-read.
- Very responsible professor. Taught us a lot of detailed stuff about speech recognition.

Course Evaluation

2015

Detailed Statistics and Comments: Next 2 pages

Summary

Fall: Fundamentals of Speech Recognition (E6998)

Instructor Overall Quality Interpolated Median: 4.5/5.0

Students' Comments:

- This is a speech recognition class, however, the professor is good at covering material(if you have enough pre-requisites). For example, when he talked about Machine Learning methods, I think he did a better job than the professor from my ML course.

- Even though there were too much material to cover for one semester, his textbook was very comprehensive. I would like to honor his effort for the book.

- Pretty helpful to students and our projects.

- Professor Beigi is an excellent professor. He cares about the students and teaches the material passionately. I would have to say this is one of the best classes I have taken thus far at Columbia. He is both knowledgeable and approachable, a very rare combination. The material is difficult, but he breaks it down in small pieces so all the students can follow. He engages the class well with questions and will stop if anyone has a question. Also, besides his many office hours, he is happy to stay and answer more questions. This is very rare in my experience. I cannot say enough great things about Prof. Beigi. Highly highly recommended.

- He is a very good professor. Always answer my questions in email fast and detailed.

- Professor Beigi is a leader in the field of Speech Recognition and can explain the smallest details of speech recognition methods in simple terms. It's amazing how much he knows about both practical and academic work in the fields of signal processing, machine learning and NLP as they relate to Speech and Speaker recognition.

- Beigi is an expert across so many disciplines. This presentation is always well prepared, and explanations of complex ideas are easily to understand.

- The material I felt could have been more application specific and the classes felt a bit jargonistic at times

COURSEWORKS@COLUMBIA

Program Evaluation System

Title: **COMS Final Evaluation Fall 2015**

Course: **COMSE6998_004_2015_3 / FUND SPEECH RECOGNITION**

Instructors: **Homayoon Beigi**

Dates: **12/07/2015 - 12/14/2015**

Responses**: 24/33 - 72.73%**

Number of Participants: **33**

Enrollment of All Students: **33**

Instructor Graph Report for: **Homayoon Beigi**

1 **Instructor: Organization and Preparation** **N=24**

1	Poor	**2** (8%)
2	Fair	**1** (4%)
3	Good	**0** (0%)
4	Very Good	**5** (21%)
5	Excellent	**16** (67%)

Median **5** Interpolated Median **4.75** Mean **4.33** Std Dev **1.24**

2 **Instructor: Classroom Delivery** **N=24**

1	Poor	**2** (8%)
2	Fair	**2** (8%)
3	Good	**0** (0%)
4	Very Good	**10** (42%)
5	Excellent	**10** (42%)

Median **4** Interpolated Median **4.30** Mean **4.00** Std Dev **1.25**

3 **Instructor: Approachability** **N=24**

1	Poor	**1** (4%)
2	Fair	**0** (0%)
3	Good	**0** (0%)
4	Very Good	**9** (38%)
5	Excellent	**14** (58%)

Median **5** Interpolated Median **4.64** Mean **4.46** Std Dev **0.88**

4 **Instructor: Overall Quality** **N=24**

1	Poor	**1** (4%)
2	Fair	**1** (4%)
3	Good	**2** (8%)
4	Very Good	**8** (33%)
5	Excellent	**12** (50%)

Median **4.5** Interpolated Median **4.50** Mean **4.21** Std Dev **1.06**

5 **Would you nominate this professor for the SEAS Distinguished Faculty Award?** **N=24**

1	Yes	**11** (46%)
2	No	**13** (54%)

Median **2** Interpolated Median **1.58**

Title: **COMS Final Evaluation Fall 2015**

Dates: **12/07/2015 - 12/14/2015**

Course: **COMSE6998_004_2015_3 / FUND SPEECH RECOGNITION**

Responses: **24/33 - 72.73%**

Instructors: **Homayoon Beigi**

Enrollment of Registered Students:**33**

Enrollment of All Students:**33**

Instructor Comments Report for: **Homayoon Beigi**

Q1 **If so, please explain why**

- This is a speech recognition class, however, the professor is good at covering material(if you have enough pre-requisites). For example, when he talked about Machine Learning methods, I think he did a better job than the professor from my ML course.
- Even though there were too much material to cover for one semester, his textbook was very comprehensive. I would like to honor his effort for the book.
- Pretty helpful to students and our projects.
- Professor Beigi is an excellent professor. He cares about the students and teaches the material passionately. I would have to say this is one of the best classes I have taken thus far at Columbia. He is both knowledgeable and approachable, a very rare combination. The material is difficult, but he breaks it down in small pieces so all the students can follow. He engages the class well with questions and will stop if anyone has a question. Also, besides his many office hours, he is happy to stay and answer more questions. This is very rare in my experience. I cannot say enough great things about Prof. Beigi. Highly highly recommended.
- He is a very good professor. Always answer my questions in email fast and detailed.
- Professor Beigi is a leader in the field of Speech Recognition and can explain the smallest details of speech recognition methods in simple terms. It's amazing how much he knows about both practical and academic work in the fields of signal processing, machine learning and NLP as they relate to Speech and Speaker recognition.
- Beigi is an expert across so many disciplines. This presentation is always well prepared, and explanations of complex ideas are easily to understand.
- The material I felt could have been more application specific and the classes felt a bit jargonistic at times

Course Evaluation

2014

Detailed Statistics and Comments: Next 6 pages

Summary

Spring: Fundamentals of Speaker Recognition (E6998)

Instructor Overall Quality Interpolated Median: 4.9/5.0

Fall: Fundamentals of Speech Recognition (E6998)

Instructor Overall Quality Interpolated Median: 4.13/5.0

Students' Comments:

- He has a very good command over the subjects he teaches and presents approaches from various fields to explain topics.

- Can't speak highly enough

- I think that the class website should state on the class page the deadlines for the project. I also think it would be beneficial to have some way of testing our knowledge along the way, e.g. with problem sets, or online quizzes, or guiding questions, or a vocab list.

- This course has the potential to probably be the best course in the department (mostly due to prof. Beigi's vast knowledge). However, several trade-offs need to be made, particularly because this is a multi-disciplinary course. Either we cover this much material but at a more shallow level (mathematically speaking), so that we at least have foundational knowledge in each area. Or, the course is split up to allow enough time to deliver/absorb each topic. Professor Beigi has so much knowledge to offer; it's really a matter of structuring things so that he has adequate time to have us focus and learn a more limited set of topics.
- Professor Beigi is without a doubt the most brilliant professor I've ever encountered, with deep expertise in multiple disciplines. Unfortunately, the course is disorganized. We cover too much material (most of which is very advanced), and Professor Beigi struggles at times to "dumb" things down so that we can understand.

- Professor Beigi is perhaps the most knowledgeable person I have ever met. Even though I was out of my depth for the material covered in the course, I found him kind, approachable, and really interested in making sure that students understood the material. He should definitely have his course pushed more by the department.

Title: **Spring 2014 COMS Final Evaluation**
Course: **COMSE6998_005_2014_1/FUNDAMENTALS OF SPEAKER RE**
Instructors: **Homayoon Beigi**

Dates: **04/28/2014 - 05/05/2014**
Responses: **6/10 - 60.00%**
Number of Participants: **10**
Enrollment of All Students: **10**

Graph Course Questions

1 Course: Amount Learned **N=6**

1	Poor	**0** (0%)
2	Fair	**0** (0%)
3	Good	**0** (0%)
4	Very Good	**1** (17%)
5	Excellent	**5** (83%)

Median **5** Interpolated Median **4.90** Mean **4.83** Std Dev **0.41**

2 Course: Appropriateness of Workload **N=6**

1	Poor	**0** (0%)
2	Fair	**0** (0%)
3	Good	**0** (0%)
4	Very Good	**1** (17%)
5	Excellent	**5** (83%)

Median **5** Interpolated Median **4.90** Mean **4.83** Std Dev **0.41**

3 Course: Fairness of Grading Process **N=6**

1	Poor	**0** (0%)
2	Fair	**0** (0%)
3	Good	**0** (0%)
4	Very Good	**1** (17%)
5	Excellent	**5** (83%)

Median **5** Interpolated Median **4.90** Mean **4.83** Std Dev **0.41**

4 Course: Overall Quality **N=6**

1	Poor	**0** (0%)
2	Fair	**0** (0%)
3	Good	**0** (0%)
4	Very Good	**1** (17%)
5	Excellent	**5** (83%)

Median **5** Interpolated Median **4.90** Mean **4.83** Std Dev **0.41**

5 Do you feel that the pre-requisites for this course adequately prepared you for the course? **N=6**

1	Not at all	**0** (0%)
2	Not enough	**1** (17%)
3	Yes, just right	**4** (67%)
4	Yes, I even felt a little over prepared	**1** (17%)
5	I feel like I already took this course	**0** (0%)

Median **3** Interpolated Median **3.00** Mean **3.00** Std Dev **0.63**

6 How did the workload of this course compare to that of other courses you've taken n Computer Science? **N=6**

1	Much heavier	**0** (0%)
2	Slightly heavier	**2** (33%)
3	About the same	**4** (67%)
4	A bit easier	**0** (0%)
5	Much easier	**0** (0%)

Median **3** Interpolated Median **2.75** Mean **2.67** Std Dev **0.52**

7 How did the workload of this course compare to that of other courses you've taken in other departments? **N=6**

1	Much heavier	**0** (0%)
2	Slightly heavier	**2** (33%)
3	About the same	**4** (67%)
4	A bit easier	**0** (0%)
5	Much easier	**0** (0%)

Median **3** Interpolated Median **2.75** Mean **2.67** Std Dev **0.52**

8 Do you feel that the workload of this course helped you learn the material well? **N=6**

1	I was too busy working to learn	**0** (0%)
2	Yes, I'm glad I was pushed	**1** (17%)
3	Yes, it was perfect	**5** (83%)
4	Yes, but I wasn't challenged enough	**0** (0%)
5	The work seemed extraneous	**0** (0%)

Median **3** Interpolated Median **2.90** Mean **2.83** Std Dev **0.41**

9 Of all the CS courses you have taken, how does this course rank? **N=6**

1	Very high	**1** (17%)
2	Better than average	**3** (50%)
3	Average	**2** (33%)
4	Worse than average	**0** (0%)
5	Very low	**0** (0%)

Median **2** Interpolated Median **2.17** Mean **2.17** Std Dev **0.75**

Title: **Spring 2014 COMS Final Evaluation**

Dates: **04/28/2014 - 05/05/2014**

Course: **COMSE6998_005_2014_1 / FUNDAMENTALS OF SPEAKER RECOGNITION**

Responses**: 6/10 - 60.00%**

Instructors: **Homayoon Beigi**

Number of Participants: **10**

Enrollment of All Students: **10**

Instructor Graph Report for: **Homayoon Beigi**

1 **Instructor: Organization and Preparation** **N=6**

1	Poor	**0** (0%)
2	Fair	**0** (0%)
3	Good	**0** (0%)
4	Very Good	**1** (17%)
5	Excellent	**5** (83%)

Median **5** Interpolated Median **4.90** Mean **4.83** Std Dev **0.41**

2 **Instructor: Classroom Delivery** **N=6**

1	Poor	**0** (0%)
2	Fair	**0** (0%)
3	Good	**0** (0%)
4	Very Good	**2** (33%)
5	Excellent	**4** (67%)

Median **5** Interpolated Median **4.75** Mean **4.67** Std Dev **0.52**

3 **Instructor: Approachability** **N=6**

1	Poor	**0** (0%)
2	Fair	**0** (0%)
3	Good	**0** (0%)
4	Very Good	**1** (17%)
5	Excellent	**5** (83%)

Median **5** Interpolated Median **4.90** Mean **4.83** Std Dev **0.41**

4 **Instructor: Overall Quality** **N=6**

1	Poor	**0** (0%)
2	Fair	**0** (0%)
3	Good	**0** (0%)
4	Very Good	**1** (17%)
5	Excellent	**5** (83%)

Median **5** Interpolated Median **4.90** Mean **4.83** Std Dev **0.41**

5 **Would you nominate this professor for the SEAS Distinguished Faculty Award?** **N=6**

1	Yes	**4** (67%)
2	No	**2** (33%)

Median **1** Interpolated Median **1.25**

Title: **Spring 2014 COMS Final Evaluation**

Dates: **04/28/2014 - 05/05/2014**

Course: **COMSE6998_005_2014_1 / FUNDAMENTALS OF SPEAKER RECOGNITION**

Responses**: 6/10 - 60.00%**

Instructors: **Homayoon Beigi**

Enrollment of Registered Students:**10**

Enrollment of All Students:**10**

Instructor Comments Report for: **Homayoon Beigi**

Q1 **If so, please explain why**

- He has a very good command over the subjects he teaches and presents approaches from various fields to explain topics.

Title: **Fall 2014 COMS Final Evaluation**

Dates: **12/01/2014 - 12/08/2014**

Course: **COMSE6998_004_2014_3 / FUND SPEECH RECOGNITION**

Responses**: 11/14 - 78.57%**

Instructors: **Homayoon Beigi**

Number of Participants: **14**

Enrollment of All Students: **14**

Instructor Graph Report for: **Homayoon Beigi**

1 **Instructor: Organization and Preparation** **N=11**

1	Poor	**1** (9%)
2	Fair	**1** (9%)
3	Good	**1** (9%)
4	Very Good	**4** (36%)
5	Excellent	**4** (36%)

Median **4** Interpolated Median **4.13** Mean **3.82** Std Dev **1.33**

2 **Instructor: Classroom Delivery** **N=11**

1	Poor	**0** (0%)
2	Fair	**1** (9%)
3	Good	**4** (36%)
4	Very Good	**3** (27%)
5	Excellent	**3** (27%)

Median **4** Interpolated Median **3.67** Mean **3.73** Std Dev **1.01**

3 **Instructor: Approachability** **N=11**

1	Poor	**0** (0%)
2	Fair	**0** (0%)
3	Good	**1** (9%)
4	Very Good	**3** (27%)
5	Excellent	**7** (64%)

Median **5** Interpolated Median **4.71** Mean **4.55** Std Dev **0.69**

4 **Instructor: Overall Quality** **N=11**

1	Poor	**0** (0%)
2	Fair	**0** (0%)
3	Good	**3** (27%)
4	Very Good	**4** (36%)
5	Excellent	**4** (36%)

Median **4** Interpolated Median **4.13** Mean **4.09** Std Dev **0.83**

5 **Would you nominate this professor for the SEAS Distinguished Faculty Award?** **N=11**

1	Yes	**1** (9%)
2	No	**10** (91%)

Median **2** Interpolated Median **1.95**

Title: **Fall 2014 COMS Final Evaluation**

Course: **COMSE6998_004_2014_3 / FUND SPEECH RECOGNITION**

Instructors: **Homayoon Beigi**

Dates: **12/01/2014 - 12/08/2014**

Responses**: 11/14 - 78.57%**

Enrollment of Registered Students:**14**

Enrollment of All Students:**14**

Comments Course Questions

Q1 **Enter any additional comments here**

- Can't speak highly enough

- I think that the class website should state on the class page the deadlines for the project. I also think it would be beneficial to have some way of testing our knowledge along the way, e.g. with problem sets, or online quizzes, or guiding questions, or a vocab list.

- This course has the potential to probably be the best course in the department (mostly due to prof. Beigi's vast knowledge). However, several trade-offs need to be made, particularly because this is a multi-disciplinary course. Either we cover this much material but at a more shallow level (mathematically speaking), so that we at least have foundational knowledge in each area. Or, the course is split up to allow enough time to deliver/absorb each topic. Professor Beigi has so much knowledge to offer; it's really a matter of structuring things so that he has adequate time to have us focus and learn a more limited set of topics.

Title: **Fall 2014 COMS Final Evaluation**

Dates: **12/01/2014 - 12/08/2014**

Course: **COMSE6998_004_2014_3 / FUND SPEECH RECOGNITION**

Responses: **11/14 - 78.57%**

Instructors: **Homayoon Beigi**

Enrollment of Registered Students:**14**

Enrollment of All Students:**14**

Instructor Comments Report for: **Homayoon Beigi**

Q1 **If so, please explain why**

- Professor Beigi is without a doubt the most brilliant professor I've ever encountered, with deep expertise in multiple disciplines. Unfortunately, the course is disorganized. We cover too much material (most of which is very advanced), and Professor Beigi struggles at times to "dumb" things down so that we can understand.
- Professor Beigi is perhaps the most knowledgable person I have ever met. Even though I was out of my depth for the material covered in the course, I found him kind, approachable, and really interested in making sure that students understood the material. He should definitely have his course pushed more by the department.

Course Evaluations

2013

Detailed Statistics and Comments: Next page

Summary

Fundamentals of Speaker Recognition (E6998)

Instructor Overall Quality Mean: 4.62/5.0

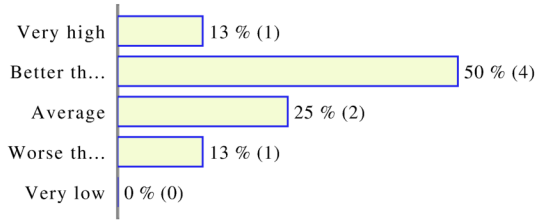
Students' Comments:

- Professor Beigi was absolutely excellent. Really really approachable – I was scared to come to office hours because I didn't really understand things and my project was a mess and he really tool the time to sit down and go through everything with me. He made me feel excited about doing research in the field. And of course, the man is just a mine of information. He was, hands down, the most intelligent and knowledgeable professor I've had so far.

- An expert in speech recognition and helpful.

- I haven't met many professors here or elsewhere who take a genuine interest in their students, which is honestly why I remain enrolled. It's one of the few course where the professor's enthusiasm and passion for the subject matter was contagious.

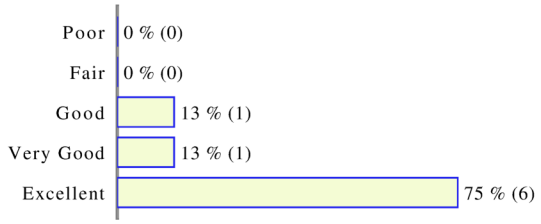
8 answers, mean = 2.38



Instructor/Evaluatee: Homayoon Beigi

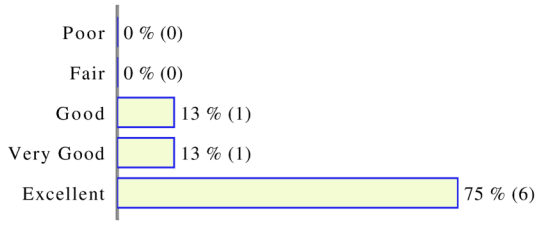
11. Instructor: Organization and Preparation

8 answers, mean = 4.62



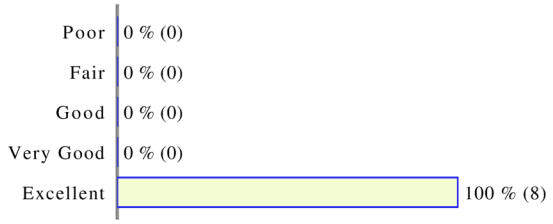
12. Instructor: Classroom Delivery

8 answers, mean = 4.62



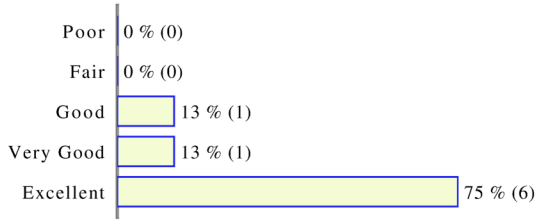
13. Instructor: Approachability

8 answers, mean = 5.00



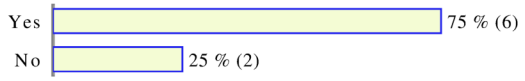
14. Instructor: Overall Quality

8 answers, mean = 4.62



15. Would you nominate this professor for the SEAS Distinguished Faculty Award?

8 answers, mean = 1.25



16. If so, please explain why

- Professor Beigi was absolutely excellent. Really really approachable - I was scared to come to office hours because I didn't really understand things and my project was a mess and he really took the time to sit down and go through everything with me. He made me feel excited about doing research in the field. And of course, the man is just a mine of information. He was, hands down, the most intelligent and knowledgeable professor I've had so far.
- An expert in speech recognition and helpful.
- I haven't met many professors here or elsewhere who take a genuine interest in their students, which is honestly why I remain enrolled. It's one of the few courses where the professor's enthusiasm and passion for the subject matter was contagious.

Course Evaluations

2012

Detailed Statistics and Comments: Next 2 pages

Summary

Fundamentals of Speaker Recognition (E6998)

Instructor Overall Quality Mean: 5.0/5.0

CourseWorks @Columbia

Program Evaluation System

Report: **Stats Distribution**

Course:	**FUNDAMENTALS/SPEAKER RECOGNIT (COMSE6998_007_2012_1)**
Instructor:	**Beigi Homayoon**
Evaluation:	**Sp12_CS_Final**
Dates:	**April 24, 2012 - May 03, 2012**
No. of Respondents:	3
No. of Students:	3
Percent Completed:	**100%**

Section: Class Questions

1: **Instructor: Organization and Preparation** n =3

Response	Weight	Frequency	Percent
Poor	1	0	0.00
Fair	2	0	0.00
Good	3	0	0.00
Very Good	4	0	0.00
Excellent	5	3	100.00
	Mean: 5.00	Median:5	Std. Dev.: 0.00

2: **Instructor: Classroom Delivery** n =3

Response	Weight	Frequency	Percent
Poor	1	0	0.00
Fair	2	0	0.00
Good	3	0	0.00
Very Good	4	1	33.33
Excellent	5	2	66.67
	Mean: 4.67	Median:5	Std. Dev.: 0.58

3: **Instructor: Approachability** n =3

Response	Weight	Frequency	Percent
Poor	1	0	0.00

Fair	2	0	0.00
Good	3	0	0.00
Very Good	4	0	0.00
Excellent	5	3	100.00
	Mean: 5.00	Median:5	Std. Dev.: 0.00

4: **Instructor: Overall Quality** n =3

Response	Weight	Frequency	Percent
Poor	1	0	0.00
Fair	2	0	0.00
Good	3	0	0.00
Very Good	4	0	0.00
Excellent	5	3	100.00
	Mean: 5.00	Median:5	Std. Dev.: 0.00

5: **Course: Amount Learned** n =3

Response	Weight	Frequency	Percent
Poor	1	0	0.00
Fair	2	0	0.00
Good	3	1	33.33
Very Good	4	1	33.33
Excellent	5	1	33.33
	Mean: 4.00	Median:4	Std. Dev.: 1.00

6: **Course: Appropriateness of Workload** n =3

Response	Weight	Frequency	Percent
Poor	1	0	0.00
Fair	2	0	0.00
Good	3	0	0.00
Very Good	4	0	0.00
Excellent	5	3	100.00
	Mean: 5.00	Median:5	Std. Dev.: 0.00

7: **Course: Fairness of Grading Process** n =3

Response	Weight	Frequency	Percent
Poor	1	0	0.00
Fair	2	0	0.00