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Structural and Machine Health Monitoring
through the application of Speaker Recognition Techniques

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The latest advancements in structural health monitoring of bridges and machinery have a lot of in common with speaker recognition techniques. Starting out as a mechanical engineer and having done considerable amount of machine health monitoring and prognosis in the mid-1980s, the speaker moved on to work in the handwriting and speaker recognition fields, making a connection among these fields. The similarities of these fields are explored and some of the research of the last few years in conjunction with the civil engineering department of Columbia University are discussed. This research has led to a completed PhD and two new PhD projects in that department. It is also the subject of a graduate course being taught by Dr. Beigi in the mechanical engineering department of Columbia. Cepstral analysis and deep neural networks are at the heart of these techniques which use the similarities in the vibration of structures, such as bridges and buildings, machinery, such as gear-meshes and bearings, and the human vocal tract. Some very promising results are shown in this revolutionary cross-discipline activity.



Homayoon Beigi earned his BS, MS, and PhD from Columbia University in 1984, 1985 and 1990 respectively. The author of the first and only comprehensive textbook on Speaker Recognition, for three decades, he has been involved in research and development in Biometrics, Pattern Recognition and Internet-Commerce. He has developed the award-winning RecoMadeEasy® Speaker Recognition and the multiple-award winning, CommerceMadeEasy® software. He has been an Adjunct Professor since 1995, teaching graduate level Speaker, Speech, Handwriting and Applied Signal Recognition, as well as Control Systems courses at the CS, ME, and EE departments of Columbia University. He was a Research Staff Member at the IBM T.J. Watson Research Center from 1991 to 2001, working on Speaker Recognition, ASR, LM, Search, Handwriting Recognition, Control, and NN Learning. He developed the SAFE Audio ANSI standard and was an active liaison in the US delegation of the ISO/SC37-JTC1-WG3 and the VoiceXML Forum on Speaker Biometrics. His other research includes Structural Health Prognosis, Image Compression, Kinematics, Financial Optimization, and Zero-Gravity Fluid Dynamics. His "Fundamentals of Speaker Recognition" has been downloaded by more than 51,000 times. His is the recipient of two IEEE best paper awards and 10 issued patents and over 70 peer-reviewed publications. He has been an Associate Editor of the AutoSoft Journal, Editor of the BISC Handwriting Recognition, Senior Member of IEEE, on Advisory Board of IEEE Spectrum, and reviewer for the Pattern Recognition Journal, IEEE PAMI, IEEE Transactions on NN, IET Signal Processing Journal, the International Journal of Control, AIAA Journal, ICASSP, Interspeech, and more.