IEEE Tappan Zee Subsection Joint Meeting with Westchester Chapters of ASME & SME Presents

Deep Learning Explained

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All are invited – Please Post

Abstract: Starting with a few seminal papers in the latter half of the 1980s, the training of multi-layer neural networks was made practical and these networks were soon used for applications in advanced nonlinear pattern recognition, control systems, and many other problems. Although neural network applications mushroomed in the 1990s, complex architectures were still not very feasible due to the tremendous amount of computation needed for the training of deep neural networks. The advancements in Graphical Processing Units (GPUs), in the form of massive parallelization capabilities at relatively low costs, created the grounds for another revolution in the field. The new resurgence of these networks was coined deep learning after the much more complex and deeper architectures. GPUs made deep neural networks a lot more accessible to the general scientific population and many more applications which used these techniques. Examples are speech recognition, speech synthesis, face recognition, financial applications, control systems, digital assistants, expert systems, and many many more. The talk will provide an explanation of these networks and will discuss some of the architectures as well as a demonstration of speech recognition using deep neural networks. Feedforward, Recurrent, Time-Delay, Long-Short-Term-Memory, and Convolutional network architectures are described with some sample applications for each of these architectures. An overview of how the learning happens in these networks is also presented.

Upcoming Textbook: The second edition of "Fundamentals of Speaker Recognition," by Homayoon Beigi, published through Springer-Verlag , will be out in early 2018. This version will include considerable amount of new material on deep learning techniques and architectures, as well as many other recent advancements in pattern recognition. The first edition came out in December of 2011. According to Springer statistics, the electronic version of the first edition of his book has had over 46,000 downloads to date. Please see http://www.FundamentalsOfSpeakerRecognition.org for more information.

Bio: 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 Neural Network 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 46,000 times. His is the recipient of two IEEE best paper awards and 12 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 on the technical committes of publications such as the Pattern Recognition Journal, IEEE PAMI, and IEEE Transactions on NN, IET Signal Processing Journal, the International Journal of Control, AIAA Journal, ICASSP, Interspeech**.**