Professor HARRY WECHSLER
Department of Computer Science
George Mason University
Fairfax, VA 22030

(703) 993-1533 (office)
(703) 993-1710 (FAX)
E-mail: wechsler@gmu.edu
WWW: http://cs.gmu.edu/~wechsler/

Harry Wechsler

Harry Wechsler received the Ph.D. in Computer Science from the University of California, Irvine, in 1975. From 1976 to 1978 he was   Assistant Professor and System Manager for the Advanced Automation Research Laboratory (AARL) in the Department of Electrical Engineering at Purdue University, during 1978-1980 he was Assistant Professor at the University of Wisconsin, and in 1980 he became Associate Professor of Electrical Engineering at the University of Minnesota. Since 1987 he has been   Professor of Computer Science at George Mason University (GMU). Dr. Wechsler has been the Director for the Distributed and Intelligent Computation Center at GMU http://cs.gmu.edu/~wechsler/DIC_Center/ 1995 - 2010. His academic career includes visiting Professorships at Institut National de Recherche en Informatique et en Automatique (INRIA) (France), Kyoto University (Japan), Technion (Israel), the Center for Automation Research at the University of Maryland, Centre National de Recherche Scientifique (CNRS) and University of Paris-Orsay (France), Romanian Academy of Sciences (Romania), Commonwealth of Science and Industry Research Organization (CSIRO) (Australia), University of Geneve (Switzerland), Russian Academy of Science (Moscow), and the Chinese Academy of Sciences (Beijing).

Expertise in Artificial Intelligence, Machine Learning, Deep Learning, Data Mining, Pattern Recognition, and Image Analysis and Computer Vision, with diverse applications including Intelligence Forensics, Smart Identity Management, Image Understanding and Visual Query Answering, and Remote Sensing. Mitigates disinformation, deliberate manipulation and/or poor annotation, and denial; flag outliers; leverage vector word embedding, and semantic alignment and integration. Focuses on model selection and prediction, evidence-based reasoning, and decision-making; biometrics; anomaly, novelty, and outlier detection; and cyber security for active authentication and intrusion detection. Addresses incomplete and uncertain knowledge, answers **W5**+ questions (What, Where, When, Why, Who, and How) and meets **R5** performance metrics (Robustness to uncontrolled settings; Reliability for consistency, stability, and sustainability; Reproducibility for interoperability; Resiliency for recovery; and Re-identification for authentication.

Research on *Automatic Target Recognition (ATR)* has been supported by NSF and DARPA, research on *biometrics*, *face recognition,* and *homeland security* has been supported by FBI, DARPA, DOD/TSWG and ARL, research on *sensor fusion technologies* for *radar / ATR*   has been supported by NRL / BMD, and research on *complex physical system / solar sciences* has been supported by NASA. Dr. Wechsler has designed, developed, and implemented the FERET (face) database at GMU. Dr. Wechsler has been a consultant for both government (DOS, NIH, NRL, MIT Lincoln Lab/DARPA, NASA, and Veteran Administration) and private industry (Honeywell, Lockheed-Martin, Perkin Elmer, Procter & Gamble, SAIC, and 3M). Has been reviewer for NAS (National Academy of Sciences), NSF, UK ESPRC (Engineering and Physical Sciences Research Council), Swiss NSF, and the Hong Kong National Research Foundation. He has cooperated with the MAYO Clinic on biomedical image processing and computer tomography (CT). He has lectured extensively in US and abroad, was an invited guest lecturer for several NATO Advanced Study Institutes (ASIs) and Advanced Research Workshops (ARWs) on Computer Vision, Pattern Recognition and Robotics, and has taught professional short-courses on Computer Vision, Neural Networks, and AI. He was Director for the NATO Advanced Study Institutes (ASI) on "Active Perception and Robot Vision" held in 1989, in Maratea, Italy, "Statistics and Neural Networks" held in 1993, in Les Arcs, France, and "Face Recognition: From Theory to Applications" held in 1997, in Stirling, UK. Co-Director and Lecturer for the Summer School for "Advanced Studies on Biometrics: Authentication and Recognition," held in 2003 and 2009 in Alghero, Italy.

Served as Co-Chair for the 13th International Conference on Pattern Recognition held in Vienna, Austria, in 1996. Member of the organizing committees for the 1st, 2nd, 3rd, 4th, and 8th Int. Conferences on 'Automatic Face and Gesture Recognition', held in Zurich, Switzerland, 1995, Killington, VT, 1996, Nara, Japan, 1998, Grenoble, France, 2000, and Amsterdam, Holland, 2008; 1st, 2nd, and 3rd. Int. Conf. on Biometrics (Hong Kong, 2004; Seoul, Korea, 2007; Alghero, Italy, 2009). Member of the program committees for Computer Vision and Pattern Recognition (CVPR) held in Hilton Head, South Carolina, 2000, and Washington, DC, 2004; the 16th Int. Conf. on Pattern Recognition (ICPR) held in Quebec City, Canada, 2002, the 17th Int. Conf. on Pattern Recognition (ICPR) held in Cambridge, UK, 2004; the 12th and 13rd Int. Conf. on Image Analysis and Processing (ICIAP), held in Palermo, Italy, 2001, and Mantova, Italy, 2003; the 2nd, 3rd and 4th Int. Conf. on Audio- and Video-

based Biometric Person Authentication, held in Washington, DC, 1999, Halmstad, Sweden, 2001, and Surrey, UK, 2003; the Recognition, Analysis and Tracking of Faces and Gestures in Real-Time Systems (RATFG-RTS'99) workshop held in conjunction with Int. Conf. on Computer Vision (ICCV) Kerkyra, Greece, 1999, the Biometric Authentication Workshops, held in conjunction with European Conf. on Computer Vision (ECCV) in Dublin, Ireland, 2000, Copenhagen, Denmark, 2002, and Prague, 2004; the Advanced Video and Signal Base Surveillance Conf. held in Miami, 2003; the Int. Conf. on Image Processing (ICIP 2003; Barcelona, Spain), and (ICIP 2004; Singapore); IEEE 1st, 2nd, and 3rd Int. Conf. on Biometrics: Theory, Applications, and Systems (BTAS), Washington, DC, 2007, 2008, and 2009; and the 3rd IEEE Int. Workshop on Analysis and Modeling of Faces and Gestures (AMFG) (held in conjunction with ICCV 2007), Rio de Janeiro, Brazil, 2007. Has been Area Chair for the 2nd Int. Joint Conf. on Biometrics (IJCB), Tampa, FL., 2014. Member (2014 – 2015) of the Statistics and Applied Mathematical Institute (SAMSI) Research Program (Research Triangle Park / NC) sponsored by {NSF, Duke, NCSU, and UNC} in Forensics Science.

Dr. Wechsler lectured in the United States (Boeing, Carnegie-Mellon, Columbia Univ., IBM/Yorktown-Heights, JPL, Microsoft Research (MSR)/Redmond, Mitsubishi Electrical Research Laboratory, Siemens (SRC), NIH, NRL, SRI, Bell Labs, Salk Institute, Hughes Research Labs, USC), Australia, Austria, Canada (U of Toronto), Croatia, Czech Republic, China (National Academy of Science and Fudan University), Denmark, France (INRIA and ENS < Ecole Normale Superieure >), Germany (Max-Plank-Institut Tubingen and Hamburg Univ.), Greece, Hong Kong, Hungary, Israel, Italy (Politecnica di Milano), Japan (Kyoto University), Mexico, The Netherlands (University of Amsterdam), Romania, Russia, Slovenia, South Africa, South Korea (KAIST, Samsung, Korea University), Spain, Sweden, Switzerland (ETH and EPFL), and UK (Cambridge, Imperial College, London University and the Turing Institute / Glasgow). Dr. Wechsler has authored over 300 scientific papers. **Academic Press published his book "Computational Vision" in September 1990.** Editor for the books, "Neural Networks for Perception" (Vol. 1 & 2), published by Academic Press in November 1991, and main editor for "Face Recognition: From Theory to Applications", published by Springer-Verlag in 1998. Springer – Verlag in 2007, published his book on "Reliable Face Recognition Methods". He was elected **IEEE Fellow**, effective as of January 1, 1993, "for contributions to joint spatial/spectral image representations and neural networks, and their theoretical integration and application to human and machine perception". He was elected an **IAPR** (Int. Assoc. for Pattern Recognition) **Fellow** in 1998. Dr. Wechsler supervised 29 PhD students who upon graduation joined academia, government, and industry including Penn State, UC Davis, UVA, DARPA, JPL, NIH, NRL, MITRE, IBM, PayPal, and Microsoft.

PUBLICATIONS IMPACT for Harry Wechsler (January 11, 2019)
Citations: 17,715; h-index: 54; i10-index: 151
(Since 2014) Citations: 5,236; h-index: 31; i10-index: 65
http://scholar.google.com/citations?user=mB_85m0AAAAJ&hl=en

SELECTED PUBLICATIONS (since 1995)

1) J. Bala, K. DeJong, J. Huang, H. Vafaie, and H. Wechsler (1995), Hybrid Learning Using Genetic Algorithms and Decision Trees for Pattern Classification, *14th Int. Joint Conf. on Artificial Intelligence (IJCAI)*, Montreal, Canada.

2) S. Gutta, J. Huang, H. Wechsler, and V. Chen (1997), Automatic Video-Based Person Authentication Using the RBF Network, *1st Int. Conf. on Audio - and Video - Based Biometric Person Authentication*, Crans-Montana, Switzerland.

3) S. Gutta and H. Wechsler (1997), Face Recognition Using Hybrid Classifiers, *Pattern Recognition*, Vol. **30**, No. 4, 539-553.

4) S. Gutta, I. Imam, and H. Wechsler (1997), Hand Gesture Recognition Using Ensembles of Radial Basis Functions (ERBFs) and Decision Trees (DTs), *Int. Journal of Pattern Recognition and Artificial Intelligence*, Vol. **11**, No. 6, 845-872.

5) S. Gutta and H. Wechsler (1997), A Hybrid Architecture for Combining Multiple Classifiers, *15th International Joint Conf. on Artificial Intelligence (IJCAI)*, Nagoya, Japan.

6) S. Gutta, J. Huang and H. Wechsler (1998), Face Surveillance, *6th Int. Conf. on Computer Vision (ICCV)*, Mumbai (Bombay), India.

7) S. Gutta, J. Phillips and H. Wechsler (1998), Gender and Ethnic Classification of Face Images, *3rd Int. Conf. on Automatic Face and Gesture Recognition*, Nara, Japan.

8) P. J. Phillips, H. Wechsler, J. Huang, and P. Rauss (1998), The FERET Database and Evaluation Procedure for Face Recognition Algorithms, *Image and Vision Computing*, Vol. **16**, No. 5, 295-306.

9) H. Wechsler, P. J. Phillips, V. Bruce, F. Fogelman - Soulie and T. Huang (Eds.) (1998), FACE RECOGNITION: From THEORY to APPLICATIONS, Springer - Verlag.

10) B. Takacs and H. Wechsler (1998), A Dynamic and Multiresolution Attention Model and Its Application to Facial Landmark Detection, *Computer Vision and Image Understanding*, Vol. **70**, No. 1, 63-73.

11) A. Schultz and H. Wechsler (1998), A Discrete Dynamics Model for Synchronization of Pulse-Coupled Oscillators, *IEEE Trans. on Neural Networks*, Vol. **9**, No**.** 1, 51-57.

12) C. Liu and H. Wechsler (1999), Face Recognition Using Shape and Texture, *Computer Vision and Pattern Recognition (CVPR) Conf.*, Fort Collins, CO.

13) C. Clausen, S. Gutta and H. Wechsler (1999), Reinforcement Algorithms Using Functional Approximation, *16th Int. Joint Conf. on Artificial Intelligence (IJCAI)*, Stockholm, Sweden.

14) J. Huang and H. Wechsler (1999), Eye Detection Using Optimal Wavelet Packets and Radial Basis Functions (RBFs), *Int. Journal of Pattern Recognition and Artificial Intelligence*, Vol. **13**, No. 7, 1009-1025.

15) C. Liu and H. Wechsler (2000), Robust Coding Schemes for Indexing and Retrieval from Large Face Databases, *IEEE Trans on Image Processing,* Vol. **9**, No. 1, 132 - 137.

16) S. McKenna, S. Jabri, Z. Duric and H. Wechsler (2000), Tracking Interacting People, *4th Int. Conf. on Automatic Face and Gesture Recognition*, Grenoble, France.

17) J. Huang and H. Wechsler (2000), Visual Routines for Eye Location Using Learning and Evolution, *IEEE Trans. on Evolutionary Computation*, Vol. **4**, No. 1, 73-82.

18) C. Claussen and H. Wechsler (2000), Color Image Compression Using PCA and Back - Propagation Learning, *Pattern Recognition*, Vol. **33**, No. 9, 1555-1560.

19) A. Pujol, J. J. Villanueva, and H. Wechsler (2000), Automatic View Based Caricaturing and Face Recognition, *15th Int. Conf. on Pattern Recognition (ICPR)*, Barcelona, Spain.

20) C. Liu and Harry Wechsler (2000), Learning the Face Space – Representation and Recognition (invited lecture), *15th Int. Conf. on Pattern Recognition (ICPR)*, Barcelona, Spain.

21) C. Clausen and H. Wechsler (2000), Quad-Q Learning, *IEEE Trans. on Neural Networks*, Vol. **11**, No. 2, 279-294.

22) C. Liu and H. Wechsler (2000), Evolutionary Pursuit and Its Application to Face Recognition, *IEEE Trans. on Pattern Analysis and Machine Intelligence,* Vol. **22**, No. 6, 570 – 582.

23) S. Gutta, J. Huang, P. J. Phillips and H. Wechsler (2000), Mixtures of Experts for Categorization of Human Faces Based on Gender and Ethnic Origin and Pose Discrimination, *IEEE on Neural Networks*, Vol. **11**, No. 4, 948 – 960.

24) A. Rosenfeld and H. Wechsler (2000), Pattern Recognition – Historical Perspective and Future Directions, *Int. Journal of Imaging Systems and Technology*, Vol. **11** (2), 101- 116.

25) S. J. McKenna, S. Jabri, Z. Duric, H. Wechsler and A. Rosenfeld (2000), Tracking Groups of People, *Computer Vision and Image Understanding*, Vol. **80**, 42-56

26) C. Liu and H. Wechsler (2001), Shape-and-Texture Based Enhanced Fisher Classifier for Face Recognition, *IEEE on Image Processing*, Vol. **10**, No. 4, 598-608.

27) C. Liu and H. Wechsler (2001), Face Recognition Using Independent Gabor Wavelet Features, *3rd Int. Conf. on Audio – and Video-Based Biometric Person Authentication (AVBPA),* Halmstad, Sweden.

28) M. Abramson and H. Wechsler (2001), Competitive Reinforcement Learning for Combinatoric Problems, *Int. Joint Conference on Neural Networks*, Washington, DC.

29) C. Liu and H. Wechsler (2001), Gabor Feature Enhanced Fisher Classifier for Face Recognition, *8th Int. Conf. on Computer Vision (ICCV),* Vancouver, Canada.

30) Z. Duric, F. Li and H. Wechsler (2002), Recognition of Arm Movements, *5th Int. Conf. on Automatic Face and Gesture Recognition*, College Park, MD.

31) C. Liu and H. Wechsler (2002), Gabor Feature Based Classification Using the Enhanced Fisher Linear Discriminant Model (EFM) for Face Recognition, *IEEE Trans. on Image Processing,* Vol. **11**, No. 4, 467 – 476.

32) Z. Duric, W. Gray, R. Heishman, F. Li, A. Rosenfeld, C. Schunn, and H. Wechsler (2002), Integrating Perceptual and Cognitive Modeling for Adaptive and Intelligent HCI, *Proc. of IEEE*, Vol**. 90**, No. 7, 1272-1289.

33) H. Wechsler, Z. Duric, F. Li and V. Cherkassky (2002), Motion Estimation Using VC - Generalization Bounds, *16th Int. Conf. on Pattern Recognition (ICPR)*, Quebec-City, Canada.

34) S. Gutta, V. Philomin, M. Trajkovic, and H. Wechsler (2002), *Partial Faces for Face Recognition, Biometric Consortium Conference (BC2002),* Washington, DC.

35) F. Li and H. Wechsler (2003), Open World Face Recognition with Credibility and Confidence Measures, *4th Int. Conf. on Audio and Video-Based Biometric Person Authentication (AVBPA),* Surrey, UK.

36) C. Liu and H. Wechsler (2003), Independent Component Analysis of Gabor Features for Face Recognition, *IEEE Trans. on Neural Networks,* Vol. **14**, No. 4, 919-928.

37) M. Abramson and H. Wechsler (2003), Tabu Search Exploration for On-Policy Reinforcement Learning, *2003 Int. Joint Conf. on Neural Networks*, Portland, OR.

38) S. S. Ho and H. Wechsler (2003), Transductive Confidence Machine for Active Learning, *2003 Int. Joint Conf. on Neural Networks*, Portland, OR.

39) S. Gutta and H. Wechsler (2003), Analysis of Partial-Faces for Face Recognition, *10th Int. Conf. on Computer Analysis of Images and Patterns (CAIP),* Groningen, The Netherlands.

40) Z. Duric, F. Li, H. Wechsler and V. Cherkassky (2003), Controlling Model Complexity in Flow Estimation, *9th Int. Conf. on Computer Vision*, Nice, France.

41) V. Chen, F. Li, S. S. Ho and H. Wechsler (2004), Analysis of Micro-Doppler Signatures, *Proc. of IEE on Radar, Sonar and Navigation*, Vol. **150**, No. 4, 271-276.

42) H. Wechsler, Z. Duric, F. Li and V. Cherkassky (2004), Motion Estimation Using Statistical Learning Theory, *IEEE Trans. on Pattern Analysis and Machine Intelligence*, Vol.**26**, No. 4, 466 – 478.

43) F. Li and H. Wechsler (2004), Watch List Face Surveillance Using Transductive Inference, *1st Int. Conf. on Biometric Authentication (ICBA),* Hong Kong.

44) S. Gutta and H. Wechsler (2004), Face Recognition Using Asymmetric Faces, *1st. Int. Conf. on Biometrics Authentication (ICBA)*, Hong Kong**.**

45) S. S. Ho and H. Wechsler (2004), Learning from Data Streams via Online Transduction, *4th Int. Conf. on Data Mining (ICDM) Workshop*, Brighton, UK.

46) F. T. Alotaiby, J. Chen, E. Sibley, E. J. Wegman, H. Wechsler and D. Sprague (2004), Teacher Driven Web-Based Learning System, *Proc. of the 5th Conf. on Information Technology in Education ACM SIGITE,* Salt Lake City, UT.

47) F. T. Alotaiby, J. Chen, E. Sibley, H. Wechsler, E. J. Wegman and D. Sprague (2005), Adaptive Web-Based Learning Systems, *12th IEEE Int. Conf. on the Engineering of Computer Based Systems (ECBS),* Greenbelt, MD.

48) S. S. Ho and H. Wechsler (2005), On the Detection of Concept Changes in Time-Varying data Stream by Testing Exchangeability, *21st Conf. on Uncertainty in Artificial Intelligence (UAI2005)*, Edinburgh, Scotland, UK.

49) S.S Ho and H. Wechsler (2005), Adaptive SVM for Time-Varying Data Streams Using Martingales, *19th Int. Joint Conf. on Artificial Intelligence (IJCAI),* Edinburgh, Scotland, UK.

50) F. Li and H. Wechsler (2005), Open Set Face Recognition Using Transduction, *IEEE Trans. on Pattern Analysis and Machine Intelligence*, Vol. **27**, No. 11, 1686 – 1697.

51) V. Chen, F. Li, S. S. Ho and H. Wechsler (2006), Micro-Doppler Effect in Radar - Phenomenon, Model, and Simulation Study, *IEEE Trans. on Aerospace and Electronic Systems,* Vol. **42**, No. 1, 2 – 21.

52) J. Chen, D. Carr, H. Wechsler, and Z. Pan (2006), Interactive Visualization of Multivariate Statistical Data, *Int. Journal of Visual Reality*, Vol. **5**, No. 3, 1 – 10. **GOOGLE CLASSIC PAPER**

53) D. DeBarr and H. Wechsler (2006), Spam Detection Using Transduction, *1st Int. Conference on Information Security and Computer Forensics*, Chennai, India.

54) H. Wechsler (2007), *Reliable Face Recognition Methods: System Design, Implementation and Evaluation*, Springer.

55) S. S. Ho and H. Wechsler (2007), Detecting Changes in Unlabeled Data Streams Using Martingales, *20th Int. Joint Conf. on Artificial Intelligence (IJCAI),* Hyderabad, India.

56) J. Chen and H. Wechsler (2007), Human – Computer Intelligent Interaction Using Augmented Cognition and Emotional Intelligence, *12th Int. Conf. on HCI*, Beijing, China, Lecture Notes in Computer Science (LNCS 4563), Springer, 205 - 214 (invited lecture).

57) F. Li and H. Wechsler (2007), Robust Part-Based Face Recognition Using Boosting and Transduction, *IEEE First International Conference on Biometrics: Theory, Applications and Systems (BTAS '07)*, Washington, DC.

58) S. Palka and H. Wechsler (2007), Fingerprints Vulnerabilities to Front- and Back- end Attacks, *IEEE First International Conference on Biometrics: Theory, Applications and Systems (BTAS '07)*, Washington, DC.

59) E. Lawson and H. Wechsler (2007), Comparative assessment of ICA Architecture for Gait Recognition, *IEEE First International Conference on Biometrics: Theory, Applications and Systems (BTAS '07)*, Washington, DC.

60) R. Heishman, Z. Duric, and H. Wechsler (2007), Understanding Cognitive and Affective States from Eyelid Movements, *IEEE First International Conference on Biometrics: Theory, Applications and Systems (BTAS '07)*, Washington, DC.

61) H. Lai, F. Li, and H. Wechsler (2007), Robust Face Recognition Strategies Using Feed-forward Architectures and Parts, *Analysis and Modeling of Faces and Gestures (AMFG2007) Workshop* (held in conjunction with *Int. Conf. on Computer Vision - ICCV 2007*), Rio de Janeiro, Brazil.

62) S. S. Ho and H. Wechsler (2008), Query by Transduction, *IEEE Trans. On Pattern Analysis and Machine Intelligence*, Vol. **30**, No. 9, 1557-1571.

63) O. Olmedo, J. Zhang, H. Wechsler, A. Poland, and K. Borne (2008), Automatic Detection and Tracking of Coronal Mass Ejections (CMEs) in Coronagraph Time Series, *Solar Physics*, Vol. **248**, 485 – 499.

64) H. Lai, V. Ramanathan, and H. Wechsler (2008), Reliable Recognition of Occluded and Disguised Faces Using Adaptive and Robust Correlation Filters, *Computer Vision and Image Understanding*, Vol. **111**, No. 3, 329-350.

65) F. Li and H. Wechsler (2008), Robust Fusion Using Boosting and Transduction for Component-Based Face Recognition, *10th Int. Conf. on Control, Automation, Robotics, and Vision (ICARCV08)*, Hanoi, Vietnam.

66) W. Lawson, Z. Duric, and H. Wechsler (2008), Gait Analysis Using Independent Components of Image Motion, *8th Int. Conf. on Automatic Face and Gesture Recognition*, Amsterdam, the Netherlands.

67) F. Li and H. Wechsler (2009), Face Authentication Using Recognition-by-Parts, Boosting and Transduction, *Int. Journal of Artificial Intelligence and Pattern Recognition (IJPRAI)*, Vol. **23**, No. 3, 545 - 573.

68) H. Wechsler (2009), Linguistics and Face Recognition, *Journal of Visual Languages and Computing*, Vol. **20**, No. 3, 145 - 155.

69) D. DeBarr and H. Wechsler (2009), Spam Detection Using Clustering, Active Learning, and Random Forests, *6th Conf. on Email and Anti-Spam*, Mountain View, CA.

70) N. Schmid and H. Wechsler (2010), Information Theoretical (IT) and Statistical Learning (SLT) Characterization of Biometric Recognition Systems, *SPIE Electronic Imaging: Media Forensics and Security*, San Jose, CA.

71) H. Wechsler and N. Schmid (2010), Robust Biometrics Using Multi-Layer and Multi-Level Fusion, *3rd IDGA Conf. on Biometrics for National Security and Defense*, Washington, D.C (invited lecture).

72) D. DeBarr and H. Wechsler (2010), Spam Detection Using Social Network Analysis, *3rd Int. Conf. on Social Computing, Behavioral Modeling, and Prediction (SBP 2010)*, Washington, DC.

73) V. Ramanathan and H. Wechsler (2010), Phishing Detection Using Probabilistic Latent Semantic Analysis, *Quantitative Methods in Defense and National Security*, Washington, DC.

74) J. Zhuo, F. Nicolo, N. Schmid, and H. Wechsler (2010), Adaptive Biometric Authentication Using Non-Linear Mappings on Quality Measures and Verification Scores, *17th Int. Conf. on Image Processing (ICIP)*, Hong Kong.

75) H. Wechsler (2010), Identity Management Using Biometrics and Forensics, *2nd IDGA (Institute for Defense & Government Advancement) Conf. on Identity Management,* Washington, D.C. (invited lecture).

76) V. Ramanathan and H. Wechsler (2010), Robust Face Recognition for Occlusion and Disguise Using Holistic Anthropometric and Appearance-Based Features and Boosting, *Pattern Recognition Letters* Vol. **30**, 2425 – 2435.

77) H. Wechsler (2010), Intelligent Biometric Information Management, *J. of Intelligent Information Management* Vol. **2**, 499 – 511.

78) S. S. Ho and H. Wechsler (2010), A Martingale Framework for Detecting Changes in the Data Generating Model in Data Streams, *IEEE Trans. on Pattern Analysis and Machine Intelligence,* Vol. **32**, No. 12, 2113 – 2127.

79) H. Wechsler (2011), Best Practices and Evaluation Protocols for Real - World Face Recognition, *4th IDGA (Institute for Defense & Government Advancement) Conf. on Biometrics for National Security and Defense*, Washington, D.C. (invited lecture).

80) M. De Marsico, M. Nappi, D. Riccio, and H. Wechsler (2011), Iris Segmentation Using Pupil Localization, Linearization, and Limbus Reconstruction, *J. of Ambient Intelligence and Human Computing*, Vol. **2**, No. 9, 153 – 162.

81) H. Wechsler (2011), Smart and Secure Identity Management, *Int. Conf. on Biometrics and Security in Global Perspective*, Washington, DC. (Invited lecture).

82) M. De Marsico, M. Nappi, D. Ricci, and H. Wechsler (2011), Robust Face Recognition after Plastic Surgery Using Local Region Analysis, *Int. Conf. on Image Analysis and Recognition (ICIAR),* Burnaby, BC, Canada.

83) H. Wechsler and S.S. Ho (2011), Evidence-Based Management of Data Collection and Decision-Making Using Algorithmic Randomness and Active Learning, *J. of Intelligent Information Management,* Vol. **3**, No. 4, 142 – 159.

84) N. Basit and H. Wechsler (2011), Computational Mutagenesis and Protein Function Prediction Using Computational Geometry, 4-Body Statistical Potential and On-Line Transduction, *Advances in Bioinformatics,* Vol. **2011**, Article ID 958129, doi:10.1155/2011/958129.

85) N. Basit and H. Wechsler (2011), Function Prediction for in silico Protein Mutagenesis Using Transduction and Active Learning, *IEEE International Conference on Bioinformatics & Biomedicine*, Atlanta, Georgia.

86) H. Wechsler (2012), Biometrics, Forensics, Security, and Privacy Using Smart Identity Management and Interoperability: Validation and Vulnerabilities of Various Techniques, *Review of Policy Research*, Vol. **29**, No. 1, 63 – 89.

87) D. DeBarr and H. Wechsler (2012), Spam Detection Using Random Boost, *Pattern Recognition Letters,* Vol. **33**, No. 10, 1237 – 1244.

88) V. Ramanathan and H. Wechsler (2012), PhishGILLNET – Phishing Detection Methodology Using Probabilistic Latent Semantic Analysis, Adaboost, and Co-Training, *EURASIP Journal of Information Security,* Vol. **2012:**1, Springer, http://jis.eurasipjournals.com/content/2012/1/1.

89) V. Ramanathan and H. Wechsler (2012), Phishing Website Detection Using Latent Dirichlet Allocation and AdaBoost, *IEEE Int. Conf. on Intelligence and Security Informatics*, Washington, DC.

90) Y. S. Wang and H. Wechsler (2012), Musical Keys and Chords Detection Using Unsupervised Learning with Infinite Gaussian Mixture, *ACM International Conference on Multimedia Retrieval (ICM),)* Honk Kong, China.

91) A. El-Masri, P. Likarish, H. Wechsler, and B.Kang (2012), Identifying Users with Applications Specific Command Streams, *13th International Workshop of Information Security Applications*, Jeju Island, Korea.

92) H. Khiyari, M. DeMarsico, A. Abate, and H. Wechsler (2012), Biometric Interoperability Across Training, Enrollment, and Testing for the Purpose of Face Identification, *IEEE Workshop on Biometric Measurements and Systems for Security and Medical Applications*, Salerno, Italy.

93) D. Riccio, G. Tortora, M. DeMarsico, and H. Wechsler (2012), EGA- Ethnicity, Gender, and Age Preannotated Face Database, *IEEE Workshop on Biometric Measurements and Systems for Security and Medical Applications*, Salerno, Italy.

94) M. Nappi and H. Wechsler (2012), Robust Re-Identification Using Randomness and Statistical Learning: Quo Vadis, *Pattern Recognition Letters*, Vol. **33**, No. 14, 1820 – 1827.

95) M. De Marsico, M. Nappi, D. Ricci, and H. Wechsler (2013), Robust Face Recognition for Uncontrolled Pose and Illumination Changes, *IEEE Trans. on Systems, Man, and Cybernetics: Systems,* Vol. **43**, No. 1, 149 – 163.

96) V. Ramanathan and H. Wechsler (2013), Phishing Detection and Impersonated Entity Discovery Using Conditional Random Field and Latent Dirichlet Allocation*, Computer and Security*, Vol. **34**, 123 - 139.

97) A. Liu, Jim X. Chen, and H. Wechsler (2013), Real-time Covert Timing Channels Detection in a Networked Virtual Environment, *9th Annual IFIP WG 11.9 International Conference on Digital Forensics*, Orlando, FL.

98) D. DeBarr, V. Ramanathan, and H. Wechsler (2013), Phishing Detection Using Traffic Behavior, Spectral Clustering, and Random Forests, *IEEE Int. Conf. on Intelligence and Security Informatics (ISI)*, Seattle, WA.

99) N. Basit and H. Wechsler (2013), Explanation and Prediction of nsSNP-Induced Pathology Using Association Mining, Transduction, and Active Learning, Advanced Studies in Biology, Vol. **5**, No. 5, 199-214.

100) H. Wechsler (2013), Face Recognition for Uncontrolled Settings, *IARPA / JANUS' Proposer Day*, College Park, MD.

101) D. DeBarr and H. Wechsler (2013), Fraud Detection Using SVM, Reputation Features, and Random Forests, *9th International Conference on Data Mining (DMIN'13)*, Las Vegas, NV.

102) Y. S. Wange and H. Wechsler (2013), Unsupervised Audio Key and Chord Recognition, *16th Int. Conf. on Digital Audio Effects (DAFx'13),* Maynooth, Ireland.

103) M. De Marsico, M. Nappi, D. Ricci, and H. Wechsler (2013), Demographics versus Biometric Interoperability, *17th International Conference on Image Analysis and Processing (ICIAP),* Naples, Italy.

104) N. A. Schmid, J. Zuo, F. Nicolo, and H. Wechsler (2013), IRIS QUALITY METRICS for ADAPTIVE AUTHENTICATION, in *Handbook of Iris Recognition*, M. J. Burge and K. W. Bowyer (Eds.), pp. 67 – 84, Springer.

105) S. Barra, C. Galdi, M. DeMarisco, D. Ricci, and H. Wechsler (2013), FAME: Face Authentication for Mobile Encounter, *IEEE Workshop on Biometric Measurements and Systems for Security and Medical Applications (BIOMS 2013),* Naples, Italy.

106) D. DeBarr, H. Sun, and H. Wechsler (2013), Adversarial Spam Detection Using Randomized Hough Transform – Support Vector Machines (RHT-SVM), *12th Int. Conf. on Machine Learning and Applications (ICMLA),* Miami, Florida.

107) H. Wechsler and Fayin Li (2014), ROBUST BIOMETRICS and FACE RECOGNITION, in *Conformal Predictions for Reliable Machine Learning: Theory, Adaptations, and Applications*, V. Balasubramanian, S.S. Ho, and V. Vovk (Eds.), Elsevier, 189 – 215.

108) V. Balasubramanian, S. Chakraborty, S.S. Ho, H. Wechsler, and S. Panchanathan (2014), ACTIVE LEARNING, in *Conformal Predictions for Reliable Machine Learning: Theory, Adaptations, and Applications*, V. Balasubramanian, S.S. Ho, and V. Vovk (Eds.), Elsevier, 49 – 70.

109) S.S. Ho and H. Wechsler (2014), ON LINE CHANGE DETECTION USING EXCHANGEABILITY, in *Conformal Predictions for Reliable Machine Learning: Theory, Adaptations, and Applications*, V. Balasubramanian, S.S. Ho, and V. Vovk (Eds.), Elsevier, 99 – 114.

110) A. El Masri, P. Likarish, H. Wechsler, and B. Byunghoon Kang (2014), Identifying Users with Application-Specific Command Streams, *12th Int. Conf. on Privacy, Security and Trust (PST 2014)*, Toronto, Canada.

111) H. Wechsler (2014), FACE RECOGNITION METHODS for UNCONTROLLED SETTINGS, in *Face Recognition in Adverse Conditions,* M. DeMarisco, M. Nappi, and M. Tistarelli, (Eds.), IGI Global, 38 - 68.

112) H. Sun, J. X. Chen, and H. Wechsler (2014), A New Segmentation Method for Broadcast Sports Video, *8th Int. Conf. on Frontier of Computer Science and Technology (FCST)*, Chengdu, China.

113) H. Wechsler (2015), Reliable, Robust, ands Resilient Biometrics – Interoperability and Performance Evaluation, *9th Conf. on Biometrics for Government and Law Enforcement,* Arlington, VA (Keynote Presentation).

114) M. De Marsico, M. Nappi, D. Ricci, and H. Wechsler (2015), Face Recognition after Plastic Surgery Using Local Based Approaches, *Pattern Recognition,* Vol. **48**, No. 4, 1261 – 1276.

115) M. De Marsico, M. Nappi, D. Riccio, and H. Wechsler (2015), Mobile Iris Challenge Evaluation (MICHE) – I, Biometric Iris Dataset and Protocols, *Pattern Recognition Letters*, Vol. **57**, No. 5, 17 – 23.

116) A. El Masri, P. Likarish, H. Wechsler, and B. Byunghoon Kang (2015), Active Authentication Using Scrolling Behaviors, *6th IEEE Int. Conf. on Information and Communication Systems (ICICS 2015)*, Amman, Jordan.

116) L. Bergamasco, R. Oliveira, H. Wechsler, C. Dajuda, and F. Nunes (2015), Content- Based Image Retrieval of 3D Medical Models Using Spectral Clustering, *28th Int. IEEE Symposium on Computer-Based Medical Systems (CBMS)*, Sao Paolo, Brazil.

117) L. Bergamasco, H. Oliviera, H. Biscaro, F. Nunes, and H. Wechsler (2015), 3D Cardiac Model Retrieval Using Bipartite Graphs, *28th Int. IEEE Symposium on Computer-Based Medical Systems (CBMS)*, Sao Paolo, Brazil.

118) H. Wechsler (2015), Cyber Security Using Adversarial Learning and Conformal Prediction, *J. of Intelligent Information Management,* Vol. **7**, No. 4, 195 – 222.

119) A. Liu, J. X. Chen, and H. Wechsler (2015), Real-time Timing Channel Detection in an SDN-enabled Virtual Environment, *J. of Intelligent Information Management,* Vol. **7**, No. 6, 283 – 302.

120) H. El Khiyari and H. Wechsler (2016), Face Recognition across Time Lapse using Convolutional Neural Networks, *Journal of Information Security*, Vol. **4**., No. **7**, 141 - 151.

121) N. A. Schmid, J. Zuo, F. Nicolo, and H. Wechsler (2016), IRIS QUALITY METRICS for ADAPTIVE AUTHENTICATION, in *Handbook of Iris Recognition* (2nd ed.), K. W. Bowyer and M. J. Burge and (Eds.), pp. 101 – 118, Springer.

122) C. Galdi, H. Wechsler, V. Cantoni, M. Porta, and M. Nappi (2016), Towards Demographic Categorization Using Gaze Analysis, *Pattern Recognition Letters* (Special Issue on Eye Biometrics), Vol. **82**, 226 – 231.

123) H. El Khiyari and H. Wechsler (2016), Face Verification Subject to Varying (Age, Ethnicity, and Gender) Demographics Using Deep Learning*, Int. Journal of Biometrics and Biostatistics*, Vol. **7**, No. 4, 1 – 5, DOI: 10.4172/2155-6180.1000323.

124) C. Galdi, M. Nappi, D. Ricci, and H. Wechsler (2016), Eye Movement Analysis for Human Authentication*, Pattern Recognition Letters,* Vol. **84**, 272 – 283.

125) M. De Marsico, M. Nappi, D. Ricci, and H. Wechsler (2017), Leveraging Implicit Demographic Information for Face Recognition Using Multi-Modal Expert System, *Multimedia Tools and* Applications, Vol. **76**, No. 23, 383 – 411.

126) A. S. Toor, H. Wechsler, and M. Nappi (2017), Question Part Relevance and Editing for Cooperative and Context-Aware VQA (C2VQA), *15th IEEE Int. Workshop on Content-Based Multimedia Indexing (CBMI)*, Florence, Italy, *ACM*, 4:1 – 4.6.

127) H. El Khiyari and H. Wechsler (2017), Age Invariant Face Recognition Using Convolutional Networks and Set Similarity Distances, *Journal of Information Security*, Vol. **8**, No. 3, 174 – 185.

128) G. Guo and H. Wechsler (Eds.) (2017), Mobile Biometrics, *IET Book Series on Advances in Biometrics*, Kent, UK.

129) A. S. Toor and H. Wechsler (2018), Biometrics and Forensics Integration Using Deep Multi-Modal Semantic Alignment and Joint Embedding, *Pattern Recognition Letters*, Vol. **113**, 29 – 37.

130) A. S. Toor, H. Wechsler, M. Nappi, and K-K. R. Cho (2018), Visual Question Authentication Protocol, *Computers and Security*, Vol. **76**, 285 – 294.

131) A. S. Toor and H. Wechsler (2019), Modern Art Challenges Face Recognition, *Pattern Recognition Letters*, https://doi.org/10.1016/j.patrec.2018.02.014 (in press).

132) A. S. Toor, H. Wechsler, and M. Nappi (2019), Biometric Surveillance Using Visual Question Answering*, Pattern Recognition Letters*, https://doi.org/10.1016/j.patrec.2018.02.013 (in press).

133) A. S. Toor, H. Wechsler, and M. Nappi (2019), Question Action Relevance and Editing for Visual Question Answering, *Multimedia and Application Tools*, https://doi.org/10.1007/s11042-018-6097-z (in press).

PATENTS

1. Fractal Image Compression Using Quad-Q-Learning (with Clifford Claussen) (# 6,775,415 B1 awarded on August 10, 2004) (licensed in 2006 by *Intellectual Ventures* / Nathan Myhrvold, CEO/).

2. Feature Based (Face Recognition) Classification (with Chengjun Liu) (# 6,826,300 B2 awarded on November 30, 2004).

3. Open Set (Face) Recognition Using Transduction (with Fayin Li) (# 7,492,943 B2 awarded on February 17, 2009).

4. Recognition by Parts Using Adaptive and Robust Correlation Filters (with Hung Lai and Venkatesh Ramanathan) (# 8,073,287 B1 awarded on December 6, 2011).

5. Data Stream Change Detector (with Shen - Shyang Ho) (# 8,073,963 B1 awarded on December 6, 2011).

6. Face Authentication Using Recognition-by-Parts, Boosting, and Transduction (with Fayin Li) (#8,194,938 B2 awarded on June 5, 2012).

7. Robust Face Recognition for Occlusion and Disguise Using Holistic Anthropometric and Appearance-Based Features and Boosting (with Venkatesh Ramanathan) (# 8,379,940 B2 awarded on February 19, 2013).

8. Age Invariant Face Recognition Using Convolutional Neural Networks and Set Distances (with Hachim El Khiyari) (non-provisional regular application 15 / 936,525 filed with the US Patent Office on March 27, 2018) (pending).

9. Visual Question Authentication Protocol (VQAP) System and Methods (with Andeep Toor) (provisional application 62 / 775,118 filed with the US Patent Office on December 4, 2018) (pending)