COLLEGE OF ENGINEERING AND COMPUTER SCIENCE
FLORIDA ATLANTIC UNIVERSITY

Announces the Ph.D. Dissertation Defense of

Saurin Sharad Parikh

for the degree of Doctor of Philosophy (Ph.D.)

"Predicting Levels of Learning with Eye Tracking"

Nov. 16, 2017, 3 p.m.
Engineering East, Room 405
777 Glades Road
Boca Raton, FL

DEPARTMENT:
Computer and Electrical Engineering and Computer Science

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ABSTRACT OF DISSERTATION
Predicting Levels of Learning with Eye Tracking

E-Learning is transforming the delivery method of education. Today, millions of students take self-paced online courses. However, the content and language complexity often hinders comprehension, and that with lack of immediate help from the instructor leads to weaker learning outcomes. Ability to predict difficult content in real time enables eLearning systems to adapt content as per students' level of learning. The recent introduction of low-cost eye trackers has opened a new class of applications based on eye response. Eye tracking devices can record eye response on the visual element or concept in real time. The response and the variations in eye response to the same concept over time may be indicative of the levels of learning. We have analyzed reading patterns using eye tracker and derived eye response features based on psycholinguistics, contextual information processing, anticipatory behavior analysis, recurrence fixation analysis, and pupils' response. We use eye and pupil responses to predict the level of learning of a term/concept for individuals.

The main contribution is the spatio-temporal analysis of the eye response to a term/concept to derive relevant first pass (spatial) and reanalysis (temporal) eye response features. A model, built using these derived features, uses our proposed feature weighted linguistics classifier (FWLC) to achieve a prediction accuracy of 90.54% an increase of 23.62% over baseline and 29.54% over the first-pass variant of baseline (majority voting classifier). On comparing the performance of FWLC with other frequently used machine learning classifiers, FWLC achieves highest true positive rate. This research has applications into adaptive eLearning and learning assessment.

BIOGRAPHICAL SKETCH
Born in India
B.S., Gujarat University, Ahmedabad, India
M.C.A., Gujarat University, Ahmedabad, India
Ph.D. 2017, Florida Atlantic University, Boca Raton, Florida

CONCERNING PERIOD OF PREPARATION
& QUALIFYING EXAMINATION

Time in Preparation: 2014 - 2017

Qualifying Examination Passed: Spring 2015

Published Papers:

S. Parikh & H. Kalva (2018). Predicting Learning Difficulty based on Gaze and Pupil Response, *IS&T Conference on Human Vision & Electronic Imaging,* Burlingame, California, USA (Under Review).

S. Parikh & H. Kalva (2018). Feature Weighted Linguistics Classifier for Predicting Learning Difficulty Using Eye Tracking, *ACM Transactions on Applied Perception,* USA (Under Review).

S. Parikh & H. Kalva (2018). Eye Gaze Feature Classification for Predicting Levels of Learning , *ACM International Conference on User Modelling,* Adaptation and Personalization (UMAP), USA (Under Review).

S. Parikh & H. Kalva (2017). Predicting Information Context Processing from Eye Movements. *19th European Conference on Eye Movements (ECEM)* at Bergische Universität, Wuppertal, Germany, August, 2017 (In Press).

S. Parikh & H. Kalva (2017). Real Time Learning Level Assessment using Eye Tracking, *A Workshop on Computational and Mathematical models in Vision (MODVIS, a Satellite event of VSS 2017),* St Petersburg, Florida, USA, paper included in Cognition and Perception Commons, Other Computer Engineering Commons, May 2017.

K. Parikh, S. Parikh, H. Kalva, D. Jaramillo (2017). Cognitive Systems-Redefining the Library User Interface, *International Conference on Changing Landscape of Science & Technology Libraries (CLSTL 2017),* Affiliation: IIT Gandhinagar, India, March 2017, DOI: 10.13140/RG.2.2.28305.22888.

S. Parikh, D. Ruiz, H. Kalva, G. Fernandez-Escribano and V. Adzic (2017), High Bit-Depth Medical Image Compression with HEVC, *IEEE Journal of Biomedical and Health Informatics*, vol. PP, no. 99, DOI: 10.1109/JBHI.2017.2660482.

S. Parikh, H. Kalva and V. Adzic (2016), Evaluation of HEVC Compression for High Bit Depth Medical Images, *IEEE International Conference on Consumer Electronics (ICCE)*, Las Vegas, NV, pp. 311-314. DOI: 10.1109/ICCE.2016.7430625.

S. Parikh, D. Ruiz, H. Kalva and G. Fernández-Escribano, (2016), Content Dependent Intra Mode Selection for Medical Image Compression using HEVC, *IEEE International Conference on Consumer Electronics (ICCE)*, Las Vegas, NV, pp. 561-564. DOI: 10.1109/ICCE.2016.7430731.

Patent Application:

S. Parikh & H. Kalva, System and Method for Real Time Assessment of Levels of Learning and Adaptive Instruction Delivery, U.S. provisional patent application no. 62500753.

Awards:

Engineering Second Place, at 8th Annual Graduate Research Day, FAU, May 2017.

Third Place, at Three Minutes Research Competition (CEECS Department Level), Feb 2017.