
Event Prediction in Pharyngeal High-Resolution Manometry

Nicolas Schilling¹, Andre Busche¹, Simone Miller², Michael Jungheim², Martin Ptok², and Lars Schmidt-Thieme¹

¹ University of Hildesheim, Information Systems and Machine Learning Lab
{schilling,busche,schmidt-thieme}@ismll.uni-hildesheim.de

² Medizinische Hochschule Hannover, Klinik für Phoniatrie und Pädaudiologie
{Miller.Simone,Jungheim.Michael,Ptok.Martin}@mh-hannover.de

Abstract. A prolonged phase of increased pressure in the upper esophageal sphincter (UES) after swallowing might result in globus sensation. Therefore it is mandatory to evaluate restitution times of the UES in order to distinguish normal from impaired swallow associated muscular activities. Estimating the event t^* where the UES has returned to its resting pressure after a patient has swallowed can be accomplished by predicting if swallowing activities are present or not. While the problem, whether a patient suffers from dysphagia, is approached in [MIELENS, 2012], our task directly allows for a profound understanding of pharyngeal activities.

From the machine learning point of view, the problem can be understood as binary sequence labeling, while the goal is not to globally find the most accurate sequence classification, but to find a sample t^* within the sequence obeying a certain characteristic: We seek a best approximation of label change which can be thought of as a dissection of the sequence into two individual parts. Whereas commonly used models for sequence labeling are based on graphical models [NGUYEN, 2007], we approach the problem using logistic regression as classifier and integrating sequential features by means of FFT-coefficients. Additionally, we add a Laplacian regularizer in order to encourage a smooth classification due to the monotonicity of target labels.

References

- MIELENS, J. et al. (2012): Application of Classification Models to Pharyngeal High-Resolution Manometry. *Journal of Speech, Language, and Hearing Research*, 55, 892–902.
- NGUYEN, N. and GUO, Y. (2007): Comparison of Sequence Labeling Algorithms and Extensions. In: Zoubin Ghahramani (Ed.): *Proceedings of the 24th international conference on Machine learning*. ACM, New York, NY, USA, 681–688.

Keywords

Sequence Labeling, Laplacian Regularizer, Pharyngeal Manometry