Visar Berisha, PhD

ISCA Distinguished Lecturer, Term 2023/2024

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Biography:

Visar Berisha is a Professor at Arizona State University, with a joint appointment in the College of Engineering and the College of Health Solutions. He was previously Fulton Entrepreneurial Professor at ASU and had a joint appointment with the Mayo Clinic as a Research Fellow. Berisha's main research interests include clinical speech analytics and machine learning for healthcare. With a focus on speech, his lab has developed and validated on a large-scale new machine learning and statistical signal processing tools for remote assessment of clinically-relevant changes in speech. This has led to global adoption of these tools to track patient outcomes. Recently, a tool based on his technology (commercialized by a company he co-founded, Aural Analytics) for assessment of cognition via speech was registered with the Food and Drug Administration (FDA). A second tool was designated as a Breakthrough Device by the FDA.

Berisha's research is primarily funded by the National Institutes of Health, the Department of Defense, and the National Science Foundation. This work has led to many academic publications, several patents, and a VC-backed company. Berisha's work has also been featured in the New York Times, on ESPN, National Public Radio, the Wall Street Journal, Wired magazine, and several other international media outlets.

Presentations:

- **The challenges with existing approaches to clinical speech analytics:** The focus of this talk will be on converging evidence collected from multiple systematic reviews that the traditional supervised machine learning paradigm leads to clinical speech models that do not generalize. The background for this topic area can be found in [2] and [3].
- **A new measurement model for clinical speech applications:** Many existing clinical speech papers use high-dimensional repurposed input features originally developed for other applications (e.g. OpenSMILE, GeMAPS, Praat, etc.). However, these features are clinically uninterpretable and exhibit poor-to-moderate repeatability. The focus of this topic area will be a new measurement model for clinical speech analytics that results in interpretable features related to respiration, speech motor-control, and cognitive-linguistics. Publications relevant to this work include, [3], [4], and [5].
- **Creative use of deep learning when working with limited clinical data:** The focus of this topic area will be on combining domain expertise with deep learning to create robust new tools for measuring clinically-relevant changes in speech. The publication in [1] is one example.
- **Translating clinical speech analytics from the lab to the clinic:** It takes, on average, 17 years to translate evidence-based research into clinical practice. The focus of this topic area will be on how we can shorten this timeline by promoting algorithm development practices that result in better generalization and easier translation. The work in [2] is relevant for this.

References:

[1] Mathad, V.C., Liss, J.M., Chapman, K., Scherer, N. and Berisha, V., 2022. Consonant-vowel transition models based on deep learning for objective evaluation of articulation. *IEEE/ACM Transactions on Audio, Speech, and Language Processing*, *31*, pp.86-95.

[2] Berisha, V., Krantsevich, C., Hahn, P.R., Hahn, S., Dasarathy, G., Turaga, P. and Liss, J., 2021. Digital medicine and the curse of dimensionality. *NPJ digital medicine*, *4*(1), p.153.

[3] Stegmann, G.M., Hahn, S., Liss, J., Shefner, J., Rutkove, S.B., Kawabata, K., Bhandari, S., Shelton, K., Duncan, C.J. and Berisha, V., 2020. Repeatability of commonly used speech and language features for clinical applications. *Digital Biomarkers*, *4*(3), pp.109-122.

[4] Stegmann, G.M., Hahn, S., Liss, J., Shefner, J., Rutkove, S., Shelton, K., Duncan, C.J. and Berisha, V., 2020. Early detection and tracking of bulbar changes in ALS via frequent and remote speech analysis. *Nature npj Digital Medicine*, *3*(1), pp.1-5.

[5] Berisha, V., Wang, S., LaCross, A. and Liss, J., 2015. Tracking discourse complexity preceding Alzheimer's disease diagnosis. *Journal of Alzheimer's Disease*, *45*(3), pp.959-963.