

potential confounding variables such as disease stage, medication state and cognitive deficits.

It is worth exploration of developing a regression model based on the current classification model, which could make it possible to conduct fine-grained evaluation on the motor function and the disease progression. Additional information from user's everyday smartphone interaction, such as voice signal during phone calls, accelerometer data during idle periods, can be used to complement the current analysis.

This work was supported by National Key R&D Program of China (2016YFB1001405), NSFC (61232013 and 61422212), CAS Key Research Program of Frontier Sciences (QYZDY-SSW-JSC041), and CAS Pioneer Hundred Talents Program.

References

1. Arroyo-Gallego, T., et al. (2017). Detection of Motor Impairment in Parkinson's Disease via Mobile Touchscreen Typing. *IEEE Transactions on Biomedical Engineering*.
2. Bot, B. M., et al. "The mPower study, Parkinson disease mobile data collected using ResearchKit." *Scientific Data* 3(2016):160011.
3. Campos F. L. et al., "Rodent models of Parkinson's disease: Beyond the motor symptomatology," *Frontiers Behav. Neurosci.*, vol. 7, Jan. 2013, Art. no. 175.
4. Fan, X. and Wang, J. BayesHeart: A Probabilistic Approach for Robust, Low-Latency Heart Rate Monitoring on Camera Phones. In *Proceedings of IUI2015*.
5. Gabel, M., et al. (2012, August). Full body gait analysis with Kinect. In *Engineering in Medicine and Biology Society (EMBC), 2012 Annual International Conference of the IEEE* (pp. 1964-1967). IEEE.
6. Ghika, J., et al. (1993). Portable system for quantifying motor abnormalities in Parkinson's disease. *IEEE Transactions on Biomedical Engineering*, 40(3), 276-283.
7. Keijsers, N. L., et al. (2006). Ambulatory motor assessment in Parkinson's disease. *Movement Disorders*, 21(1), 34-44.
8. L. M. L. de Lau and M. M. B. Breteler, "Epidemiology of Parkinson's disease," *Lancet Neurol.*, vol. 5, no. 6, pp. 525–35, Jun. 2006.
9. Mazilu, S., et al. GaitAssist: a daily-life support and training system for parkinson's disease patients with freezing of gait. In *Proceedings of CHI2014*.
10. McNaney, R., et al. LApp: a speech loudness application for people with Parkinson's on Google glass. In *Proceedings of CHI2015*.
11. McNaney, R., et al. Exploring the acceptability of google glass as an everyday assistive device for people with parkinson's. In *Proceedings of CHI2014*.
12. Mentis, H. M., et al. Crafting a View of Self-Tracking Data in the Clinical Visit. In *Proceedings of CHI2017*.
13. Patel, S., et al. (2009). Monitoring motor fluctuations in patients with Parkinson's disease using wearable sensors. *IEEE transactions on information technology in biomedicine*, 13(6), 864-873.
14. Patrick, S. K., et al. (2001). Quantification of the UPDRS rigidity scale. *IEEE transactions on neural systems and rehabilitation engineering*, 9(1), 31-41.
15. Spieker, S., et al. Reliability, specificity and sensitivity of longterm tremor recordings. *Electroencephalography & Clinical Neurophysiology*, 97, 326–331.