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Pulse Wave Analysis in the Human Brain

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Cardiac pulsations in the human brain have recentlly garnered interest due to their potential involvement in the pathogenesis of neurodegenerative diseases. The (pulse) wave, which describes the velocity of blood flow along an intracranial artery, consists of a forward (anterograde) and backward (retrograde, reflected) part, but the measurement usually consists of a superposition of these components. In this talk, we provide a mathematical framework for the inverse problem of estimating the pulse wave velocity as well as the forward and backward component of the pulse wave separately, using MRI measurements on the middle cerebral artery. Additionally, we provide an analysis of the problem, which is necessary for the application of a solution method based on an alternate direction approach. The proposed method's applicability is demonstrated through numerical experiments using simulation data.

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