

A Transformer-Based Approach to Matrix Balancing in Economics: A Paradigm Shift Beyond Iterative Methods

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This paper introduces a Transformer-based (the technology underlying Artificial Intelligence models) approach to matrix balancing in economics, addressing the limitations of classical iterative methods such as the RAS algorithm variants. Matrix balancing is a critical task in economic modeling, underpinning the construction or update of consistent Supply-Use and Input-Output tables. Traditional iterative methods often suffer from slow convergence, high sensitivity to initial conditions, and difficulties in incorporating complex constraints. The challenge increases when facing unfeasible problems like 0 vs non-zero prior/target.

In contrast, our Transformer-based method directly learns the optimal transformation to balance a given matrix while preserving its inherent structural relationships. The comprehensive improvements underscore that deep learning techniques, particularly those based on Transformer architectures, offer significant gains in accuracy, efficiency, and robustness for economic applications.