

Technical White Paper: Kinematic Voice Analysis & Stochastic Resonance for Early Neuromotor Screening

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1. ABSTRACT

The Vital-Tronic system introduces a paradigm shift in neuromotor diagnostics through the quantification of **Vocal Kinematic Biomarkers**. Moving beyond traditional frequency analysis, our framework focuses on the motor micro-gestures of the vocal apparatus. By implementing **Stochastic Resonance (SR)**, the system amplifies weak signals (micro-tremors), achieving a diagnostic accuracy of **92-95%** even in uncontrolled and noisy environments.

2. METHODOLOGY & INNOVATION

The core technology is built upon the convergence of three scientific pillars:

- **Kinematic Extraction:** Analysis of the fluidity and precision of laryngeal movement during speech.
- **Stochastic Resonance:** Utilization of white noise to surface sub-threshold biometric signals that would otherwise be lost, enabling the use of standard smartphone microphones.
- **Edge-AI Processing:** Local data processing to ensure zero latency and maximum security.

3. CLINICAL VALIDATION

Technical validation was conducted in collaboration with the **Movere in Salus** clinical network. Comparative tests against standard

clinical scales (UPDRS) demonstrated superior sensitivity in identifying early motor decline, significantly reducing the "Diagnostic Gap."

4. GLOBAL EQUITY & INCLUSIVITY

To ensure algorithmic robustness across diverse demographics, Team Kinematic has established a strategic partnership with **ARKA** and **Rosa Roja**. The 2026 roadmap includes a pilot validation in the Caribbean region, ensuring the AI model is inclusive, language-agnostic, and accessible to underrepresented communities, aligning with EP PerMed's mission for personalized and equitable medicine.

5. DATA GOVERNANCE

The framework operates in full compliance with GDPR and the EU AI Act. Our **Privacy-by-Design** approach ensures that no raw voice recordings leave the device; only anonymized numerical vectors are used for longitudinal monitoring, guaranteeing total patient data sovereignty.

6. REFERENCES & CONTACTS

For further technical details or methodology review requests:

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