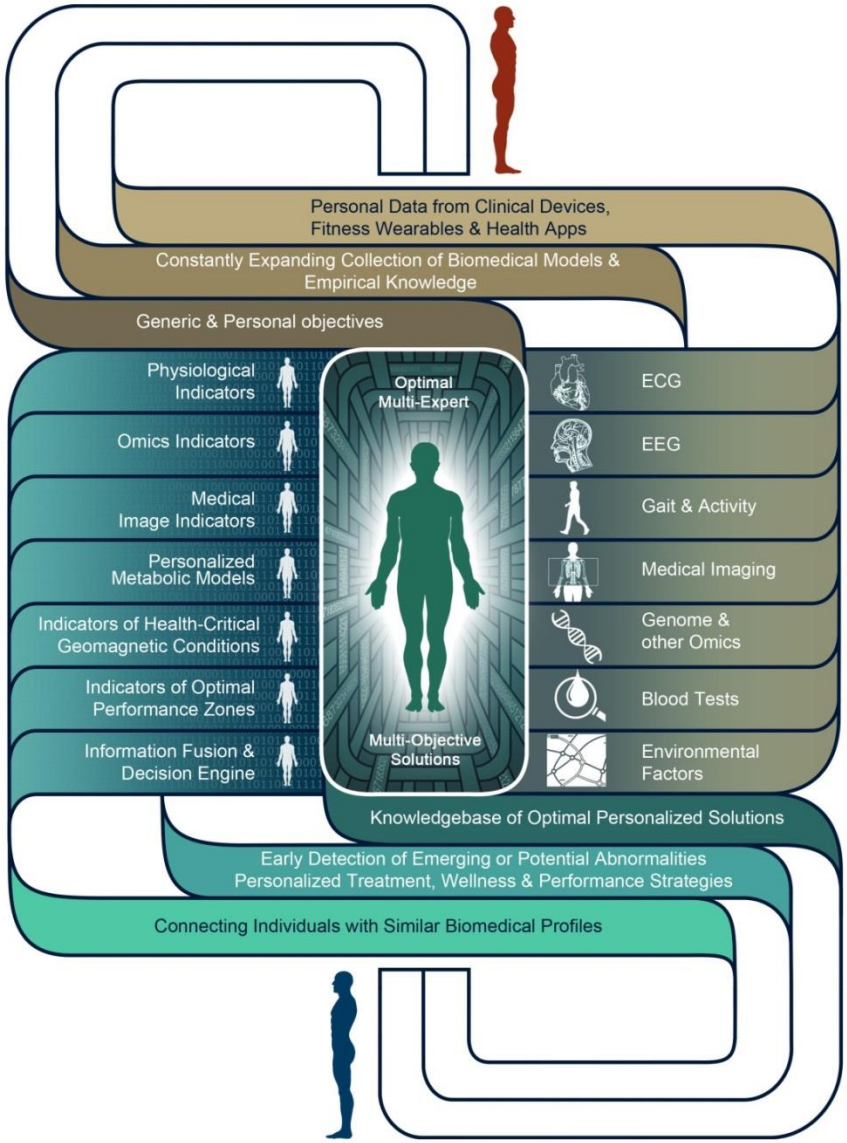
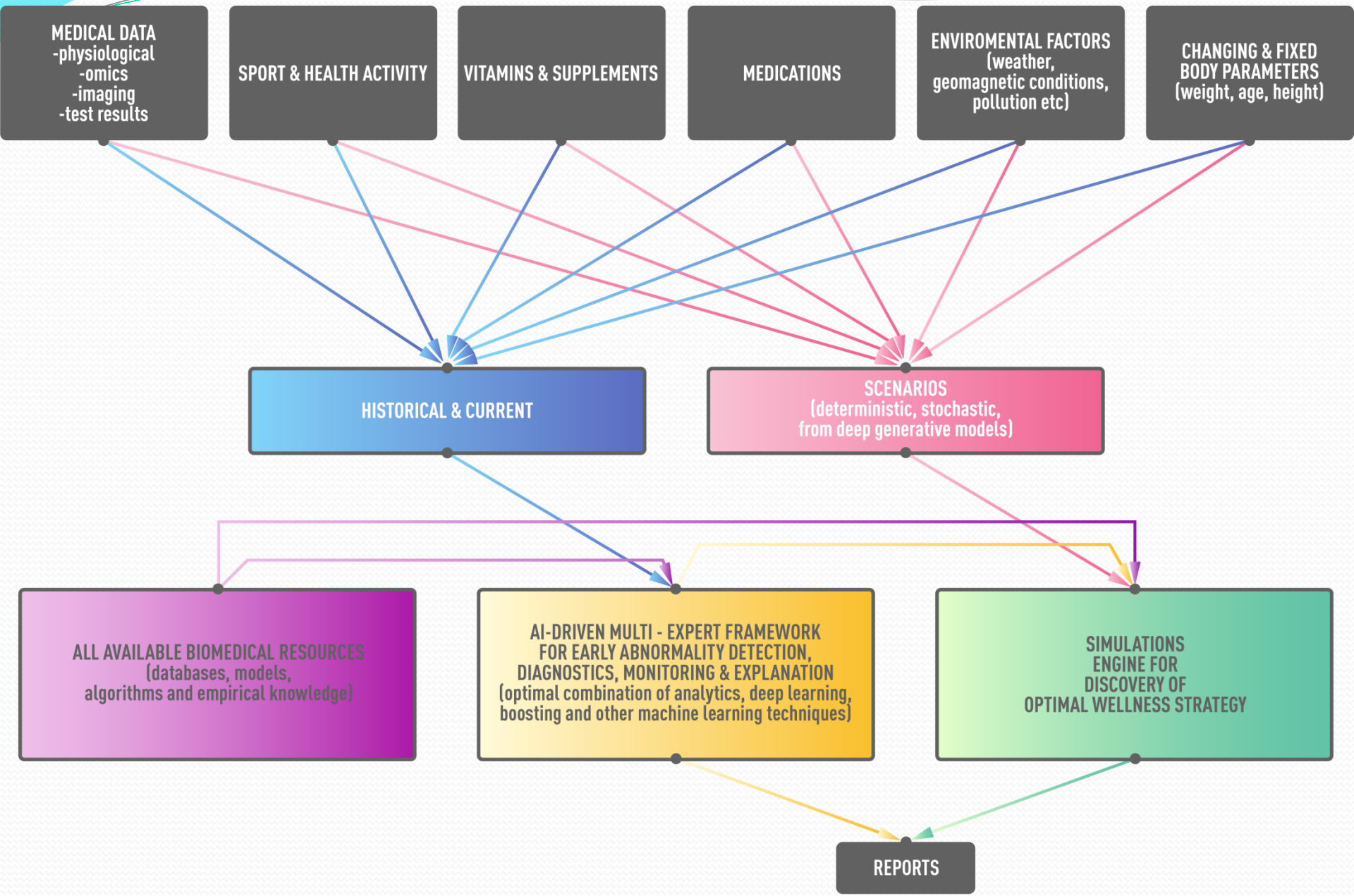
Multi-Expert Discovery of Personalized Optimal Biomedical Solutions (patent pending)



Summary

- AI-Driven Framework for Discovery of Multi-Expert Personalized Biomedical Models & Indicators
- High-Capacity Engine for Multi-Factor Simulation and Multi-Objective Optimization of Treatment, Wellness & Rehabilitation Strategies
- 24/7 Automated Personalization, Monitoring & Decision Support
- Optimal Combination of All Available Biomedical Resources, Novel Research Results & Personal Data to Solve Your Current Problems
- Clear Explanation & Interpretation of the Discovered Personalized Treatment and Wellness Strategies
- Early Detection of the Emerging Medical Abnormalities, Health-Critical & Acute Events, Overtraining and Psychological Conditions
- Predictive Indications of Personalized Zones of Optimal Performance in Sport and Other Competitive Fields

System Outline and Workflow



Selected Applications

- Early Detection of Emerging Abnormalities or Overtraining from Wearable-Device Data
- Early Detection of Treatment Effects for Personalization of Treatment Strategy and Regimen
- Predictive Personalization by Matching Current Biomedical State to Existing Cases
- Predictive Alerts for Rare & Hard-to-Quantify Best-Performance or Critical States
- Discovery of Optimal Regimen from the Long History of Personal Data
- Discovery of Personalized Health-Critical Geo-Magnetic / Weather Events and Predictive Alerts
- Quantitative Description and Monitoring of Individual Zones of Optimal Functioning (IZOF)
- Monitoring and early detection of emerging life-threatening abnormalities
- Integrated Decision Support Solutions for Athletes and Coaches
- Early Diagnostics and Monitoring of Emerging Neurological, Psychological, Psychotic, and Developmental Abnormalities from Wearable-Device (ECG and gait) and Multi-Modal Clinical Data
- Discovery of Optimal Personalized Protocols in Neurofeedback and Other Alternative Therapies
- Discovery of Optimal Nutraceutical or Drug Combinations
- Engine for forward simulation and multi-objective discovery of optimal wellness strategies:
  - Uses all available data to quantify current psycho-physiological personal state
  - Using analytical and deep generative models, creates multi-horizon scenario paths incorporating potential environment and weather effects, probability of genomic mutations, probability of developing different abnormalities given current state and other factors.
  - Using simulation results, multi-objective optimization engine discovers complementary sets of optimal wellness-maintenance strategies

Our Research (Selected Publications)

- Synergy of physics-based reasoning and machine learning in biomedical applications: towards unlimited deep learning with limited data (2019)
- Leveraging domain-expert knowledge, boosting and deep learning for identification of rare and complex states (2019)
- Advantages of Hybrid Deep Learning Frameworks in Applications with Limited Data (2018)
- Multi-expert evolving system for objective psychophysiological monitoring and fast discovery of effective personalized therapies (2017)
- Generic Ensemble-Based Representation of Global Cardiovascular Dynamics for Personalized Treatment Discovery and Optimization (2016)
- Multi-Complexity Ensemble Measures for Gait Time Series Analysis: Application to Diagnostics, Monitoring and Biometrics (2015)
- Universal multi-complexity measures for physiological state quantification in intelligent diagnostics and monitoring systems (2013)
- Robust algorithmic detection of cardiac pathologies from short periods of RR data (2013)
- GENOTYPE CLASSIFICATION AND ALLELIC PATTERNRECOGNITIONUSING KOHONEN SELF-ORGANIZING MAPS (2002)
- Boosting-based discovery of multi-component physiological indicators: Applications to express diagnostics and personalized treatment optimization (2010)
- Ensemble learning frameworks for the discovery of multi-component quantitative models in biomedical applications (2010)
- Robust algorithmic detection of the developed cardiac pathologies and emerging or transient abnormalities from short periods of RR data (2011)
- Ensemble Decomposition Learning for Optimal Utilization of Implicitly Encoded Knowledge in Biomedical Applications (2011)
- Diagnostics of complex and rare abnormalities using ensemble decomposition learning (2011)
- Multi-complexity measures for early detection and monitoring of neurological abnormalities from gait time series (2013)