



Advanced Computational Techniques in Prediction of Treatment for Chronic Disorders (Hypertension)

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Introduction

Goal: Develop advanced ML Models to predict the best hypertension treatments and the risk of complications.

Data: Original EHR dataset with diagnoses, comorbidities, medications, labs, procedures, vital signs.

Tasks:

- Predict the most effective medication (Task 1)
- Rank blood pressure medications by expected success (Task 2)
- Complication risk prediction (Task 3).

Data analytics: Data preprocessing (comorbidities frequencies, medications frequencies, labs selection, count number of medical visits for each patient, etc.) , dimensionality reduction, feature engineering, ML models.



AI & ML for Prediction and Ranking

Methods:

- Tasks 1 & 2: Medication Prediction & Ranking

- **ML Models Planned:**

- XGBoost, RNN, Transformers, Learning-to-Rank (LTR), Extreme Multi-Label Classification (XMLC).

- **Positive outcome:** Controlled BP (<130/85), no complications.

- Task 3: Complication Prediction

- **Models Planned:**

- XGBoost, Transformers, RNN, Regression models: time-to-event prediction.

Results (preliminary):

- **Domains:** Number of patients with data per domains: Comorbidities : 541 539 patients • Labs : 515 596 patients • Medications : 390 641 patients
- **Visits:** Number of patients with 2+ visits – 45% of total number, Number of patients with 3 visits – 24% of total patients



Next Phase – We are preparing to apply for NIH (National Institute of Health) and NSF (National Science Foundation) funding to scale this work into clinical decision support tools.