Artificial Intelligence for Medical Data with Python

10 SAMPLE SLIDES

10 th session – New Trends and APPs in Health Care

UNIVERSITY OF THE AEGEAN

SCHOOL OF ENGINEERING

DEPARTMENT OF INFORMATION AND COMMUNICATION SYSTEMS ENGINEERING
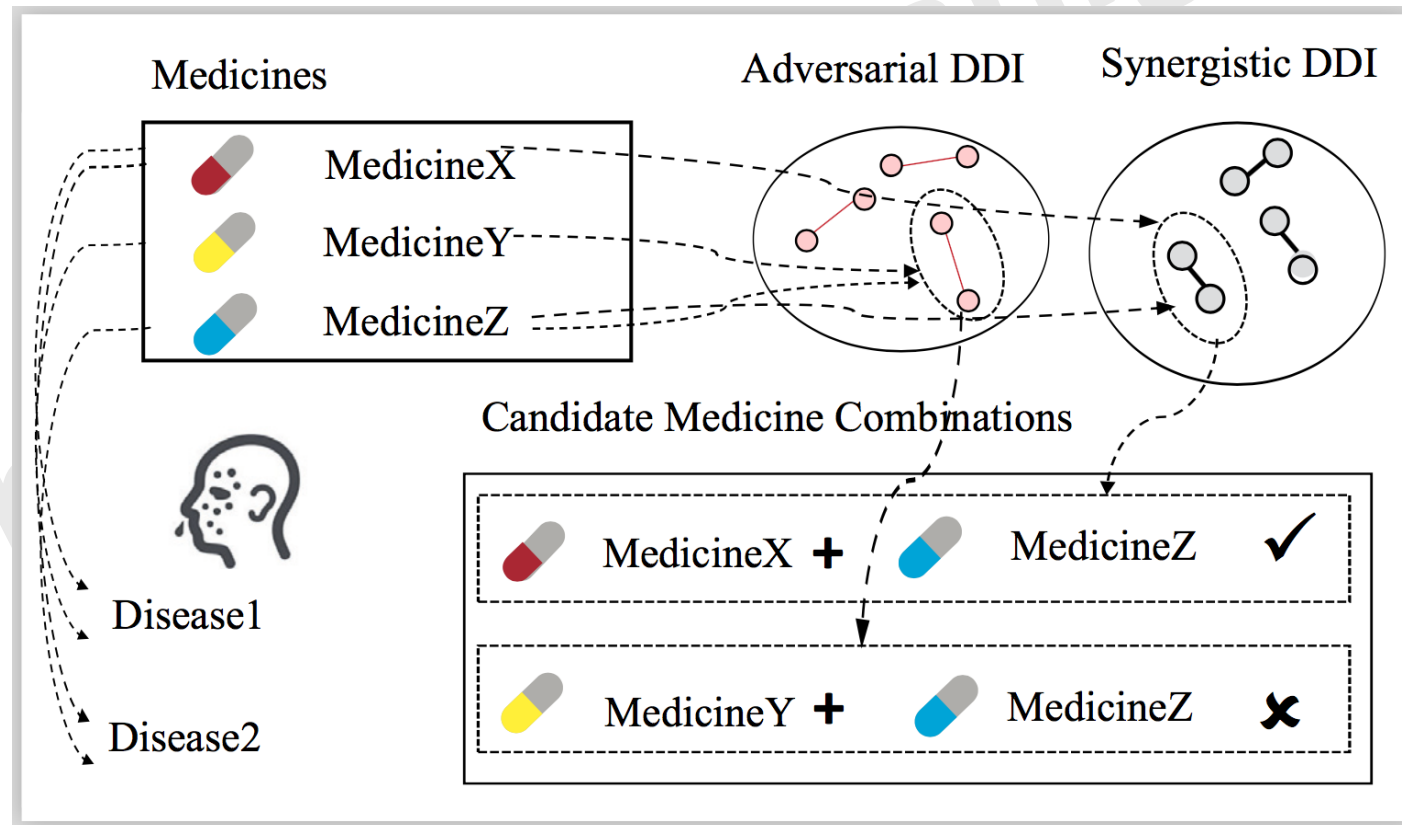
Presenter: Panagiotis Symeonidis

Associate Professor

http://panagiotissymeonidis.com

psymeon@aegean.gr

Our Motivation

- Effectiveness: Provide Accurate Medicine Combinations
- Safety: Reduce the unwanted drug side effects for less toxicity
- Fast recovery: increase the synergistic action of drugs

Evalutation Protocol: Precision vs. Recall

- **Precision is** the fraction of relevant drugs out of all predicted drugs

$$Precision = \frac{tp}{tp + fp}$$

False positive are drugs which were predicted as relevant but the patient does not need them

- **Recall** is the fraction of relevant drugs out of all prescribed drugs from the doctors

$$Recall = \frac{tp}{tp + fn}$$

False negatives are the drugs which were relevant but were not predicted as being so

Since we should correctly identify all those drugs that were prescribed by the doctor, recall should be considered as more important metric than precision.

Evalutation Protocol: Drug-Drug unwanted side effects Rate

$$DDI\ rate = \frac{1}{m} \sum_{i}^{m} \frac{\left|(c_j, c_k) \in Y_i \& (c_j, c_k) \in \mathcal{A}_{ddi}\right|}{\sum_{j,k} 1}$$

where $\sum_{j,k} 1$ is the total number of possible pairwise drug combinations, $\mathcal{A}_{ddi}$ represents all DDI pairs in the DDI knowledge base, i is a sample index in the test set representing a patient and m is the size of the test set (i.e., the number

DDI change % =

$$\frac{\text{DDI Rate (EHR+DDI)} - \text{DDI Rate (EHR)}}{\text{DDI Rate (EHR)}} \times 100.$$

Top-10 most common unwanted side effects

('arterial_pressure_decreased', 28568)
('anaemia', 27006)
('Difficulty_breathing', 26037)
('nausea', 25190)
('diarrhea', 23848)
('edema_extremities', 21981)
('body_temperat_increased', 21806)
('Hypoventilation', 21322)
('chest_pain', 21013)
('dizziness', 20204)

Electronic Health Records (EHR)
& Drug Drug Interactions (DDI)
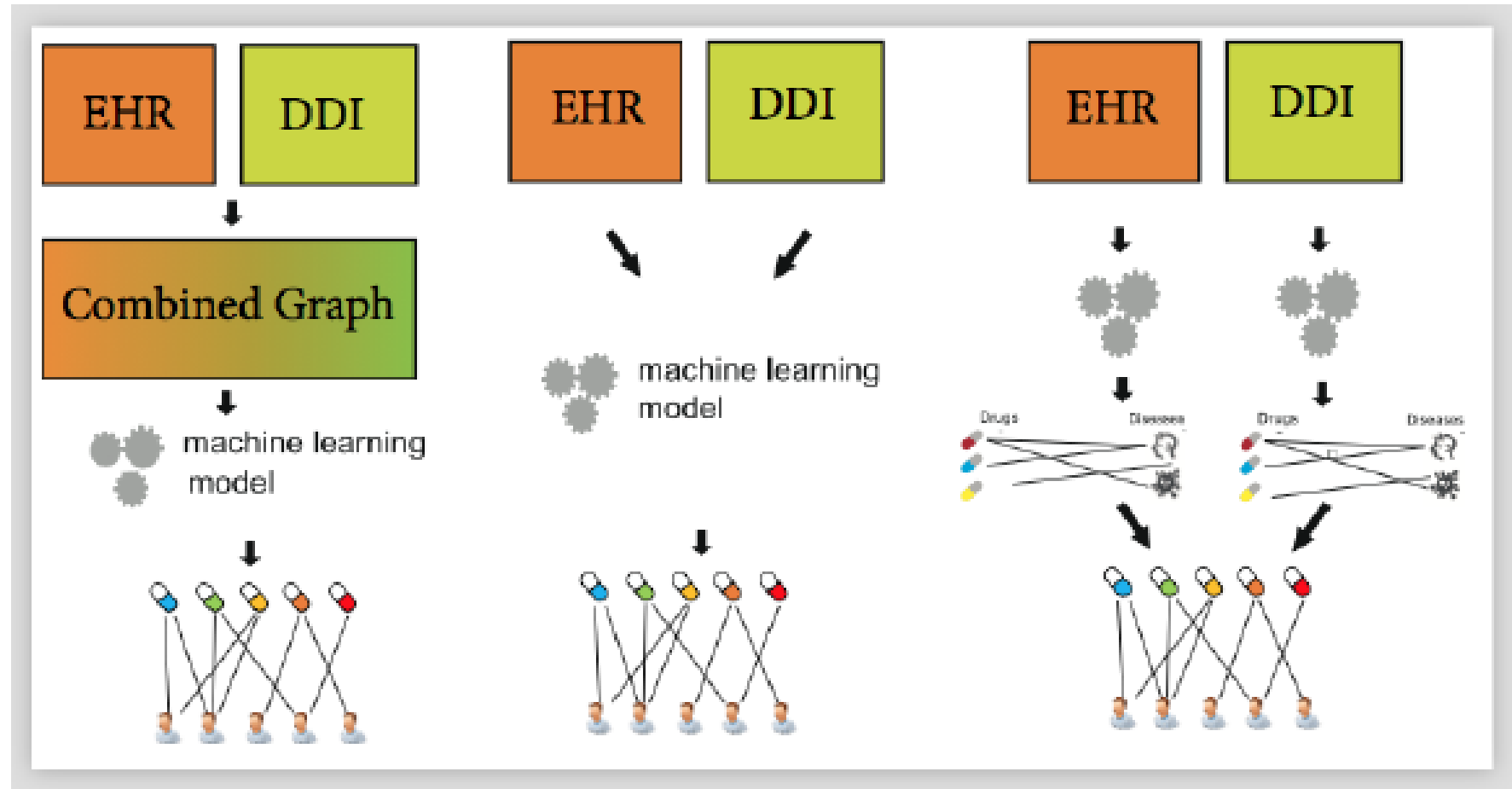
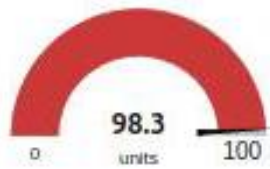(RWR)   (CMF, A2C, DDQN)   (HYBRID)

Server side's Dashboard
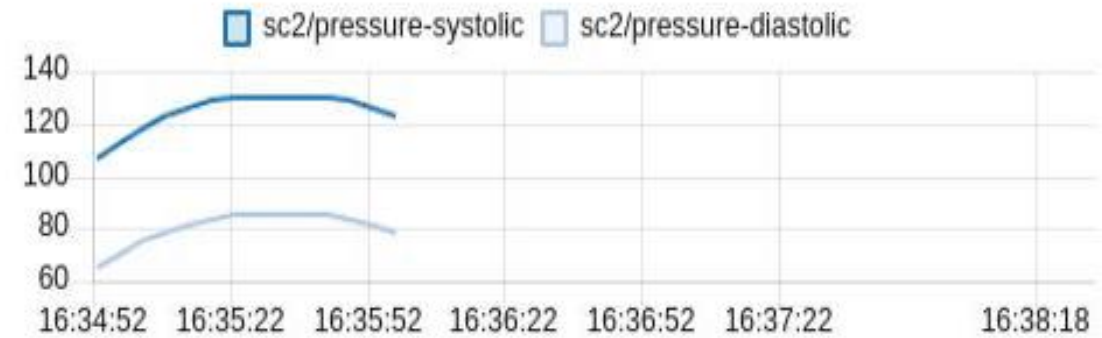## for online monitoring the Patient's clinical status
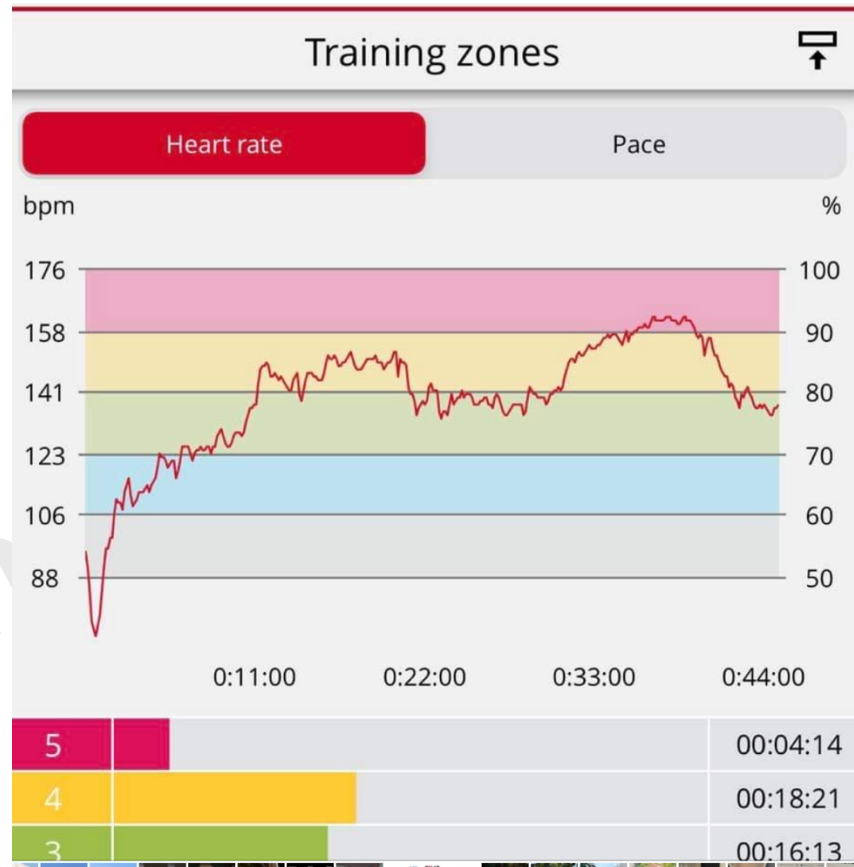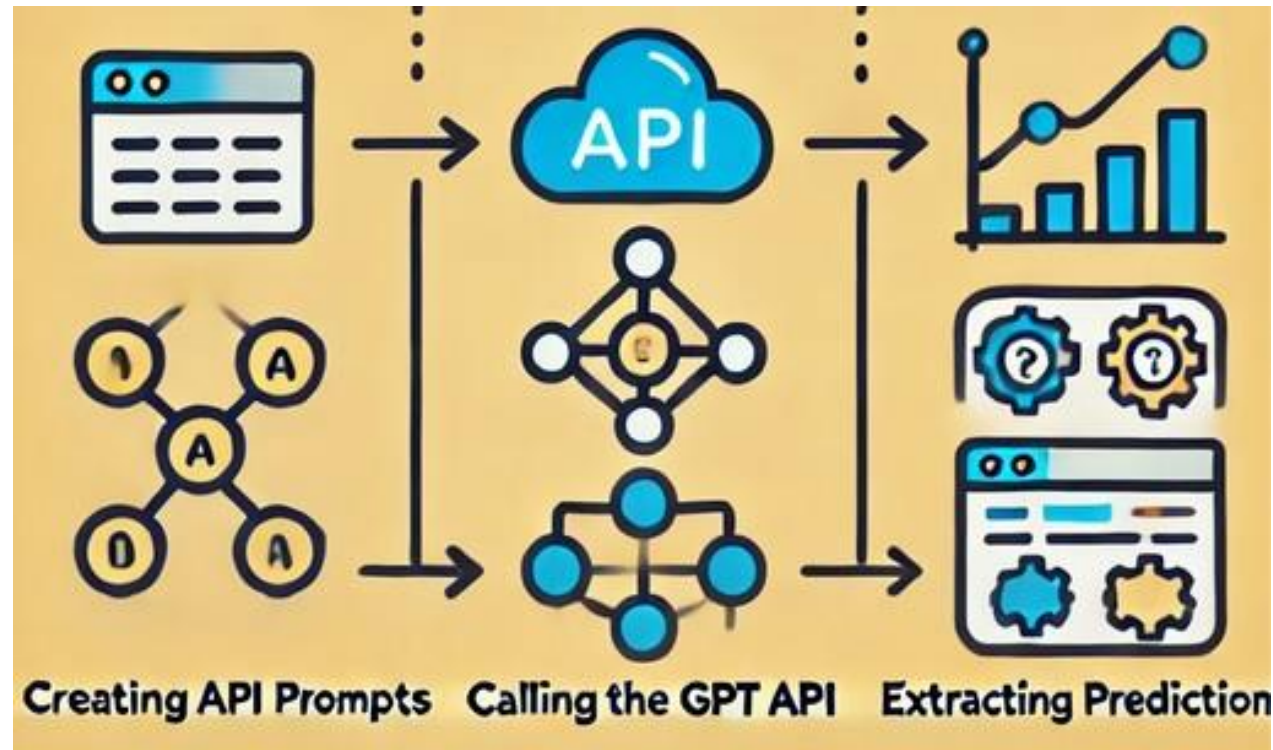
Other possible research directions (1/2)

- Recommendations for the Physical Activity of patients through wearables and biosensors

| Zone	Effort	Target Heart Rate*	Training Benefit
ZONE 1	50% – 60%	–	Warmup / Recovery
ZONE 2	60% – 70%	–	Base Fitness
ZONE 3	70% – 80%	–	Aerobic Endurance
ZONE 4	80% – 90%	–	Anaerobic Capacity
ZONE 5	90% – 100%	–	Speed Training

Prompt Engineering

1. Creating API Prompts: Formatting patient data for GPT API.

2. Calling the GPT API: Sending formatted prompts and receive predictions.

3. Extracting Predictions: Parsing responses for predictions.

Creating and Sending Prompts

```python
def create_prompt(patient_data):
    prompt = f"Given the following patient data, predict if the patient has heart disease (1) or not (0):\n\n"
    prompt += "age, sex, cp, trestbps, chol, fbs, restecg, thalach, exang, oldpeak, slope, ca, thal\n"
    prompt += f"{patient_data}\n"
    return prompt

def send_patient_to_GPT(patient_data):
    prompt = create_prompt(patient_data)
    response = call_GPT_api(prompt)
    return response
```

This segment of the code creates a prompt with the patient's data and sends it to the GPT API to get a prediction.

Results and Metrics
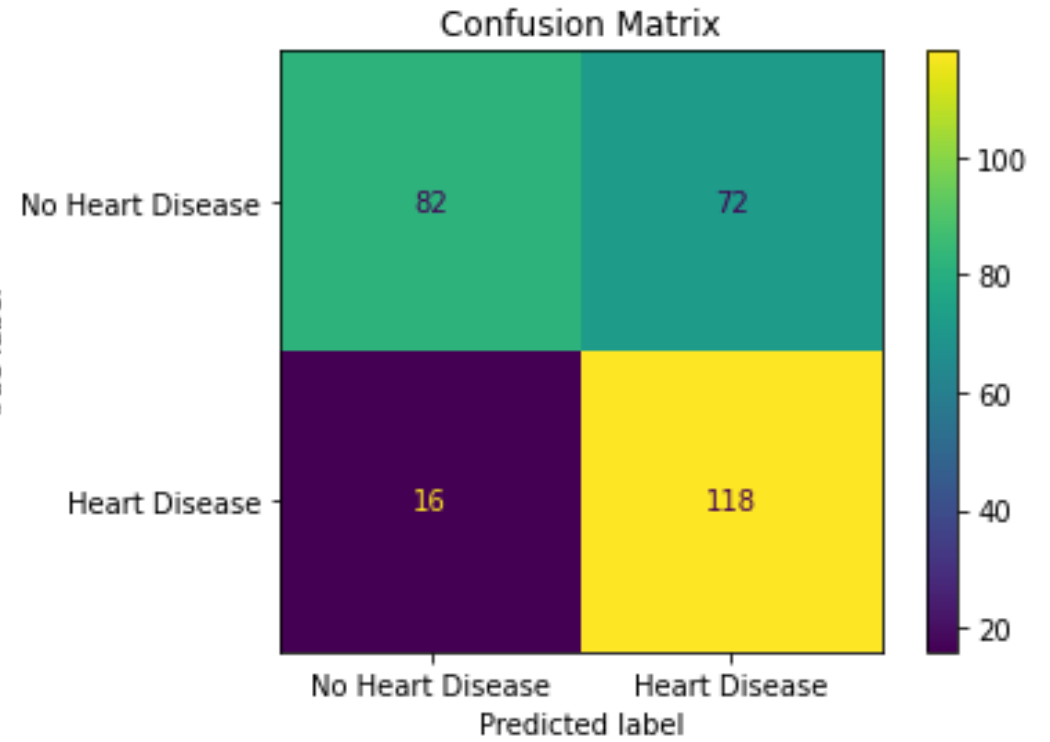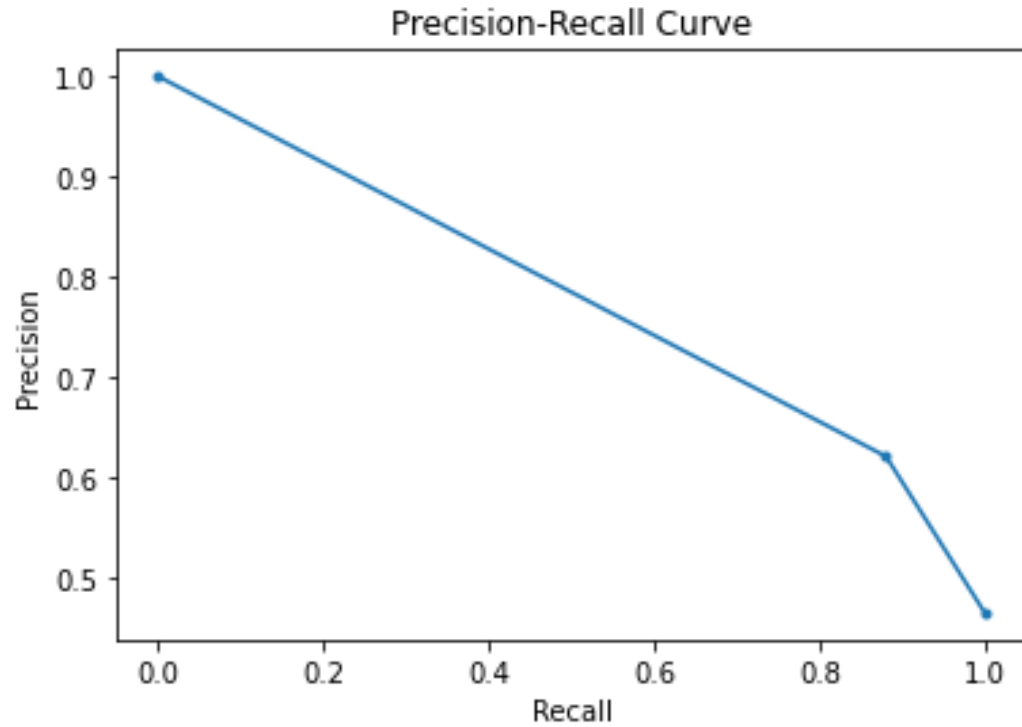
Results:
Accuracy: 0.69
Precision: 0.62
Recall: 0.88
F1 Score: 0.73