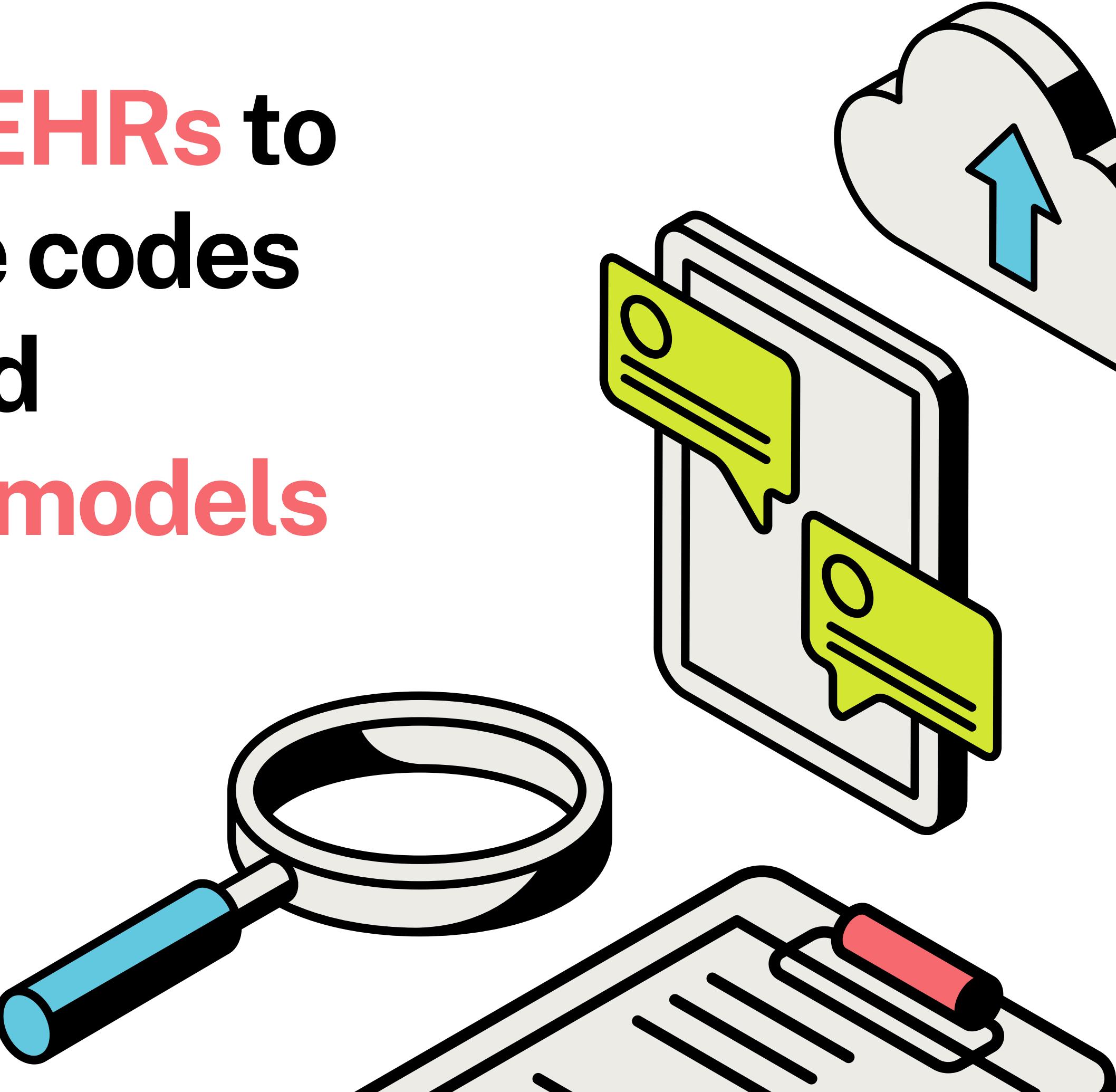


Utilizing patient EHRs to predict insurance codes through advanced multimodal data models

Sally Zhao

Tien Nguyen

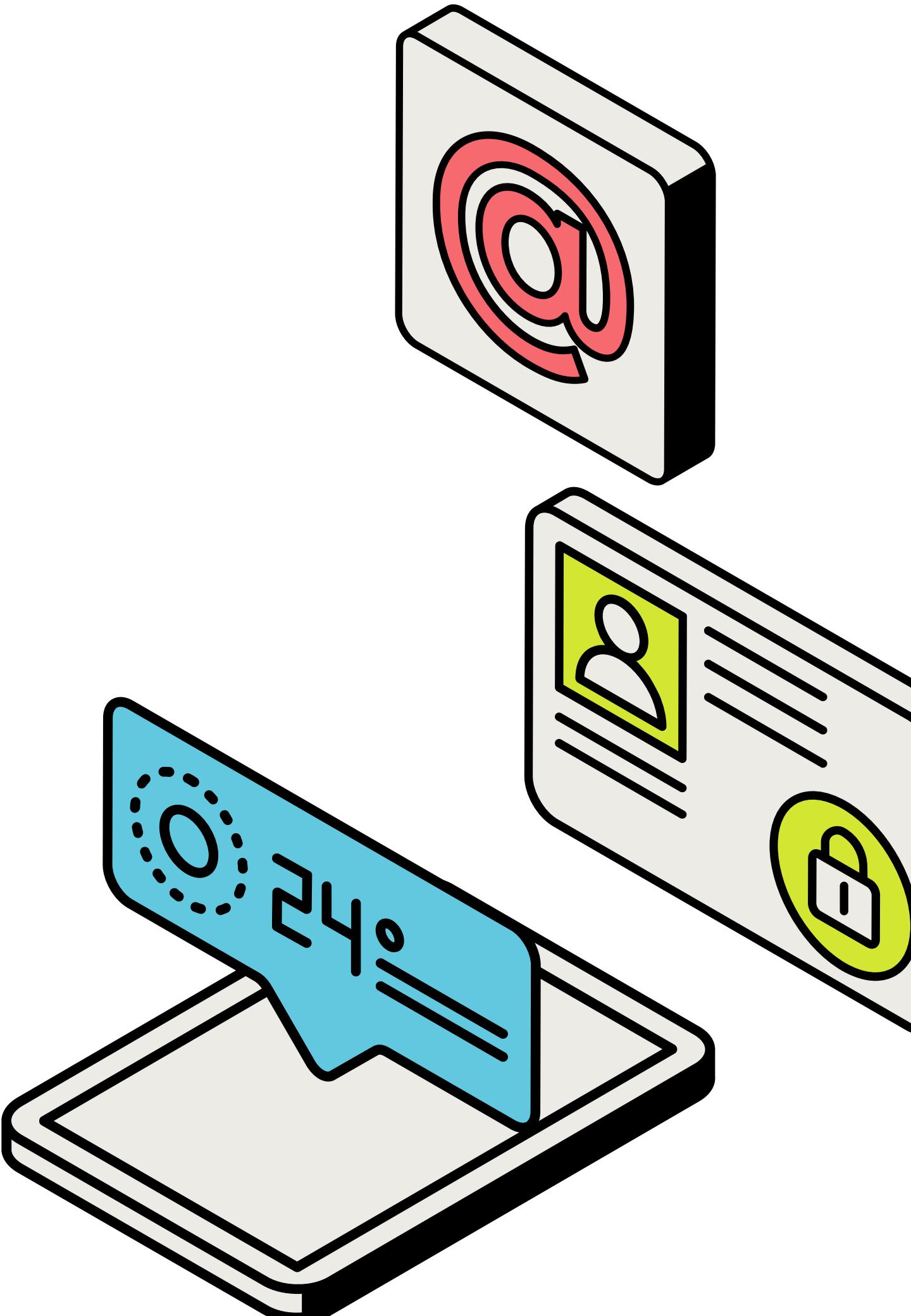
Yawen Zhou



Current challenges in insurance coding

- Time-consuming, error-prone
- Reliance on extensive, varied EHR data

=> Necessity for **automated, accurate predictive tools** in healthcare



What is Multimodal Data?

Data from multiple modalities including text, images, and numerical data

IMPORTANCE IN HEALTHCARE

Captures comprehensive patient information

Enables richer analysis & interpretation for AI models



Relevance to Deep Learning

A

**Integrates complex,
multimodal data for
better accuracy**

B

**Case study:
using textual analysis
to interpret tone &
context in doctors' notes**

C

**Identifies patterns &
relationships unseen
by humans**

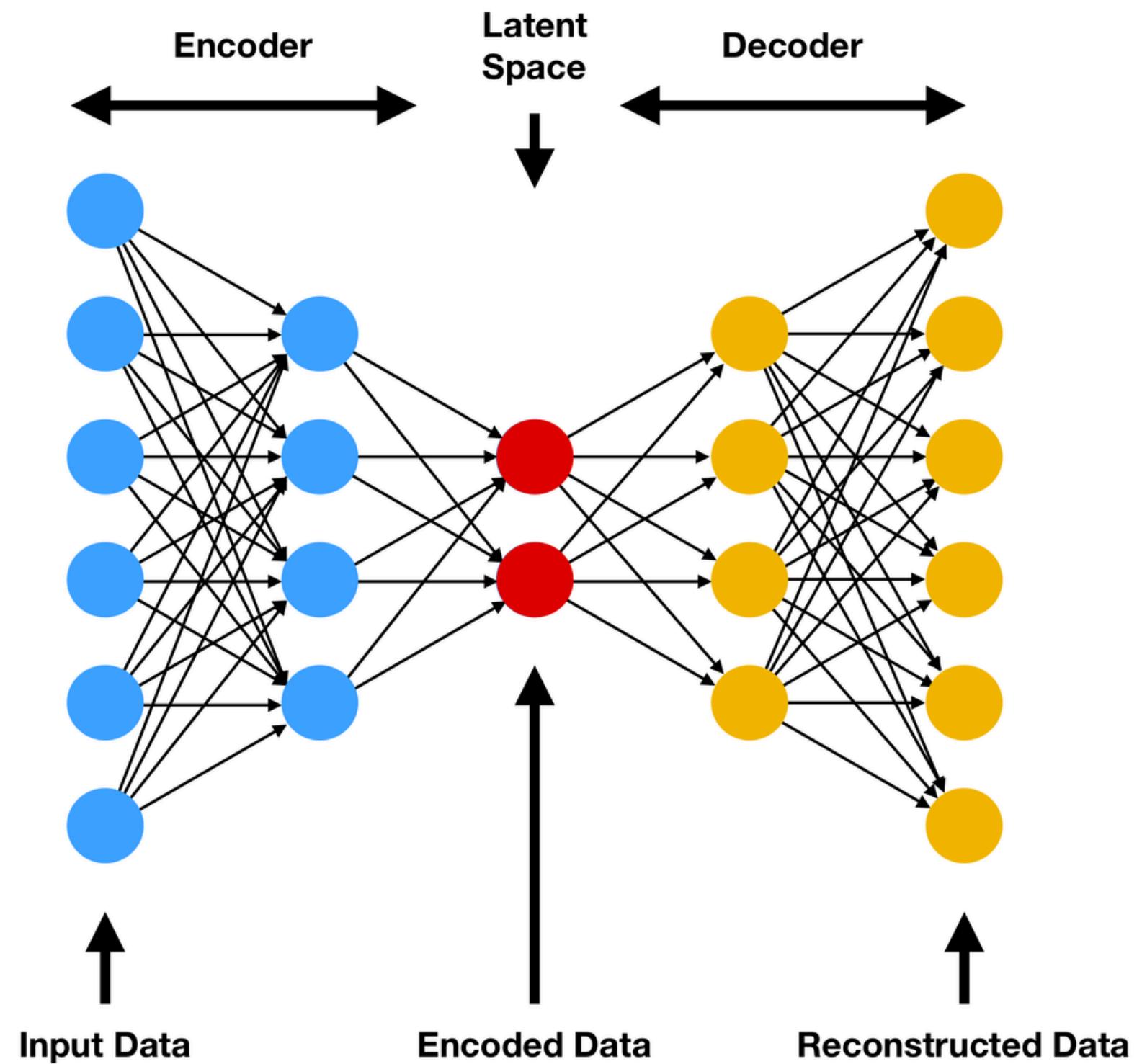


Representing Multimodal Data in Models

Representation:

Transform data into high dimensional vector

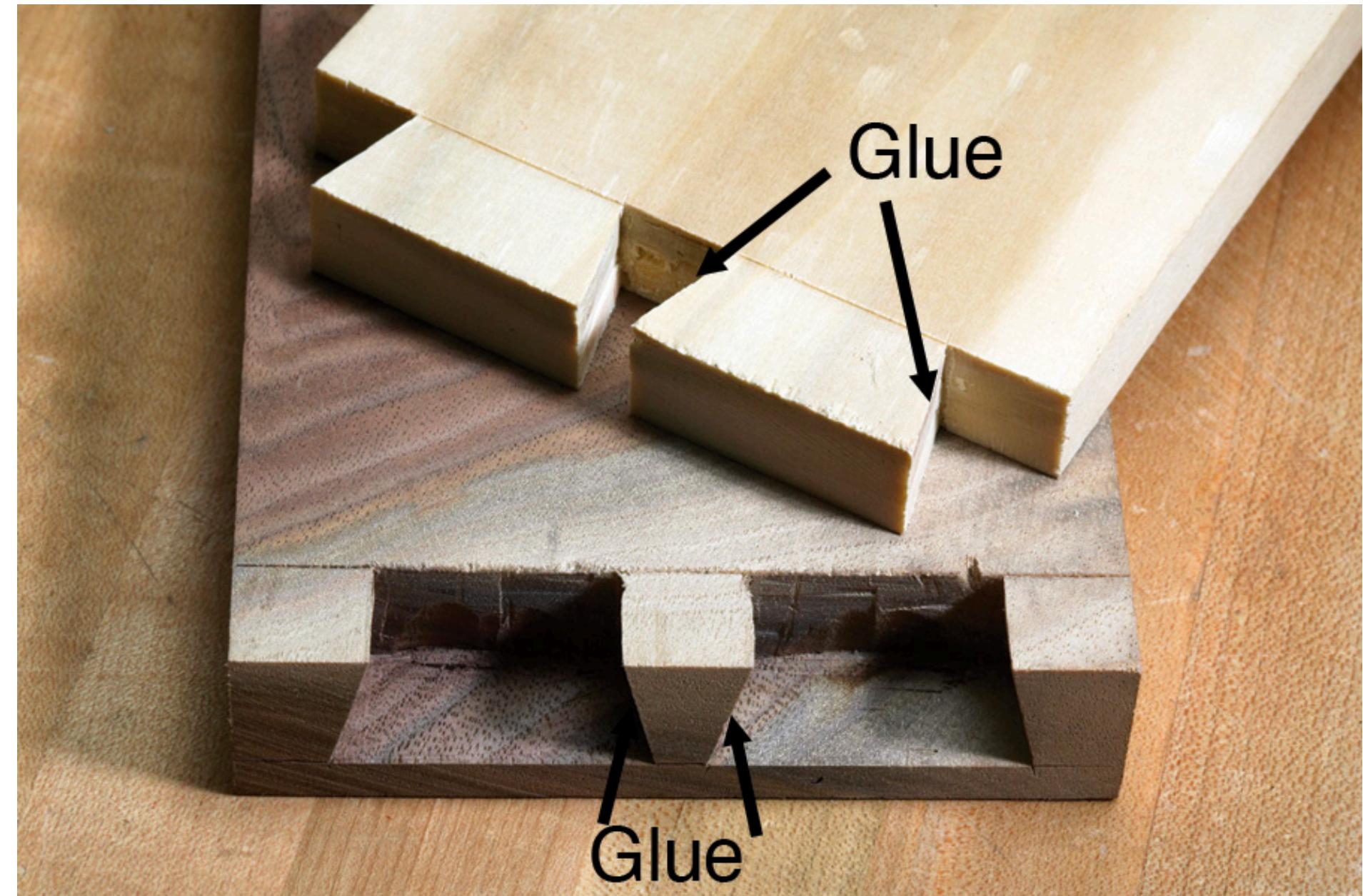
- Joint representation
- Coordinated representation



Fusion:

Joining different data forms

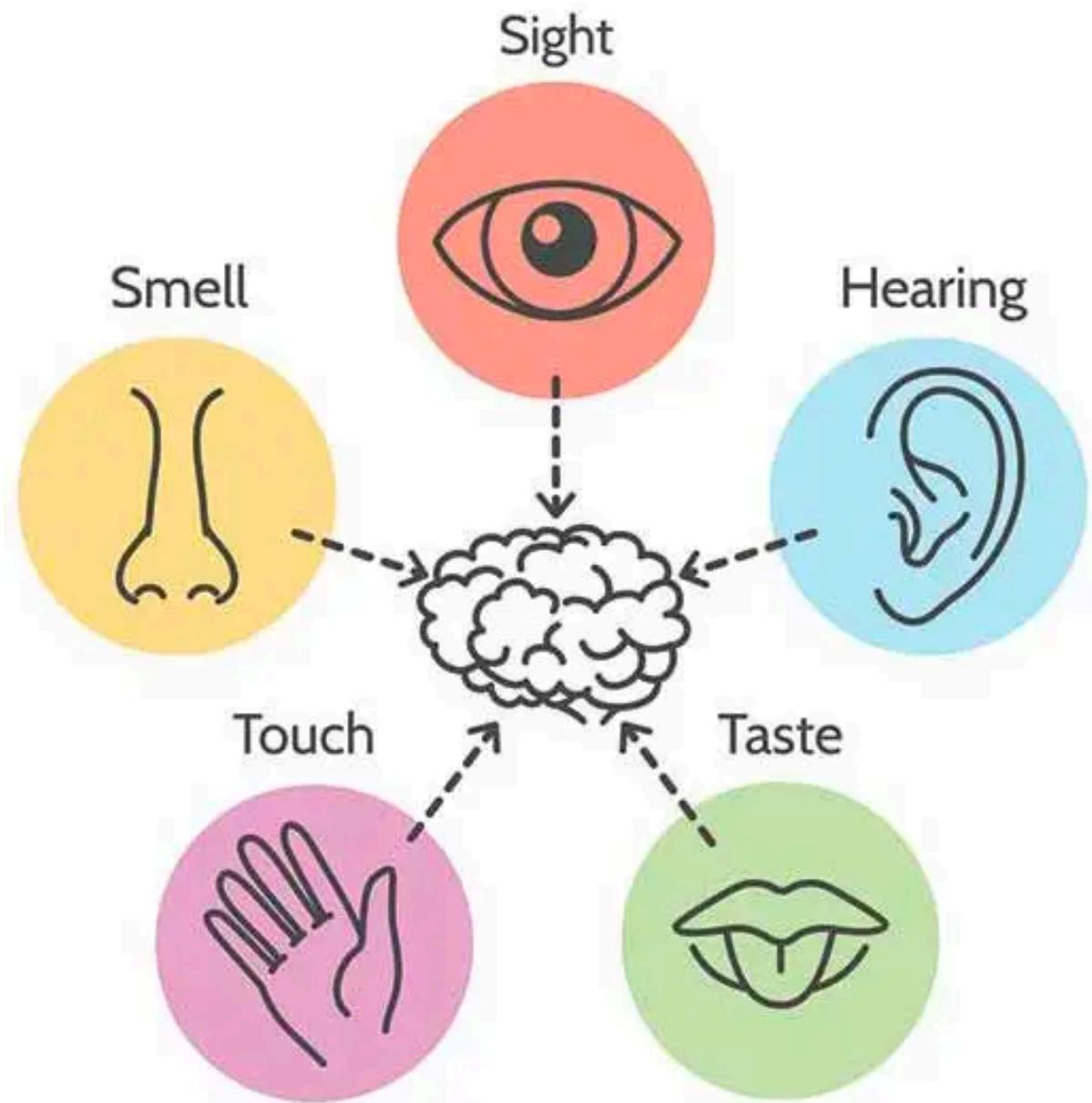
- Early
- Late
- How to fuse?



Alignment:

Synchronizing data sources

- Find direct relationships
- Semantic concepts



Translation:

Converting data
between modalities

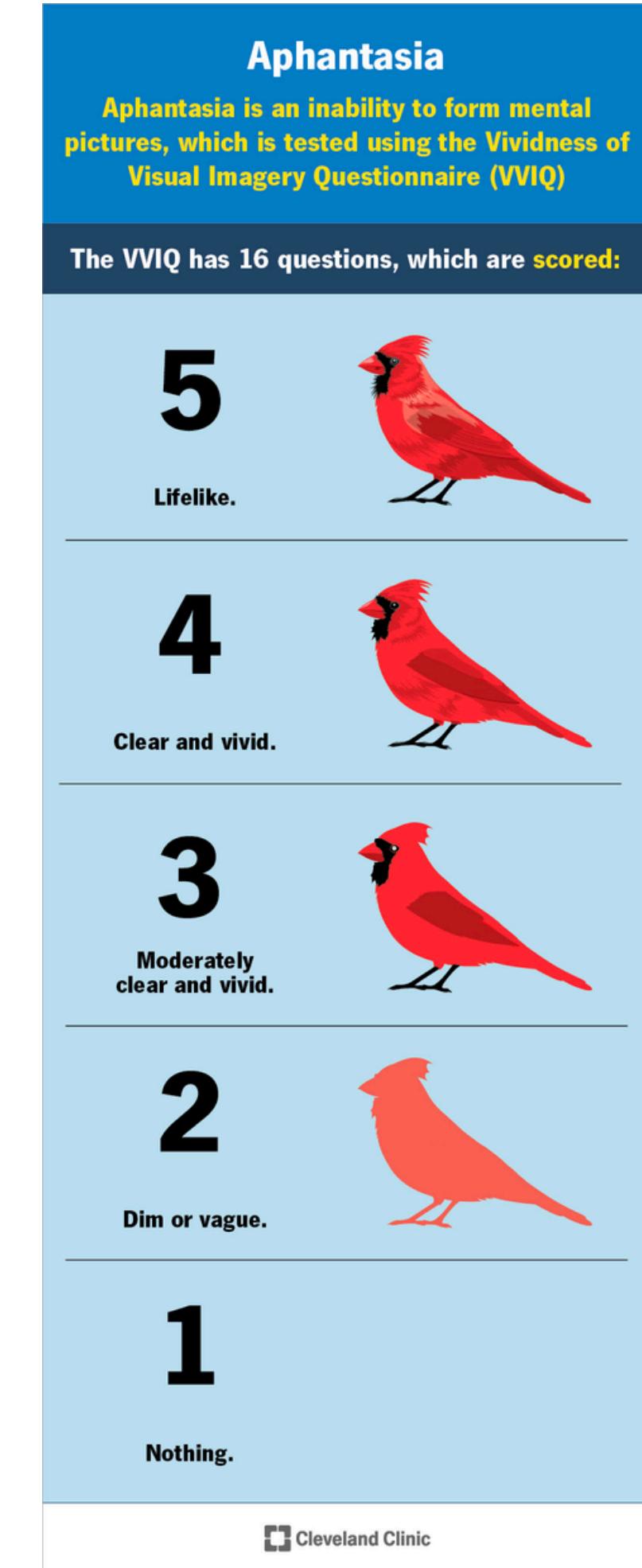
- Convert text to image
- Convert categorical to numerical

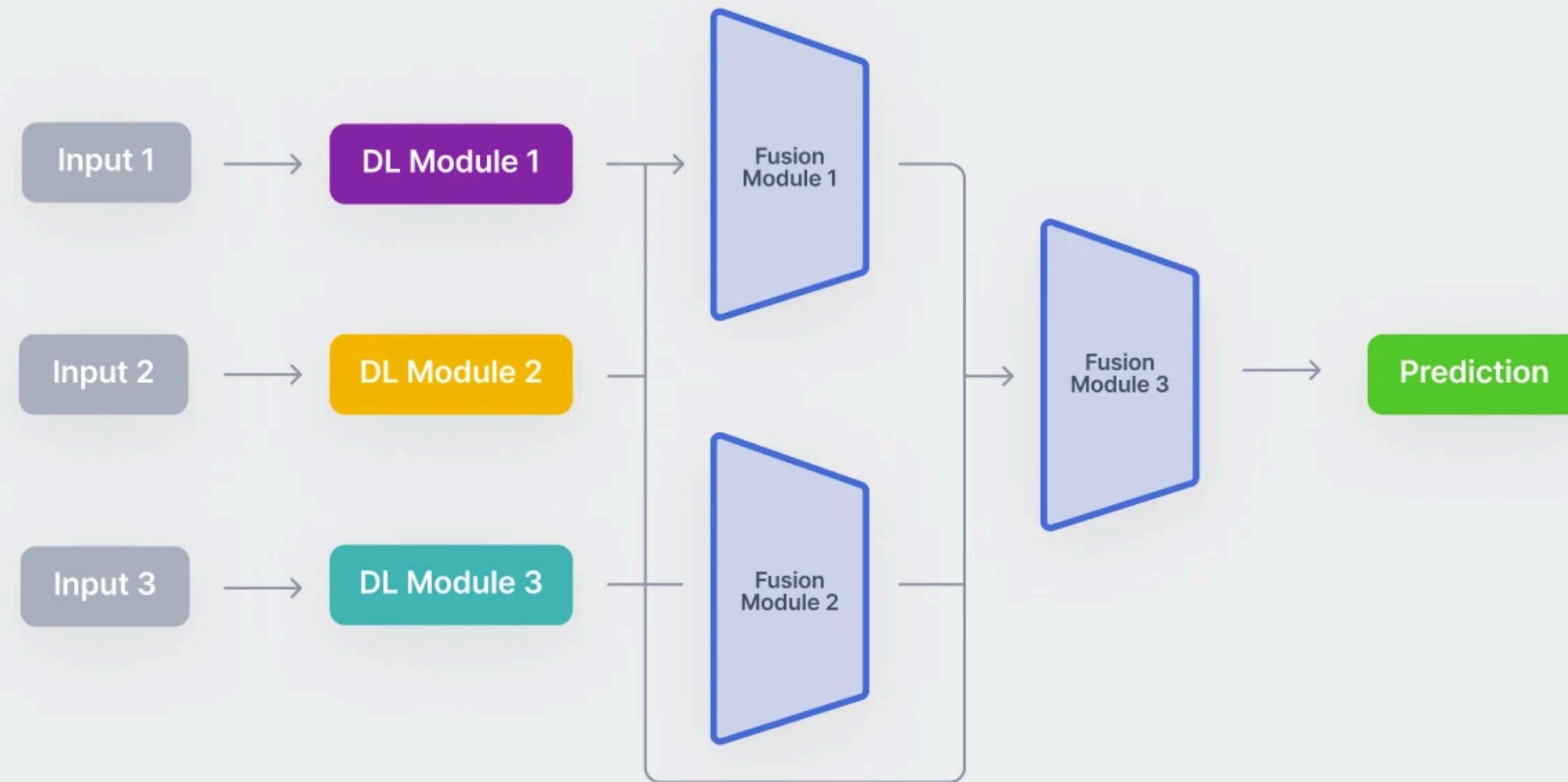


Co-learning:

Enhancing predictions through shared insights

- Transfer info.
- Noisy / incomplete data





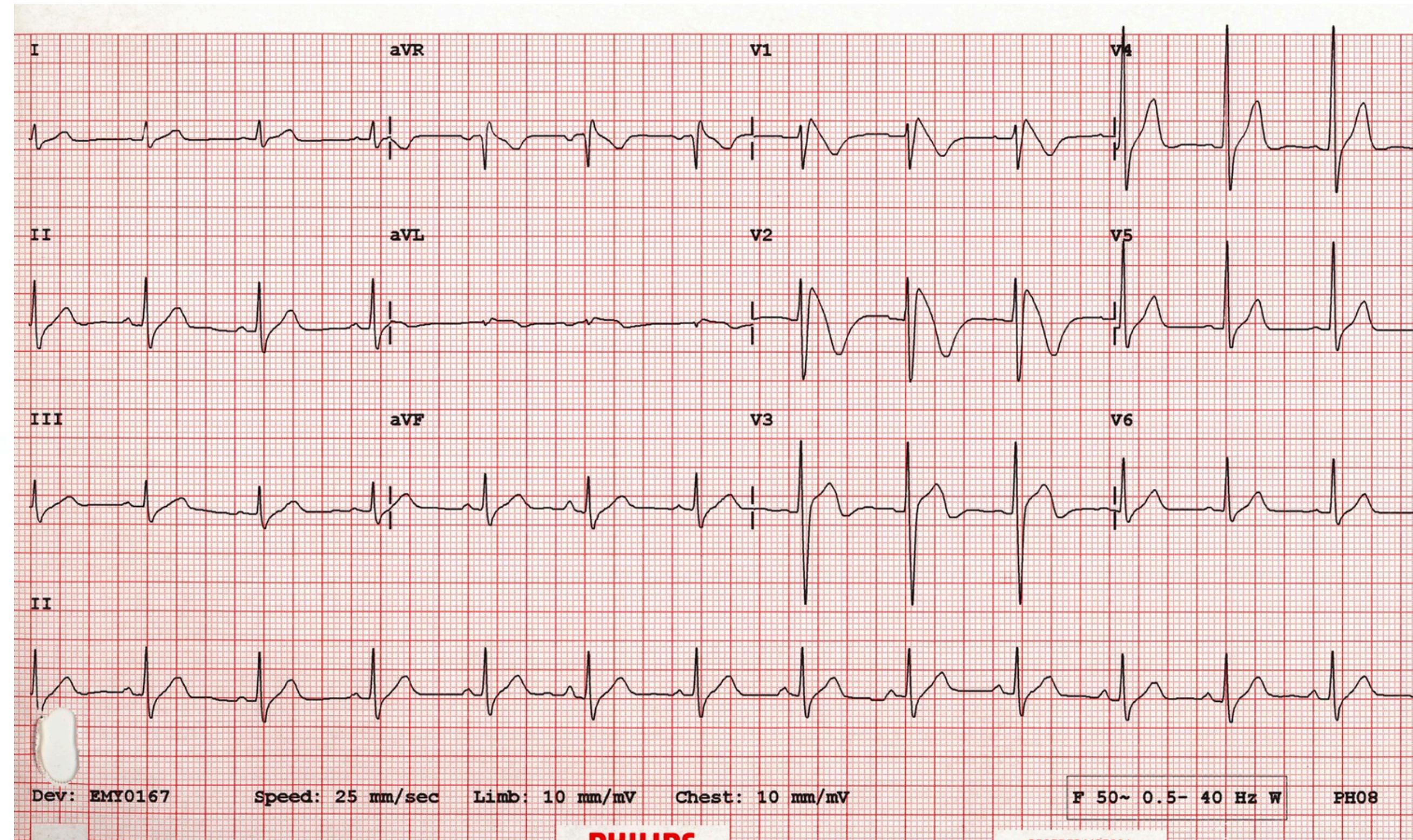
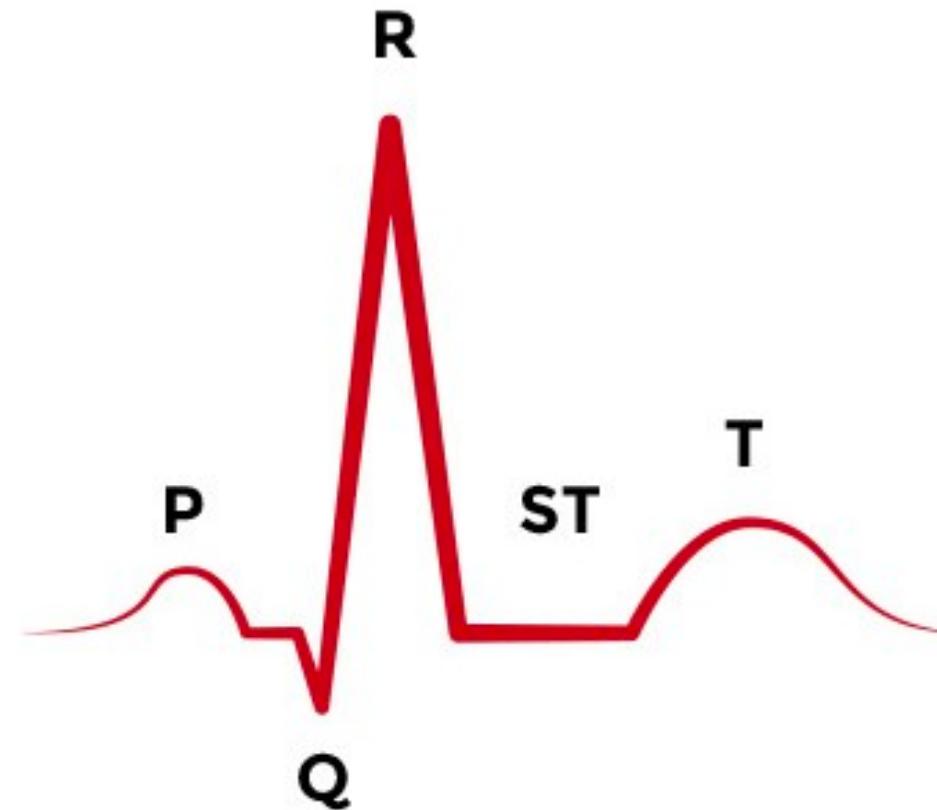
OUR MODEL

INPUT DATA

- Age
- Height
- Sex
- Weight
- Detailed doctor's notes
- ECG results



ECG - Electrocardiogram

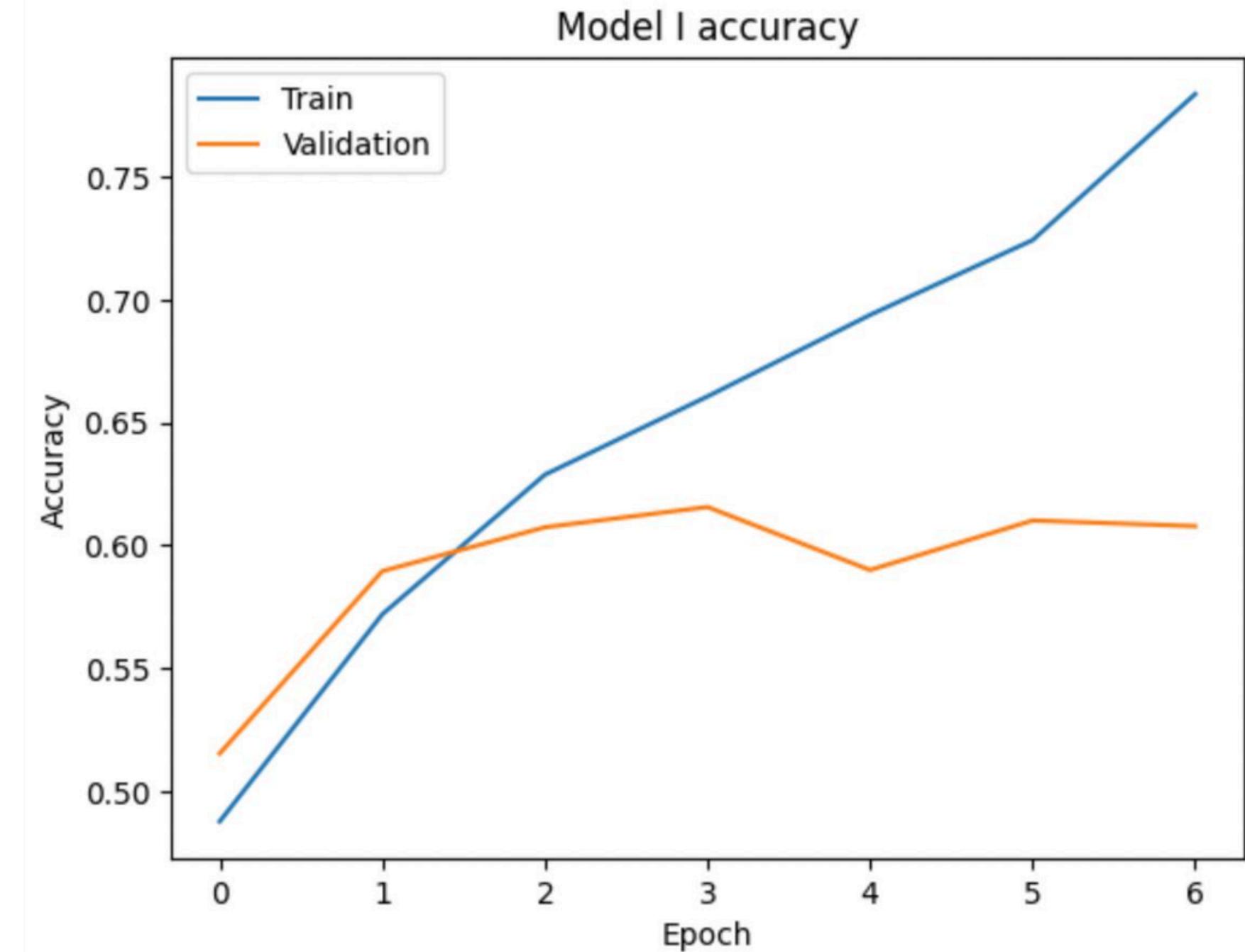
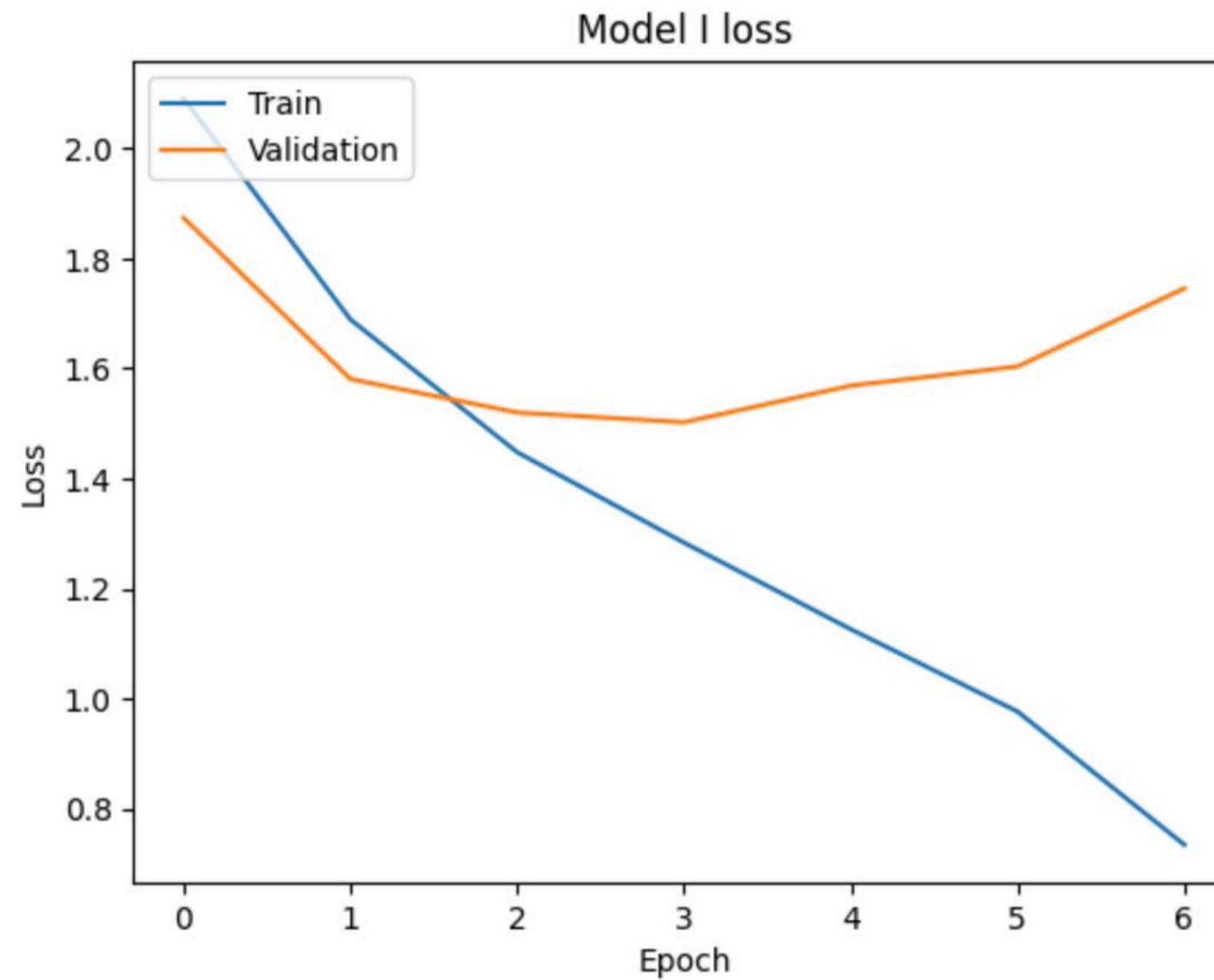


OUTPUTS - SCP Codes

- Insurance codes
- Diagnostics
- ICD-10 Code equivalents

```
'NORM', 'IMI', 'AFLT', 'NDT', 'NST_', 'LVH', 'LPFB', 'LAFB',
'IRBBB', 'IVCD', 'LMI', 'ASMI', 'AMI', 'ISCAL', '1AVB', 'PACE',
'ILMI', 'ISCIL', 'CRBBB', 'CLBBB', 'ISCAS', 'RVH', 'LNGQT', 'ALMI',
'ISC_', 'EL', 'AFIB', 'INJAS', 'IPMI', 'WPW', 'INJAL', 'ISCIN',
'LAO/LAE', 'IPLMI', 'SEHYP', 'ILBBB', 'DIG', 'RAO/RAE', 'PSVT',
'ISCLA', 'STACH', 'PMI', 'PVC', 'ISCAN', '3AVB', 'INJIN', 'INJLA',
'INJIL', '2AVB'], dtype=object)
```

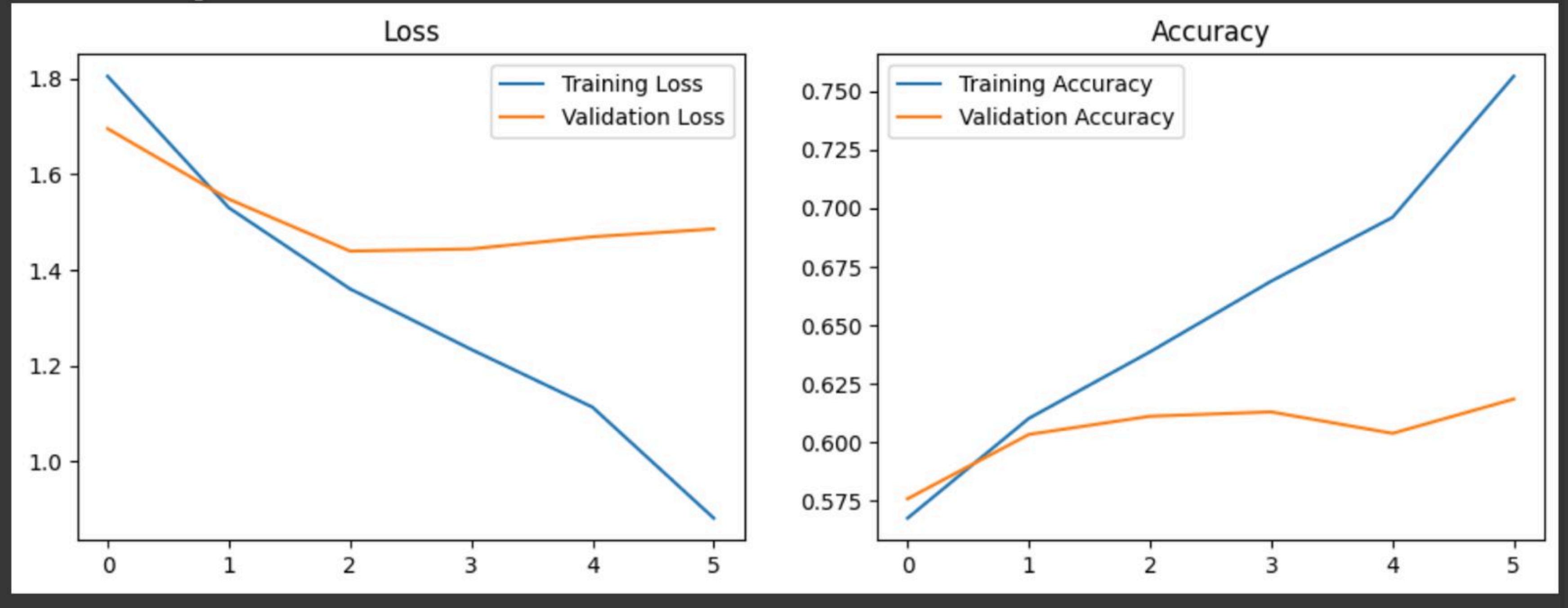
MODEL 1 PREDICTION ACCURACY



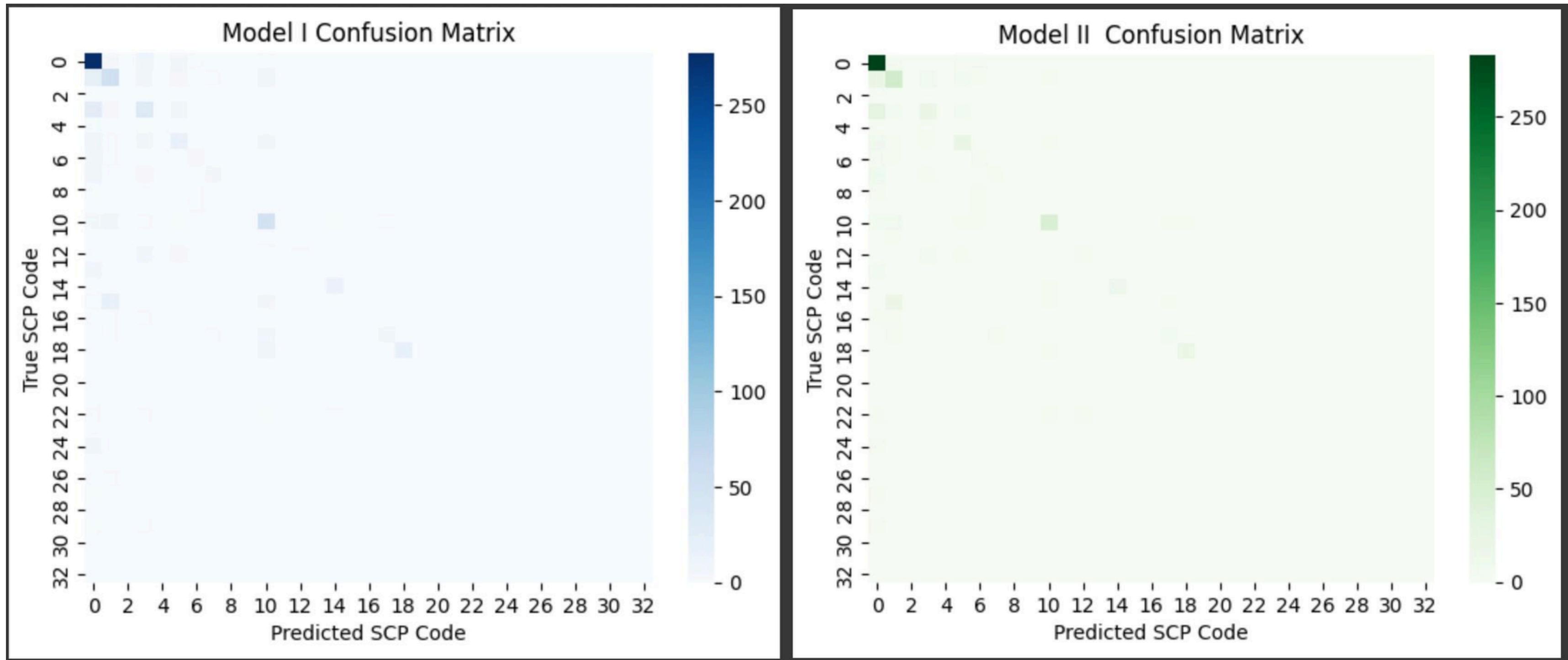
MODEL 2 PREDICTION ACCURACY

Test Loss: 1.4396817684173584

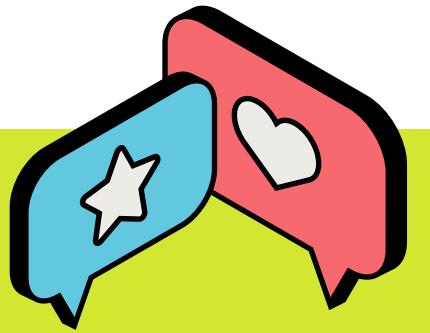
Test Accuracy: 0.6110856533050537



CONFUSION MATRICES

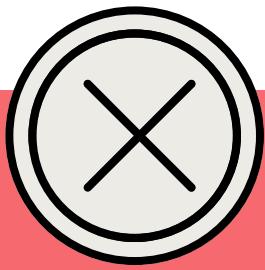


IMPACTS



Clinical impact

Assists in diagnostic accuracy, enhances doctor decision-making



Operational impact

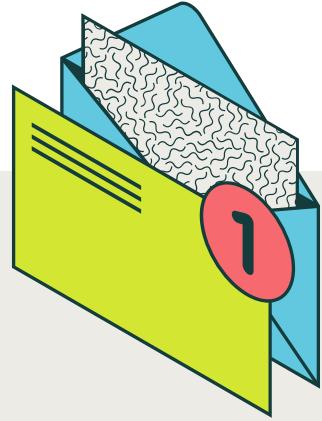
Streamlines billing, reduces admin. overhead



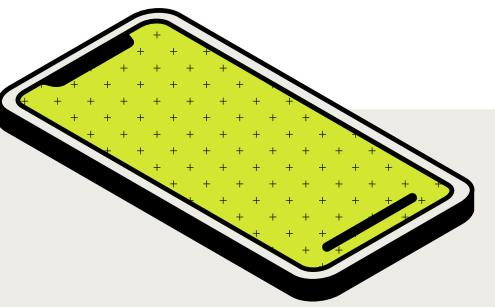
Patient care

Faster & more accurate diagnosis, improved health outcomes

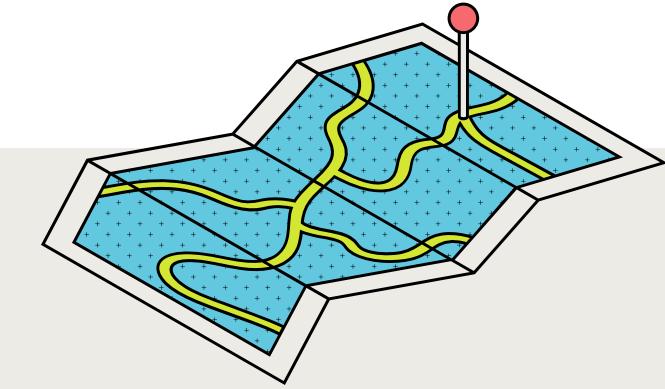
FUTURE



AUTOENCODERS



LLMS



OTHER METHODS

Thank you.

