Multimodal Explainable AI and Its Impact on Human Cognition

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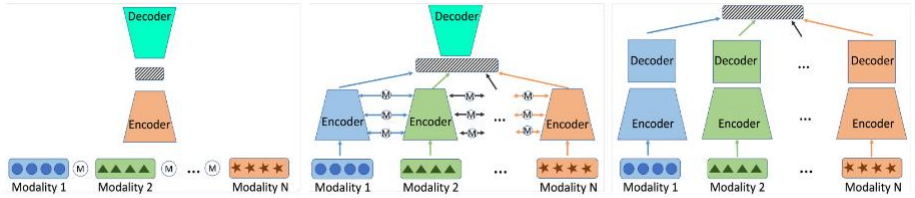
Decision-Making with AI becomes Inherently Complex and Multimodal

Originalbild

Merkmal	Wert
Läsion ist erhaben	FALSCH
Alkoholkonsum	WAHR
Läsion ist gewachsen	WAHR
Läsion hat sich verändert	WAHR

Predictive AI is more and more used for **complex and multimodal tasks**

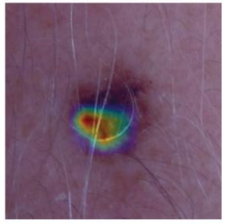


(a) The raw-data-level fusion (b) The hierarchical feature fusion (c) The decision-level fusion

F. Zhao et al., 2024

Multimodal data needs to be **fused (combined),** influencing model **predictions**, modality **interrelationships** etc.

Heatmap-Überlagerung



Wichtigste Patienteninformationen (Metadaten)

* Relevanz für KI: beschreibt, wie stark dieses Merkmal zur KI-Entscheidung beigetragen hat

Merkmal	Wert	Relevanz für KI*
Läsion ist erhaben	FALSCH	24.97%
Alkoholkonsum	WAHR	13.43%
Läsion ist gewachsen	WAHR	13.25%
Läsion hat sich verändert	WAHR	9.42%

Lack of understanding of how **multimodality** influences **user understanding** and human-XAI **performance**

Problem & Motivation

We are missing evidence on how multimodal explanations are perceived by humans.

Project Steps and Goals:

1. **Identify** an interesting use case (fake news, hateful memes, healthcare...)
2. **Implement** various fusion and explanation architectures
3. **Set up** a real-world experiment
4. **Evaluate**

Project Details and Deliverables

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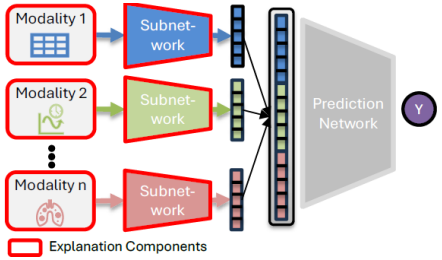
Multimodal XAI Clusters to Implement

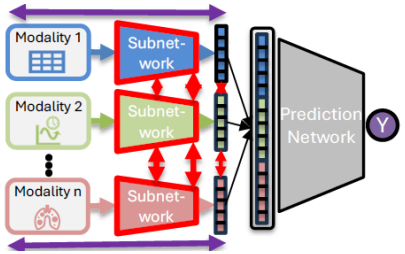
Intra-Modal Explanations



Can users make sense without interactions?

Does missing information mislead?

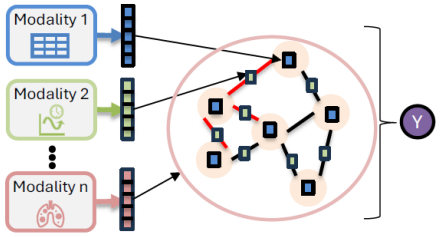
Cross-Modal Explanations



Do latent interactions overwhelm?

Can extracted features be interpreted?

Relational Structure Explanations



Can users make sense of relations?

Can extracted features be interpreted?

Experiment Setup & Outcome Measures

Decide for outcome measures based on the literature and set up an online experiment

- Cognitive Load
- Confidence
- Mental Model Shifts
- Decision-Making Quality
- Learning

Example for perceived explainability

The explanation was clear and easy to understand.

I understood why the AI made this decision.

The explanation helped me with my decision.

The explanation was sufficiently detailed.

Deliverables

- Use Case Selection
- Reasonable model and XAI implementations
- Online Experiment (Setup)
- Evaluation

This team project is not purely technical but closer to a full research project

Organizational Overview

About the Project

- Team of **6-8 students**
- M.Sc. **Business Informatics** or M.Sc. **Data Science**
- Duration: **6 Months**
- Language: **English**
- Online: **Possible**, but some **mandatory on-site meetings** (Kick-off, final presentation)

About You

- Programming skills in **Python**
- Experience with training and evaluating **ML/DL** models
- Experience/Interest in **Explainable AI**
- Interest in conducting **quantitative research**

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