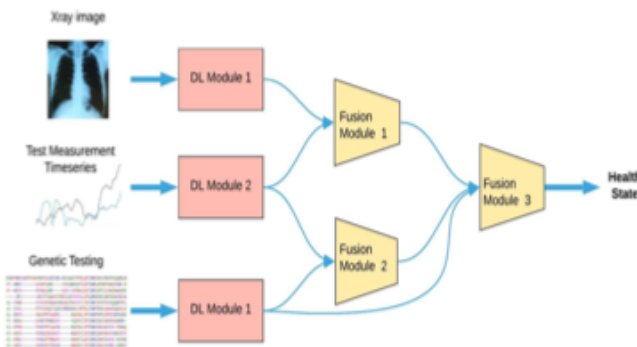


Multimodal Deep Learning

MARKET NEED

All industries are now collecting large volumes of data from diverse sources. However, when developing a predictive analytics application it is challenging to know how best to utilize these different data modalities. The project explores the use of deep learning to integrate heterogeneous data sources in a single predictive model for better performance.



Example of a multimodal model for diagnosing patients

Deep Learning has become the mainstream machine learning method due to its impressive performance in many applications.

However, multimodal deep learning research currently focusses on only very specific settings.

TECHNOLOGY SOLUTION

We implemented a multimodal deep learning library:

- That allows users to create multi-input deep learning models using a plug and play approach, for any type of data.
- Can be extended easily by new modules implemented by users.

The library was tested on two predictive tasks:

- Protein structure prediction
- Categorizing retail products.

A demonstrator was developed for product categorization to show the multimodal approach.

APPLICABILITY

Multiple sources of inputs can help models to be more accurate and robust.

Multimodal deep learning can be applied across many industries, including:

- **Healthcare:** medical imagery, sensor readings, text reports
- **Finance:** transactions, text documents
- **Predictive Maintenance:** sensor data, weather predictions, status logs
- **Mobile Communications:** contract data, call frequency, time series

Deep Learning for Multimodal Data

Predicted Categories for the Product

Product Title: ULYSSES

Product Description: Everybody knows now that Ulysses is the greatest novel of the century. Anthony Burgess, Observer following the events of one single day in Dublin, the 16th June 1904, and what happens to the characters Stephen Dedalus, Leopold Bloom and his wife Molly. Ulysses is a monument to the human condition. It has survived censorship, controversy and legal action, and even been deemed blasphemous, but remains an undisputed modernist classic: classically inspired, gamelike, funny, somewhat vulgar, visceral and ultimately redemptive. It confirms Joyce's belief that literature "is the eternal affirmation of the spirit of man." The most important expression which the present age has found: it is a book to which we are all indebted, and from which none of us can escape. T. S. Eliot "Intoxicating... a towering work, in its word play surpassing even Shakespeare" Guardian

Product Image:

Predicted Categories:

- ARTS, CRAFTS & SEWING
- AUTOMOTIVE
- BABY
- BEAUTY
- BOOKS**
- ELECTRONICS
- GROCERY & GOURMET FOOD
- HEALTH & PERSONAL CARE
- HOME & KITCHEN
- MUSIC**
- MUSICAL INSTRUMENTS
- OFFICE PRODUCTS
- PATIO, LAWN & GARDEN
- PET SUPPLIES
- SPORTS & OUTDOORS
- TOOLS & HOME IMPROVEMENT
- TOYS & GAMES

Demonstrator Interface