

CoRe-Learning

(Connective & Recreative Learning)

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Issues in Learning Contents for Self-study

Various tools are available,
but skillful media creation is needed to create an attractive content for learning!!

Many learning contents are resulting in

- Excessive length
- Monotonous
- Redundant
- Messy
- Language

Effecting in
Learning process



- Concentration
- Interest
- Engagement
- Understanding
- Mother tongue

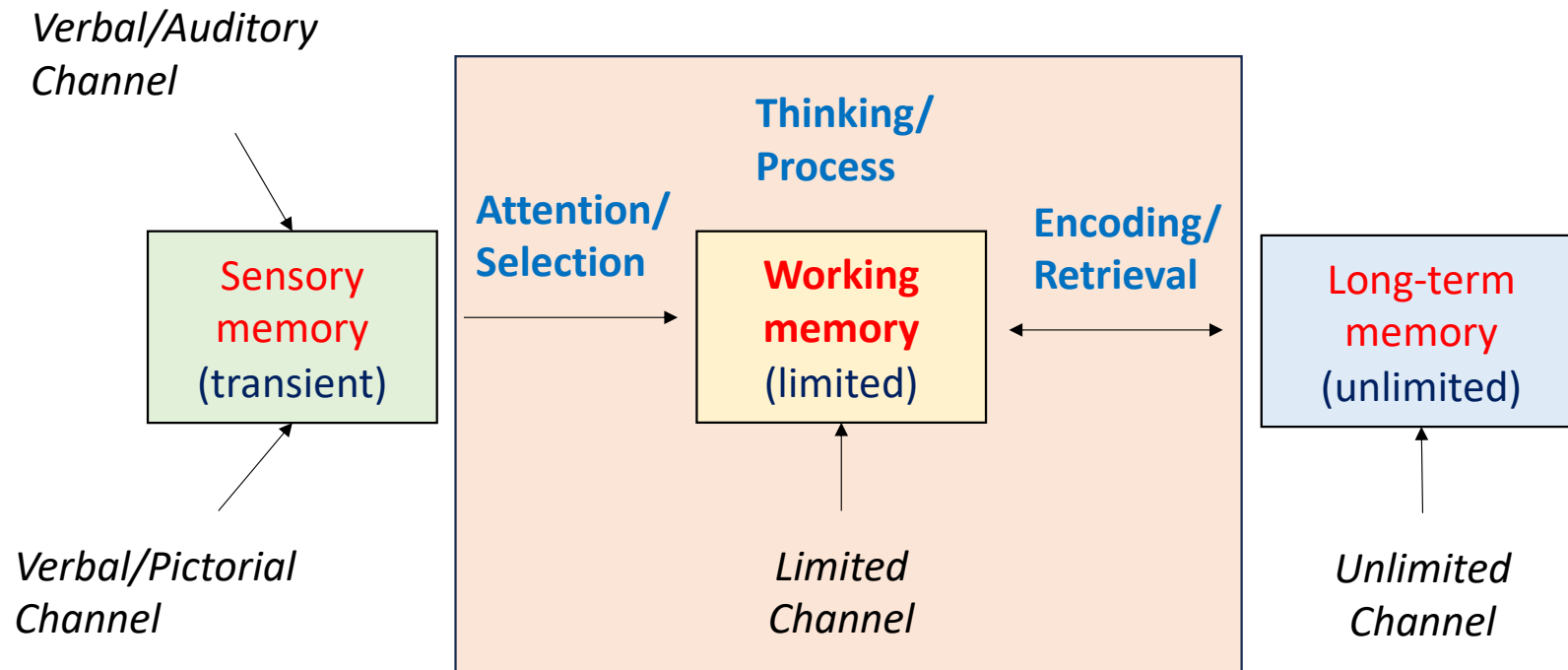
Classroom Lecture Recording

- Redundancy
- Word corrections
- Hesitation and stuttering
- Error-prone
- Interruptions

Learning Memory

Components in Human Memory in Learning

Mayer (2003), and Mayer and Moreno (2007)



Mayer, R. (2003). The Promising of Multimedia Learning: Using the Same Instructional Design Method across Different Media, *Learning and Instruction*, 12, 125-141.

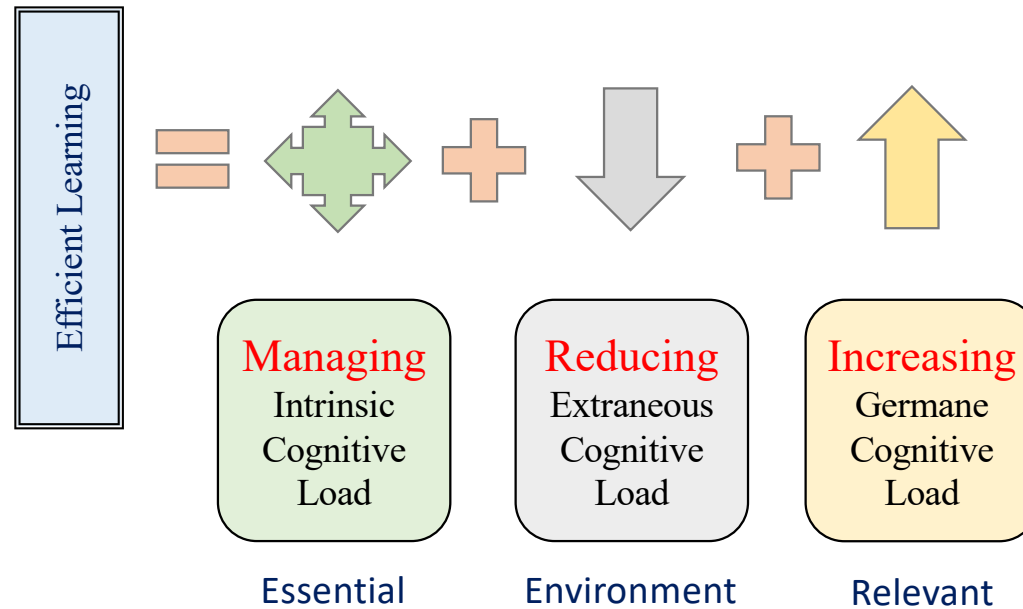
Moreno, R., and Mayer, R. (2007). Interactive Multimodal Learning Environments. *Educational Psychology Review*, 19, 309-326.

Cognitive Load Theory

- Intrinsic Cognitive Load (Essential knowledge)
 - This is the load imposed by the task itself. This is effectively fixed, but we should try and reduce it by 'chunking' breaking the task down into smaller parts.
- Extraneous Cognitive Load (Peripheral information)
 - This is the environment and the way we present the information. We should try and minimize this.
- Germane Cognitive Load (Relevant to background knowledge)
 - This is the processing that takes place comparing the new information to what we already know and encoding new learning to the long-term memory as schema. The more we know about something the lower the Germane Cognitive Load will be as thoughts and processes are automated.

Working Memory in Learning Process

Sweller (2010)

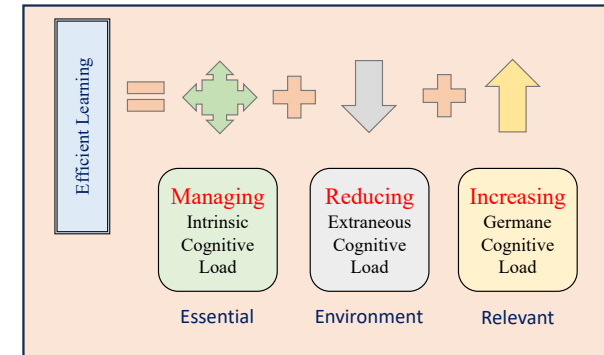


Sweller, J. (2010). Element interactivity and intrinsic, extraneous, and germane cognitive load. *Educational Psychology Review*, 22, 123- 138.

Sweller, J., Ayres, P. and Kalyuga, S. (2011). *Cognitive load theory*. Springer. New York.

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Suitable Learning VDO Property based on Cognitive Load Theory



1. Shortening the video length not to exceed 6 minutes based on the Guo et al. (2014) survey that student median engagement time for videos less than 6 minutes long is close to 100%.

Manage intrinsic

2. Providing video synopsis for better structure.

3. Summarizing the content for quick view of the contents.

4. Indexing the content for keyword search and scene search.

5. Linking from one video to other related videos for total understanding.

Reduce extraneous

6. Categorizing the videos for better accessibility.

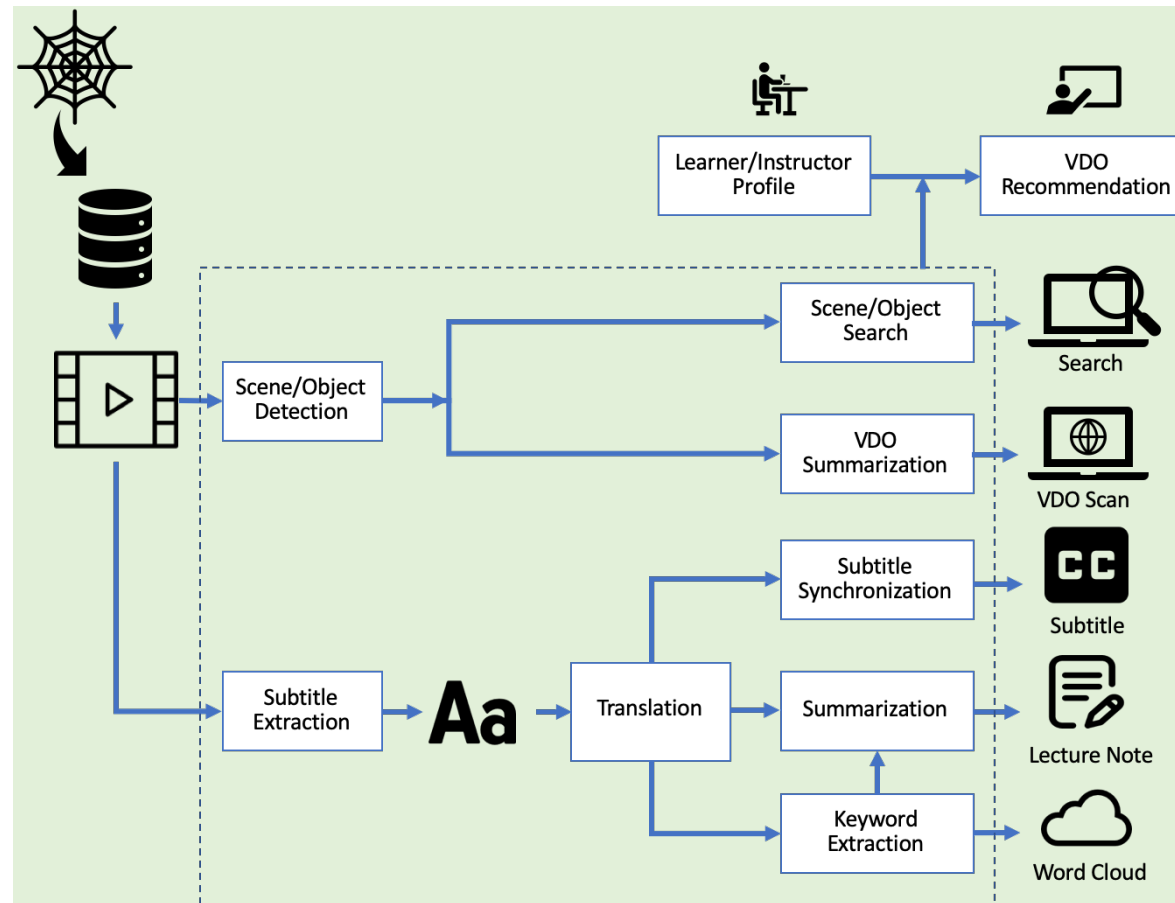
7. Extracting keywords for better representation of the content.

Increase germane

NLP Techniques

- **Video Speech Refinement:** Smoothen recorded speech in videos, eliminating common issues such as pauses, repetitions, and stuttering, to result in polished and professional-quality content.
- **Multilingual Subtitle Support:** Convert source videos into multilingual transcriptions and adding subtitles to ensure learners, to access and understand the material better.
- **Content Summarization:** Generate concise summaries of videos, enabling learners to review key points before delving into the full content, to reduce cognitive load by providing a clear overview of the material.
- **Keyword Extraction for Word Cloud Indexing:** Extract key terms and phrases from video transcriptions to generate visually appealing word clouds, to provide learners with a quick visual summary of the content, highlighting the most important themes and concepts.
- **Extraneous Knowledge Link:** Integrate relevant external knowledge to supplement the learning content, to provide learners with additional context and background information.
- **Quiz Generation:** Generate quizzes based on the video content, to reinforce learning and assess comprehension.

Connective Learning Scheme



Chapter

Chapter

0:00 - 10:00 - 音響学
音響学の定義と聴
覚音響学、音響
学が他の分野と
関係する点

10:00 - 25:00 - 音響
学
フーリエ変換と周
波数分析

25:00 - 35:00 - 音響
学
ASRエンジンとAP
スプレッドシート
ASRパイプライン

35:00 - 50:00 - 音響
学
時系列処理と音響
学
隠れマルコフモデ
ル

50:00 - 65:00 - 音響
学
NLPモデル(ユニグラム、バイグラム、トライグラム): 各モデルの定義と役割
ASRにおける文法と構文: 言語モデルが単語を予測する能力
言語モデリングの課題: 大規模データを扱う際のメモリと計算の効率性の管理方法

Chapter

0:00 - 10:00 - Introduction to Acoustic Phonetics
Main idea: To provide an understanding of phonetics and its importance in speech processing.
Details:
Phonetics is the study of sounds in human speech. It includes articulatory phonetics (production of sounds), acoustic phonetics (sound properties), and auditory phonetics (perception).
The role of phonetics in automatic speech recognition (ASR) and how it helps in understanding speech sounds from production to perception

10:00 - 25:00 - Acoustic Analysis Techniques
Main idea: Explaining tools and methods for analyzing speech sounds.
Details:
Spectrograms: Visual representation of sound intensity over time, showing different frequencies.
Fourier Transform (FT) and Short-time Fourier Transform (STFT): Used to convert time-domain signals to frequency-domain, essential for analyzing frequency components.
Mel-Frequency Cepstral Coefficients (MFCCs): Widely used features in ASR that mimic human auditory response by emphasizing perceptually relevant frequency information.

25:00 - 35:00 - Automatic Speech Recognition Basics
Main idea: Introduction to ASR systems, engines, and workflows.
Details:
Overview of ASR engines and APIs (e.g., CMU Sphinx, Google API, IBM Speech to Text).
Difference between offline (like CMU Sphinx) and online recognition (like Google and IBM APIs).
Key components of the ASR pipeline, from capturing audio to producing recognized text.

35:00 - 50:00 - Acoustic Modeling in Speech Recognition
Main idea: How acoustic models help in understanding and classifying speech sounds.
Details:
Gaussian Mixture Models (GMMs): Handle variations in speech (e.g., accent, pronunciation) by probabilistically modeling the data.
Hidden Markov Models (HMMs): Represent phonemes as sequences of states and model transitions, which are essential for recognizing speech patterns.

External link

Convolutional neural network

From Wikipedia, the free encyclopedia

For other uses, see [CNN \(disambiguation\)](#).

This article needs additional citations for verification. Please help improve this article by adding citations to reliable sources. Unsourced material may be challenged and removed.

Find sources: "Convolutional neural network" – news · newspapers · books · scholar · JSTOR (June 2019) (Learn how and when to remove this message)

A **convolutional neural network** (**CNN**) is a specialized type of feed-forward neural network that learns features by itself via filter (or kernel) optimization. This type of deep learning network has been applied to process and make predictions from many different types of data including text, images and audio.^[1]

Part of a series on **Machine learning and data mining**

Paradigms	[show]
Problems	[show]
Supervised learning (classification · regression)	[show]
Clustering	[show]

Quiz

Quiz

Question 1: CNNにおける畳み込み層の役割は何ですか?

Select an answer

☐ A. 入力画像から特徴を抽出する

☐ B. 学習率を減らす

☒ C. 活性化関数を使用する

☐ D. 重みを最適化する

Wrong X

Question 2: CNNで一般的に、

Select an answer

☐ A. シグモイド

☐ B. シンタックストハイパー

☒ C. ReLU

☐ D. ソフトマックス

Correct J!

Question 3: CNNにおけるプーリング層の役割は何ですか?

Select an answer

☐ A. 特徴から特徴を抽出する

☐ B. 特徴マップの次元を削減

☒ C. ReLU

☐ D. Softmax

Correct J!

Question 4: 畳み込み層の目的は何ですか?

Select an answer

☐ A. 特徴から特徴を抽出する

☐ B. 特徴マップの次元を削減

☒ C. To classify images

☐ D. To apply non-linear functions

Correct J!

Question 5: What is the purpose of a pooling layer in CNNs?

Select an answer

☐ A. To extract features from images

☐ B. To reduce the dimensions of feature maps

☒ C. To classify images

☐ D. To apply non-linear functions

Correct J!

Question 6: What type of learning is used to adapt pre-trained models to new datasets?

Co-Learning

CONNECTIVE LEARNING

Professor/Instructor
Prof. Virach Somlertlamvanich

Lecture VDO Selection
J-ISR-CH4_Convolutional_Neura...

Select language
☐ Original (Japanese)
☒ English (US)
☐ Chinese
☐ Japanese

Lecture Video

Convolution

$(1 \times 3 + 2 \times 1) + (2 \times 1 + 3 \times 1) = 4$

カーネル、フィルター

Element-wise multiplication (要素ごとの乗算)

$(1 \times 3)_{top} + (2 \times 1)_{bottom} = 5$

One step at a time

Wordcloud

learning, Convolutional, Feature, Layer, Residual, connections, Dataset

Summary

Convolutional Neural Networks (CNNs) are a class of deep neural networks primarily used for image recognition and pattern detection. Inspired by the human visual system, CNNs are widely used in computer vision tasks, such as image classification, object detection, and medical imaging.

Basic Architecture of CNNs: CNNs consist of several key layers: the convolutional layer, pooling (subsampling) layer, and fully connected layer. The convolutional layer extracts features from input images using filters (kernels) that detect edges, textures, and other visual patterns. The pooling layer reduces the dimensions of feature maps, decreasing the computational load while retaining essential information—commonly using max pooling. The fully connected layer combines all extracted features and assigns probabilities to classifications. These layers are connected to form a hierarchical structure that captures both low- and high-level features of images.

Activation Functions and Data Augmentation: Activation functions like ReLU (Rectified Linear Unit) and Softmax introduce non-linearity to the network, enabling CNNs to capture complex relationships within the data and improve classification accuracy. Data augmentation is another

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Conclusion

- **Model architecture:** we propose the architecture of Multi-lingual CoRe-Learning model that bridges the gap between the challenges faced by learners and lecturers in the current digital learning landscape.
- **Learning content refinement:** we connect the SOTA NLP techniques to refine and generate the content that leverage the learning efficiency according to the Cognitive Load Theory and human learning process.

Your Contribution

- Sharing your open teaching VDO contents
- Collaborative editing open teaching contents
- Sustaining open CoRe-Learning platform