CONSTRUCTOR

From L&D to organizational learning: are knowledge models the key to closing critical information gaps?

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constructor.tech

L&D vs knowledge management

Learning & Development – improving skills, knowledge, competencies

- Delivery methods: e-learning platforms, workshops and seminars, coaching and mentoring, on-the-job training

- Content prepared by professional team; all the knowledge is explicit by definition.

- L&D is the formalized process with metrix. It is possible to measure the effect and improve

Issues
- All activities are centralized and initiated by L&D team
- Content is the key, and it is a challenge always have relevant content and regular activities to deliver it to people

Knowledge Management - capture, store, share, and effectively utilize knowledge within the organization

- Delivery method: employees access knowledge and learning materials on demand

- Explicit and Tacit knowledge types are recognized

- No bottleneck in updating knowledge, everyone can contribute

Issues
- Still needed centralized process of sharing knowledge, e.g. for onboarding
- Training skills is not fully covered

How can we combine the best of two?

Let's see the trends
and new technologies upcoming

Well-known pedagogic trends in education are...

Hybrid

Hybrid in space & time model requires dramatically different systems and processes for learning, practice & research enabling equal effectiveness for remote, on-premise, virtual and augmented students.

Star Wars: The Clone Wars

Adaptive

Machine Intelligence can be used to adjust scope and difficulty of learning & practice material based on an **individual student capabilities & progress, specific context of the teacher and subject.**

<Constructive>

Interdisciplinary collaborative practice-based learning, assisted by AI to create capstone projects by groups of students across multiple courses/professors. Constructors need broad view of all applicable knowledge.

FedEx started as a Yale term paper idea

Technology Trends Next 5-10 years

These trends create opportunities to solve more of real-world problems

AI & Software 3.0

- Machine Intelligence & Robotics
- All present software has to be rewritten to take full advantage of the above
- Automating knowledge processing
- Dramatically better User Experiences
- Significantly more complex logic

OpenAI ($3.4B ARR) partners with FigureAI to give GPT-5 a body

Metaverse & Metapresence

- Augmented physical and virtual reality, virtual reality modifying physical reality
- Generating video or animated content for any topic with AI
- Using above advances for more effective communications, distributed in space & time

Apple Vision Pro: ready for immersive shopping experience

Neuroscience & Neuropsychology

- Human Brian is mostly the only thing used to teach, learn, research & engineer
- Neuroscience: much deeper understanding brain with better equipment and models
- Neuropsychology: extended psychology with understanding brain actual structure
- Intercommunications: optimal communications methods with the brain

Apple Vision Pro: ready for immersive shopping experience

Knowledge Flow: Research > Education > Tech

Articles (Create)

- Scopus database has 2.88M articles in 2023
- 505K articles for 1993 (5.7x in 30y, 6% CAGR)
- Total amount of papers is estimated from 200M (Web of Science = WoS) to 400M (Google Scholar)

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Courses (Spread)

- The time for a research publication to be widely adopted by university programs varies from 2-3 months (e.g., NLP, genAI) to decades (e.g. Quantum Computing pioneered by Feynman in 1981)
- 2023 Q1-2 – ChatGPT success. 2023 Q3-Q4 – Generative AI courses and programs in universities and AltCred
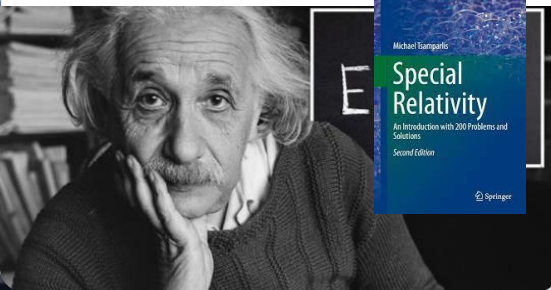
Specifications (Build)

- 29% of all patents make some kind of citation to the science (Marx and Fuegi 2020)
- Average gap between an article and the patent is 17 years
- Average shortest time gap between a patent and a cited journal is 7 years (Ahmadpoor and Jones 2017)

Nuclear power offers a clean energy alternative

Nuclear power offers a clean energy alternative

New Format for Constructor Knowledge Model

Text, Symbols, Pictures, Charts, Indices, Links, Data

- Most of the knowledge humans consume is represented by text, pictures/visuals, and videos
- AI can generate all of these: text-to-image - DALLE, Midjourney; text-to-video - C>T Avatar, Sythesia, D-ID, Sora; text-to-text - GPTs, LLaMA
- ~328.77 million terabytes of data are created each day, 250M emails, 5.9M Google searchers every minute


Anatomy of a Journal Article Citation
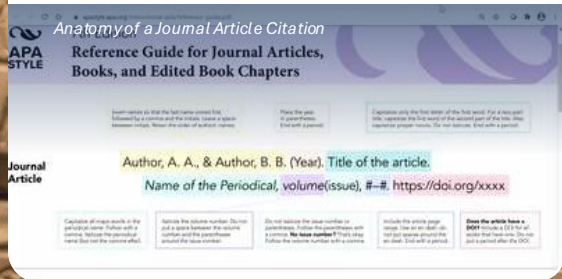
Code and Configs

- Machine-readable description of all resources, middleware, and configuration setting needed to run the model code
- Retrieval-Augmented Generation (RAG)
- Agents code – patterns: retrieval, self-discovery, self-criticism
- Model fine-tuning
- Instructional Datasets

Neural Network and PyTorch code
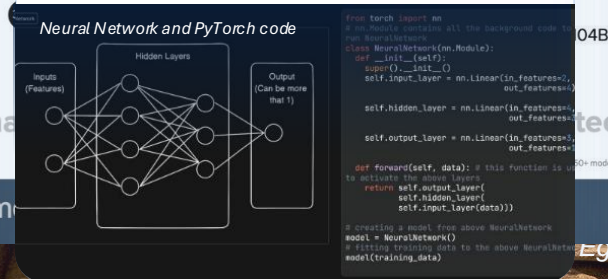
Knowledge Inference

- Knowledge Application - retrieval in various forms (chat, API, specialized UI)
- Knowledge Browser – visual representation of Knowledge in various forms (mindmap, graph, ontology)
- Knowledge Workflow – complex sequence of actions transforming information (extraction, summarization, comparison, explanation, classification, argumentation, analogy, etc.)

Neuronal Network with electrical activity
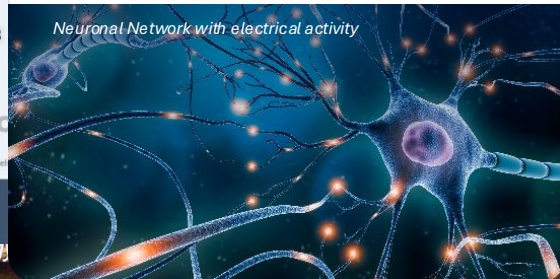
Foundational Constructor Models (CM)

User/Organization CM – Mental World

- Articles/papers read, messages, notes, video scripts, and any other formats of information produced and consumed
- Organization - User CMs combined in a research group/entity/society
- Knowledge stored connected with all corresponding logics and prerequisites

Archive (2020) Movie

Record CM – Platonic Mathematical World

- Record can be an article, a hypothesis, a proposal, a publication, a lecture, a course etc., or a whole research domain with links to adjacent research domains
- Examples of Research Domains:
  - Differential Geometry
  - Soft Matter Physics
 - Adaptive Responsive Functional Materials

Archive (2020) Movie

Machine CM – Physical World

- Something we can build based on the mental and mathematical knowledge and models
- The von Neumann universal constructor is a theoretical self-replicating machine that can:
  1. Read instructions to build other machines or copy itself
  2. Execute those instructions to create new machines
  3. Copy its own instructions to pass on to its "offspring"

Archive (2020) Movie

Sir Roger Penrose
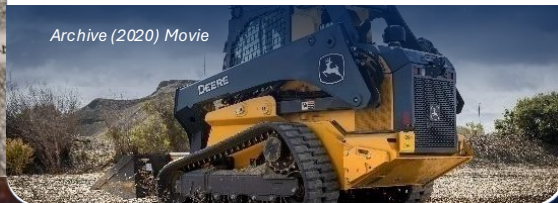
Large Constructor Models – more than books

Ask Questions & Understand Internals

- Ask any questions in any language, ask follow-up questions
- Perform computations, data analytics, visualize data
- Personalized experience based on user background and level of access
- Understand internal structure and reasoning, explore parameters space & interpret results
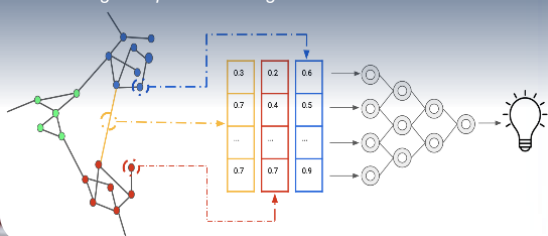

Knowledge Graph Embedding

Add Knowledge

- Adding fresh data, extending datasets, publishing updates
- Adding personal or company data that should not be visible to others
- Connecting push or pull data sources, and configuring auto-update rules
- Upload legacy documents (text, images, PDF, etc.)

The Fifth Element (1997) – Leeloo learns all facts about human race

Customize, Integrate, Expand

- Branch & modify CM for separate use
- Re-train or fine-tune a branch and merge back
- Connect and Merge CMs
- Create applications on top of Constructor Model
- Applications can be used by people or by Constructor Models

Groundhog Day classic comedy film, 1993

Constructor Model is "Alive"

Adaptive

- Knows who is the user, what is his background, and adapts accordingly
- Maintains context and coherence throughout the interaction
- Personalizes responses based on user preferences and history

Panther Chameleon, Madagascar

Interactive

- Responds to user queries and prompts in a conversational manner, initiates relevant questions to gather more information from the user
- Offers suggestions and recommendations based on user input and context
- Provides timely reminders and notifications to assist the user

Sphinx creature posing riddles to those who sought passage

Dynamic

- Continuously learns and adapts based on user interactions and feedback
- Incorporates new knowledge to expand its capabilities over time
- Improves performance and accuracy with each conversation

Xenomorph in "Alien: Romulus" (2024)

CM Adoption Challenges

Privacy and Security

- Confidentiality, Data connections, Access Control, Censorship
- Data poisoning, Adversarial prompting, Unauthorized code execution, Inadequate sandboxing
- Global Cybersecurity market is estimated $170B in 2023

CalypsoAI – AI testing and security

Copyrights and other IP

- Managing copyrights, licenses, trademarks
- Managing patents defensively and offensively
- Managing originality – preserving "copyrightability"
- Its own and ecosystem licensing, copyright, trademark management

Computer-generated Paul Walker face in "Furious 7" (2015)

Interoperability

- Switching to another or multiple CMs: when the AI flow was designed for a particular LLM or CM, an introduction of a new/updated or additional LLM
- Newly emerging CMs should have backward compatibility is a must-have for all software and applications
- CMs should be compatible scholarly knowledge ecosystem

NeXT computer running the first web server

C>ONSTRUCTOR Group | Knowledge + Capital + Technology

C>ONSTRUCTOR Knowledge

- **Global Local:** Main campus in Bremen, secondary campus in Schaffhausen
- **Broad Disciplines** but with application of Computers, Software Engineering and AI
- Highly **Fundamental** Science with Clear and Near **Applications**
- **Meta Hybrid**: 10,000+ on campus, 150,000+ hybrid/online

Sciences & Technology

Business & Entrepreneurship

Humanities & Politics

University Institute Academy

C>ONSTRUCTOR Capital

- Seed, Early & Growth stage venture fund investing in Software Tech, Deep Tech, Edu Tech
- Leveraging Constructor Group Access to University & Research Clusters, Expertise & People
- To find, approach & help companies for its portfolio

- Check size $0.1-10+M
- $150+M fund I, $1B+/fund in 15 years
- 5x+ return, 40%+ net IRR → 30x+ over 10 years;
- 20-30 seed; 10-20 early/growth deals per year
- 5+ partners, 12+ team

Zurich, Switzerland

C>ONSTRUCTOR Technology

- Tech platform for $300B/year vertical Knowledge Market (Science, Research, and Education)
- Which requires specialized Applications, Platform, Infrastructure, Consulting & Services
- To make scientists, researchers, administrators and educators more effective and more efficient

Microsoft Azure

High St@kes, No Prisoners

A Winner's Tale of Greed and Glory in the Internet Wars

Charles H. Ferguson

Constructor Platform High Level Architecture

Infrastructure Layer

- Software Defined Infrastructure
- Provisioning and management of heterogeneous compute and storage resources
- Enabling scalability and flexibility with ongoing monitoring and optimization
- Wide range of middleware, LLMs, tools and workflows – ready to use together

IBM z16 mainframe

Constructor Director

- Privacy and Security management
- System management and monitoring and analytics
- Data Management, Import/Export, Streaming, Migration tools
- Performance and cost optimization
- 3rd party software integration management

Conductor's Platform (Special "Bolshoi Theatre" Edition)

Application Platform

- Application Stack and Development Tools
- APIs and SDKs with documentation
- Developer Portal
- App Standards and Design Guidelines
- Community forums and support
- Marketplace / App Store
- Platform Marketing, Partnerships & Sales

Steve Jobs presents iPhone SDK

Apple Vision Pro: ready for immersive shopping experience

How is it related to corporate education?

Knowledge model can be always updated

- getting data/information from different sources, including explicit and tacit.

- there is no human bottlenecks.

Knowledge model can be used in different modes

- Giving knowledge on demand in a form of chat or integrated into any application

- Integrating knowledge model into learning management systems to keep formal L&D processes running

LMS

CRM

ERP

Service Desk

Communication channels

Knowledge models
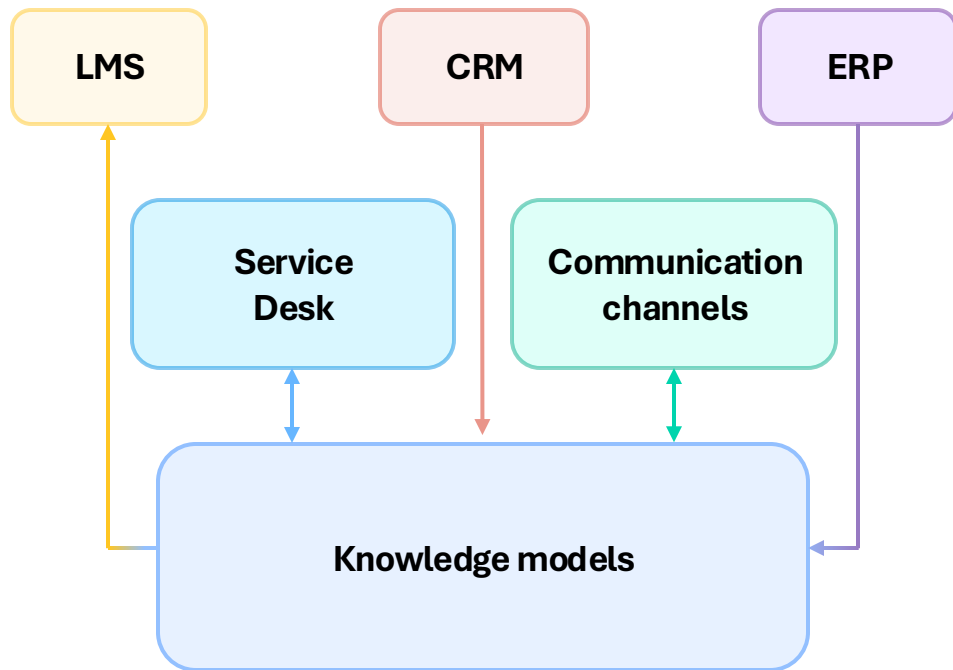
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Thank you!

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