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# CAPSTONE PROJECT

## COURSE CONTENT SIMPLIFICATION AGENT

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# OUTLINE

- Problem Statement
- Technology used
- Wow factor
- End users
- Result
- Conclusion
- Git-hub Link
- Future scope
- IBM Certifications

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# PROBLEM STATEMENT

Educational materials often vary in complexity and are not always accessible to learners with different levels of prior knowledge. Students may struggle to grasp key concepts due to jargon heavy or overly advanced explanations in faculty notes and textbooks.

The solution is to develop an AI powered agent that can intelligently analyze academic content and reframe explanations based on the learner's current proficiency—ranging from beginner to expert. This would support more inclusive learning and personalized education delivery at scale.

# TECHNOLOGY USED

- IBM cloud lite services
- Natural Language Processing (NLP)
- Retrieval Augmented Generation (RAG)
- IBM Granite model

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# IBM CLOUD SERVICES USED

- IBM Cloud Watsonx AI Studio
- IBM Cloud Watsonx AI runtime
- IBM Cloud Agent Lab
- IBM Granite-3-3-8b-instruct foundation model

# WOW FACTORS

It takes really complicated stuff and turns it into easy, interesting explanations that actually make sense. Whether you're a beginner or already know a lot, it adjusts to you. It saves tons of time, helps you really understand topics, and makes learning way less stressful.

## It includes:

- It can explain things at any level — beginner, intermediate, or advanced.
- Let's you choose how you want it: quick definitions, bullet notes, tables, charts, or full detailed explanations.
- Always adds real-life examples so it's easier to relate and remember.
- Breaks down big, complicated paragraphs into simple notes.
- Can explain in different languages.
- Even gives links to books, research papers, and other sources if you want to go deeper.
- Adjusts how it talks — whether you just need a quick summary or a deep dive for a project.

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## END USERS

- Students
- Faculty & Teachers
- Researchers & Academics
- Professionals & Lifelong Learners
- Institutions

# RESULTS

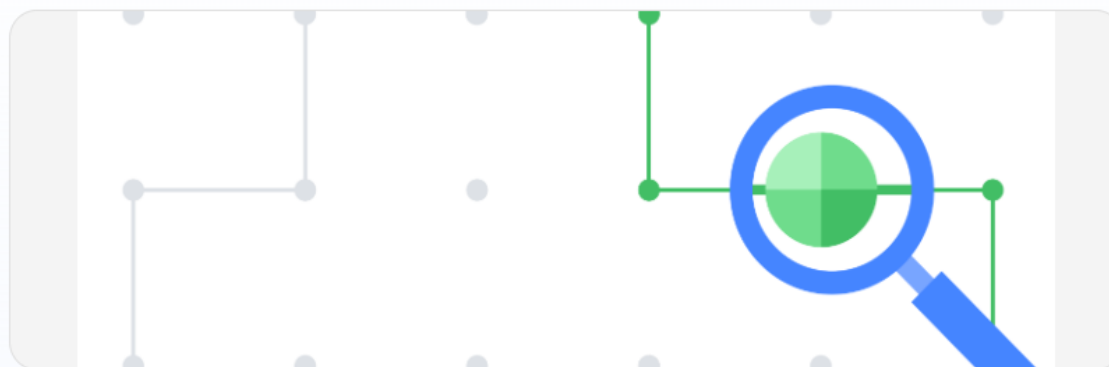
## Agent preview



MadeEasy 12:04 AM

Welcome to MadeEasy

Complicated notes? Scary concept? No worries, your friend got you!



Type something...






# RESULTS

## Agent preview

**VS** You: 12:50 AM

The scalability of heterogeneous multi-core architectures in modern processors necessitates an intricate balance between thread-level parallelism (TLP) and instruction-level parallelism (ILP), compounded by the challenges of cache coherence and memory consistency models in NUMA (Non-Uniform Memory Access) systems. As core counts increase, the overhead of maintaining coherence through directory-based protocols grows nonlinearly, leading to potential bottlenecks in interconnect bandwidth and latency. Moreover, speculative execution mechanisms, while improving ILP, exacerbate side-channel vulnerabilities such as Spectre and Meltdown, necessitating architectural mitigations that often trade performance for security. These complexities demand a co-design approach involving hardware optimizations, compiler strategies, and adaptive scheduling algorithms to achieve an optimal balance between performance, energy efficiency, and security in future exascale computing environments. simplify and explain

 MadeEasy 12:50 AM

Sure, let's break this down!

Modern processors are using something called "heterogeneous multi-core architectures." This means they have multiple types of cores working together to handle different tasks efficiently. Balancing these cores is tricky and involves two main concepts:

1. **Thread-Level Parallelism (TLP):** This is about how well the processor can handle multiple threads (sequences of instructions) at the same time.
2. **Instruction-Level Parallelism (ILP):** This refers to how efficiently the processor can execute multiple instructions within a single thread simultaneously.

Type something...



## Agent preview

However, as the number of cores increases, managing shared resources like caches and ensuring memory consistency across all cores becomes more challenging, especially in Non-Uniform Memory Access (NUMA) systems where different cores might have varying access times to memory.

As the number of cores grows, maintaining coherence (making sure all cores have the same view of memory) through directory-based protocols becomes more complex and can create bottlenecks in the interconnect (the paths through which cores communicate).

Additionally, techniques to improve ILP, like speculative execution (guessing which instructions to execute next), have been found to inadvertently introduce security vulnerabilities such as Spectre and Meltdown. To address these, architectural changes are needed, but these often come at the cost of performance.

To tackle these intricate challenges, experts suggest a "co-design approach." This means that hardware designers, compiler developers (who write programs that translate code into instructions the processor can understand), and those designing scheduling algorithms (which decide the order in which tasks run) need to work together. The goal is to optimize performance, energy efficiency, and security for future super-powerful computing systems known as exascale computing environments.

In summary, modern processors are becoming more complex with many cores working together. Balancing their performance, managing shared resources, and ensuring security are major challenges that require a collaborative approach from different areas of computer science to solve.

h. How did I get this answer?

Type something...



# RESULTS

## Agent preview



You: 12:52 AM

differentiate these in tables



MadeEasy 12:53 AM

Sure, here's a comparison table to differentiate the key terms mentioned:

Term	Description	Focus Area
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<b>Heterogeneous Multi-core Architectures</b>	Processors with multiple types of cores handling different tasks.	Hardware Design
<b>Thread-Level Parallelism (TLP)</b>	The ability of a processor to handle multiple threads simultaneously.	Scheduling and Task Management
<b>Instruction-Level Parallelism (ILP)</b>	The efficiency of executing multiple instructions within a single thread.	Microarchitecture and Compiler Strategies
<b>Cache Coherence</b>	Ensuring all cores have a consistent view of shared data in the cache.	Memory System Management
<b>Memory Consistency Models</b>	Defining the rules for how memory operations appear to execute in an indivisible sequence.	Memory System Design

Type something...



# RESULTS

## Agent preview

आधुनिक प्रोसेसर विभिन्न कार्यों को संभालने के लिए विभिन्न प्रकार के कोर का उपयोग करते हैं। इन कोर को संतुलित करना जटिल है और इसमें दो मुख्य अवधारणाएँ शामिल हैं:

1. **थ्रेड-लेवल पैरललिज्म (TLP):** यह दर्शाता है कि प्रोसेसर कितने थ्रेड (निर्देशों की एक श्रृंखला) को एक साथ संभाल सकता है।
2. **इंस्ट्रक्शन-लेवल पैरललिज्म (ILP):** यह एकल थ्रेड में निर्देशों को कितनी कुशलता से निष्पादित किया जा सकता है, इसका वर्णन करता है।

जैसे-जैसे कोर की संख्या बढ़ती है, NUMA (Non-Uniform Memory Access) प्रणालियों में साझा संसाधनों जैसे कैश को सुसंगत बनाए रखना और मेमोरी संगति मॉडल अधिक चुनौतीपूर्ण हो जाते हैं। सुसंगतता बनाए रखने के लिए डायरेक्टरी-आधारित प्रोटोकॉल का उपयोग करने का ओवरहेड गैर-रैखिक रूप से बढ़ता है, जिससे इंटरकनेक्ट बैंडविड्थ और विलंबता में संभावित बॉटलनेक पैदा हो सकते हैं।

इसके अलावा, प्रदर्शन में सुधार के लिए निष्कर्षात्मक निष्पादन (जानने से पहले निर्दिष्ट नहीं होने वाले निर्देशों को निष्पादित करना) का उपयोग ILP में सुधार करता है लेकिन साइड-चैनल भेद्यताओं जैसे Spectre और Meltdown को बढ़ाता है। इन भेद्यताओं को दूर करने के लिए आर्किटेक्चरल संशोधनों की आवश्यकता होती है, जो अक्सर प्रदर्शन को सुरक्षा के लिए समझौता करते हैं।

इन जटिलताओं को संबोधित करने के लिए, विशेषज्ञ एक "सह-डिज़ाइन दृष्टिकोण" की सिफारिश करते हैं। इसका मतलब है कि हार्डवेयर डिजाइनर, कम्पाइलर रणनीतियों के लिए लेखन करने वाले (कोड को प्रोसेसर द्वारा समझने योग्य निर्देशों में अनुवाद करने वाले), और अनुकूली शेड्यूलिंग एल्गोरिदम के डिजाइन करने वाले को एक साथ काम करना चाहिए। लक्ष्य भविष्य के एक्सास्केल प्रोसेसिंग वातावरण में प्रदर्शन, ऊर्जा द

► How did I get this answer?

Type something...




# RESULTS

## Agent preview

 You: 12:57 AM

what is machine learning

 MadeEasy 12:57 AM

Machine learning (ML) is a fascinating subset of artificial intelligence (AI) that focuses on the development of algorithms and statistical models that enable computers to perform tasks without explicit programming. Instead of writing code for every specific task, machine learning gives computers the ability to learn and improve from experience.

Here's a simple breakdown:

1. **Data:** Machine learning starts with data. This data can be anything from images, text, numbers, to clicks on a website.
2. **Algorithm:** A machine learning algorithm is like a recipe that the computer follows to learn from the data. There are many types of algorithms, including supervised learning, unsupervised learning, semi-supervised learning, and reinforcement learning.
  - **Supervised Learning:** The algorithm learns from labeled data (data that has the desired answer). For example, if we're teaching a computer to recognize images of cats, we'd provide it with many pictures of cats, each correctly labeled. The algorithm identifies patterns in these images that define a "cat."
  - **Unsupervised Learning:** Here, the algorithm works with unlabeled data, finding patterns

|Type something...



## Agent preview

3. **Model:** After processing the data and applying the algorithm, a model is created. This model encapsulates the pattern or relationship the algorithm has learned. For instance, in the cat image example, the model would be the set of characteristics that define what an image contains a cat.
4. **Prediction/Decision:** Once the model is trained, it can make predictions or decisions without being explicitly programmed to do so. For example, it can classify new images as containing a cat or not, based on what it learned.
5. **Iteration:** Machine learning is an iterative process. Models are continually refined as more data becomes available or as performance is evaluated.

**Real-world examples of machine learning** include:

- **Recommendation Systems:** Netflix suggests shows you might like based on your viewing history.
- **Spam Filters:** Email services use ML to identify and filter out spam.
- **Voice Assistants:** Siri, Alexa, and Google Assistant use ML to understand and respond to voice commands.
- **Fraud Detection:** Banks use ML algorithms to detect unusual activity that might indicate fraudulent transactions.
- **Self-driving Cars:** These vehicles rely heavily on ML for tasks like object and pedestrian detection.

|Type something...




# RESULTS

## Agent preview

**VS** You: 01:00 AM

Provide best machine learning courses

 MadeEasy 01:00 AM

Sure, here are some of the top-rated machine learning courses across various platforms, catering to different levels of expertise:

### For Beginners

#### 1. Machine Learning by Andrew Ng on Coursera

- **Platform:** Coursera
- **Why it's great:** This is one of the most popular introductory machine learning courses, taught by Andrew Ng, co-founder of Coursera and Adjunct Professor at Stanford University. It covers the basics of ML, data mining, and statistical pattern recognition.
- **Link:** [Machine Learning by Andrew Ng](#)

#### 2. Intro to Machine Learning with Python by Kirchhoff on Udacity

- **Platform:** Udacity
- **Why it's great:** This nanodegree program is project-based and uses Python, a popular language in ML. It's excellent for those who want hands-on experience.
- **Link:** [Intro to Machine Learning with Python](#)

Type something...



## Agent preview

### Intermediate Level

#### 3. Deep Learning Specialization by Andrew Ng on Coursera

- **Platform:** Coursera
- **Why it's great:** A series of five courses diving into the deep aspects of neural networks and deep learning, suitable for those with some foundational knowledge.
- **Link:** [Deep Learning Specialization](#)

#### 4. Machine Learning A-Z™: Hands-On Python & R In Data Science by Kirchhoff on Udemy

- **Platform:** Udemy
- **Why it's great:** This course covers a wide range of ML topics and uses both Python and R, providing flexibility for learners who prefer either language.
- **Link:** [Machine Learning A-Z](#)

### Advanced Level

#### 5. Fast.ai Practical Deep Learning for Coders

- **Platform:** Fast.ai
- **Why it's great:** This course is known for its practical approach, focusing on getting quick results with deep learning using the PyTorch framework.

Type something...



# RESULTS

## API reference

The screenshot shows the IBM Watsonx web interface. The browser address bar displays the URL: `eu-de.dataplatform.cloud.ibm.com/ml-runtime/deployments/7dc804aa-446d-4a6c-9b59-1a4d17af9cab?space_id=6dfc787e-6c0e-4f6d-8c4d-0f0b362394cc&context=wx`. The page header includes the IBM Watsonx logo, an 'Upgrade' button, a help icon, a notification bell, the user's account 'Vaishnavi Shinde's Account', the region 'Frankfurt', and a version selector 'VS'.

The main content area is titled 'MadeEasy' and shows a 'Deployed' status with an 'Online' badge. Below this, there are tabs for 'API reference', 'Test', 'Evaluations', and 'Preview'. The 'API reference' tab is active, displaying 'Endpoints for inferencing'. It lists two endpoints: a 'Private endpoint' and a 'Public endpoint', each with a URL and a copy icon. To the right of the endpoints, there is a 'Bearer <token>' field with an 'IAM' button.

Below the endpoints, there is a link to 'Learn more about the 2021-05-01 version query parameter'. At the bottom, there is a 'Code snippets' section with a table of languages: cURL, Java, JavaScript, Python, and Scala.

A sidebar on the right titled 'About this deployment' provides additional details:

- Name:** MadeEasy
- Description:** Complicated notes? Scary concepts? No worries, your friend got you!
- Deployment Details:**
  - Deployment ID: 7dc804aa-446d-4a...
  - Serving name: No serving name.
  - Software specification: runtime-24.1-py3.11
  - Hardware specification: Extra extra small: 1 CPU and 2 GB RAM
  - Copies: 1
- Tags:** wx-agent
- Associated asset:** MadeEasy



# RESULTS

## Deployed AI Agent

IBM watsonx Upgrade ? ⓘ Vaishnavi Shinde's Account Frankfurt VS

Deployment spaces / MadeEasy / MadeEasy /

MadeEasy ✓ Deployed Online

API reference Test Evaluations **Preview**

New chat +

**You** 01:16 AM  
what is Laplace transform?

**MadeEasy** 01:16 AM  
Hi again! I'm MadeEasy, ready to help with your query about the Laplace Transform.

Let's break it down:

**Definition:** The Laplace Transform is a mathematical technique used to convert a function defined in the time domain into a function defined in the frequency domain. It's a powerful tool in engineering, especially for solving differential equations and analyzing systems.


**Key Points:**

- **Time-domain function:** A function that varies with time, like (  $f(t)$  ).
- **Frequency-domain function:** A function that varies with frequency, like (  $F(s)$  ).
- **Differential equations:** Equations involving unknown functions and their derivatives, often used to model physical systems.

Type something...

# RESULTS

## Deployed AI Agent

 IBM watsonx

Upgrade ? 🔔

Vaishnavi Shinde's Account ▾

Frankfurt ▾

VS


Deployment spaces / MadeEasy / MadeEasy /

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MadeEasy ✔️ Deployed Online

API reference Test Evaluations **Preview**

New chat +

 You 01:19 AM

I don't understand what does cloud computing means

 MadeEasy 01:19 AM

Hi there! I'm MadeEasy, and I'm here to explain cloud computing to you.

**Definition:** Cloud computing is the delivery of different services through the Internet, including data storage, servers, databases, networking, and software. Instead of keeping files on a proprietary hard drive or local storage device, cloud-based storage makes it possible to save them to a remote database. As long as an electronic device has access to the web, it has access to the data and the software programs to run it.

**Key Concepts:**

- **Services:** Cloud computing involves delivering various services such as storage, servers, databases, networking, software, analytics, and intelligence over the Internet ("the cloud") to offer faster innovation, flexible resources, and economies of scale.
- **Deployment Models:** There are three main types of cloud computing models: Public, Private, and Hybrid clouds.

type something... ➤



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## CONCLUSION

- The agent can simplify the hard course content into easy explanations with real world examples if needed.
- It is able to explain in different languages so that any user can understand it.
- It is able to recommend reference books for related topic.
- Saves time and reduces stress by simplifying even the hardest topics.

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## GITHUB LINK

<https://github.com/Vaishnavi304-MIT/Course-content-simplification-AI-agent>

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## FUTURE SCOPE

- Multilingual Learning Expansion
- Interactive Learning
- Multimedia Integration
- Accessibility Features like text-to-speech, sign language videos.
- Integration with Learning Management Systems (LMS)
- Personalized study plans
- AI-Powered Assessment Tools

# IBM CERTIFICATIONS

In recognition of the commitment to achieve  
professional excellence



## Vaishnavi Shinde

Has successfully satisfied the requirements for:

### Getting Started with Artificial Intelligence



Issued on: Jul 18, 2025  
Issued by: IBM SkillsBuild

Verify: <https://www.credly.com/badges/325a38bd-e302-42b8-930d-fee4555b94a4>



IBM **SkillsBuild**

Completion Certificate



This certificate is presented to

Vaishnavi Shinde

for the completion of

**Lab: Retrieval Augmented Generation with  
LangChain**

(ALM-COURSE\_3824998)

According to the Adobe Learning Manager system of record

**Completion date:** 24 Jul 2025 (GMT)

**Learning hours:** 20 mins

In recognition of the commitment to achieve  
professional excellence



# Vaishnavi Shinde

Has successfully satisfied the requirements for:

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## Journey to Cloud: Envisioning Your Solution

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Issued on: Jul 19, 2025

Issued by: IBM SkillsBuild

Verify: <https://www.credly.com/badges/f3153f70-fbec-4654-99ca-409fa1bfd7d8>





**THANK YOU**