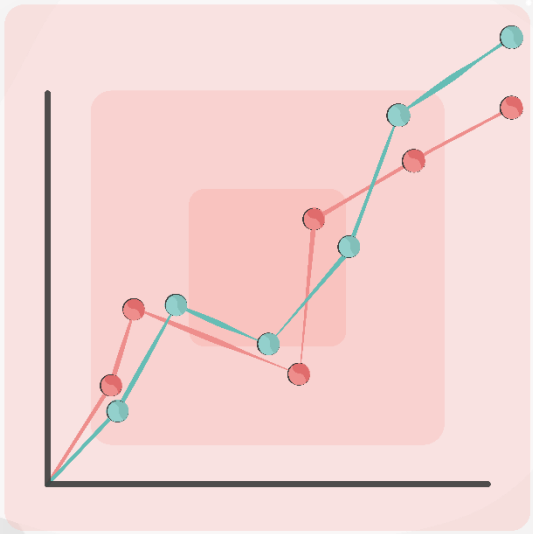
Data engineering

Module: Data pipelines

Topic: On-premise resource management



Welcome to today's webinar.

Ice breaker

Building Careers Through Education

Everybody Matters. Stronger Together. Student, Learner and Client Centric. Trust and Respect. Embrace Change.

Discussion…

- What's the most chaotic tech issue you've ever experienced at work or school?"
- True or False: On-premise systems are outdated and irrelevant in today's cloud-first world?
- What is one key skill or insight you hope to gain from today's session?

Submit your responses to the chat or turn on your microphone

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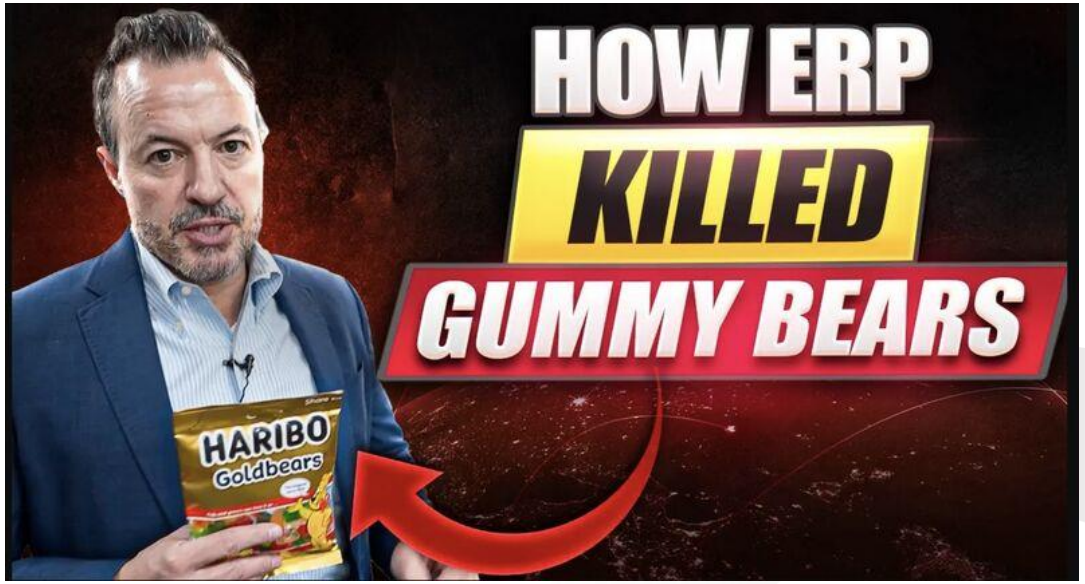
Real-world case study

Haribo’s ERP Implementation Failure (2018)

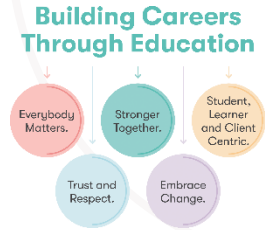
- Enterprise Resource Planning (ERP) launched across 16 factories in 10 countries
- Poor process mapping & no infrastructure stress testing
- Inventory tracking failed → empty shelves
- Sales dropped 25% after rollout
- **Root causes:** underplanning, no load balancing, no monitoring
- Highlights need for capacity planning & observability



How Haribo’s ERP failure cost them millions,
Image source: *LinkedIn*

This case shows that even a beloved global brand can suffer major losses when on-premise systems are poorly managed.

e-learning recap

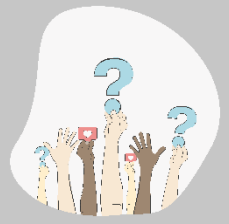


Reflecting on your learning…

The e-learning for this topic, covered the following areas:

1. Understanding On-Premise Infrastructure
2. Setting Up and Maintaining Infrastructure
3. Managing Computational Resources
4. Optimising Pipeline Efficiency
5. Load Balancing and Scheduling
6. Using Docker and Kubernetes On-Prem

Q&A discussion



- Do you have any questions about any of these areas?
- Did everything in the e-learning make sense?

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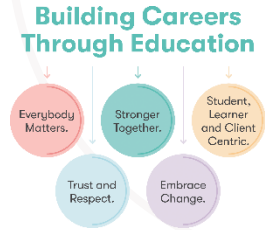
Webinar Agenda

Today, we will cover the following:

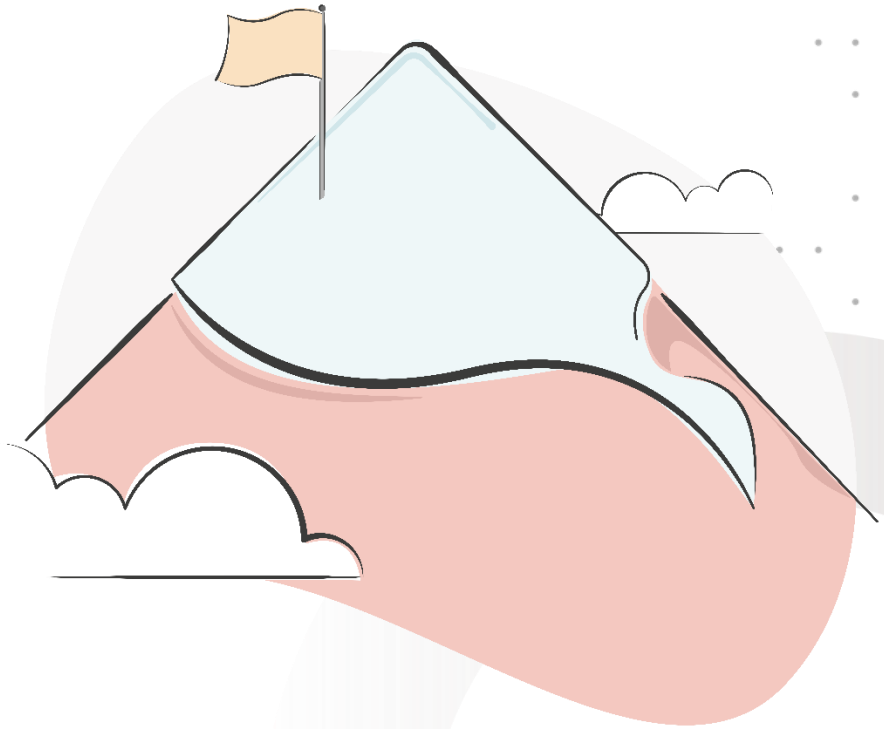
1. Core concept recap
2. Practical lab
3. Summary
4. Q&A

Session aim and objectives



By the end of this session, you should be able to:

- Design and Maintain On-Premise Data Infrastructure
- Optimise Resource Usage for Data Pipelines
- Implement Scalable and Reliable On-Prem Workflows Using Modern Tooling



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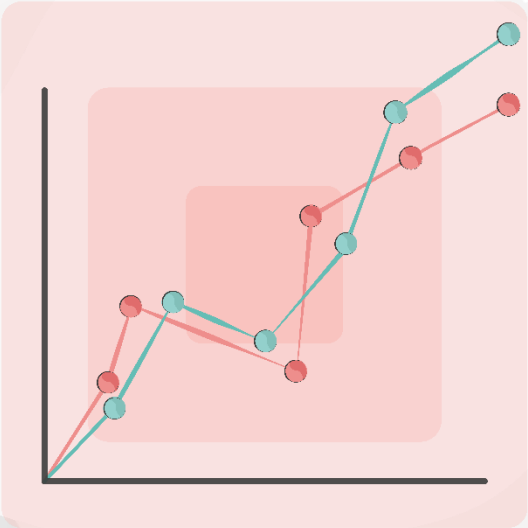
Recap of core concepts

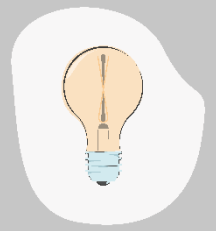


Defining on-premise infrastructure

What Is On - Premise Infrastructure?

- Physical servers, storage, and networking
- Self - managed environments
- No auto - scaling or managed services

Figure: *On-premise architecture, Source: Datapac*



Unlike the cloud, where services are abstracted and scalable, on - prem systems require manual setup, configuration, and maintenance.

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Setup essentials

Building your infrastructure

- Plan for compute, storage, and redundancy
- Design secure network topology
- Harden OS and runtime environments

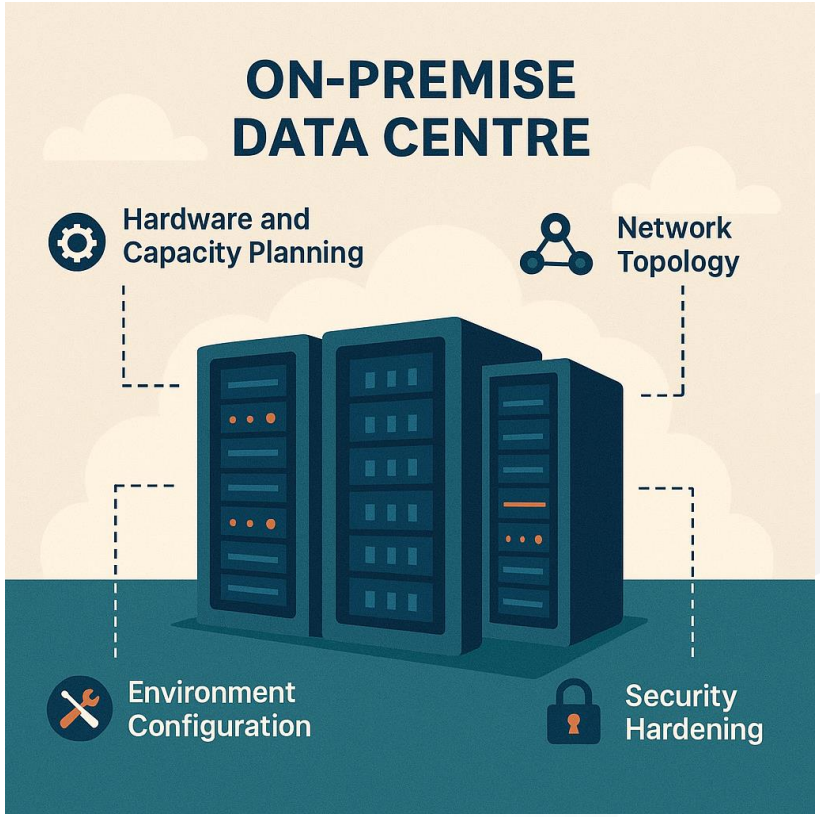


Figure: *Key Considerations for Setting Up an On-Premise Data Centre*

Maintenance matters

Keeping systems healthy

- Patch regularly and automate updates
- Monitor CPU, memory, and disk
- Test backups and document everything

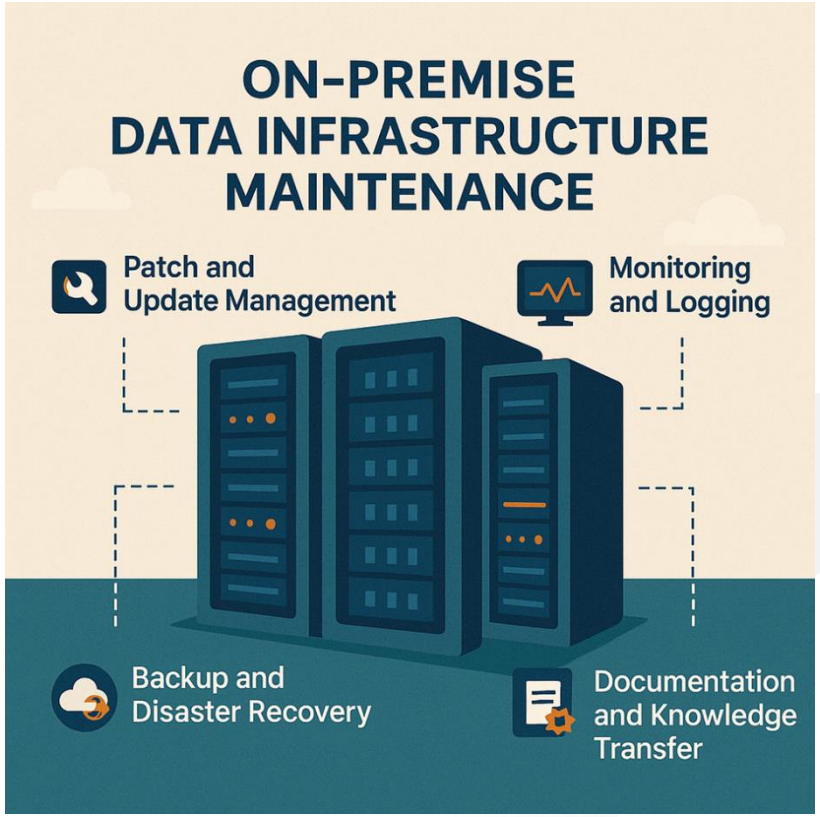


Figure: *Ensuring System Health through Regular Maintenance and Monitoring*

Resource awareness

Understanding system limits

- CPU, RAM, I/O, and network are finite
- No “scale up” button
- Poor planning = system crashes

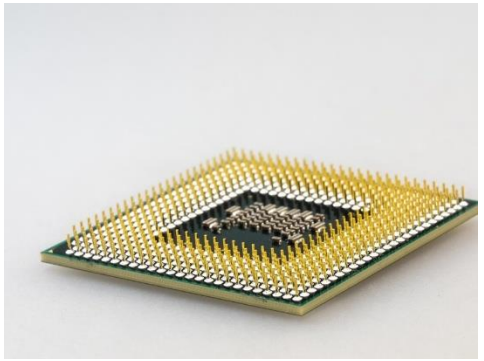


Figure: a Central Processing Unit (CPU)

Figure: a RAM stick, or memory module.

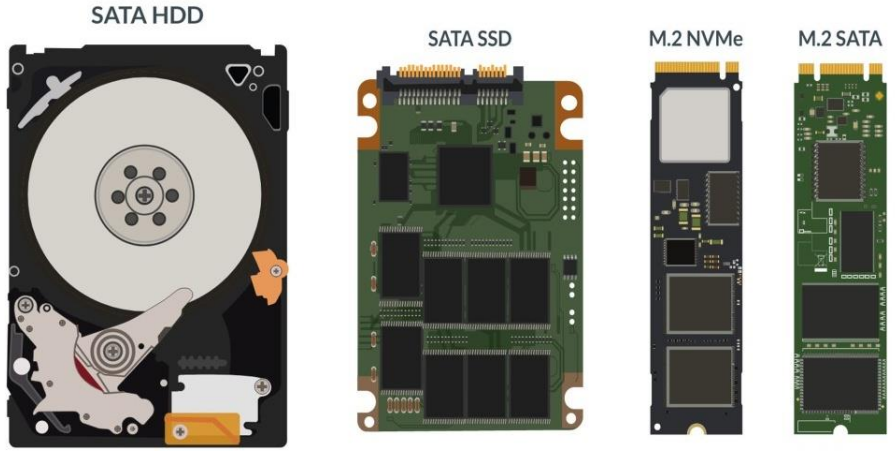
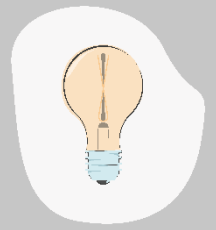


Figure: Figure: different types of hard disk storage.

Smart usage

Optimising resource consumption

- Chunk large datasets
- Use vectorised operations
- Avoid unnecessary I/O



These techniques reduce load on CPU, memory, and disk - keeping your system responsive and stable.

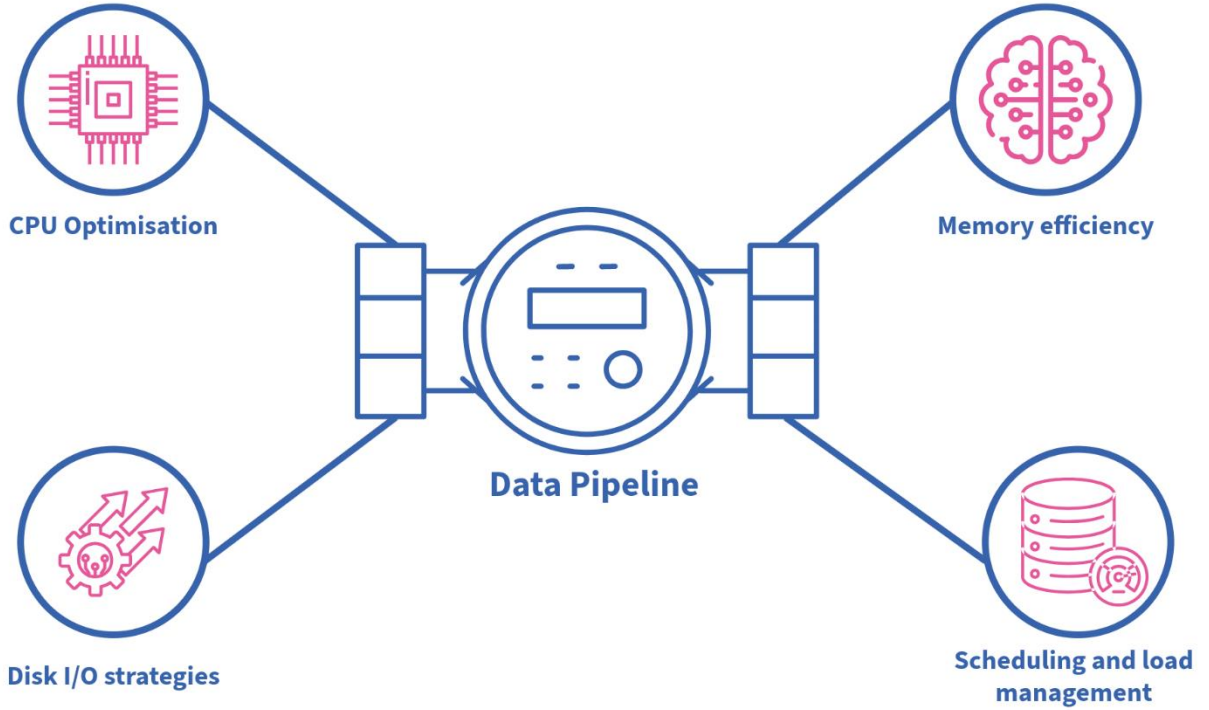
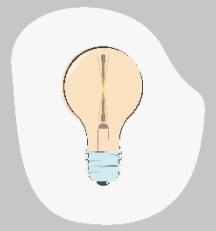


Figure: *Ensuring System Health through Regular Maintenance and Monitoring*

Scheduling strategy

Avoiding the midnight crash

- Stagger job start times
- Prioritise critical workloads
- Schedule off - peak execution



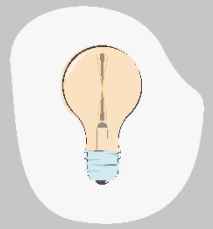
Tip: Don’t schedule all jobs at once—stagger them, prioritise critical tasks, and use off-peak hours to keep systems running smoothly.

Like a shared kitchen, your infrastructure needs coordination - stagger jobs, prioritise tasks, and schedule smartly to avoid a system traffic jam.

Tooling up

Docker & Kubernetes On-Prem

- Manual provisioning and networking
- Local storage and registries
- Monitor everything yourself



Docker and Kubernetes are powerful - but on - prem, you're responsible for the plumbing.

Logos for two tools common to a on-premise data infrastructure: Docker and Kubernetes

Real - World Lessons

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Case Studies in Action…

Manufacturing: Staggered jobs → no more failures,

Image source: itn.co.uk

Hospital: Rehearsed updates → enabled rolling upgrades.

Image source: Tagmedstaffing.com

University: Added quotas → fairer GPU usage.

Image source: Universitiesac.co.uk

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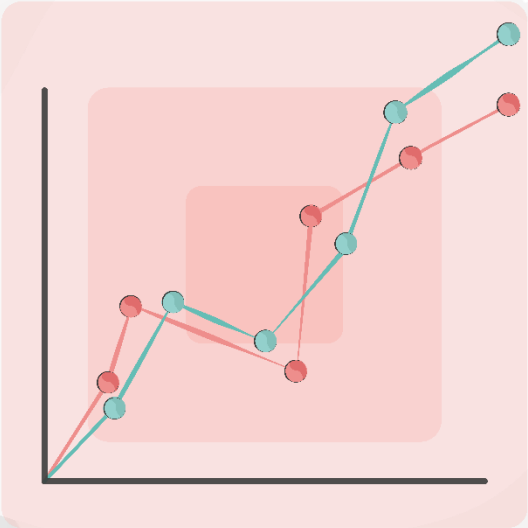
Practical lab



Exercise part 3

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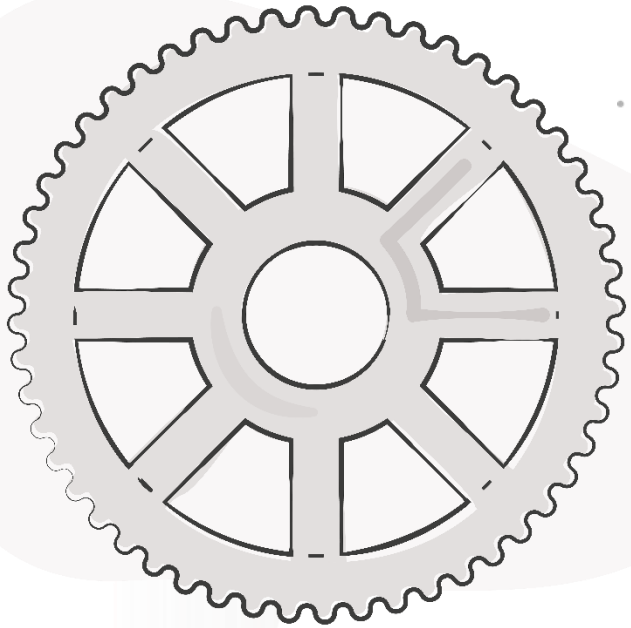
Next phase of design based on US data

- **Update Database Schema:** Modify the schema to accommodate data from the American version of the software application.
- **Re-implement Data Pipeline:** Develop a pipeline to clean, validate, and load UK, French, and American data into the revised schema.
- **Use Test Data:** Utilise provided test data for 10 American users and their login timestamps.
- **Future Phases:** Prepare to integrate data from additional countries w varying formats.
- **Documentation:** Establish comprehensive documentation for the schema and pipeline for future implementation by other teams.



Practical challenge

Files Provided in the Hub:

- US User Data.csv: Contains 10 sample records.
- US-User-LoginTS.csv: Contains login timestamps for January 2025..

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Key Learning Summary

- Running your own servers means owning everything from cabling to backups - and learning to think like a systems engineer.
- Know what happens under the hood when pipelines run - and why unmanaged resource use can bring everything else crashing down.
- Small adjustments like chunking data, limiting threads, or compressing files can make a big difference on tight on-prem systems.
- **Timing really matters -** when and how you run your jobs can prevent bottlenecks and keep shared systems running smoothly.
- Docker and Kubernetes still work on-prem, but you have to build the cloud-like environment around them yourself.
- Real-world success comes from visibility, good habits, and learning from the things that go wrong before they break everything.

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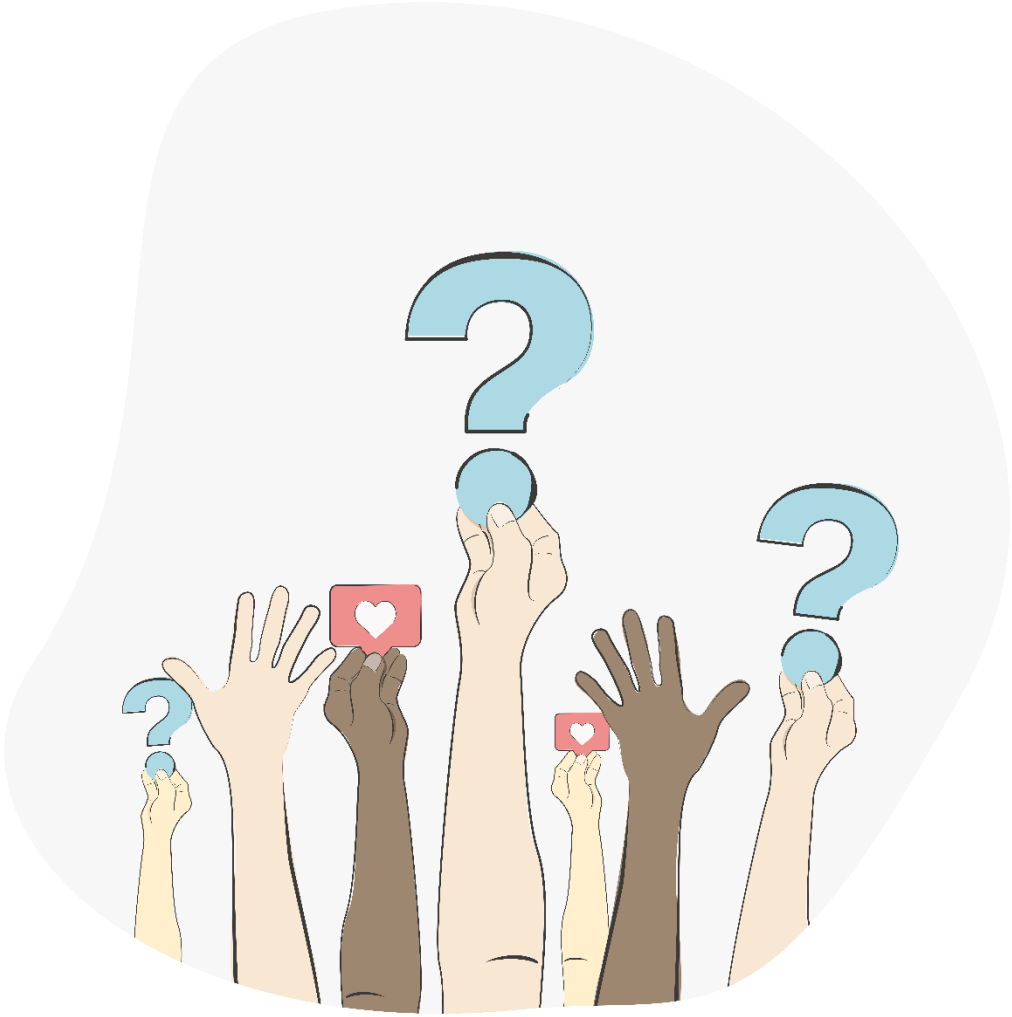
Any questions or feedback?



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Thank you