DHBW Ravensburg

Intelligence Engineering

Solving Real World Problems At Scale

Prof. Dr.-Ing. Mark Schutera | November 9, 2026 · *drifting stream*

LECTURE _

Orientation

what this course is, what it assumes, what you are going to know afterwards.

You have been given a lot of raw **data**,

and you want to engineer the shit out of it.

You have been given a business problem,

and you want to choose the right metrics and objectives to solve it.

Your initial models perform well in offline experiments,

and you want to deploy them at scale.

You want to harden your deployments

to quickly detect, debug, and address issues that arise in production.

There is a lot of manual work and handling involved so far,

and you want an operation vacation for your machine learning product or service.

You want to learn about a framework and foundation for building machine learning systems

that can be shared and reused across machine learning use cases and data products.

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Overview

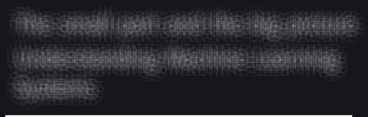
Machine Learning and Data Engineering

The lecture in one slide

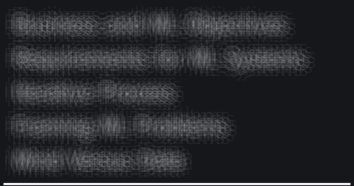
Lecture	Contents
I	Overview of Machine Learning Systems
II	Introduction to Machine Learning Systems Design
III	Data Engineering Fundamentals
IV	Training Data
V	Feature Engineering
VI	Model Development and Offline Evaluation
VII	Model Deployment and Prediction Service
VIII	Data Distribution Shifts and Monitoring
IX	Continual Learning and Test in Production
X	Infrastructure and Tooling for MLOps
XI	The Human Side of Machine Learning

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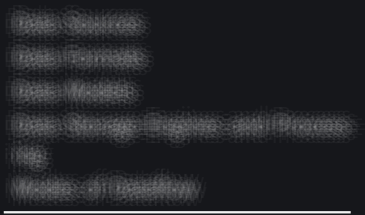
I Overview of Machine Learning Systems



II Introduction to Machine Learning Systems Design

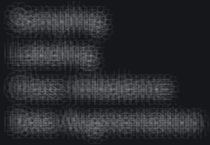


III Data Engineering Fundamentals



The lecture in one slide

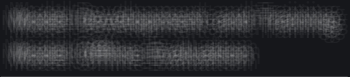
IV Training Data



V Feature Engineering



VI Model Development and Offline Evaluation

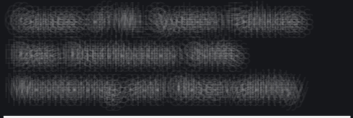


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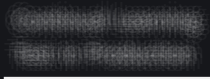
VII Model Deployment and Prediction Service



VIII Data Distribution Shifts and Monitoring

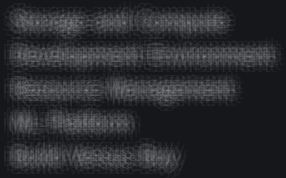


IX Continual Learning and Test in Production

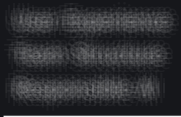


The lecture in one slide

X Infrastructure and Tooling for MLOps



XI The Human Side of Machine Learning



Course Work

The Hive is Real. Dataset on Hugging Face.

Presentation (15 min) + Q&A (open)

You get recordings of a beehive entrance and contribute data engineering, an annotation policy, a prediction service or specialized tooling.

Open whiteboard, three slides or one page only. Be ready when the class starts.



The bee

Course Work

What I am looking for:

Introduction by Motivation and Literature

Method by Explanation and/or Demonstration

Results show what was achieved and how well

Discussion on findings, limitations and what's next

Smart and Aesthetic Thoughts, Designs, Ideas and Questions.



The bee

Extra Mile

Special projects

If you are up for the extra mile, let me know. I have special projects that I can assign to you.

Wrapped in the same presentation and Q&A format. Yes, it will be more challenging and take more time and effort.

A classic: lose-lose in the short term, yet **win-win in the long term**.



A large banana

Brainwriting, 90 minutes

1. **5 min** Form groups of **4 to 5** students.
2. **10 min** Research: Google, Agent, you name it.
3. **10 min** Each student writes four ideas.
4. **5 min** Research.
5. **10 min** Stacks pass to the next table, each adds two.
6. **5 min** Research.
7. **10 min** Stacks pass again, each adds the last two.
8. **15 min** Cluster and clean the ideas per group.
9. **15 min** Cluster across teams.
10. **5 min** Walk the idea deck: everyone looks at all clusters.



The bee

It is your obligation to

get yourself a presentation slot and brainstorm a project idea to work on.

References

1 Chip Huyen. *Designing Machine Learning Systems: An Iterative Process for Production-Ready Applications*. Sebastopol, CA: O'Reilly Media, 2022.