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Predictive Maintenance & Condition Monitoring

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Prof. Dr.-Ing. Valentin Plenk received a **diploma in electrical engineering** from Technical University of Munich. After graduating as Diplom-Ingenieur in 1991 he joined the team of the institute for Precision Engineering and Micro Technology as a researcher.

In this function he worked in various projects. Two that stand out are SFB 336 der TU München and the Brite/Euram 2 project BRE20628. In 1996 he passed **his doctorate in the department of mechanical engineering** of the Technical University of Munich in the field of surface roughness measurements.

1996 he took up a position as developing engineer hard- and software with Karl Süss KG in Garching. One of his achievements was a 150% increase in machine throughput in the main product line by optimizing the control software program.

1997 he started to manage the hard- and software group at Karl Süss' Garching plant. He supervised 10 developers in his group and improved the engineering processes for special purpose machines. The job also required close cooperation with and frequent visits to the subsidiary in Burlington, Vermont.

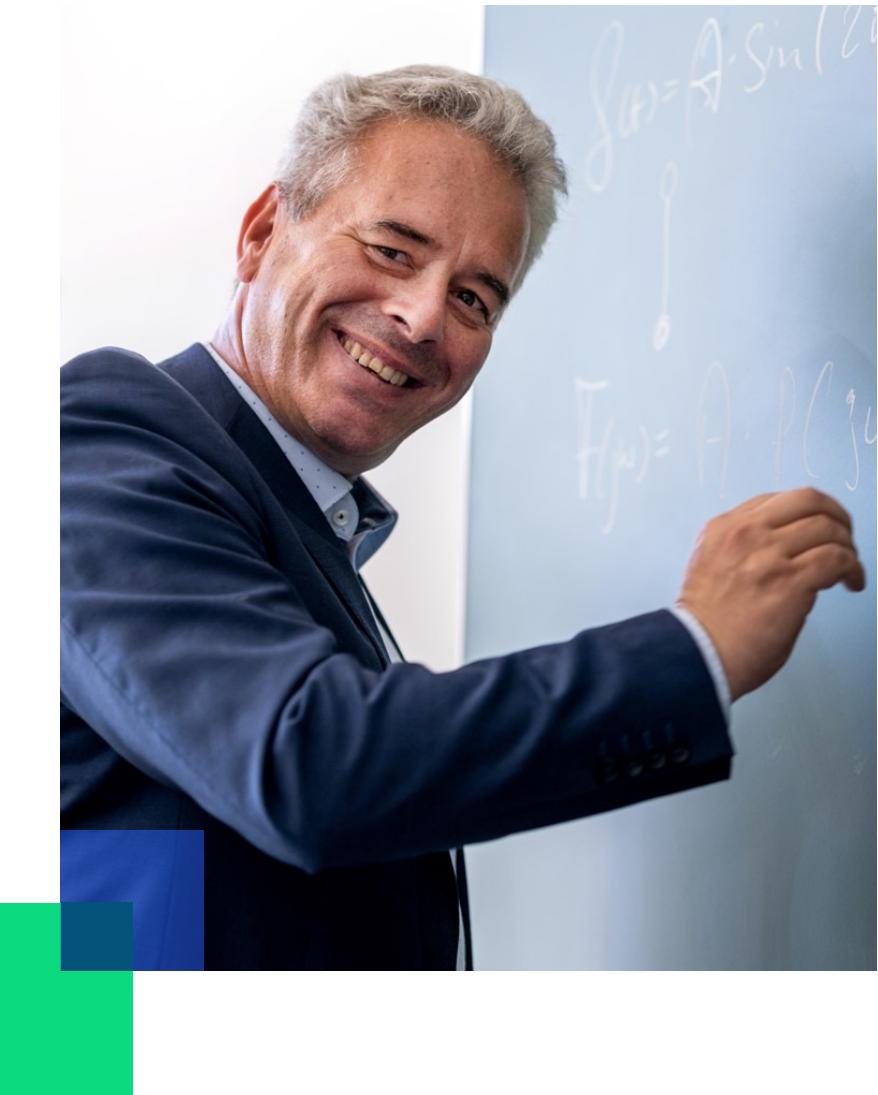
Since October 2000 Valentin Plenk teaches control engineering as a full professor at Hof University.

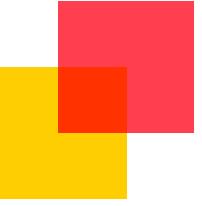
After various small research projects he was elected Dean of the Engineering Department and managed the department from 2003 to 2007 and 2009 to 2015. In his second term he headed the reorganization process that integrated the former textile department into the Engineering Department.

Since January 2016 he has been leading the **research team for Cyber-Physical Systems** at Hof University's Institute of Information Systems (iisys).

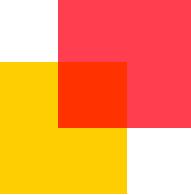
From October 1, 2017 to October 1, 2020 he was the scientific head of the **Institute of Information Systems** (iisys).

Since October 1, 2020 he is Vice President Research and Development.





Expectations / Prior knowledge



A few words on „German Culture“

- We do NOT teach You. YOU learn from us!
(We expect you to take an active instead of a passive role)
- We are punctual. Eight o'clock means 8:00
- Due dates are due dates NOT basis for negotiations!
(If in doubt, start early and get feedback before the due date)

- We expect answers to our questions.
(Not an enumeration of all your recollections that might relate to the question)
- Plagiarism, Cut and Paste from colleagues/Google is not accepted!
(Citing other peoples work is accepted, even recommended)



Syllabus

Goals for the competence areas

- The students have an overview of typical fields of applications and problems in the field of predictive maintenance and condition monitoring. They are familiar with approaches to data preparation and data evaluation. They have an overview of typical processing, evaluation and machine learning methods in this field. They have mastered at least one typical interactive tool for prototyping applications in this field and can independently carry out their own investigations. They are able to assess, on the basis of these investigations, which automated evaluations are possible for a given data set.

Teaching Content:

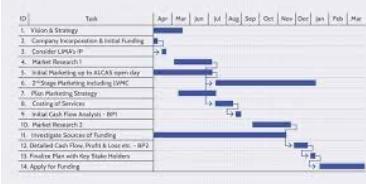
- The module introduces the field of Predictive Maintenance and Condition Monitoring using concrete case studies. It gives an overview of typical tools, algorithms, procedures and techniques. The students apply these independently to selected data sets.



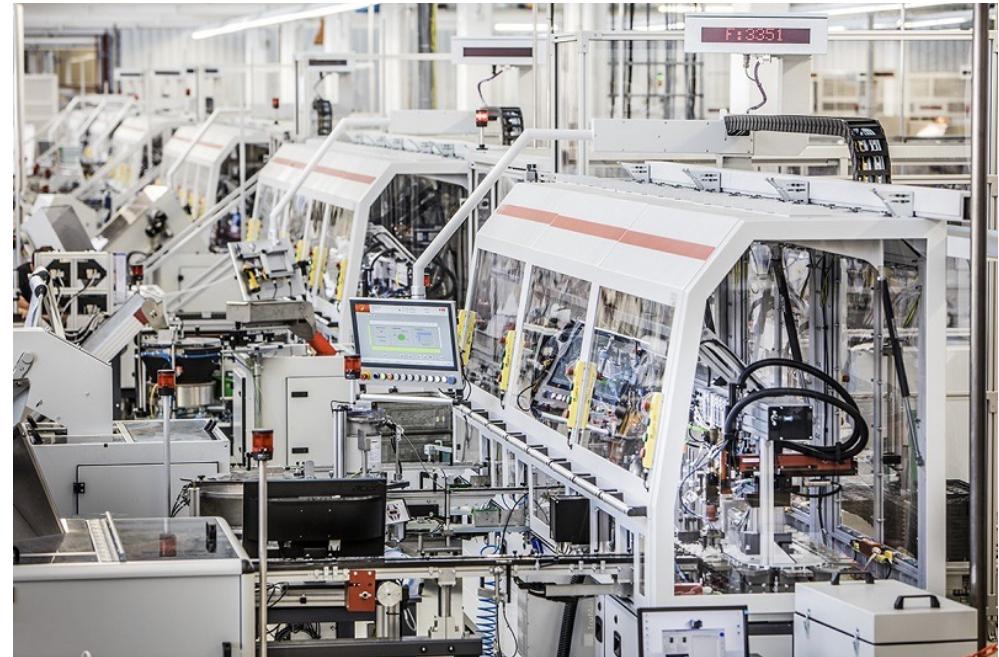
<https://www.google.com/url?sa=&url=https%3A%2F%2Fwww.firebaseio.com%2F&psig=AOvVaw1hEEwpFaOflcUC-AtY5x&ust=1677840763467000&source=images&cd=vfe&ved=0CBAQjRxqFwotCljwwwYeKvI0CFQAAAAAdAAAABAJ>

Motivation

- _ Lots of machines / production resources 😕
- _ Lots of data / little information 😞
- _ Condition monitoring
== „machine feels pain“ 
- _ Predictive maintenance
== condition monitoring + decision to act ☺

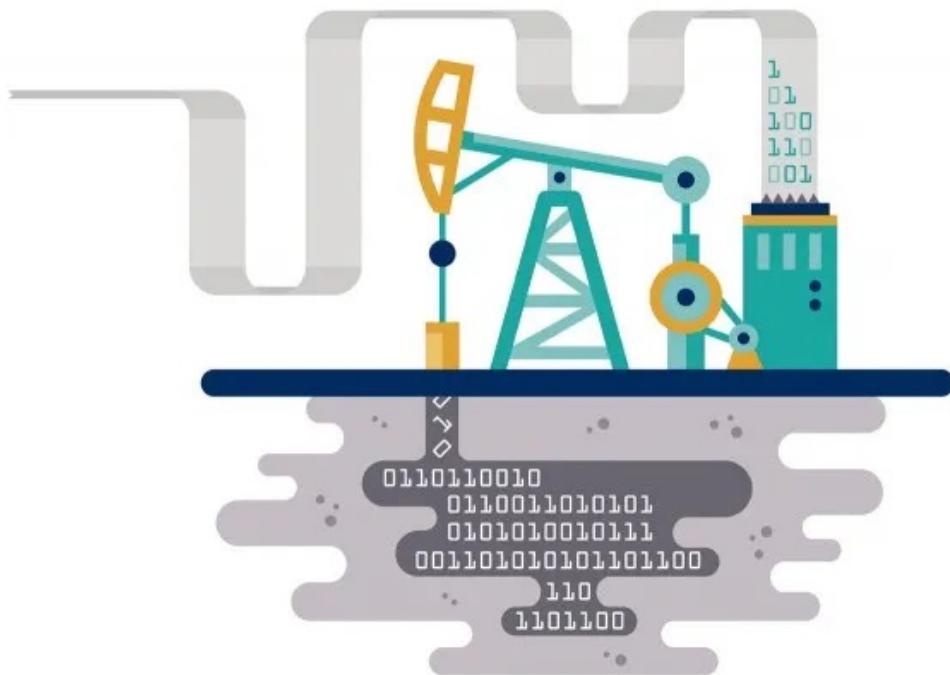


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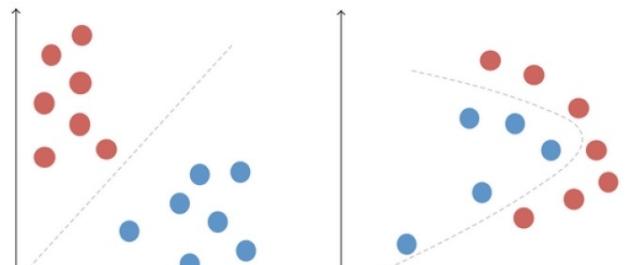
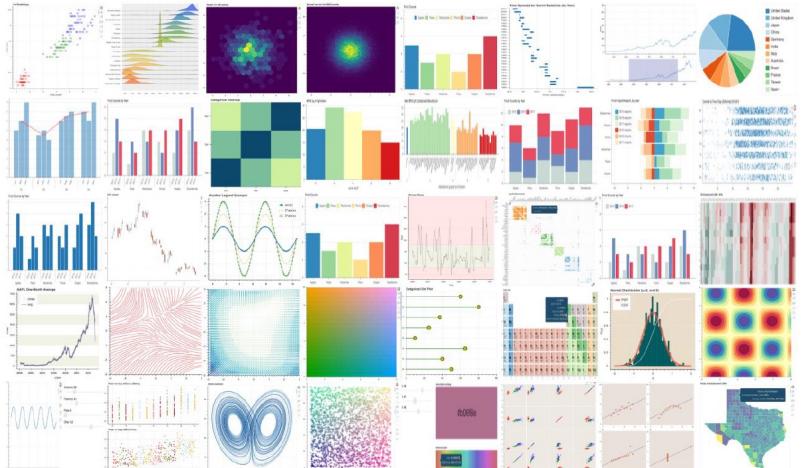


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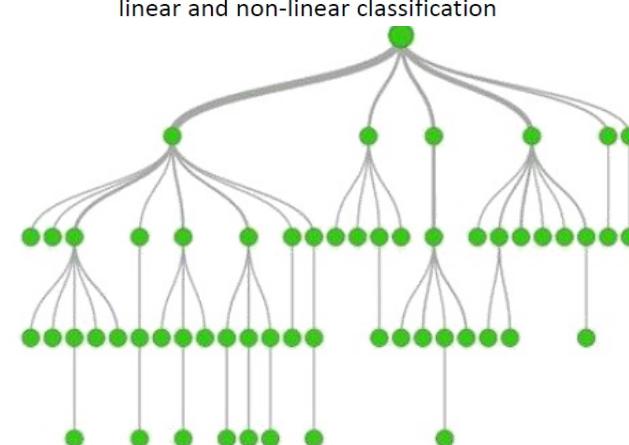
„Data is the new oil“ – how do we refine it? – From raw data to information



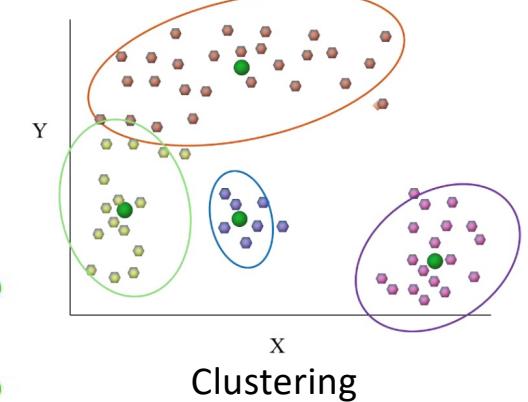
From information to decisions - classification / clustering & machine learning



linear and non-linear classification



Tree-based classification



Clustering

Bibliography



Python Machine Learning Crash Course for Beginners

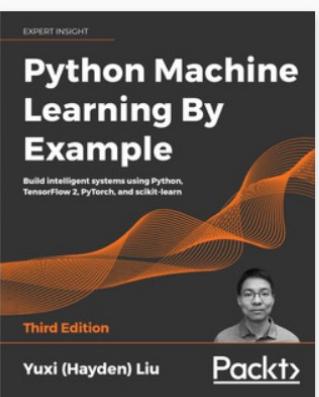
by [AI Sciences](#)

Released April 2021

Publisher(s): Packt Publishing

ISBN: 9781801077453

<https://ezproxy.hof-university.de/login?url=https://www.oreilly.com/library/view/python-machine-learning/9781801077453/>



Python Machine Learning By Example - Third Edition

by [Yuxi Liu](#)

Released October 2020

Publisher(s): Packt Publishing

ISBN: 9781800209718

<https://ezproxy.hof-university.de/login?url=https://www.oreilly.com/library/view/python-machine-learning/9781800209718/>

Organisation

- _ 4 SWS, 6 ECTS
 - _ Lecture 2 SWS / Exercises 2 SWS
 - _ 6 ECTS = 180 h
 - _ thereof 30 h lecture, 30 h exercises, ~ 60 h
 - _ 6 h / week self study, preparation for exercises ~ 90 h
 - _ 30 h preparation for exam
- _ Prüfung
 - _ 80 % of Labs
 - _ SchrP 90;
 - _ permitted aids: handwritten notes, script, pocket calculator, books, PC with Jupyter Notebooks

