lehrende	titelde	titelen	bachelor	master diplom	plaetze b	plaetze md	inhalt	voraussetzungen	literatur	informationen	email	typ	sprache	rein	angewandt
Prof. Dr. Felix Brandt, Martin Bullinger	Markets, Algorithms, Incentives, and Networks (MAIN)	Markets, Algorithms, Incentives, and Networks (MAIN)	ja	Ja	3	2	In recent years, there has been an increasing interest in topics at the intersection of economics and computer science, as witnessed by the continued rapid rise of research areas such as algorithmic game theory and computational social choice. This development is due to the emergence of computational networks such as the Internet as well as the need to get a grip on algorithmic questions in economics. In this seminar, we will deal with both the theoretical foundations as well as their computational properties and possible applications.	It is expected that participants are experienced in formally proving mathematical statements and are familiar with standard proof techniques. Additionally, basic knowledge of complexity theory is useful (e.g., module IN0011).	The seminar will mostly be based on the books Economics and Computation by David C. Parkes and Sven Seuken and the Handbook of Computational Social Choice. Both books will be available for free download for participants of the seminar in our Moodle course http://go.tum.de/612829 via the guest key provided during the seminar overview meeting.	There will be a seminar overview (Vorbesprechung) online meeting on Friday, July 10, 2020. All students have to apply for the seminar. Further information (including the application procedure) can be found in the course homepage: go.tum.de/291400	christian.stricker@tum.de	Seminar	englisch	0	1
Hannes Petermeier	Mathematik und Algorithmen der Chemometrie mit Anwendungen	Mathematics and Algorithms of Chemometry with applications	ja	Nein	10		Die Studierende bereiten die mathematischen Grundlagen der in der Chemometrie angewendeten Verfahren auf und wenden sie auf ein Anwendungsbeispiel an. Insbesondere das Aufzeigen der Grenzen der Verfahren steht im Vordergrund. Eine praktische Programmieraufgabe in MATLAB oder R ist Teil der Ausarbeitung.	Bereitschaft, sich in ein Thema einzuarbeiten.	Wird bei der Vorbesprechung (Videokonferenz in der letzten Semesterwoche) bekannt gegeben.	Das Seminar wird als Webinar abgehalten. Der Seminarvortrag ist als Video, das man als Tutorial für die besprochene Methode verwenden kann, vorzubereiten.	hannes.petermeier@tum.de	Seminar	deutsch	0	1
Prof. Michael Wolf	Mathematische Grundlagen Neuronaler Netze	Mathematical foundations of neural networks	ja	Nein	8		The seminar will provide a mathematical introduction to the following topics: - Foundations of supervised learning - Representation and approximation capabilities of neural networks - Training of neural networks - The unreasonable effectiveness of neural networks	Analysis 1&2, LADS 1&2, Grundlagen in Statistik und/oder Wahrscheinlichkeitstheorie	Literatur wird individuell bekannt gegeben.	Das Seminar findet geblockt an vier Terminen (vorauss. November 2020) statt.	m.wolf@tum.de	Seminar	englisch	0	1
Carlos Amendola, Tim Fuchs, Felix Krahmer, Claudio Verdun	Gruppentests für Infektionskrankheiten	Group Testing for Infectious Diseases	ja	Ja	2	4	Massive testing is an important ingredient to control infectious diseases such as the current COVID-19 pandemic. Group testing methodologies, where multiple different specimens are tested as a pool using a single test, can help increase the efficiency by reducing the number of required tests. In this seminar, we will study the extensive mathematical literature regarding the problem of determining appropriate designs of the group testing protocol. In particular, we aim to cover under which assumptions group testing makes sense at all, and if yes, which group size is optimal.	MA5441 Fundamentals of Statistics	Ding-Zhu Du, Frank Kwang Hwang. Combinatorial Group Testing and Its Applications, World Scientific, 1993 Ding-Zhu Du, Frank Kwang Hwang. Pooling Designs And Nonadaptive Group Testing: Important Tools For Dna Sequencing, World Scientific, 2006 Matthew Aldridge, Oliver Johnson, Jonathan Scarlett. Group testing: an information theory perspective Now Publishers, 2019 Further literature for each seminar topic will be provided to the participants in the form of research articles.	The seminar will take place in blocks on 3-5 afternoons throughout the semester.	felix.krahmer@tum.de	Seminar	englisch	0	1
Prof. Dr. A.S. Schulz, Dr. D. Poças, D. Vaz	Approximationsalgorithmen für kombinatorische Optimierungsprobleme	Approximation Algorithms for Combinatorial Optimization Problems	nein	Ja		8	NP-complete optimization problems cannot be solved in polynomial time (unless P=NP). One way to obtain efficient algorithms anyway is to relax optimality. An approximation algorithm is an algorithm that runs in polynomial time and computes a feasible solution with an objective function value that is within a certain factor of that of an optimal solution. This seminar covers recent results as well as advanced techniques in the field. Participants will be assigned research papers and are expected to deliver a presentation, demonstrating in-depth understanding of the discussed problem, key technical ideas and proofs, related bibliography, and open questions.	Discrete Optimization or Combinatorial Optimization	Original research articles.	TBD	andreas.s.schulz@tum.de	Seminar	englisch	1	1
Noam Berger	Das zufällige Cluster-Modell	The Random Cluster Model	ja	Ja	4	5	In this seminar we will study the random cluster model and its relation to models of magnetization.	Measure Theory, Probability Theory - necessary. Probability on graphs - recommended	"The random cluster model" by G. Grimmett. Available at https://www.statslab.cam.ac.uk/~grg/books/rcm.html		noam.berger@tum.de	Seminar	englisch	1	1

lehrende	titelde	titelen	bachelor	master diplom	plaetze b	plaetze md	inhalt	voraussetzungen	literatur	informationen	email	typ	sprache	rein	angewandt
Christina Kuttler	Mathematische Modelle für ansteckende Krankheiten	Mathematical Models for Communicable Diseases	ja	Ja	7	5	Not only in times of COVID-19, communicable diseases were big threats to populations. A better, quantitative understanding of these processes help also to develop defense strategies or how to optimise treatments. Different mathematical tools may be appropriate as modelling approaches. In the seminar, we will mainly focus on Ordinary differential equations and Partial differential equations

Often, the dynamic behaviour for whole populations is described by differential equation models. PDEs allow e.g. for considering spatial models. For small populations, stochastic models may be more appropriate.
We will discuss typical modelling approaches including their analysis as well as concrete examples for diseases (like Influenza, HIV, and Tuberculosis).

This seminar will be based on parts of the book "Mathematical Models for Communicable Diseases" by Fred Brauer and Carlos Castillo-Chavez and further original papers in this context dependent on the interests and previous knowledge of the participants. | Mathematical models in Biology, Knowledge in Ordinary differential equations | Fred Brauer, Carlos Castillo-Chavez: Mathematical Models for Communicable Diseases, SIAM 2013 and other publications in this context | Further organisation, e.g. choice of preferred topic for the talk etc. will be done after the group of participants is fixed.
Questions are always welcome! | kuttler@ma.tum.de | Seminar | englisch | 0 | 1 |
| Elisabeth Ullmann, Julija Zavadlav, Fabian Wagner | Maschinelles Lernen und Unsicherheitsquantifizierung für Physik-basierte Modelle | Machine Learning and Uncertainty Quantification for Physics-Based Models | nein | Ja | | 5 | Machine learning and uncertainty quantification (UQ) are ubiquitous in modern science and engineering applications. In the last two decades, UQ for complex physical processes has been developed rapidly with focus on grid-based process models such as finite element models which are well established in engineering applications. On the other hand, machine learning techniques have not traditionally been applied to physics-based models. The recent surge in data-driven models based on machine learning techniques such as deep learning is changing the computational science and engineering landscape. Novel hybrid models based on neural networks are emerging and are already enhancing traditional methods. In this seminar we discuss theoretical and computational aspects that arise from combining PDE-based models and neural networks, in particular, physics-informed neural networks (PINNs), neural networks for PDE approximation, and applications in UQ and turbulence models.

Intended Audience:
Master's students in the Faculty of Mathematics and in the Faculty of Mechanical Engineering | Advanced topics in Machine Learning, Statistics, and Numerics of PDEs are covered thus we require a basic knowledge in these areas, e.g. the courses MA1401, MA3303, IN2346. Ideally, participants have prior knowledge covered in the following courses:
Numerical methods for Uncertainty Quantification (MA5348)
Physics-based Machine Learning (MW2450) | The material discussed in the seminar is based on recent research papers. Examples are:

Physics Informed Deep Learning (Part I): Data-driven Solutions of Nonlinear Partial Differential Equations
https://arxiv.org/abs/1711.10561
Physics Informed Deep Learning (Part II): Data-driven Discovery of Nonlinear Partial Differential Equations
https://arxiv.org/abs/1711.10566

On the Convergence and generalization of Physics Informed Neural Networks
https://arxiv.org/abs/2004.01806

Neural Operator: Graph Kernel Network for Partial Differential Equations
https://arxiv.org/pdf/2003.03485.pdf

Variational Physics-Informed Neural Networks For Solving Partial Differential Equations
https://arxiv.org/abs/1912.00873

A composite neural network that learns from multi-fidelity data: Application to function approximation and inverse PDE problems
https://arxiv.org/abs/1903.00104

A deep surrogate approach to efficient Bayesian | Das Seminar wird zusammen mit MW (Professur Mehrskalige Modellierung von flüssigen Materialien, Prof. Zavadlav) durchgeführt. Je 5 Plätze werden für Studierende im Master Fakultät Mathematik angeboten und 5 Plätze für Master Fakultät Maschinenwesen. | elisabeth.ullmann@ma.tum.de | Seminar | englisch | 0 | 1 |
| Johannes Zimmer | TUM-Imperial College Seminar über Markovoperatoren, Entropie und Evolution | TUM-Imperial College London Seminar on Markov Operators, Entropy and Evolution | nein | Ja | | 7 | Diffusion (of particle systems, say) is a ubiquitous process in nature. How can we describe diffusion processes and more generally statistical phenomena on a macroscopic scale, as evolution of a density? We will study several approaches, including Markov semigroups, Frobenius-Perron operators and Koopman operators. The framework will reveal beautiful connections to geometry and physics, notably the entropy. One aim of this seminar is to explore these connections a bit. The seminar will run as online seminar jointly between TUM and Imperial College London. | Analysis and/or probability. The seminar will cover both analytic and probabilistic topics, so an interest in these fields is important. The talks will be tailored to the individual background. | Dominique Bakry, Ivan Gentil und Michel Ledoux: Analysis and geometry of Markov diffusion operators, Springer 2014
Andrzej Lasota und Michael C. Mackey: Chaos, fractals, and noise, Springer 1994. | Students interested in participating are kindly asked to contact the organisers directly by email until 30 July 2020, so we can arrange an information/preparation session. The organisers are Johannes Zimmer (ne52yap@mytum.de, TUM) and Greg Pavliotis (g.pavliotis@imperial.ac.uk, Imperial). | ne52yap@mytum.de | Seminar | englisch | 1 | 1 |
| Simone Warzel | Eine mathematische Einführung in die Theorie der Spingläser | A Mathematical Introduction to Spin Glasses | ja | Ja | 4 | 5 | Spin glass models are archetypes for complex cost landscapes. They are discussed in a variety of applications from physics, neural networks to computer science.
In this seminar you will be introduced to mean-field spin glasses as the random energy model, the Sherrington-Kirkpatrick glass and the Hopfield model for neural networks. Discussing properties of these models you will be introduced to a broad set of mathematical techniques such as concentration of measure estimates, variational methods or elements of the theory of point processes. | Introduction to Probability Theory [MA1401]
Probability theory [MA2409] | We will mostly follow Part III in:
A. Bovier, Statistical mechanics of disordered systems: a mathematical perspective, Cambridge UP 2012. | | warzel@ma.tum.de | Seminar | englisch | 1 | 1 |

lehrende	titelde	titelen	bachelor	master diplom	plaetze b	plaetze md	inhalt	voraussetzungen	literatur	informationen	email	typ	sprache	rein	angewandt
Prof. Michael Ulbrich, Franziska Neumann, Fabian Schaipp	Aktuelle Entwicklungen in der Nichtlinearen Optimierung	Recent Advances in Nonlinear Optimization	ja	Ja	6	8	Dieses Seminar widmet sich aktuelle Entwicklungen der nichtlinearen Optimierung und bereitet zudem auf eine Bachelor- oder Masterarbeit in diesem Gebiet vor. In den Vorträgen werden insbesondere aktuelle Themen aus folgenden Bereichen der nichtlinearen Optimierung behandelt: Neue Entwicklungen in Theorie und Methoden der Optimierung, speziell auch in den Bereichen Data Science und Machine Learning; innovative Anwendungen in Technik, Natur- und Wirtschaftswissenschaften, KI, etc. English version: This seminar addresses recent advances in nonlinear optimization and also serves as a preparation for a Bachelor's or Master's thesis in this field. The seminar covers the following topics (and more): Recent advances in optimization theory and methods, especially also in data science and machine learning; novel applications in technology, engineering, natural sciences, AI, etc.	For Bachelor students: Nichtlineare Optimierung: Grundlagen (MA2503) recommended (not mandatory): Linear and Convex Optimization (MA2504) or (in parallel to the seminar, attendence of) Nonlinear Optimization: Advanced (MA3503). For Master students: Nichtlineare Optimierung: Grundlagen (MA2503) Nonlinear Optimization: Advanced (MA3503) recommended (not mandatory): Linear and Convex Optimization (MA2504)	The presentations will be based on recent journal articles.	In the first week of the semester we will meet (perhaps virtually) and present a selection of topics from which you can choose your preferred topic. The talks will then start 4-6 weeks later with 2 presentations per session.	mulbrich@ma.tum.de	Seminar	englisch	0	1
Daniel Matthes	Funktionalungleichungen	Functional Inequalities	ja	Ja	4	2	Functional inequalities compare integral expressions. An elementary example is Hölder's inequality that estimates the integral of a product of two functions by a product of the integrals of appropriate powers of the individual functions. In the seminar, we prove a variety of far more sophisticated functional inequalities, for instance those that go by the names of Young, Hardy-Littlewood-Sobolev, or logarithmic Sobolev. The proofs are partially ingenious, using deep geometric constructions, hidden symmetries and non-obvious dualities. We shall also discuss applications of these inequalities in differential geometry (e.g. curvature bounds) and physics (rate of equilibration in particle systems).	Participants should have completed the introductory lectures Analysis 1+2 as well as the one on measure and integration. Knowledge from the courses on functional analysis and/or PDEs are occasionally helpful, but are not needed.	We shall use the book E.Lieb und M.Loss: "Analysis" (GSM 14, AMS) as our main source. For more advanced talks, I can provide a plentitude of current research articles.		matthes@ma.tum.de	Seminar	englisch	1	1
Mathias Drton	Expectation-Maximization (EM) Algorithmus	Expectation-Maximization (EM) Algorithm	ja	Ja	3	3	The Expectation-Maximization (EM) algorithm is a popular optimization algorithm for computation of maximum likelihood estimates in statistical models for incomplete data. Examples of applications include mixture models, hidden Markov models, factor analysis and other latent variable models. The seminar participants will present classic papers introducing the EM framework and its applications, as well as recent work that gives statistical guarantees for estimates computed using EM.	Probability Theory, Basic Statistics. For Master students: Computational Statistics.	Papers including A.P. Dempster, N.M. Laird, D.B. Rubin (1997). Maximum likelihood from incomplete data via the EM algorithm. With discussion. J. Roy. Statist. Soc. Ser. B 39(1):1-38. C. Jin, S. Balakrishnan, M.J. Wainwright, and M.I. Jordan (2016). Local maxima in the likelihood of Gaussian mixture models: Structural results and algorithmic consequences. In NIPS Conference. S. Balakrishnan, M.J. Wainwright. B. Yu (2017). Statistical guarantees for the EM algorithm: from population to sample-based analysis. Ann. Statist. 45(1): 77-120.	Preliminary meeting intended for early August 2020.	mathias.drton@tum.de	Seminar	englisch	0	1
Robert König	Einführung in Quantenalgorithmen	Introduction to Quantum Algorithms	ja	Ja	6	3	This seminar will provide an introduction to the theory of quantum computing, focusing on algorithms. We will cover the fundamentals of quantum mechanics and discuss known quantum algorithms and their properties. This includes Shor's algorithm, algorithms for the hidden subgroup problem, Grover's search algorithm and various related oracle-based quantum speedups.	Analysis 1&2, Lineare Algebra 1&2, Einführung in die diskrete Mathematik.	Literature: Primarily Ronald de Wolf, Quantum Computing: Lecture Notes, arXiv:1907.09415. Additional literature TBD.	This seminar will be held as a block-seminar at the beginning of term. See https://www-m5.ma.tum.de/Allgemeines/Lehrveranstaltungen for additional information.	robert.koenig@tum.de	Seminar	englisch	0	1
Oliver Junge	Wissenschaftliches Rechnen mit Maple und MATLAB	Solving Problems in Scientific Computing Using Maple and MATLAB	ja	Nein	13		In jedem Kapitel des Buches "Solving Problems in Scientific Computing using Maple and Matlab" wird ein kleines Problem aus der Mathematik oder einer Anwendung vorgestellt und mithilfe einer symbolischen oder numerischen Software gelöst. Jeder Teilnehmer/in sucht sich ein Kapitel aus, trägt darüber vor und stellt ihre /seine numerischen Experimente vor.	Die Inhalte der ersten drei Semester, Spaß am Programmieren.	Walter Gander, Jiri Hrebicek: Solving Problems in Scientific Computing using Maple and Matlab, Springer, 2004.	Die Auswahl der Kapitel wird noch Ende Juli stattfinden.	oj@tum.de	Seminar	deutsch	0	1
Oliver Junge	Conley Index Theorie	Conley Index Theory	nein	Ja		13	We will jointly read and discuss the classical monograph "Isolated invariant sets and the Morse index" by Charles Conley. Within roughly 80 pages, Conley develops a general global theory of dynamical systems using tools from algebraic topology. Consequently, a brief introduction to basic notions from that field will also be part of the seminar.	MA 3081 Dynamical Systems	CONLEY, C. "Isolated Invariant Sets and the Morse Index." CBMS Lecture Notes, Providence, RI 38 (1978).		oj@tum.de	Seminar	englisch	0	1

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Fabian Theis, Benjamin Schubert, Tingying Peng	Deep Learning Seminar	Deep Learning Seminar	nein	Ja		20	The seminar will be held as a block over the course of two days (date TBA) at the Institute of Computational Biology, Helmholtz Zentrum München. Each participant has to give a talk on one of the topics below. Talks should last around 20 min. Grading will account for all aspects of the talk, in particular, whether the topic has been explained clearly and pedagogically, with the necessary level of detail. To take the most out of the seminar, we would like you to also prepare a 1-2 page summary of your topic as a handout for your fellow students so that we have an encyclopedia of advanced Deep Learning topics at the end of the seminar. You have to be registered for the exam at TUMonline.	Basic machine learning knowledge, successful completion of statistical learning or introduction to deep learning is a plus	You can read up on these topics at https://www.deeplearningbook.org/. •Chapter 6: Deep Feedforward Networks •Chapter 8: Optimization for Training Deep Models •Chapter 9: Convolutional Networks •Chapter 10: Sequence Modeling: Recurrent and Recursive Nets		tingying.peng@tum.de	Seminar	englisch	0	1
Massimo Fornasier and Peter Massopust	Mathematik der Data Science	Mathematics of Data Science	nein	Ja		11	1.“Deep learning” (T+P) 2.“Identification of neural networks 1” (T) 3.“Identification of neural networks 2” (T+P) 4.“Approximation theory” of neural networks (T) 5.“Reinforcement Learning” (T+P) 6.“Stochastic gradient descent” (T+P 7.“Consensus based optimization” (T+P) 8.“Johnson-Lindenstrauss Lemma + Clustering (k-means etc.)” (T+P) 9.“Compressed sensing” (T+P) 10.“Johnson-Lindenstrauss Lemma + Restricted Isometry property”(T) 11.“Learning with kernels and SVM” (T+P)	Linear Algebra Probability Convex Optimization Foundations of Data Analysis	http://www.deeplearningbook.org/ http://www.ems-ph.org/journals/show_pdf.php?issn=0213-2230&vol=10&iss=3&rank=2 https://arxiv.org/pdf/1804.01592 & https://arxiv.org/pdf/1907.00485 https://arxiv.org/pdf/1901.02220 http://rail.eecs.berkeley.edu/deeprlcourse-fa17/index.html http://papers.nips.cc/paper/5355-stochastic-gradient-descent-weighted-sampling-and-the-randomized-kaczmarz-algorithm.pdf https://arxiv.org/pdf/1909.09249 https://arxiv.org/pdf/2003.05086 https://arxiv.org/pdf/2001.11988 http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.141.4812&rep=rep1&type=pdf https://arxiv.org/pdf/1408.4045.pdf https://people.ricam.oeaw.ac.at/m.fornasier/CSFornasierRauhut.pdf (T+P) https://link.springer.com/content/pdf/10.1007/s00365-007-9003-x.pdf https://arxiv.org/pdf/1009.0744.pdf https://stuff.mit.edu/afs/athena/course/9/9.s915/OldFiles/www/classes/dealing_with_data.pdf https://www.cs.utah.edu/~piyush/teaching/learning-with-kernels.pdf		massimo.fornasier@ma.tum.de	Seminar	englisch	0	1
Prof. Dr. Nina Gantert, Prof. Dr. Sabine Jansen (LMU)	Statistische Mechanik und Färbungsprobleme	Statistical Mechanics and q-Colorings	nein	Ja		8	A proper q-coloring of a graph is an assignment of one of q colors to each vertex of the graph so that adjacent vertices are colored differently. Sample uniformly among all proper q-colorings of a large discrete cube in the d-dimensional integer lattice. Does the random coloring obtained exhibit any large-scale structure? Does it have fast decay of correlations? We discuss these questions and the way their answers depend on the dimension d and the number of colors q. The questions are motivated by statistical physics (anti-ferromagnetic materials, square ice) and combinatorics (proper colorings, independent sets) .	Probability Theory (notwendig) Markov Processes (empfohlen)	Ron Peled, Yinon Spinka: Three lectures on random proper colorings of Z^d (available at https://arxiv.org/abs/2001.11566 Sasha Friedli, Yvan Velenik: Statistical Mechanics of Lattice Systems: a Concrete Mathematical Introduction (availbale from the homepage of the second author)	You should know probability theory - knowledge in physics is not necessary to follow the seminar.	nina.gantert@tum.de	Seminar	englisch	0	1
PD Dr. Aleksey Min	Data Analytics für Schadenversicherungsmathematik	Data Analytics for Non-Life Insurance Pricing	ja	Nein		8	Verallgemeinerte Lineare Modelle, Verallgemeinerte Additive Modelle, Kredibilitätstheorie, Neuronale Netzwerke, Klassifikationsbäume, Ensemble-Learning Methoden, Stützvektormethoden	MA2402	Wüthrich, M. V. and Buser, C. (2018): Data Analytics for Non-Life Insurance Pricing. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2870308	Online Seminarvorbesprechung am 17.07.2020 um 16:00. Mehr Informationen sind unter https://www.groups.ma.tum.de/mathfinance/lehre/wintersemester-202021/	min@tum.de	Seminar	deutsch	0	1
Stefan Weltge, Ina Seidel	Fortgeschrittene Themen der Algorithmischen Diskreten Mathematik	Advanced Topics in Algorithmic Discrete Mathematics	ja	Ja	6	6	In this seminar, we will discover efficient and elegant algorithms for discrete optimization problems that go beyond what is taught in introductory courses. We will cover topics such as matchings in non-bipartite graphs, matroid intersection, submodular function minimization, as well as approximation algorithms for knapsack, facility location, or sparsest cut.	"Algorithmische Diskrete Mathematik" or some equivalent introduction to basic algorithms	Korte, Vygen - Combinatorial Optimization		weltge@tum.de	Seminar	englisch	1	1
Carsten Marr, Tingying Peng	Rechnergestützte Pathologie: Algorithmen und Anwendungen	Computational Pathology: Algorithms and Applications	nein	Ja		15	Computational Pathology encompasses algorithms and methods that answer scientific and clinical questions in pathology. In the few last years, traditional analyses are challenged with deep learning methods that allow for more standardised, robust and powerful applications. In this seminar, we will study recent research papers that develop or apply deep learning methods in a pathology context. Whenever possible, we will re-implement the applied methods, analyse the used technologies and discuss the biomedical and clinical implications.	Basic knowledge of machine learning, statistics, and programming in a language like python, R or MATLAB, strong interest in biomedical Voraussetzungen and clinical applications.	Fuchs, T.J. & Buhmann, J.M., 2011. Computational pathology: challenges and promises for tissue analysis. Computerized medical imaging and graphics: the official journal of the Computerized Medical Imaging Society, 35(7-8), pp.515–530. Esteva, A. et al., 2017. Dermatologist-level classification of skin cancer with deep neural networks. Nature. Available at: http://www.nature.com/doifinder/10.1038/nature21056.	After a successful completion of the module, the students will be ableto read and evaluate scientific literature on computational pathology, and they have learned how to extract computational content and re-implement parts of the analysis. Finally, the course will strengthen the presentation and discussion skills of the participants.	carsten.marr@helmholtz-muenchen.de	Seminar	englisch	0	1

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Boris Vexler	Numerische Analysis für Optimalsteuerungsprobleme mit partiellen Differentialgleichungen	Numerical Analysis for PDE-Constrained Optimal Control Problems	nein	Ja		8	We consider optimal control problems governed by partial differential equations (PDEs) and discretize them using finite element methods (FEM). For resulting discretization we discuss a priori and a posteriori error estimates as well as adaptive strategies for solution.	Modern Methods in Nonlinear Optimization (MA4503)	Aktuelle Forschungsartikel, die in der Vorbesprechung bekannt gegeben werden.		vexler@ma.tum.de	Seminar	englisch	0	1
Johannes Müller und Volker Hösel	Stochastische Modelle infektiöser Krankheiten	Stochastic Models for Infectious Diseases	ja	Ja	7	8	As we observe in the current pandemic, stochastic effects as super-spreader events are important factors that have impact on the dynamics of an infection. We learn about stochastic models for infectious diseases, and the main tools to analyse epidemic models (Reed-Frost models, Sellke construction, Final size distribution, stochastic coupling, threshold theorems etc.)	Basic knowledge about stochastics. The book is available in the library (electronically), have a look!!	Hakan Andersson, Tom Briton Stochastc Epidemic Models and Their Statistical Analysis Springer, 2000 F. Brauer, P. van den Driessche, J. Wu Mathemaical Epidemiology Lect. Notes in Math. 1945 Springer 2008		johannes.mueller@mytum.de	Seminar	englisch	0	1
Prof. Donna Ankerst	Räumlich-zeitliche Modellierung	Spatio-Temporal Modeling for Infectious Diseases	nein	Ja		12	In response to the challenges of COVID-19, this seminar will train students in spatio-temporal modeling for analysis and prediction of the epidemiology of infectious diseases worldwide. Students will select a leading statistical methods paper in the field to present, and have the choice of extended research in the area of the paper versus their own visualization and analysis of web-scraped real-time COVID data. Interested students who can meet the requirements should send the following items from a TUM email address to Prof. Donna Ankerst at ankerst@tum.de no later than July 19, 2020: •Transcript of TUM Master grades, •Email text statement of motivation for the seminar, including selection of 3 papers from Literature in order of priority with motivation.	Participation in applied regression, generalized linear models, multivariate statistics, and/or computational statistics	1)Sansom P, Copley VR, Naik FC, Leach S, Hall IM. A case-association cluster detection and visualisation tool with an application to Legionnaires' disease. Stat Med.2013;32(20):3522-3538. doi:10.1002/sim.5765 2)Diggle PJ, Moraga P, Rowlingson B, Taylor BM. Spatial and spatio-temporal log-Gaussian Cox processes: extending the geostatistical paradigm. Statistical Science. 2013;28(4):542-563. doi:10.1214/13-STS441 3)Malesios C, Demiris N, Kalogeropoulos K, Ntzoufras I. Bayesian epidemic models for spatially aggregated count data. Stat Med. 2017;36(20):3216-3230. doi:10.1002/sim.7364 4)Meyer S, Held L. Power-law models for infectious disease spread. Annals of Applied Statistics. 2014;8(3):1612-1639. doi:10.1214/14-AOAS743 5)Paul M, Held L, Toschke AM. Multivariate modelling of infectious disease surveillance data. Stat Med. 2008;27(29):6250-6267. doi:10.1002/sim.3440 6)Stocks T, Britton T, Höhle M. Model selection and parameter estimation for dynamic epidemic models via iterated filtering: application to rotavirus in Germany. Biostatistics. 2020;21(3):400-416. doi:10.1093/biostatistics/kxy057 7)Diggle PJ. Spatio-temporal point processes, partial likelihood, foot and mouth disease. Stat Methods Med Res. 2006;15(4):325-336. doi:10.1191/0962280206sm454oa 8)Heaton MJ, Berrett C, Pugh S, Evans A, Sloan C.	Thursdays 2-4 pm, virtual attendance mandatory	ankerst@tum.de	Seminar	englisch	0	1
Silke Rolles	Stochastische Modelle auf Graphen	Stochastic Models on Graphs	ja	Ja	7	4	In dem Seminar sollen stochastische Modelle auf Graphen besprochen werden. Themen sind insbesondere Perkolation, zufällige Spannbäume, Kontaktprozess, interagierende Teilchensysteme und verstärkte Irrfahrten.	Probability theory (MA2409)	Geoffrey Grimmett: Probability on graphs: random processes on graphs and lattices. Cambridge University Press. 2010. sowie Veröffentlichungen, die auf der Seminarhomepage gelistet sind.	Siehe https://www-m5.ma.tum.de/Allgemeines/MA6011_20 20W Es wird eine Vorbesprechung über Zoom stattfinden.	srolles@ma.tum.de	Seminar	deutsch	1	1
Caroline Lasser	Algorithmen aus dem "Buch"	Algorithms from the Book	ja	Ja	6	6	Das Seminar ist ein gemeinsamer Lektüre- und Diskussion-Kurs des Buches "Algorithms from the Book" von Kenneth Lange (SIAM, 2020). Es beschäftigt sich mit berühmten und erfolgreichen Algorithmen und ihren mathematischen Grundlagen.	Solide Kenntnisse in Analysis und linearer Algebra, Grundkenntnisse in Numerik	Kenneth Lange, Algorithms from the Book, SIAM, 2020 (Über die Bibliothek können Sie auf eine digitale Version des Buchs im Volltext zugreifen.)	Weitere Informationen finden Sie unter https://www-m8.ma.tum.de/foswiki/pub/M8/Allgemeines/CarolineLasserTeach/Seminar_OscQuad_SS20.pdf?=t=12	classer@ma.tum.de	Seminar	deutsch	0	1