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| 课程名称（中英文） | 复杂系统性能评价和优化（Performance Evaluation and Optimization for Complex Systems） | | | |
| 课程负责人 | 姓名 | 贾庆山 | 职称 | 教授 |
| 课程号 | 90250052 | | 课序号 | 0 |
| 课程先修条件  （中英文） | 微积分，线性代数，概率论，随机过程（推荐，非必须）  Calculus, linear algebra, probability, stochastic process (recommended, not mandatory) | | | |
| 课程学时 | 课内学时\_32\_\_\_\_\_\_\_  教师课外投入时间\_\_32\_\_\_\_\_\_  学生课外投入时间\_\_32\_\_\_\_\_\_ | | | |
| 课程大纲及  考核方式 | 请提供2023秋季学期英文版大纲，如尚未定稿可提供2022秋季学期大纲。可另附附件提交。  Final score (100%) = Final exam (40%) + homework (20%) + discussion (20%)+ project (including 5min presentation) (20%)  **Weekly teaching schedule**  week 1 - Overview, introduction  Reading Assignment (RA) -  Chapter 1 (p. 1-50),  Cassandras and Lafortune, Introduction to Discrete Event Systems, third edition, Springer, 2021.  https://link.springer.com/content/pdf/10.1007/978-3-030-72274-6.pdf  week 2 - Ordinal optimization, the fundamentals, the unconstrained case;  RA -  Chapter 2  Yu-Chi Ho, Qianchuan Zhao, Qing-Shan Jia, Ordinal Optimization- Soft Optimization for Hard Problems, Springer, 2007.  http://reserves.lib.tsinghua.edu.cn/book6//00009025/00009025000/mobile/index.html  week 3 - Ordinal optimization, the extensions to VOO, COO, selection rules;  RA-  Chapter 3,4,5  Yu-Chi Ho, Qianchuan Zhao, Qing-Shan Jia, Ordinal Optimization- Soft Optimization for Hard Problems, Springer, 2007.  http://reserves.lib.tsinghua.edu.cn/book6//00009025/00009025000/mobile/index.html  week 4 - MDP models, VI, PI (model-based)  RA-  Section 2.1, 2.2, 2.3  Dimitri P. Bertsekas, Dynamic Programming and Optimal Control - Approximate Dynamic Programming, Vol. II, 4th Edition, Athena Scientific, 2012. Chinese Translation published and available at Tsinghua library  http://reserves.lib.tsinghua.edu.cn/Search/BookDetail?bookId=25889eaf-f950-4931-bcaa-e7923c0bb797  week 5 - MDP algorithms (large state space, large action space) - unknown models?  RA - Selected publications  1. Cao, X.-R., Ren, Z., Bhatnagar, S., Fu, M., Marcus, S., A time aggregation approach to Markov decision processes, Automatica, 38(6):929-943, June 2002.  https://www.sciencedirect.com/science/article/abs/pii/S0005109801002825  2. Xia, L., Zhao, Q.C., and Jia, Q.-S., “A structure property of optimal policies for maintenance problems with safety-critical components,” IEEE Transactions on Automation Science and Engineering, Vol. 5, No. 3, pp. 519-531, Jul. 2008.  3. Jia, Q.-S., “A structural property of optimal policies for multi-component maintenance problems,” IEEE Transactions on Automation Science and Engineering, Vol. 7, No. 3, pp. 677-680, Jul. 2010.  4. Jia, Q.-S. and Wu, J., “A structural property of charging scheduling policy for shared electric vehicles with wind power generation,” IEEE Transactions on Control Systems Technology, 29(6): 2393-2405, Dec. 2020.  5. Jin, J., Hao, L., Xu, Y., Wu, J., and Jia, Q.-S., “Joint Scheduling of Deferrable Demand and Storage With Random Supply and Processing Rate Limits,” IEEE Transactions on Automatic Control, Vol. 66, No. 11, 5506-5513, November 2021.  week 6 - RL elementary (model-free)  Sutton and Barto, Reinforcement Learning - An Introduction, second edition, Chapter 3-5.  http://reserves.lib.tsinghua.edu.cn/Search/BookDetail?bookId=d01a1b9b-d428-4de9-8596-4807e76dcb97  week 7 - RL practice  Sutton and Barto, Reinforcement Learning - An Introduction, second edition, Chapter 13.  http://reserves.lib.tsinghua.edu.cn/Search/BookDetail?bookId=d01a1b9b-d428-4de9-8596-4807e76dcb97  week 8 - RL algorithms (TRPO, GAE, PPO, DDPG)  papers about TRPO, GAE, PPO, and DDPG  [TRPO] Schulman, J., Levine, S., Moritz, P., Jordan, M., and Abbeel, P., "Trust Region Policy Optimization," Proceedings of the 31st International Conference on Machine Learning, Lille, France, 2015.  [GAE] Schulman, J., Moritz, P., Levine, S., Jordan, M.I., and Abbeel, P., "High-Dimensional Continuous Control Using Generalized Advantage Estimation," ICLR 2016.  [PPO] Schulman, J., Solski, F., Dhariwal, P., Radford, A., and Klimov, O., "Proximal Policy Optimization Algorithms," arXiv:1707.06347v2  [DDPG] Lillicrap, T. P., Hunt, J.J., Pritzel, A., Heess, N., Erez, T., Tassa, Y., Silver, D., and Wierstra, D., "Continuous Control with Deep Reinforcement Learning," ICLR 2016.  week 9 - Event-based optimization (models)  Xi-Ren Cao, Stochastic Learning and Optimization - A Sensitivity-Based Approach, Springer, 2007. Chapter 8, section 8.3.1  http://reserves.lib.tsinghua.edu.cn/Search/BookDetail?bookId=0325c681-e8c4-496c-8d8e-c0aa44d68564  week 10 - EBO key equations (performance difference, derivative)  Xi-Ren Cao, Stochastic Learning and Optimization - A Sensitivity-Based Approach, Springer, 2007. Chapter 8, section 8.3.2, 8.3.3  http://reserves.lib.tsinghua.edu.cn/Search/BookDetail?bookId=0325c681-e8c4-496c-8d8e-c0aa44d68564  week 11 - EBO algorithms (policy iteration, policy gradient)  Xi-Ren Cao, Stochastic Learning and Optimization - A Sensitivity-Based Approach, Springer, 2007. Chapter 8, section 8.3.4, 8.4  http://reserves.lib.tsinghua.edu.cn/Search/BookDetail?bookId=0325c681-e8c4-496c-8d8e-c0aa44d68564  week 12 - No-Free-Lunch-Theorem  Yu-Chi Ho and D. Pepyne, "A simple explanation of the no free lunch theorem and its significance," Journal of Optimization - Theory and Applications, 115(3): 547-570, 2002.  Yu-Chi Ho, Qianchuan Zhao, and D. Pepyne, "The no free lunch theorem, complexity and network security," IEEE Transactions on Automatic Control, 48(5): 783-793, 2003.  week 13 - Elements of Simulation, OCBA  Chen, C. H., J. Lin, E. Yucesan, and S. E. Chick, "Simulation Budget Allocation for Further Enhancing the Efficiency of Ordinal Optimization," Journal of Discrete Event Dynamic Systems: Theory and Applications, Vol. 10, pp. 251-270, July 2000.  week 14 - Nested Partitions, memoryless triangle  Leyuan Shi, Sigurdur Ólafsson, (2000) Nested Partitions Method for Global Optimization. Operations Research 48(3):390-407.  week 15 - Queueing theory fundamentals (Little's Law) + introduction to final quiz.  week 16 - Student presentation | | | |