- [1] Volodymyr Mnih, Koray Kavukcuoglu, David Silver, Andrei A. Rusu, Joel Veness, Marc G. Bellemare, Alex Graves, Martin A. Riedmiller, Andreas Fidjeland, Georg Ostrovski, Stig Petersen, Charles Beattie, Amir Sadik, Ioannis Antonoglou, Helen King, Dharshan Kumaran, Daan Wierstra, Shane Legg, and Demis Hassabis. Human-level control through deep reinforcement learning. Nat., 518(7540):529–533, 2015.
- [2] Hongyuan Mei, Mohit Bansal, and Matthew R. Walter. Listen, attend, and walk: Neural mapping of navigational instructions to action sequences. In AAAI, pages 2772–2778. AAAI Press, 2016.
- [3] Felix Hill, Olivier Tieleman, Tamara von Glehn, Nathaniel Wong, Hamza Merzic, and Stephen Clark. Grounded language learning fast and slow. In *ICLR*. OpenReview.net, 2021.
- [4] Blai Bonet and Hector Geffner. Planning as heuristic search. *Artif. Intell.*, 129 (1-2):5–33, 2001.
- [5] Silvia Richter and Matthias Westphal. The LAMA planner: Guiding cost-based anytime planning with landmarks. J. Artif. Intell. Res., 39:127–177, 2010.
- [6] Patrik Haslum, Nir Lipovetzky, Daniele Magazzeni, and Christian Muise. An Introduction to the Planning Domain Definition Language. Synthesis Lectures on Artificial Intelligence and Machine Learning. Morgan & Claypool Publishers, 2019.
- [7] Andrew Y. Ng, Daishi Harada, and Stuart Russell. Policy invariance under reward transformations: Theory and application to reward shaping. In *ICML*, pages 278– 287. Morgan Kaufmann, 1999.

[8] Andrew Y. Ng and Stuart Russell. Algorithms for inverse reinforcement learning. In *ICML*, pages 663–670. Morgan Kaufmann, 2000.

- [9] Jack Koch, Lauro Langosco, Jacob Pfau, James Le, and Lee Sharkey. Objective robustness in deep reinforcement learning. *CoRR*, abs/2105.14111, 2021.
- [10] Alexander Pan, Kush Bhatia, and Jacob Steinhardt. The effects of reward misspecification: Mapping and mitigating misaligned models. In *ICLR*. OpenReview.net, 2022.
- [11] Lauro Langosco di Langosco, Jack Koch, Lee D. Sharkey, Jacob Pfau, and David Krueger. Goal misgeneralization in deep reinforcement learning. In *ICML*, volume 162 of *Proceedings of Machine Learning Research*, pages 12004–12019. PMLR, 2022.
- [12] Rodrigo Toro Icarte, Toryn Q. Klassen, Richard Anthony Valenzano, and Sheila A. McIlraith. Reward machines: Exploiting reward function structure in reinforcement learning. J. Artif. Intell. Res., 73:173–208, 2022.
- [13] Prasoon Goyal, Scott Niekum, and Raymond J. Mooney. Using natural language for reward shaping in reinforcement learning. In *IJCAI*, pages 2385–2391. ijcai.org, 2019.
- [14] Bo Liu, Yuqian Jiang, Xiaohan Zhang, Qiang Liu, Shiqi Zhang, Joydeep Biswas, and Peter Stone. LLM+P: empowering large language models with optimal planning proficiency. CoRR, abs/2304.11477, 2023.
- [15] Jason Wei, Maarten Bosma, Vincent Y. Zhao, Kelvin Guu, Adams Wei Yu, Brian Lester, Nan Du, Andrew M. Dai, and Quoc V. Le. Finetuned language models are zero-shot learners. In *ICLR*. OpenReview.net, 2022.
- [16] Colin Raffel, Noam Shazeer, Adam Roberts, Katherine Lee, Sharan Narang, Michael Matena, Yanqi Zhou, Wei Li, and Peter J. Liu. Exploring the limits of transfer learning with a unified text-to-text transformer. J. Mach. Learn. Res., 21: 140:1–140:67, 2020.
- [17] Linxi Fan, Guanzhi Wang, Yunfan Jiang, Ajay Mandlekar, Yuncong Yang, Haoyi Zhu, Andrew Tang, De-An Huang, Yuke Zhu, and Anima Anandkumar. Minedojo: Building open-ended embodied agents with internet-scale knowledge. In NeurIPS, 2022.

[18] Yuqing Du, Olivia Watkins, Zihan Wang, Cédric Colas, Trevor Darrell, Pieter Abbeel, Abhishek Gupta, and Jacob Andreas. Guiding pretraining in reinforcement learning with large language models. In *ICML*, volume 202 of *Proceedings of Machine Learning Research*, pages 8657–8677. PMLR, 2023.

- [19] Duo Zheng, Shijia Huang, Lin Zhao, Yiwu Zhong, and Liwei Wang. Towards learning a generalist model for embodied navigation. In CVPR, pages 13624–13634. IEEE, 2024.
- [20] Jared Kaplan, Sam McCandlish, Tom Henighan, Tom B Brown, Benjamin Chess, Rewon Child, Scott Gray, Alec Radford, Jeffrey Wu, and Dario Amodei. Scaling laws for neural language models. arXiv preprint arXiv:2001.08361, 2020.
- [21] Tom B. Brown, Benjamin Mann, Nick Ryder, Melanie Subbiah, Jared Kaplan, Prafulla Dhariwal, Arvind Neelakantan, Pranav Shyam, Girish Sastry, Amanda Askell, Sandhini Agarwal, Ariel Herbert-Voss, Gretchen Krueger, Tom Henighan, Rewon Child, Aditya Ramesh, Daniel M. Ziegler, Jeffrey Wu, Clemens Winter, Christopher Hesse, Mark Chen, Eric Sigler, Mateusz Litwin, Scott Gray, Benjamin Chess, Jack Clark, Christopher Berner, Sam McCandlish, Alec Radford, Ilya Sutskever, and Dario Amodei. Language models are few-shot learners. In NeurIPS, 2020.
- [22] Hugo Touvron, Thibaut Lavril, Gautier Izacard, Xavier Martinet, Marie-Anne Lachaux, Timothée Lacroix, Baptiste Rozière, Naman Goyal, Eric Hambro, Faisal Azhar, Aurélien Rodriguez, Armand Joulin, Edouard Grave, and Guillaume Lample. Llama: Open and efficient foundation language models. CoRR, abs/2302.13971, 2023.
- [23] Yonghui Wu, Mike Schuster, Zhifeng Chen, Quoc V. Le, Mohammad Norouzi, Wolfgang Macherey, Maxim Krikun, Yuan Cao, Qin Gao, Klaus Macherey, Jeff Klingner, Apurva Shah, Melvin Johnson, Xiaobing Liu, Lukasz Kaiser, Stephan Gouws, Yoshikiyo Kato, Taku Kudo, Hideto Kazawa, Keith Stevens, George Kurian, Nishant Patil, Wei Wang, Cliff Young, Jason Smith, Jason Riesa, Alex Rudnick, Oriol Vinyals, Greg Corrado, Macduff Hughes, and Jeffrey Dean. Google's neural machine translation system: Bridging the gap between human and machine translation. CoRR, abs/1609.08144, 2016.

[24] Cong Duy Vu Hoang, Philipp Koehn, Gholamreza Haffari, and Trevor Cohn. Iterative back-translation for neural machine translation. In NMT@ACL, pages 18–24. Association for Computational Linguistics, 2018.

- [25] Aitor Lewkowycz, Anders Andreassen, David Dohan, Ethan Dyer, Henryk Michalewski, Vinay V. Ramasesh, Ambrose Slone, Cem Anil, Imanol Schlag, Theo Gutman-Solo, Yuhuai Wu, Behnam Neyshabur, Guy Gur-Ari, and Vedant Misra. Solving quantitative reasoning problems with language models. In NeurIPS, 2022.
- [26] Zhihong Shao, Peiyi Wang, Qihao Zhu, Runxin Xu, Junxiao Song, Mingchuan Zhang, Y. K. Li, Y. Wu, and Daya Guo. Deepseekmath: Pushing the limits of mathematical reasoning in open language models. CoRR, abs/2402.03300, 2024.
- [27] Tian Ye, Zicheng Xu, Yuanzhi Li, and Zeyuan Allen-Zhu. Physics of language models: Part 2.1, grade-school math and the hidden reasoning process. CoRR, abs/2407.20311, 2024.
- [28] Joshua Robinson and David Wingate. Leveraging large language models for multiple choice question answering. In *ICLR*. OpenReview.net, 2023.
- [29] Takeshi Kojima, Shixiang Shane Gu, Machel Reid, Yutaka Matsuo, and Yusuke Iwasawa. Large language models are zero-shot reasoners. In NeurIPS, 2022.
- [30] Jaehun Jung, Lianhui Qin, Sean Welleck, Faeze Brahman, Chandra Bhagavatula, Ronan Le Bras, and Yejin Choi. Maieutic prompting: Logically consistent reasoning with recursive explanations. In *EMNLP*, pages 1266–1279. Association for Computational Linguistics, 2022.
- [31] Zonglin Yang, Li Dong, Xinya Du, Hao Cheng, Erik Cambria, Xiaodong Liu, Jian-feng Gao, and Furu Wei. Language models as inductive reasoners. In EACL (1), pages 209–225. Association for Computational Linguistics, 2024.
- [32] Ashish Vaswani, Noam Shazeer, Niki Parmar, Jakob Uszkoreit, Llion Jones, Aidan N. Gomez, Lukasz Kaiser, and Illia Polosukhin. Attention is all you need. In NIPS, pages 5998–6008, 2017.
- [33] Jiahui Yu, Yuanzhong Xu, Jing Yu Koh, Thang Luong, Gunjan Baid, Zirui Wang, Vijay Vasudevan, Alexander Ku, Yinfei Yang, Burcu Karagol Ayan, Ben Hutchinson, Wei Han, Zarana Parekh, Xin Li, Han Zhang, Jason Baldridge, and Yonghui

Wu. Scaling autoregressive models for content-rich text-to-image generation. *Trans. Mach. Learn. Res.*, 2022, 2022.

- [34] William Peebles and Saining Xie. Scalable diffusion models with transformers. In ICCV, pages 4172–4182. IEEE, 2023.
- [35] Keyu Tian, Yi Jiang, Zehuan Yuan, Bingyue Peng, and Liwei Wang. Visual autoregressive modeling: Scalable image generation via next-scale prediction. In *NeurIPS*, 2024.
- [36] Xinlong Wang, Xiaosong Zhang, Zhengxiong Luo, Quan Sun, Yufeng Cui, Jinsheng Wang, Fan Zhang, Yueze Wang, Zhen Li, Qiying Yu, Yingli Zhao, Yulong Ao, Xuebin Min, Tao Li, Boya Wu, Bo Zhao, Bowen Zhang, Liangdong Wang, Guang Liu, Zheqi He, Xi Yang, Jingjing Liu, Yonghua Lin, Tiejun Huang, and Zhongyuan Wang. Emu3: Next-token prediction is all you need. CoRR, abs/2409.18869, 2024.
- [37] Chunting Zhou, Lili Yu, Arun Babu, Kushal Tirumala, Michihiro Yasunaga, Leonid Shamis, Jacob Kahn, Xuezhe Ma, Luke Zettlemoyer, and Omer Levy. Transfusion: Predict the next token and diffuse images with one multi-modal model. CoRR, abs/2408.11039, 2024.
- [38] Xiaokang Chen, Zhiyu Wu, Xingchao Liu, Zizheng Pan, Wen Liu, Zhenda Xie, Xingkai Yu, and Chong Ruan. Janus-pro: Unified multimodal understanding and generation with data and model scaling, 2025. URL https://arxiv.org/abs/2501.17811.
- [39] Vishal Pallagani, Bharath C. Muppasani, Kaushik Roy, Francesco Fabiano, Andrea Loreggia, Keerthiram Murugesan, Biplav Srivastava, Francesca Rossi, Lior Horesh, and Amit P. Sheth. On the prospects of incorporating large language models (llms) in automated planning and scheduling (APS). In *ICAPS*, pages 432–444. AAAI Press, 2024.
- [40] Gail Weiss, Yoav Goldberg, and Eran Yahav. Thinking like transformers. In ICML, volume 139 of Proceedings of Machine Learning Research, pages 11080– 11090. PMLR, 2021.
- [41] Hattie Zhou, Arwen Bradley, Etai Littwin, Noam Razin, Omid Saremi, Joshua M. Susskind, Samy Bengio, and Preetum Nakkiran. What algorithms can transformers learn? A study in length generalization. In ICLR. OpenReview.net, 2024.

[42] Arvid Frydenlund. The mystery of the pathological path-star task for language models. In EMNLP, pages 12493–12516. Association for Computational Linguistics, 2024.

- [43] Xinyun Chen, Ryan A. Chi, Xuezhi Wang, and Denny Zhou. Premise order matters in reasoning with large language models. In *ICML*. OpenReview.net, 2024.
- [44] Jason Wei, Xuezhi Wang, Dale Schuurmans, Maarten Bosma, Brian Ichter, Fei Xia, Ed H. Chi, Quoc V. Le, and Denny Zhou. Chain-of-thought prompting elicits reasoning in large language models. In NeurIPS, 2022.
- [45] DeepSeek-AI, Daya Guo, Dejian Yang, Haowei Zhang, et al. Deepseek-r1: Incentivizing reasoning capability in llms via reinforcement learning, 2025. URL https://arxiv.org/abs/2501.12948.
- [46] Yuwei Fu, Haichao Zhang, Di Wu, Wei Xu, and Benoit Boulet. Furl: Visual-language models as fuzzy rewards for reinforcement learning. In *ICML*. OpenReview.net, 2024.
- [47] Gregor Bachmann and Vaishnavh Nagarajan. The pitfalls of next-token prediction. In ICML. OpenReview.net, 2024.
- [48] Tairan Fu, Javier Conde, Gonzalo Martínez, María Grandury, and Pedro Reviriego. Multiple choice questions: Reasoning makes large language models (llms) more self-confident even when they are wrong, 2025. URL https://arxiv.org/abs/2501.09775.
- [49] Hengyuan Hu, Denis Yarats, Qucheng Gong, Yuandong Tian, and Mike Lewis. Hierarchical decision making by generating and following natural language instructions. In NeurIPS, pages 10025–10034, 2019.
- [50] Mohit Shridhar, Jesse Thomason, Daniel Gordon, Yonatan Bisk, Winson Han, Roozbeh Mottaghi, Luke Zettlemoyer, and Dieter Fox. ALFRED: A benchmark for interpreting grounded instructions for everyday tasks. In CVPR, pages 10737– 10746. Computer Vision Foundation / IEEE, 2020.

[51] Thomas Carta, Clément Romac, Thomas Wolf, Sylvain Lamprier, Olivier Sigaud, and Pierre-Yves Oudeyer. Grounding large language models in interactive environments with online reinforcement learning. In ICML, volume 202 of Proceedings of Machine Learning Research, pages 3676–3713. PMLR, 2023.

- [52] Zihao Wang, Shaofei Cai, Guanzhou Chen, Anji Liu, Xiaojian Ma, and Yitao Liang. Describe, explain, plan and select: Interactive planning with llms enables openworld multi-task agents. In NeurIPS, 2023.
- [53] Russell Kaplan et al. Beating atari with natural language guided reinforcement learning. ArXiv, abs/1704.05539, 2017. URL https://api.semanticscholar. org/CorpusID:6022828.
- [54] Prasoon Goyal, Scott Niekum, and Raymond J. Mooney. Pixl2r: Guiding reinforcement learning using natural language by mapping pixels to rewards. In CoRL, volume 155 of Proceedings of Machine Learning Research, pages 485–497. PMLR, 2020.
- [55] Yuqing Du, Olivia Watkins, Zihan Wang, Cédric Colas, Trevor Darrell, Pieter Abbeel, Abhishek Gupta, and Jacob Andreas. Guiding pretraining in reinforcement learning with large language models. In ICML, volume 202 of Proceedings of Machine Learning Research, pages 8657–8677. PMLR, 2023.
- [56] Juan Rocamonde, Victoriano Montesinos, Elvis Nava, Ethan Perez, and David Lindner. Vision-language models are zero-shot reward models for reinforcement learning. In *ICLR*. OpenReview.net, 2024.
- [57] Yufei Wang, Zhanyi Sun, Jesse Zhang, Zhou Xian, Erdem Biyik, David Held, and Zackory Erickson. RL-VLM-F: reinforcement learning from vision language foundation model feedback. In *ICML*. OpenReview.net, 2024.
- [58] Vishal Pallagani, Bharath Muppasani, Biplav Srivastava, Francesca Rossi, Lior Horesh, Keerthiram Murugesan, Andrea Loreggia, Francesco Fabiano, Rony Joseph, and Yathin Kethepalli. Plansformer tool: Demonstrating generation of symbolic plans using transformers. In *IJCAI*, pages 7158–7162. ijcai.org, 2023.
- [59] Nicholas Rossetti, Massimiliano Tummolo, Alfonso Emilio Gerevini, Luca Putelli, Ivan Serina, Mattia Chiari, and Matteo Olivato. Learning general policies for planning through GPT models. In *ICAPS*, pages 500–508. AAAI Press, 2024.

[60] Tom Silver, Soham Dan, Kavitha Srinivas, Joshua B. Tenenbaum, Leslie Pack Kaelbling, and Michael Katz. Generalized planning in PDDL domains with pretrained large language models. In AAAI, pages 20256–20264. AAAI Press, 2024.

- [61] Lin Guan, Karthik Valmeekam, Sarath Sreedharan, and Subbarao Kambhampati. Leveraging pre-trained large language models to construct and utilize world models for model-based task planning. In NeurIPS, 2023.
- [62] Subbarao Kambhampati, Karthik Valmeekam, Lin Guan, Mudit Verma, Kaya Stechly, Siddhant Bhambri, Lucas Saldyt, and Anil Murthy. Position: Llms can't plan, but can help planning in llm-modulo frameworks. In *ICML*. OpenReview.net, 2024.
- [63] Karthik Valmeekam, Matthew Marquez, Alberto Olmo Hernandez, Sarath Sreedharan, and Subbarao Kambhampati. Planbench: An extensible benchmark for evaluating large language models on planning and reasoning about change. In NeurIPS, 2023.
- [64] Karthik Valmeekam, Matthew Marquez, Sarath Sreedharan, and Subbarao Kambhampati. On the planning abilities of large language models A critical investigation. In NeurIPS, 2023.
- [65] Lei Huang, Weijiang Yu, Weitao Ma, Weihong Zhong, Zhangyin Feng, Haotian Wang, Qianglong Chen, Weihua Peng, Xiaocheng Feng, Bing Qin, and Ting Liu. A survey on hallucination in large language models: Principles, taxonomy, challenges, and open questions. CoRR, abs/2311.05232, 2023.
- [66] Jelena Luketina, Nantas Nardelli, Gregory Farquhar, Jakob N. Foerster, Jacob Andreas, Edward Grefenstette, Shimon Whiteson, and Tim Rocktäschel. A survey of reinforcement learning informed by natural language. In *IJCAI*, pages 6309–6317. ijcai.org, 2019.
- [67] Brian Ichter, Anthony Brohan, Yevgen Chebotar, Chelsea Finn, Karol Hausman, Alexander Herzog, Daniel Ho, Julian Ibarz, Alex Irpan, Eric Jang, Ryan Julian, Dmitry Kalashnikov, Sergey Levine, Yao Lu, Carolina Parada, Kanishka Rao, Pierre Sermanet, Alexander Toshev, Vincent Vanhoucke, Fei Xia, Ted Xiao, Peng Xu, Mengyuan Yan, Noah Brown, Michael Ahn, Omar Cortes, Nicolas Sievers, Clayton Tan, Sichun Xu, Diego Reyes, Jarek Rettinghouse, Jornell Quiambao, Peter Pastor,

Linda Luu, Kuang-Huei Lee, Yuheng Kuang, Sally Jesmonth, Nikhil J. Joshi, Kyle Jeffrey, Rosario Jauregui Ruano, Jasmine Hsu, Keerthana Gopalakrishnan, Byron David, Andy Zeng, and Chuyuan Kelly Fu. Do as I can, not as I say: Grounding language in robotic affordances. In *CoRL*, volume 205 of *Proceedings of Machine Learning Research*, pages 287–318. PMLR, 2022.

- [68] Ishika Singh, Gargi Singh, and Ashutosh Modi. Pre-trained language models as prior knowledge for playing text-based games. In AAMAS, pages 1729–1731. International Foundation for Autonomous Agents and Multiagent Systems (IFAAMAS), 2022.
- [69] Shuang Li, Xavier Puig, Chris Paxton, Yilun Du, Clinton Wang, Linxi Fan, Tao Chen, De-An Huang, Ekin Akyürek, Anima Anandkumar, Jacob Andreas, Igor Mordatch, Antonio Torralba, and Yuke Zhu. Pre-trained language models for interactive decision-making. In NeurIPS, 2022.
- [70] Jessy Lin, Yuqing Du, Olivia Watkins, Danijar Hafner, Pieter Abbeel, Dan Klein, and Anca D. Dragan. Learning to model the world with language. In *ICML*. OpenReview.net, 2024.
- [71] Andrew Szot, Max Schwarzer, Harsh Agrawal, Bogdan Mazoure, Rin Metcalf, Walter Talbott, Natalie Mackraz, R. Devon Hjelm, and Alexander T. Toshev. Large language models as generalizable policies for embodied tasks. In *ICLR*. OpenReview.net, 2024.
- [72] Greg Brockman, Vicki Cheung, Ludwig Pettersson, Jonas Schneider, John Schulman, Jie Tang, and Wojciech Zaremba. Openai gym. *CoRR*, abs/1606.01540, 2016.
- [73] Emanuel Todorov, Tom Erez, and Yuval Tassa. Mujoco: A physics engine for model-based control. In 2012 IEEE/RSJ international conference on intelligent robots and systems, pages 5026–5033. IEEE, 2012.