

C. Lu, C. Zhao, C. Deng, C. Ruan, D. Dai, D. Chen, D. Ji, E. Li, F. Lin, F. Dai, F. Luo, G. Hao, G. Chen, G. Li, H. Zhang, H. Xu, H. Ding, H. Gao, H. Qu, H. Li, J. Guo, J. Li, J. Chen, J. Yuan, J. Tu, J. Qiu, J. Li, J. L. Cai, J. Ni, J. Liang, J. Chen, K. Dong, K. Hu, K. You, K. Gao, K. Guan, K. Huang, K. Yu, L. Wang, L. Zhang, L. Zhao, L. Wang, L. Zhang, L. Xu, L. Xia, M. Zhang, M. Zhang, M. Tang, M. Zhou, M. Li, M. Wang, M. Li, N. Tian, P. Huang, P. Zhang, Q. Wang, Q. Chen, Q. Du, R. Ge, R. Zhang, R. Pan, R. Wang, R. J. Chen, R. L. Jin, R. Chen, S. Lu, S. Zhou, S. Chen, S. Ye, S. Wang, S. Yu, S. Zhou, S. Pan, S. S. Li, S. Zhou, S. Wu, T. Yun, T. Pei, T. Sun, T. Wang, W. Zeng, W. Liu, W. Liang, W. Gao, W. Yu, W. Zhang, W. L. Xiao, W. An, X. Liu, X. Wang, X. Chen, X. Nie, X. Cheng, X. Liu, X. Xie, X. Liu, X. Yang, X. Li, X. Su, X. Lin, X. Q. Li, X. Jin, X. Shen, X. Chen, X. Sun, X. Wang, X. Song, X. Zhou, X. Wang, X. Shan, Y. K. Li, Y. Q. Wang, Y. X. Wei, Y. Zhang, Y. Xu, Y. Li, Y. Zhao, Y. Sun, Y. Wang, Y. Yu, Y. Zhang, Y. Shi, Y. Xiong, Y. He, Y. Piao, Y. Wang, Y. Tan, Y. Ma, Y. Liu, Y. Guo, Y. Ou, Y. Wang, Y. Gong, Y. Zou, Y. He, Y. Xiong, Y. Luo, Y. You, Y. Liu, Y. Zhou, Y. X. Zhu, Y. Huang, Y. Li, Y. Zheng, Y. Zhu, Y. Ma, Y. Tang, Y. Zha, Y. Yan, Z. Z. Ren, Z. Ren, Z. Sha, Z. Fu, Z. Xu, Z. Xie, Z. Zhang, Z. Hao, Z. Ma, Z. Yan, Z. Wu, Z. Gu, Z. Zhu, Z. Liu, Z. Li, Z. Xie, Z. Song, Z. Pan, Z. Huang, Z. Xu, Z. Zhang, and Z. Zhang. Deepseek-r1 incentivizes reasoning in llms through reinforcement learning. *Nat.*, 645(8081):633–638, 2025. doi: 10.1038/S41586-025-09422-Z. URL <https://doi.org/10.1038/s41586-025-09422-z>.

Y. Huang and L. F. Yang. Gemini 2.5 pro capable of winning gold at IMO 2025. CoRR, abs/2507.15855, 2025. doi: 10.48550/ARXIV.2507.15855. URL <https://doi.org/10.48550/arXiv.2507.15855>.

A. Q. Jiang, S. Welleck, J. P. Zhou, T. Lacroix, J. Liu, W. Li, M. Jamnik, G. Lample, and Y. Wu. Draft, sketch, and prove: Guiding formal theorem provers with informal proofs. In The Eleventh International Conference on Learning Representations, ICLR 2023, Kigali, Rwanda, May 1-5, 2023. OpenReview.net, 2023. URL <https://openreview.net/forum?id=SMA9EAovKMC>.

T. Luong and E. Lockhart. Advanced version of gemini with deep think officially achieves gold-medal standard at the international mathematical olympiad, 2025. URL <https://goo.gle/imo-gold>.

T. Luong, D. Hwang, H. H. Nguyen, G. Ghiasi, Y. Chervonyi, I. Seo, J. Kim, G. Bingham, J. Lee, S. Mishra, A. Zhai, C. H. Hu, H. Michalewski, J. Kim, J. Ahn, J. Bae, X. Song, T. H. Trinh, Q. V. Le, and J. Jung. Towards robust mathematical reasoning. In Proceedings of the 2025 Conference on Empirical Methods in Natural Language Processing, 2025. URL <https://aclanthology.org/2025.emnlp-main.1794/>.

OpenAI. Learning to reason with llms, 2024. URL <https://openai.com/index/learning-to-reason-with-llms/>.

OpenAI. Introducing gpt-5, 2025. URL <https://openai.com/index/introducing-gpt-5>.

L. C. Paulson. Isabelle - A Generic Theorem Prover (with a contribution by T. Nipkow), volume 828 of Lecture Notes in Computer Science. Springer, 1994. ISBN 3-540-58244-4. doi: 10.1007/BF0030541. URL <https://doi.org/10.1007/BF0030541>.

Z. Z. Ren, Z. Shao, J. Song, H. Xin, H. Wang, W. Zhao, L. Zhang, Z. Fu, Q. Zhu, D. Yang, Z. F. Wu, Z. Gou, S. Ma, H. Tang, Y. Liu, W. Gao, D. Guo, and C. Ruan. Deepseek-prover-v2: Advancing formal mathematical reasoning via reinforcement learning for subgoal decomposition. CoRR, abs/2504.21801, 2025. doi: 10.48550/ARXIV.2504.21801. URL <https://doi.org/10.48550/arXiv.2504.21801>.