

# 刘博

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## 自我介绍

我是来自北京理工大学计算机科学与技术专业的博士研究生, 师从刘辉教授 (CCF 软件工程专委会秘书长)。博士在读期间发表了高水平学术论文 (CCF-A, SCI -区) 6 篇, 参与了多个研究项目, 申请了软件著作权 2 项, 与华为公司合作了“智能化代码坏味的检测与重构”项目并已落地。研究方向包括: 智能化软件工程, 基于大模型的软件工程 (LLM4SE), 代码坏味, 软件重构, 代码演化, 程序分析, 软件质量等。

## 教育背景

2021.9 ~ 至今	北京理工大学 (博士)	计算机学院	计算机科学与技术	GPA: 3.43 (Top 5%)
2018.9 ~ 2021.6	江苏大学 (硕士)	江苏省工业网络安全技术重点实验室	软件工程	GPA: 3.82 (Top 1%)
2013.9 ~ 2017.6	江苏大学 (本科)	计算机科学与通信工程学院	软件工程	GPA: 3.64 (Top 2%)

## 项目经历

- 2023.9 ~ 2024.8** **基于大模型的软件重构及其质量保障** **算法设计与实现**  
项目简介: 研究基于大语言模型 (LLM) 的自动化软件重构, 并探究其可靠性保障  
关键词: 软件重构, 重构挖掘, 大模型, 软件质量  
主要工作: 1. 面向 LLM 的代码优化 Prompt 工程。2. 一种面向源代码的重构挖掘算法。3. 一种基于检测的代码重构分析及质量保障机制。
- 2022.1 ~ 2025.12** **基于深度学习的软件重构推荐方法 (国自然)** **算法设计与实现**  
项目简介: 研究基于深度学习和大模型的智能重构推荐方法, 提高代码质量和可维护性  
关键词: 软件重构, 代码坏味, 上帝类, 深度学习, 大模型  
主要工作: 1. 一个来自真实世界中上帝类 (God Class) 解决方案的数据集。2. 一种基于大模型和相对物理位置的上帝类解耦方案。
- 2022.4 ~ 2024.6** **实时增量式代码坏味检测工具 (军科院)** **算法设计与实现**  
项目简介: 开发基于实时监控的代码坏味检测工具, 并及时推荐合适的重构方案  
关键词: 软件重构, 代码坏味, 监控器, 实时重构  
主要工作: 1. 一个增量式检测框架, 实时监控开发者代码变更并识别潜在重构机会。2. 提出 10 种常见代码坏味检测算法。3. 一种基于启发式规则和 LLM 的重构策略。4. 开发 InsRefactor 工具, 并集成至 Eclipse, IntelliJ IDEA 插件。
- 2021.4 ~ 2022.6** **智能化代码坏味的检测与重构 (华为)** **算法设计与实现**  
项目简介: 利用深度学习技术自动检测代码坏味, 并推荐智能重构方案  
关键词: 软件重构, 代码坏味, 依恋情结, 深度学习  
主要工作: 1. 一个基于启发式规则和决策树的移动方法 (Move Method) 重构分类器。2. 一种基于真实数据的高质量重构数据集构建方法。3. 一个大规模, 高质量的依恋情结 (Feature Envy) 数据集。4. 一种基于深度学习的依恋情结检测与重构方法。  
项目链接: <https://bbs.huaweicloud.com/blogs/416188>

## 研究成果

- Bo Liu**, Hui Liu, Nan Niu, Yuxia Zhang, Guangjie Li, He Jiang, and Yanjie Jiang. An Automated Approach to Discovering Software Refactorings by Comparing Successive Versions. *IEEE Transactions on Software Engineering*, pp. 1-23, January 2025. <https://doi.org/10.1109/TSE.2025.3534239> (CCF-A, SCI -区)
- Bo Liu**, Hui Liu, Guangjie Li, Nan Niu, Zimao Xu, Yifan Wang, Yunni Xia, Yuxia Zhang, and Yanjie Jiang. Deep Learning Based Feature Envy Detection Boosted by Real-World Examples. *Proceedings of the 31st ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE '23)*, 3-9 December, 2023, San Francisco, CA, USA, pp. 908-920. <https://doi.org/10.1145/3611643.36163> (CCF-A, Oral)
- Bo Liu**, Hui Liu, Nan Niu, Yuxia Zhang, Guangjie Li, and Yanjie Jiang. Automated Software Entity Matching Between Successive Versions. *Proceedings of the 38th IEEE/ACM International Conference on Automated Software Engineering (ASE '23)*, 11-15 September, 2023, Kirchberg, Luxembourg, pp. 1615-1627. <https://doi.org/10.1109/ASE56229.2023.00132> (CCF-A, Oral)

- [4] **Bo Liu**, et al. (Equal Contribution) Deep learning-based software engineering: progress, challenges, and opportunities. *SCIENCE CHINA Information Sciences*, vol. 68, no. 1, pp. 1-88, December 2024. <https://doi.org/10.1007/s11432-023-4127-5> (CCF-A, SCI 二区)
- [5] **Bo Liu**, Yanjie Jiang, Yuxia Zhang, Nan Niu, Guangjie Li, and Hui Liu. Exploring the Potential of General Purpose LLMs in Automated Software Refactoring: An Empirical Study. *Automated Software Engineering*, pp. 1-43, February 2025. <https://doi.org/10.1007/s10515-025-00500-0> (CCF-B, SCI 一区)
- [6] **Bo Liu**, Jinfu Chen, Weijia Wang, Saihua Cai, Jingyi Chen, and Qiaowei Feng. An adaptive search optimization algorithm for improving the detection capability of software vulnerability. *Proceedings of the 13th Asia-Pacific Symposium on Internetware (Internetware '22)*, 11-12 June, 2022, Hohhot, China, pp. 212-220. <https://doi.org/10.1145/3545258.3545283> (CCF-C, Oral)
- [7] **Bo Liu**, Jinfu Chen, Songling Qin, Zufa Zhang, Yisong Liu, Lingling Zhao, and Jingyi Chen. An Approach Based on the Improved SVM Algorithm for Identifying Malware in Network Traffic. *Security and Communication Networks*, vol. 2021, no. 1, pp. 5518909:1-14, April 2021. <https://doi.org/10.1155/2021/5518909> (CCF-C)
- [8] Jinfu Chen, **Bo Liu**, Saihua Cai, Weijia Wang, and Shengran Wang. AIdetectorX: A Vulnerability Detector Based on TCN and Self-Attention Mechanism. *Proceedings of the 7th International Symposium on Dependable Software Engineering. Theories, Tools, and Applications (SETTA '21)*, 25-27 November, 2021, Beijing, China, pp. 161-177. [https://doi.org/10.1007/978-3-030-91265-9\\_9](https://doi.org/10.1007/978-3-030-91265-9_9) (CCF-C, Oral)
- [9] Jinfu Chen, Weijia Wang, **Bo Liu**, Saihua Cai, Dave Towey, Shengran Wang. Hybrid semantics-based vulnerability detection incorporating a Temporal Convolutional Network and Self-attention Mechanism. *Information and Software Technology*, vol. 171, pp. 107453, July 2024. <https://doi.org/10.1016/j.infsof.2024.107453> (CCF-B, SCI 二区)
- [10] Tianyi Chen, Yanjie Jiang, Fu Fan, **Bo Liu**, Hui Liu. A Position-Aware Approach to Decomposing God Classes. *Proceedings of the 39th IEEE/ACM International Conference on Automated Software Engineering (ASE '24)*, 27 October - 1 November, 2024, Sacramento, CA, USA, pp. 129-140. <https://doi.org/10.1145/3691620.369499> (CCF-A, Oral)
- [11] Saihua Cai, Jinfu Chen, Xinru Li, **Bo Liu**. Minimal Rare-Pattern-Based Outlier Detection Method for Data Streams by Considering Anti-monotonic Constraints. *Proceedings of the 23rd International Conference on Information Security (ISC '20)*, 16-18 December, 2020, Bali, Indonesia, pp. 274-289. [https://doi.org/10.1007/978-3-030-62974-8\\_16](https://doi.org/10.1007/978-3-030-62974-8_16) (CCF-C, Oral)
- [12] Jinchang Hu, Jinfu Chen, Sher Ali, **Bo Liu**, Jingyi Chen, Chi Zhang, and Jian Yang. A Detection Approach for Vulnerability Exploiter Based on the Features of the Exploiter. *Security and Communication Networks*, vol. 2021, no. 1, pp. 5581274:1-14, May 2021. <https://doi.org/10.1155/2021/5581274> (CCF-C)
- [13] Chi Zhang, Jinfu Chen, Saihua Cai, **Bo Liu**, Yiming Wu, Ye Geng. iTES: Integrated Testing and Evaluation System for Software Vulnerability Detection Methods. *Proceedings of the 19th International Conference on Trust, Security and Privacy in Computing and Communications (TrustCom '20)*, 29 December - 1 January, 2021, Guangzhou, China, pp. 1455-1460. <https://doi.org/10.1109/TrustCom50675.2020.00196> (CCF-C, Oral)
- [14] Saihua Cai, Rubing Huang, Jinfu Chen, Chi Zhang, **Bo Liu**, Shang Yin, and Ye Geng. An efficient outlier detection method for data streams based on closed frequent patterns by considering anti-monotonic constraints. *Information Sciences*, vol. 555, pp. 125-146, May 2021. <https://doi.org/10.1016/j.ins.2020.12.050> (CCF-B, SCI 一区)
- [15] 蔡赛华, **刘博**, 陈锦富, 张翊, 陈海波. 一种用于确定最佳的神经网络输入向量长度的方法, 发明专利, 专利号: 202110659650.7, 公布日期: 2025.2.14, 申请单位: 江苏大学
- [16] 陈锦富, 施登洲, 张祖法, **刘博**, 黄如兵. 一种基于改进的聚类与自相似性的恶意程序检测方法, 发明专利, 专利号: 202010469345.7, 公布日期: 2022.12.16, 申请单位: 江苏大学
- [17] **刘博**. 基于深度学习的依恋情结方法检测系统, 证书号: 2023SR0133811, 登记日期: 2023.1.20, 申请单位: 北京理工大学
- [18] **刘博**. 基于启发式和机器学习的依恋情结方法识别系统, 证书号: 2023SR0133812, 登记日期: 2023.1.20, 申请单位: 北京理工大学

## 个人荣誉

- 省级竞赛: 首届江苏省研究生网络空间安全科研创新实践大赛三等奖
- 省级创新: 基于视频分析的车辆安全保护系统研究, 项目编号: 201510299055Y
- 担任职务: 本科期间担任团支部书记一职, 硕士期间担任班长一职
- 学业荣誉: 本科期间荣获学业一等奖学金, 三好学生, 优秀学生干部, 优秀毕业生  
硕士期间荣获学业一等奖学金, 优秀团员, 优秀毕业论文, 优秀毕业生  
博士期间荣获学业特等奖学金, 优秀学生, 华瑞世纪奖学金 (Top 2%)