Graduate School of Science and Technology Master's Thesis Abstract

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Abstract

Computational notebooks are the preferred tool for data science, combining executable scripts with narrative documentation. With the rise of generative AI (GenAI), distinguishing between human-written and GenAI-synthesized artifacts is increasingly vital. This thesis explores the complementary strengths and weaknesses of both paradigms by evaluating 25 code and documentation features within competitive Kaggle notebooks. The findings reveal that gold-medal human notebooks are primarily distinguished by longer, more detailed documentation, alongside greater structural diversity and innovative problem-solving. Conversely, while GenAI notebooks achieve higher static code quality with fewer code smells and less technical debt, they present a critical operational paradox: 33¥% (3 out of 9) of the top-performing GenAI notebooks failed to complete execution. These outcomes confirm that static analysis alone is insufficient, as it misses critical data-handling and logic errors that limit the notebooks' practical utility, ultimately demonstrating that static quality does not guarantee usability. Based on these findings, this thesis highlights future agendas to optimize human-AI collaboration and addresses the limitations of relying solely on static evaluation metrics.