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AN ISSUE RECOMMENDER MODEL USING THE DEVELOPER COLLABORATION NETWORK

Abstract

Assignment of new issues to developers is an important part of software maintenance activities. In this research, we build an issue recommendation model that recommends new issues to developers and highlights the defect prone software modules to the developer who owns an issue. Existing solutions address the automated issue assignment problem through text mining. We propose a recommender model that uses the collaboration network of developers on software modules and the structured issue data as its input. We perform an exploratory analysis using the issue data of two large software systems and observe the trends in the issue ownership, issue defect relations and issue timelines. Our base model estimates the developer centrality for each issue category and recommends issues to developers based on their centrality ranking. We test the performance of our recommender using the maintenance data of a globally developed large enterprise software using recommendation accuracy and workload imbalance as the performance metrics. We extend the recommender to address, (i) The problem of developer workload imbalances, (ii) The problem of assigning issues to a new group of developers by using stochastic Kronecker networks to model the future structure of the collaboration network. We change a learning based defect predictor's output based on recent history to update the predicted defect-prone software modules on a real-time basis. Our empirical analysis shows that: (i) The performance of our recommender model approximates historical trends of issue allocation, (ii) Heuristics applied to the model output reduces the issue ownership inequalities and model approximation performance, (iii) Kronecker networks can be used to estimate the future collaboration on the issues and the model can be extended by them to propose issues to new developer groups, (iv) Real time defect prediction model can significantly improve probability of detection over time while not changing false alarm rates.

PUBLICATIONS

Book Chapters

1. A. T. Misirli, A. Bener, B. Caglayan, G. Calikli, B. Turhan, "Field Studies: A Methodology for Construction and Evaluation of Recommendation Systems in Software Engineering", "Recommendation Systems in Software Engineering", W. Maalej, M. Robillard, R. Walker, T. Zimmermann (eds.), Springer (accepted)

Journals

1. B. Caglayan, Misirli, A. T., Bener, A., and Miransky, A., "Predicting Defective Modules in Different Test Phases" (accepted)
2. B. Caglayan, A. Bener, "Effect of Developer Collaboration Activity on Software Quality In Two Large Scale Projects", Journal of Systems and Software (submitted)
3. B. Caglayan, A. Bener, "An Issue Recommender Model Using the Developer Collaboration Network", Software Quality Journal (submitted)

Conferences

1. Caglayan, B., A. Bener, and A. Miranskyy, "Emergence of Developer Teams in the Collaboration Network", CHASE Workshop in ICSE 2013, May 18-26, 2013, San Francisco, USA.
2. Gul Calikli, Bora Caglayan, Ayse Tosun and Ayse Bener, "Modeling Human Aspects to Enhance Software Quality Management", International Conference on Information Systems (ICIS 2012), Orlando Florida, USA, December, 2012.
3. Bora Caglayan and Ayse Bener, "Issue Ownership Activity In Two Large Software Projects", 9th International Workshop on Software Quality, Cary North Carolina, USA, November, 2012
4. Bora Caglayan, Ayse Tosun-Misirli, Gul Calikli, Ayse Bener, Turgay Aytac and Burak Turhan, "Dione: An Integrated Measurement and Defect Prediction Solution", 2012 International Symposium on the Foundations of Software Engineering (FSE-20 2012), Cary North Carolina, USA, November, 2012
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9. Caglayan, A. Tosun, A. Miranskyy, A. Bener, N. Ruffolo, "Usage of Multiple Prediction Models Based On Defect Categories", Promise 2010, 2010
10. S. Alhassan, B. Çağlayan, A. Bener, "Do More People Make the Code More Defect Prone?: Social Network Analysis in OSS Projects", SEKE 2010, San Francisco, CA, USA, 2010
11. E. Kocagüneli, A.Tosun, A. Bener, B. Çağlayan, B. Turhan, "Prest: An Intelligent Software Metrics Extraction, Analysis and Defect Prediction Tool", in Proceedings of the 21st International Conference on Software Engineering and Knowledge Engineering (SEKE), 2009, Boston, USA.
12. B. Caglayan, A. Bener, S. Koch, "Merits of Using Repository Metrics in Defect Prediction", Emerging Trends in FLOSS Research and Development, International Workshop on, 2009, Vancouver, Canada

Defense Jury Members

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