Report from the First International Workshop on Realizing Artificial Intelligence Synergies in Software Engineering (RAISE 2012)

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ABSTRACT

The aim of the Realizing Artificial Intelligence Synergies in Software Engineering (RAISE) series of workshops is to provide a forum for researchers and industry practitioners to exchange and discuss the latest innovative synergistic AI and SE techniques and practices. Namely, we are interested in AI solutions to SE problems and SE practices to answer AI obstacles, and techniques that could benefit these realms bi-directionally. This report summarizes the First International RAISE Workshop and indicates some future activities.

Categories and Subject Descriptors

D.2.2 **[Software Engineering]:** Design Tools and Techniques. K.6.3 I.2.6 **[Artificial Intelligence]:** Learning. I.2.5 **[Programming Languages and Software]:** (D.3.2) Expert system tools and techniques

General Terms

Algorithms, Measurement, Design, Experimentation, Languages, Theory.

Keywords

AI, software engineering, computational intelligence

INTRODUCTION

The aim of the Realizing Artificial Intelligence Synergies in Software Engineering (RAISE) series of workshops is to provide a forum for researchers and industrial practitioners to exchange and discuss the latest innovative synergistic AI and SE techniques and practices. The long term vision of RAISE is to widen the AI-and-SE community to include researchers and practitioners from other related communities such as image and vision computing, bioinformatics, cognitive psychology, mobile software engineering, description logics etc.

WORKSHOP THEMES AND GOALS

- The workshop served as a platform to stimulate discussion, thoughts and subsequent collaboration on the following themes applied to software engineering:

- Testing and quality assurance
- Spectra-based software diagnosis
- System dynamics and simulation models
- Software metrics applied to AI techniques.
- Rapid prototyping and scripting for AI techniques
- Cost analysis and risk assessment in software projects
- Software for knowledge acquisition and representation
- Knowledge representation and reasoning in software engineering
- Software specification, design, integration and requirement engineering;
- Assessing the quality of datasets (imbalance, noise, missing values, etc.)
- Ontologies and other semantic aspects in software development and maintenance
- Cognitive psychology for requirements engineering and knowledge engineering
- Machine Learning and Computational Intelligence techniques (fuzzy logic, neural networks, evolutionary computation, etc.)

There are many approaches to addressing the above that include, but are not limited to:

- Domain modelling and language engineering (e.g., domain-specific languages)
- Software optimization, transformation, and configuration management
- Search Based Software Engineering, meta-heuristic algorithms
- Constraint-logic programming, inductive logic programming
- Reverse engineering and program understanding
- Visual modelling and model-driven development

- Software reuse, evolution, and maintenance
- Software analysis and validation
- Bayesian Belief Networks
- Rule-based programming
- Case-based reasoning
- Data mining

Whilst papers relating to any of the above topics were welcomed, preference was given to papers offering data or baseline results for an AI + SE challenge problem.

WORKSHOP PROGRAM

Even though this was the first workshop in the series we were delighted to find that we had 22 very high quality submissions, of which 10 were accepted following peer review.

The Workshop started with an excellent and thought provoking keynote presentation by Professor Mark Harman which explored the relationships between Search Based Software Engineering, Probabilistic Reasoning and Machine Learning for Software Engineering [1]. The talk finished by setting out some future challenges in the area of AI for SE.

The first session of presentations grouped together two papers related to ontologies and the semantic web. This was followed by a session with presentations on runtime adaptation of components, adaptation for consistency of specifications and models, dynamic reverse engineering of formal models and machine learning through gestures. In the afternoon session of presentations speakers discussed topics related to machine learning, context-based search, machine learning for predicting mutation scores and software engineering repositories. The reader is invited to visit the RAISE 2012 website for further details (http://promisedata.org/raise/2012) and to read the full text of the papers in the Workshop Proceedings of the 34th International Conference on Software Engineering.

In the final session of the afternoon the Workshop was split into two Working Groups. The Groups were each given a different theme for their consideration:

Group 1. Missing data, big data and scalability

Group 2. Tools that benefit SE

At the end of the afternoon we reconvened in a plenary session and each Working Group reported on their findings.

Prior to the Workshop the Steering Committee had nominated papers for the Best Paper Award, and a decision was made by two unconflicted members of the Committee. At the end of the Workshop the Best Paper Award went to *Predicting Mutation Score Using Source Code and Test Suite Metrics* by Kevin Jalbert and Jeremy Bradbury of the Institute of Technology at the University of Ontario. This paper received the best reviews and presents a fascinating new technology.

CONCLUSIONS AND FUTURE DIRECTIONS

The workshop was very successful in bringing together researchers and practitioners with a wide range of research interests, and the resulting discussions were constructive and animated. We agreed that a lot of work remains to be done and disseminated through the publication of journal and conference papers, as well as through workshops such as RAISE. Indeed, the workshop was so successful that the American National Science Foundation is now funding a related event, Planning Future Directions in Artificial Intelligence and Software Engineering (AISE'12)[1], at FSE in November.

Selected papers from the workshop are currently under revision for a special issue which will appear in the Software Quality Journal[2] and we are currently planning to hold the 2nd International RAISE workshop at ICSE 2013 in San Francisco.

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REFERENCES

Mark Harman, *The Role of Artificial Intelligence in Software Engineering* (keynote paper), 1st International Workshop on Realizing Artificial Intelligence Synergies in Software Engineering (RAISE 2012), Zurich, Switzerland, June 5th, 2012

[1] http://www.sigsoft.org/fse20/aise.html

[2] http://www.springer.com/computer/swe/journal/11219