Predictor Models in Software Engineering (PROMISE)

1. Genearl Information

- **Principal Organizer:** Jelber Sayyad-Shirabad, University of Ottawa. He can be reached at jsayyad@site.uottawa.ca .
- **Workshop Co-chair:** Tim Menzies, Portland State University.
- **Length of the workshop:** One day.
- **Workshop Web Site:** http://www.site.uottawa.ca/promise

2. Themes and Goals

If we understand something well, we can make proper decisions about it. Software engineering is a decision intensive discipline. Do we really understand software engineering? Can we help software engineers by building models that make explicit the knowledge hidden in various software resources? Are those models "predictive"; i.e. can they be readily used to make a prediction regarding some aspect of the software, without requiring further expert interpretation? Can those models let us make better decisions? Can we assess those models? Are those models correct; e.g. do different researchers working on the same data arrive at similar models? Are there better, faster, cheaper ways to build those models? These are the questions addressed by this workshop.

The main theme of this workshop is this: "issues and challenges surrounding building predictive software models". Some progress has already been made in this field. Predictor models already exist for software development effort and fault injections as well as co-update or change predictors, software quality estimators and software escalation ("escalation" predictors try to guess what bug reports will require the attention of the senior experts). However, in most cases they have been presented in venues that cover a diverse set of interests[1]. The goal of PROMISE is to provide a forum where these researchers can meet to share data sets and to debate appropriate model generation and assessment methods, as well as other open research questions related to the field.

In the past, other researchers have addressed related issues; e.g. pattern extraction or visual data exploration or modeling. The PROSIM series (process simulation) focuses on business issues associated with constructing models. However, those process simulation models can take years to build and, so, are hard to replicate. Hence, it is hard to check if two different modeling techniques would generate better process models. Further, PROSIM simulations can produce an over-whelming amount of output and some other tools are required to automate the extraction of conclusions from those models. The MSR series (mining software repositories) has to cover a wide range of topics from information extractors, to visualization and presentation, to social network analysis and more. Very often, the information mined by MSR will require further manual analysis and interpretation by experts.

Note that none of the above work compares the decisions created from *different models* generated from the *same data*, or explored the *cost-effectiveness* of *different modeling techniques*. To achieve the promise of cost-effective, useful, predictive models we propose a workshop series where participants must contribute to a library of public domain data. A small such library exists[2] and PROMISE participants must either offer reports on that data, or offer results from a new data set (which can be added to the library). In this way, we will build up a set of repeatable experiments in creating predictive models for software engineering.

PROMISE 2005 requires that all case studies, experience reports, and presented results to be based on publicly available data. This will facilitate further validation, and comparison of research results, as well providing an opportunity for researchers to test and develop their hypothesis, algorithms, and ideas on a diverse set of software systems. We intend to post examples of such data sets on the workshop web page and encourage others to donate their data. The goals of the workshop are:

- To bring together researchers and practitioners from various backgrounds with interest in building predictive models with the aim of sharing experience and expertise.

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[1] One recent exception was the workshop on Predictive Software Models (PSM 2004)

[2] See http://scant.org/2/eg/arff. The ".arff" files *cm1, jm1, kc1, kc2, pm1* contain module defect data and the files *cocomo8117* and *cocomo81nasa17* containing software effort estimation data.

- To steer discussion and debate on various aspects and issues related to building predictive software models.
- To initiate the generation of a publicly available repository of software engineering data sets. We believe such a repository is essential to the maturity of the field of predictive software models and software engineering in general.
- To put together a list open research questions that are deemed essential by the researchers in the field

2,1. Topics of Interests: In line with the above mentioned goals the main topics of interest include:

- Applications of predictive models to software engineering data.
  - *What predictive models can be learned from software engineering data?*
- Strengths and limitations of predictive models.
- Empirical Model Evaluation Techniques.
  - *Are existing measures and techniques to evaluate and compare model goodness such as precision, recall, error rate, or ROC analysis adequate for evaluating software models, or are more specific measures geared towards software engineering domain needed?*
  - *Are certain measures better suited for certain classes of models?*
  - *What are the appropriate techniques to test the generated models e.g. hold-out, cross-validation, or chronological splitting?*
- Field evaluation challenges and techniques.
  - *What are the best practices in evaluating the generated software models in the real world?*
  - *What are the obstacles in the way of field testing a model in the real world?*
- Model shifting.(Concept drift).
  - *When does a model need to be replaced?*
  - *What are the best approaches to keeping the model in sync with the changes in the software?*
  - *What predictive models are more prone to model shift?*
- Building models using machine learning, statistical methods, and other methods.
  - *How do these techniques lend themselves to building predictive software models?*
  - *Are some methods better suited for certain class of models?*
  - *How do these algorithms scale up when handling very large amounts of data?*
  - *What are the challenges posed by the nature of data stored in software repositories that make certain techniques less effective than the others?*
- Cost benefit analysis of predictive software models
  - *Is cost-benefit analysis a necessary step in evaluating all predictive models?*
  - *What are the requirements for one to be able to perform a cost benefit analysis?*
  - *What particular costs and benefits should be considered for these models?*
- Benchmark systems and baseline models
  - *What publicly available software repositories or software measurement datasets form good benchmarks for researchers in the field?*
  - *What are best baseline models for different classes of predictive software models?*
- Case studies on building predictive software models

3. Solicitation, Participation and Selection Process

Solicitation is done through:
a) open solicitations, broadcast to standard newsgroups (e.g. comp.software-eng; seworld);
b) targeted focusing of researchers known to work in this area.

The workshop will accept potential position papers in the areas of interest mentioned above. The papers will be limited to a maximum of 5 pages. Any submission which includes empirical results that are not based on publicly accessible data sets will be rejected. Each paper will be reviewed by at least two members of the program committee in terms of their technical content and their relevance to the scope of the workshop. Workshop chairs will further review papers that have received widely different scores. We expect to have between 15 to 25 participants which will include the presenters and other interested researchers. Prior to the workshop the accepted papers will be posted on the workshop web page at: http://www.site.uottawa.ca/promise. This is to facilitate a more fruitful discussion during the workshop.

4. Workshop Format

PROMISE 2005 will be a one day workshop. We expect to have 6 to 10 presentation with additional discussion periods of approximately 25 minutes at the end of morning and afternoon presentations. The workshop will also include a panel session which will attempt to answer some of the open questions in the field or motivate future research directions. The intention is to have an interactive workshop allowing ample opportunity for the participants to present and discuss their point of views.

5. Organizers' Background

Jelber Sayyad Shirabad is a research associate with the Text Analysis and Machine Learning Group at the School of Information Technology and Engineering, University of Ottawa. His research interests include mining software repositories with special interest in learning relevance relations and building other predictive software models, and applied machine learning. He worked as a software designer on various business information systems prior to attending Carleton University in Ottawa to obtain his Master in Computer Science. He received his Ph.D. degree from University of Ottawa in 2003 where he researched the application of machine learning techniques in mining real world software repositories to model non-trivial relationships among software entities. He has been a reviewer for CSEET 2002, MSR 2004, and ECML 2004, and a member of program committee for STEP 2004. He organized the Workshop on Predictive Software Models (PSM 2004) which was co-located with ICSM 2004 (See http://www.site.uottawa.ca/psm2004). He is the contact person for this workshop and can be reached at jsayyad@site.uottawa.ca .

Tim Menzies: Ph.D. UNSW 1995; research associate professor, Computer Science, Portland State University. Organizer for workshops at ICSE 2000 (WISE), AAAI'99 (WISE), ASE'01 (MBRE). Published widely into model-based AI for software engineering (149 referred articles) including ICSE 2000, IEEE Trans SE'03, IEEE Computer'03, IEEE Trans KDE'03. Guest editor IEEE Intelligent Systems, IJHCS, RE. PC member HASE'04; ASE'02'03'04); IEEE Metrics'03, amongst others.

6. Call for Workshop Papers

Our call would be based on sections 2 and 3 (above) without the references to MSR and PROSIM

7. Proposed & Committed Program Committee Members

Victor Basili University of Maryland, US
Robert M. Bell AT&T Research, US
Gary Boetticher
University of Houston - Clear Lake
Lionel Briand Carleton University, Canada
Barry Boehm USC, US
Bojan Cukic WVU Lane, US

Jim Dabney, Titan Corporation
Martin S. Feather NASA JPL, US
Todd Graves Los Alamos National Labarotarty, US
Warren Harrison Portland State University, US
Timothy Lethbridge University of Ottawa, Canada

Tim Menzies Portland State University, US
Allen P. Nikora NASA JPL, US
Thomas J. Ostrand AT&T Research, US

Charles Pecheur NASA AMSE, US
Alessandra Russo Imperial College London , UK
Jelber Sayyad Shirabad,
University of Ottawa, Canada
Forrest Shull University of Maryland, US
Erik Stensrud Buskerud University Collage, Norway
Eleni Stroulia University of Alberta, Canada
Elaine J. Weyuker AT&T Research, US
Marvin Zelkowitz University of Maryland, US

8. Desired Workshop Dates

We would prefer to have our workshop before the main conference, either on May 16th or 17th. We request that our workshop not be on the same day as MSR. This is because some members of our PC and participants may also attend MSR and vice versa. Other related dates are:

Camera-ready copy of workshop summary	28 January 2005
Submission of workshop papers	21 February 2005
Notification of workshop papers	21 March 2005
Final proceedings ready for electronic publication	11 April 2005

9. Requested Equipment, Room Capacity and Organization

A room with 25 seats, and PC projection facilities