Prof. Jo Atlee
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October 30, 2024

To whom it may concern

I write to nominate Prof. Tim Menzies(IEEE member number 41349237, timm@ieee.org, +1-304-376-2859) of North Carolina State University, for the IEEE TCSE Lifetime Achievement Award. My proposed citation for that award would be:

> *For outstanding fundamental reseaerch contributions in SE analytics.*

In support of that award, this package contains:

1. A paragraph explaining why the nominee deserves the recommended award.
2. Letter from nominee, accepting the nomination.
3. My supporting letter.
4. Supporting letters from two referees.
5. The vitae of the applicant.

Sincerely yours,

Jo Atlee
Professor, University of Waterloo

1 A paragraph explaining why the nominee deserves the recommended award.

Decades before the IEEE (or the mining software repositories community) advocated for open science standards, Menzies was an early adopter of open science, always publishing his papers' scripts and data. By his example, Menzies **raised the bar in software analytics to a new level**. Decades before the IEEE (or the mining software repositories community) were advocating for open science standards, Menzies was an early adopter of open science, always publishing his papers' scripts and data. His methods were copied by hundreds of other researchers (e.g. his 2006 work[1] is a 20 top-most cited paper in SE in cites/year). By 2017, a fifth of the top Google Scholar Metrics papers (in IEEE Transactions on SE) used artifacts popularized and published by Menzies. Using this data, Menzies made many novel and important contributions. For SE applications, he showed that **applying standard AI approaches "out of the box" is not advisable for SE. Rather, AI should be customized for SE data and applications**. For example, Menzies' methods exploit "repetitions" in SE artifacts. Maintainable software contains repeated copies of structures familiar to many developers. Within similar regions, Menzies' methods sample sparingly before quickly moving on elsewhere. This approach finds better models, orders of magnitude faster than the prior state of the art [2][3][4][5]. For example: In 2012, when applied at NASA, Menzies' repetitions-aware technology found critical errors in the Space Shuttle's pad abort system. As part of this work on SE and AI, Menzies found that many SE data mining papers are not reproducible since their code and data was unavailable. To address that, Menzies developed PROMISE– a public repository of software data as well as the PROMISE conference series That data was used for decades, in thousands of papers, by other researchers (see the 1,273 citations to PROMISE repository[6], as of Oct'24). In recognition of his work, in 2017 the SE mining software repositories community awarded him the Foundational Contribution Award for "fundamental contributions in mining software repositories which helped others advance the state of the art."

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[1]Citations = 1891. Menzies, T., et al. (2006) "Data mining static code attributes to learn defect predictors". IEEE Trans SE 33(1), 2-13

[2]Citations = 426. Menzies, T. et al.. (2008) "Automated severity assessment of software defect reports." ICSME'08

[3]Citations = 856. T Menzies, et al.(2009) Relative value of cross-company and within-company data for defect prediction. Empirical Software Engineering 14, 540-578

[4]citations = 589. Menzies, T., et al. (2010) "Defect prediction from static code features." Automated Software Engineering 17: 375-407.

[5]Citations = 151. T. Menzies et al. (2020) "Finding Faster Configurations Using FLASH," in IEEE TSE, 46(7), pp. 794-811, 1

[6]https://scholar.google.com/citations?user=7htTUTgmLtUC&hl=en&authuser=2

2   A letter from nominees, accepting the nomination.

NC STATE UNIVERSITY

Department of Computer Science

Prof. Tim Menzies
timm@ieee.org
+1-304-376-2859

October 30, 2024

To the IEEE TCSE awards committee.

I write to accept this nomination for the TCSE lifetime achivement award.

For the committee's information, I assert my reseaerch career began in 1988 [7] (and I switched to SE in 1993 [8] [9]). Hence, I my career is longer than the 25 years required for this award.

Yours sincerely,

Tim Menzies

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[7]Tim Menzies, M. Dean, J. L. Black, J. F. Fleming: Combining Heuristics and Simulation Models: An Expert System for the Optimal Management of Pigs. AJCAI 1988: 48-61

[8]Tim Menzies, Julian M. Edwards, Kekwee Ng: The Mysterious Case of the Missing Reusable Class Libraries. TOOLS (12/9) 1993: 421-427.

[9]Tim Menzies, Steve M. Easterbrook, Bashar Nuseibeh, Sam Waugh: An Empirical Investigation of Multiple Viewpoint Reasoning in Requirements Engineering. IEEE RE 1999.

3 Support letter from nominator.

Prof. Jo Atlee
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October 30, 2024

To the IEEE TCSE awards committee.

I write to nominate Prof. Tim Menzies(IEEE member number 41349237) for the IEEE TCSE Lifetime Achievement Award. My proposed citation for that award is:

> *For outstanding fundamental reseaerch contributions in SE analytics.*

In a research career dating back 1987 [10], Menzies was (and continues to be) a pioneer and early adopter of using innovative AI methods for SE. In recognition of his work, in 2017 the SE mining software repositories community awarded him the Foundational Contribution Award for "fundamental contributions in mining software repositories which helped others advance the state of the art." Menzies was one of the first SE researchers to report that data miners can find very strong signals within SE project data:

- Menzies was one of the first to find defect predictors demonstrably better than humans (his 2006 IEEE TSE paper on that topic s a 20 top-most cited paper in SE in cites/year and 1891 total cites).
- Menzies was one of the first to apply Pareto reasoning for trading-off software requirements [11].
  - Using novel mulit-objectve optimizers based on rule-based data mining algorithms, Menzies found he could out-perform the state-of-the-art to find better optimizations, in orders of magnitude less time [12],
  - When applied at NASA in 2012, these methods found critical errors in the Space Shuttle pad abort system.
- In 2019, the ICSME conference gave Menzies' 2008 paper a "most influential" award. That text mining work defined a cheap "occasional second opinion" policy for finding more bugs in code comments, quicker.
- Menzies was the first to demonstrate large scale transfer learning of models between SE projects in different continents (see his 2009 EMSE paper).
- Menzies' research has been applied commercially around the world.
  - Turkish researchers found that when commercial teams restricted code inspections to 25 percent of the files identified using Menzies' algorithms, they found 88% of the existing code defects in software.
  - Those defect prediction methods have been commercialized and deployed at Chevron, Northrop Grumman, LogLogic, Inc., and Compagnie Financiére Alcatel.

Decades before the ACM (or the mining software repositories community) advocated for open science standards, Menzies was an early adopter of open science, always publishing his papers' scripts and data. Accordingly:

- His methods have been widely cited. For example, his IEEE TSE 2006 paper currently has 1891 citations.
- His methods have been widely copied. By 2017, a fifth of the top Google Scholar Metrics papers (in IEEE Transactions on SE) used artifacts popularized and published by Menzies
- As part of this work on SE + AI, Menzies found that many SE data mining papers are not reproducible since their code and data was unavailable. To address that, Menzies developed PROMISE– a public repository of software

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[10] A micro-computer, rule-based prolog expert-system for process control in a petrochemical plant T Menzies, B Markey Proceedings of the Third Australian Conference on Expert Systems, May 13-15, 1987.

[11] Citations = 119. Menzies T. et.al . (2002) "Converging on optimal attainment of requirements." RE'02

[12] Citations = 151. T. Menzies and V. Nair et al. (2020) "Finding Faster Configurations Using FLASH," in IEEE TSE, 46(7), pp. 794-811, 1

data as well as the PROMISE conference series That data was used for decades, in thousands of papers, by other researchers (see the 1,273 citations to PROMISE repository[13] , as of July'23).

Menzies' research teaches us that SE is subtly different to many of the problems students in the AI community, Hence, as shown in many of his papers, it is best to customize AI before applying it to SE. For example:

- Optimization methods for numerical systems have been used widely. But applying these methods is often ineffective in complex software systems where each "if" statement divides the software into regions with different properties. Fortunately, many of those regions contain repeated structures. Menzies' nonparametric optimizers exploit that repetition (by learning regions of similarity and knowing when to jump to other regions) (see his RE'02 paper).
- In this way, Menzies' optimizers can quickly learn how to make code run quicker, make web servers handle more traffic, and compile programs faster (see his 2020 IEEE TSE article) (even for systems with millions of configuration options).

To say the least, his work is highly cited. Garousi and Fernandes[14] list Menzies' IEEE 2006 Transactions on Software Engineering paper as one of the top 100 most-cited SE papers of all time:

- From 2009 to 2019, this paper had the most cites/year of any IEEE Transactions on Software Engineering paper (and for SE overall, it is a top-20 most cites/year paper).
- At the time of this writing (2023), measured in terms of citations/year, that 2006 paper ranks number two (in Google Scholar metrics for Software Systems for the TSE journal).

Menzies has been acknowledged by our community as follows:

- an IEEE Fellow award (2018);
- an ASE Fellow award (2023);
- a Foundational Contribution Award from the Mining Software repositories community (2017);
- an award from NASA headquarters from NASA's Chief of Mission Assurance (2005)
- distinguished paper awards at the top conferences in his field (FSE'21, ICSE'19, ICMSE'19);
- awards for his work on conference and journal reviewing (2011-2018)
- Appointment, editor in chief, Automated Software Engineering journal.

Details follow:

- 2023: appointed Automated Software Engineering Fellow
- 2021: Appointment, editor in chief, Automated Software Engineering journal.
- 2021: distinguished (best) paper award, FSE;
- 2019: distinguished (best) paper award, International Conference on Software Engineering.
- 2019: a "most influential" award for "Automated severity assessment of software defect reports", ICSME'09
- 2018: appointed IEEE Fellow
- 2017: MSR (Mining Software Repositories) Foundational Contribution Award in "Recognition of fundamental contributions in the field of data mining software repositories which helped others advance the state of the art."
- 2011-2018: distinguished reviewer, ACM TOSEM (only person to be awarded this for each year 2011 to 2018).
- 2005: As science chair at a NASA facility, Menzies received a commendation award from NASA's Chief of Safety and Mission Assurance (and former Space Shuttle Pilot) Byran O'Connor saying:

> "...A great researcher in his own right, ...Tim has raised the bar on quality and level of work [expected] from our researchers."

Sincerely yours,

Jo Atlee
Professor, University of Waterloo

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[13] https://scholar.google.com/citations?user=7htTUTgmLtUC&hl=en&authuser=2
[14] https://www.sciencedirect.com/science/article/pii/S0950584915001871

4   a. Referee letter #1.

October 21, 2024

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RE: Endorsement of Dr. Tim Menzies' Nomination

Dear Member of the Adjudication Committee,

I strongly support the nomination of Dr. Menzies who has been instrumental in shaping the research agenda of Software Engineering (SE). His influence extends beyond his ground-breaking research, which continues to have a profound impact on both industry and academia, and through his unwavering spearheading of vital initiatives within our community.

In today's era, marked by the ubiquity of platforms like GitHub, the widespread use of data analytics, it's easy to forget that just two decades ago, obtaining project data and applying data science approaches were rare and the domain of highly specialized experts. However, in 2005, Dr. Menzies embarked on a mission to gather data for the PROMISE repository. He reached out to potential data providers and meticulously scanned the tables of contents of conference proceedings. This collaborative effort, initially undertaken by himself then his students, led to the establishment of the PROMISE repository. Today, this repository is home to a vast collection of shareable data covering a range of domains, including defect prediction, effort estimation, and requirements models. The PROMISE repository stands as a monumental achievement that has played a pivotal role in shaping the landscape of defect prediction and software effort estimation, providing invaluable resources and accelerating the progress of knowledge.

In contrast to those who treat machine learning as a black-box tool, Dr. Menzies and his team are dedicated to a hands-on approach, deeply understanding the domain and problems before carefully selecting from a range of algorithms, rather than resorting to off-the-shelf solutions. For example, in his 2017 FSE paper, "Easy over hard: a case study on deep learning," Dr. Menzies raised awareness about the risks of using machine learning as a black-box tool and advocated the exploration of simpler, faster techniques before resorting to deep learning methods in SE tasks.

Dr. Menzies is distinguished as one of the 15 most active IEEE fellows in the SE field. He has co-authored many highly cited papers. Recent assessments by Elsevier position him as a leading figure in SE research over the past decade and the 11th most active researcher in the field based on high-impact journal publications. Dr. Menzies' profound impact on the mining software repositories field was honored with the MSR Foundational Contribution Award. One of his original papers on the PROMISE repository is now among the 100 most cited papers in the history of SE.

I wholeheartedly endorse him for this award. His research and commitment to open, collaborative, and constructive research evaluation is unparalleled, has had an enormously positive impact on SE.

Best regards,

Ahmed E. Hassan, PhD, **ahmed@cs.queensu.ca**
Mustafa Prize Laureate, Fellow of IEEE, ACM, AAIA and NSERC Stacie
ACM SIGSOFT Influential Educator, IEEE TCSE Distinguished Educator
Member of the New College of the Royal Society of Canada
Canada Research Chair in Software Analytics
School of Computing, Queen's University, Kingston Ontario, Canada

P R E P A R I N G   L E A D E R S   A N D   C I T I Z E N S   F O R   A   G L O B A L   S O C I E T Y

5   b. Referee letter #2.

UCDAVIS
COMPUTER SCIENCE

Oct 23, 2023

Dear Awards Committee,

It's my pleasure to write in support of Prof. Menzies' (Tim's) nomination for the ACM SIGSOFT Outstanding Research Award. I have known Tim for a while; have never collaborated with him directly; I hope the occasion arises in the future! My support for this nomination hinges on several key contributions that Tim has made over the years. As I understand this award, it is intended to recognize durable and broad influence on the field; so I will describe below several broadly influential aspects of Tim's work.

First, and most important, and broadly influential, is Tim's exemplary work, and continued advocacy, relating to experimental and evaluative rigour in research directed at improving software development practice. Early experimental work in PL (and to a lesser extent in SE) suffered from the "anecdata" syndrome… some nice examples would get your theories published in POPL (and friends), or sometimes even ICSE/FSE/ASE, but such works came with no guarantees of external validity. Starting with his work on defect prediction, and then with the PROMISE repository, it's fair to say that Tim was a guiding light leading SE into much greater statistical rigour. His early work and advocacy on defect prediction was required reading for my students, while I worked in the Empirical Software Engineering area.

Second, Tim has made important and noteworthy contributions to a deeper understanding of the variability in software engineering data. Just as cultural and demographic data shows some variance based on the specific demographic under study, Tim has shown that there are a great many locally specific variations in software engineering data that can positively and negatively affect performance of models trained on this data. This is an important conceptual/experimental contribution, has been highly influential, and is a key element of Tim's exceptional (for our field) citation performance (h-index of 70, and over 21,000 citations).

To the best of my knowledge, the candidate I am endorsing has not committed any action that violates the ACM Code of Ethics and ACM's Core Values.

Prem Devanbu, Research Professsor, UC Davis

6 Vitae of nominee.