Tushar Sharma

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Halifax, Canada

Education

2015-2019 **PhD in Computer Science**, funded by SENECA — a Marie Skłodowska-Curie Action, from Athens University of Economics & Business, Athens, Greece.
Thesis: Extending maintainability analysis beyond code smells
Supervisor: Prof. Diomidis Spinellis

2006-2008 **M.S. in Computer Science & Engg.** from Indian Institute of Technology-Madras, Chennai, India
Thesis: Design structures as a meta-abstraction for object-oriented software development
Supervisor: Prof. Janakiram Dharanipragada

2001-2004 **B.E. in Computer Science & Engg.** from Rajasthan University, Jaipur, India

Work Experience

Dalhousie University
Halifax, Canada

Assistant Professor (Sept 2021-Present)

Focusing on solving software engineering problems by combining traditional approaches with machine learning and natural language processing.

Siemens Corporate Technology
Charlotte, USA

Research Scientist (Oct 2019-Aug 2021)

Bridged software engineering with production engineering. Enriched production engineering usecases by software engineering advancements and machine learning.

Siemens Corporate Technology
Bangalore, India

Technical Expert (May 2008-Oct 2015)

- **Consult:** Evangelized/Coached the topics related to software design and refactoring. Provided services to development teams as an architect/consultant. Carried out extensive code/design reviews.
- **Research:** Proposed a few research projects, defined scope, worked as a key contributor. Contributed to a few research papers as author and presented them in reputed conferences. Mentored interns. Developed ideas relevant to the business and filed seven patent applications.
- **Training:** Prepared training material and deliver training sessions for topics related to Software design and architecture, refactoring, Testability, Maintainability, and tools.

External Funding

- DARPA AMP
  - **Title:** Making Intelligible Decompiled Source by Imposing Homomorphic Transforms (MINDSIGHT)
  - **Role:** PI
  - **Duration:** Mar 2021 - Aug 2021
  - **Funding amount:** $6.5M (four year project)
  - **Partners:** Siemens (prime), JHU/APL, BAE systems, UC-Irvine
- NSF I-Corps grant
  - **Title:** Customer and requirements discovery for an automated bot-based refactoring approach
  - **Role:** Industry mentor
  - **Year:** 2020-21
  - **Funding amount:** $50K
- Experience in establishing connection to funding agency program managers. Submitted proposals targeting funding from USA government funding agencies (such as DARPA I2O, DoE, NSF, MxD, and IARPA) as PI, co-PI, and key personnel. Some key submitted proposals are DARPA V-SPELLS (as PI), MxD Resilient Supply Chain (as PI), and IARPA COVID Knowledge discovery and segregation (as co-PI). This exposure has equipped me with insights, technical and non-technical, that will be helpful in

the context of my new responsibilities.
- During Ph.D., participated in multi-partner funding proposal writing for two H2020 European funding calls. One of the proposal was accepted for funding (total project budget € 4.5 million).

Teaching Experience

- Delivered tutorials for three years for "Software Engineering in Practice" course at AUEB. Topics that I covered in this course are version control systems (git and GitHub), unit testing, using IDEs effectively, debugging techniques, writing maintainable code, design patterns, Maven, and introduction to DevOps.
- Numerous speaking engagements at many international developer as well as academic conferences. The topics of the talks include technical debt, code quality and maintainability, craftsmanship, various flavors of code smells, and detecting smells using deterministic and machine learning mechanisms.
- Delivered many hands-on 1- and 2-day workshops on TDD, smells and refactoring, and technical debt. These sessions include concept/theory illustration by me, exercises attempted by the participants, and resolving their doubts.

Samples of teaching material

- **Tutorials** – Detecting and managing code smells: Research and Practice, Refactoring for software design smells
- **Class room lecture** – Version control systems, Writing maintainable code, Design patterns

Conference presentations

- Smelly relations: Measuring and understanding database schema quality
- Smelling source code using deep learning
- Does your architecture smell

Videos

- FOSDEM 2017 – Does your configuration code smell?
- FOSDEM 2019 – Smelling source code using deep learning

Publications

Peer-reviewed Journal Articles

- Tushar Sharma, Vasiliki Efastathiou, Panos Louridas, and Diomidis Spinellis, "Code Smell Detection Using Deep Learning and Transfer Learning", Journal of Systems and Software, Accepted in Mar 2021.
- Tushar Sharma, Paramvir Singh, Diomidis Spinellis. "An empirical investigation on the relationship between design and architecture smells", Empirical Software Engineering 25, 4020–4068 (2020). https://doi.org/10.1007/s10664-020-09847-2.
- Tushar Sharma, Diomidis Spinellis. "A survey on software smells", Journal of Systems and Software, Volume 138, 2018, Pages 158-173, ISSN 0164-1212, https://doi.org/10.1016/j.jss.2017.12.034.
- Tushar Sharma, Girish Suryanarayana, Ganesh Samarthyam, "Challenges to and Solutions for Refactoring Adoption: An Industrial Perspective", IEEE Software, Nov/Dec 2015.
- Girish Suryanarayana, Tushar Sharma, Ganesh Samarthyam, "Software Process versus Design Quality: Tug of War?" IEEE Software, July/August 2015.
- S G Ganesh; Tushar Sharma; Girish Suryanarayana, "Towards a Principle-based Classification of Structural Design Smells," In Journal of Object Technology, vol. 12, no. 2, 2013, pages 1:1–29. doi:10.5381/jot.2013.12.2.a1.*
- Tushar Sharma; and D Janakiram, "Inferring design patterns using the ReP graph", Journal of Object Technology, Volume 9, no. 5 (September 2010), pp. 95-110, doi:10.5381/jot.2010.9.5.a5.

Books

- Ganesh SG, Hari Kiran, Tushar Sharma (2015). Oracle Certified Professional Java SE 8 Programmer Exam 1Z0-809. 1st ed. Apress.
- Girish Suryanarayana, Ganesh SG, Tushar Sharma (2014). Refactoring for Software Design Smells: Managing Technical Debt. 1st ed. Morgan Kaufmann.
- Ganesh SG, Tushar Sharma (2013). Oracle Certified Professional Java SE 7 Programmer Exams 1Z0-804 and 1Z0-805: A Comprehensive OCPJP 7 Certification Guide. 1st ed. Apress.

Conference Publications

- Alexandra-Maria Chaniotaki, Tushar Sharma, “Architecture Smells and Pareto Principle: A Preliminary Empirical Exploration”, Accepted in MSR (Research track) 2021.
- Tushar Sharma, Marouane Kessentini, “QScored: A Large Dataset of Code Smells and Quality Metrics”, Accepted in MSR (Data showcase track) 2021.
- R. Almhana, T. Ferreira, M. Kessentini and T. Sharma, ”Understanding and Characterizing Changes in Bugs Priority: The Practitioners’ Perceptive,” 2020 IEEE 20th International Working Conference on Source Code Analysis and Manipulation (SCAM), Adelaide, Australia, 2020, pp. 87-97, doi: 10.1109/SCAM51674.2020.00015.
- Vishwajeet Thakur, Marouane Kessentini and Tushar Sharma, ”QScored: An Open Platform for Code Quality Ranking and Visualization,” in 2020 IEEE International Conference on Software Maintenance and Evolution (ICSME), Adelaide, Australia, 2020 pp. 818-821. doi: 10.1109/ICSME46990.2020.00101
- Tushar Sharma, “How Deep is the Mud: Fathoming Architecture Technical Debt Using Designite,” 2019 IEEE/ACM International Conference on Technical Debt (TechDebt), Montreal, QC, Canada, 2019, pp. 59-60, doi: 10.1109/TechDebt.2019.00018.
- Tushar Sharma, Marios Fragkoulis, Stamatia Rizou, Magiel Bruntink, and Diomidis Spinellis. 2018. Smelly relations: measuring and understanding database schema quality. In Proceedings of the 40th International Conference on Software Engineering: Software Engineering in Practice (ICSE-SEIP ’18). ACM. 55-64. DOI: https://doi.org/10.1145/3183519.3183529.
- Tushar Sharma. Detecting and managing code smells: research and practice. In Proceedings of the 40th International Conference on Software Engineering: Companion Proceeedings (ICSE ’18). ACM. 546-547. DOI: https://doi.org/10.1145/3183440.3183460.
- Tushar Sharma, Marios Fragkoulis, and Diomidis Spinellis. “House of Cards: Code Smells in Open-Source C# Repositories” in ACM/IEEE International Symposium on Empirical Software Engineering and Measurement (ESEM). 424-429. 10.1109/ESEM.2017.57.
- Maria Kechagia, Tushar Sharma, and Diomidis Spinellis, “Towards a Context Dependent Java Exceptions Hierarchy” in 39th International Conference on Software Engineering (ICSE) 2017 (Poster track).
- Tushar Sharma, Girish Suryanarayana, “Augur: Incorporating Hidden Dependencies and Variable Granularity in Change Impact Analysis” in the 16th IEEE International Working Conference on Source Code Analysis and Manipulation (SCAM) 2016.
- Tushar Sharma, Marios Fragkoulis, and Diomidis Spinellis, “Does your configuration code smell?” in 13th international conference on Mining Software Repositories (MSR), 2016.
- Ganesh SG; Tushar Sharma; Girish Suryanarayana, “Software Design Quality in Practice: Refactoring for Design Smells,” tutorial in International Conference on Software Engineering (ICSE) 2014.
- Tushar Sharma; PVR Murthy, “ESA: The Exclusive Similarity Algorithm for identifying Extract-class Refactoring Candidates Automatically,” in Indian Software Engineering Conference (ISEC) 2014.
- SG Ganesh; Girish Suryanarayana; Tushar Sharma; and Shrinath Gupta, “MIDAS: A Design Quality Assessment Method for Industrial Software,” in International Conference on Software Engineering (ICSE) 2013, SEIP track.
- Murthy, P.V.R.; Kumar, V.S.; Sharma, Tushar; Kiron Rao; “Quality Model Driven Dynamic Analysis,” Computer Software and Applications Conference (COMPSAC), 2011 IEEE 35th Annual, pp.360-365, 18-22 July 2011, doi: 10.1109/COMPSAC.2011.54.

Workshop papers

- Tushar Sharma, “Designite: A Customizable Tool for Smell Mining in C# Repositories” in SATToSE, Madrid, 7-9 June 2017.
- Ganesh Samarthyam, Girish Suryanarayana, Tushar Sharma, “Refactoring for Software Architecture Smells” in the 1st International Workshop on Refactoring (IWoR@ASE) 2016.
- Tushar Sharma, Pratibha Mishra, and Rohit Tiwari, “Designite — A Software Design Quality Assessment Tool”, in First International Workshop on Bringing Architecture Design Thinking into Developers’ Daily Activities (Bridge’16), 2016.
- Tushar Sharma, “Identifying extract-method refactoring candidates automatically,” In Proceedings of the Fifth Workshop on Refactoring Tools (WRT ’12). ACM, New York, NY, USA, 50-53. DOI=10.1145/2328876.2328883.
- Tushar Sharma, “Quantifying Quality of Software Design to Measure the Impact of Refactoring,” IEEE 36th Annual Computer Software and Applications Conference Workshops (COMPSACW), 2012, pp.266–271, 16-20 July 2012 doi: 10.1109/COMPSACW.2012.56.

Patent Applications

- Tushar Sharma, and Shrinath Gupta, "Achieving optimal refactoring order using Local-maxima Impact Factor Ordering algorithm", patent to be filed in 2014.
- Tushar Sharma, and PVR Murthy, "Exclusive similarity algorithm to identify extract class refactoring automatically", patent filed in 2013 nationally and internationally.
- Tushar Sharma, and Girish Suryanarayana, "A method for annotating design diagrams to indicate smells in software design", patent filed in 2012 nationally.
- Tushar Sharma, Shrinath Gupta, "An automated context-aware approach to infer suitable refactorings to address code-clones", patent filed in 2012 nationally.
- Tushar Sharma, "Identifying extract method refactoring candidates automatically" patent filed in 2011 nationally and internationally.
- Tushar Sharma, "Automated quality estimation for software design" patent filed in 2011 nationally and internationally.
- Tushar Sharma, and PVR Murthy, "Design intent validator framework" patent filed in 2011 nationally and internationally.
- Tushar Sharma, and PVR Murthy, "Workflow Based Refactoring" patent filed in 2010 nationally and internationally.

Book/Article Reviews

- Decoding the representation of code in the brain: an fMRI study of code review and expertise, ACM Computing Reviews, CR145600 (1712-0810), Oct 2017
- Website hosting and migration with Amazon Web Services: a practical guide to moving your website to AWS, ACM Computing Reviews, CR145975 (1807-0369), April 2018
- Building web applications with Visual Studio 2017: using .NET core and modern JavaScript frameworks, ACM Computing Reviews, CR146019 (1807-0368), May 2018
- Introduction to deep learning using R: a step-by-step guide to learning and implementing deep learning models using R, ACM Computing Reviews, June 2018
- Coders: The Making of a New Tribe and the Remaking of the World, ACM Computing Reviews, Sept 2020.
- Natural Language Processing for Social Media, ACM Computing Reviews, Oct 2020.

Mentoring Interns

- **Vishvajeet Thakur** (Mar-Aug 2020), "QScored platform for code quality ranking and visualization"
- **Bhavishya Kumar** (Jun-Sept 2019), "IntelliJ IDEA plugin for Designite"
- **Manuj Subhankar** (Jun-Dec 2015), "Code smell identification for Java"
- **Kishan Kesavan** (Jan-Jul 2015) "Augur — Change impact analysis tool"
- **Rohit Tiwari** (May-Sept 2014), "Code clone duplication detector"
- **Nachiketa Adhikari** (Jun-Dec 2012) "Scout — A refactoring candidate identification tool"
- **Srikrishna Jagarlapudi** (Jun-Dec 2012) "Scout — A refactoring candidate identification tool"
- **Madhuri Atluri** (Jan-Jun 2012) "Extract class refactoring candidate identification for Java"
- **Girish Sayana** (Jan-Jun 2012) "Extract method refactoring candidate identification for Java"
- **Niranjani S.** (Jan-May 2011) "Design intent validator framework"

Invited Talks and Tutorials

The following list does not include paper presentations at academic conferences. Videos of my some selected talks can be found on my blog; my slide-decks can be found online.

- Talk – "Smelling source code using deep learning" at FOSDEM on Feb 3, 2019 in Brussels, Belgium.
- Tutorial - "Understanding and managing technical debt" at Citrix, Bangalore on Nov 12, 2018.
- Talk - "How deep is the mud: Identifying technical debt using Eclipse JDT" at Eclipse Day India on Sept 22, 2018
- Tutorial - "Hands on TDD" at Microsoft development center, Hyderabad on Aug 27, 2018.
- Talk - "Does Your Architecture Smell?" at Technical Agility Conference, Bangalore on July 10, 2018.
- Talk – "Understanding and Improving Software Quality" at Singular Logic on May 11, 2018 in Athens, Greece.
- Talk - "What I Learned about Code Smells from Studying 700 Studies" at Programming Language seminar at University of Athens on Dec 29, 2017.
- Talk – "Understanding smells for higher software quality" at Singular Logic on Sept 5, 2017 in Athens, Greece.
- Talk – "Does your configuration code smell?" at FOSDEM on Feb 4, 2017 in Brussels, Belgium.
- Talk – "Does your design smell?" at the ASAS on September 28, 2016, in Arnhem, The Netherlands.
- Tutorial – "Achieving Design Agility by Refactoring Design Smells" at Agile in the city conference on Jun 17, 2016, in London.
- Talk – "Does your configuration code smell?" at DevOps Pro conference on May 26, 2016, in Vilnius, Lithuania.
- Workshop – "Refactoring for software design smells" organized by IEEE CS Bangalore chapter on Jun 27, 2015 in Bangalore.

- Talk – “Pragmatic Technical Debt Management” in Great Indian Developer Summit (GIDS) on Apr 21, 2015 in Bangalore, India.
- Tutorial – “Achieving design agility by refactoring design smells” in DevWeek Conference on Mar 27, 2015 in London.
- Talk – “Does you Design Smell?” in DevWeek Conference on Mar 26, 2015 in London.
- Tutorial – “Applying design principles in practice” in ISEC 2015 on Feb 18, 2015 in Bangalore, India.
- Talk – “Does your Design Smell?” in Agile Pune on Nov 22, 2014 in Pune, India.
- Tutorial – “Software Design Quality in Practice: Refactoring for Design Smells” in ICSE 2014 on May, 2014 in Hyderabad, India.

Service

Journal Reviewer	- Reviewer for Transactions on Software Engineering (TSE), Journal of Systems and Software (JSS), Information and Software Technology (IST), IET Software, and Software Quality Journal. - Reviewer for ACM Computing Reviews
Program committee member	- Program committee member for TechDebt 2021, SANER 2021, ICPC 2021, ISEC 2021, SATToSE 2020, MSR Mining Challenge 2020, ISEC 2020, Software Analytics: Mining Software Open Datasets and Repositories 2020, MSR Data Showcase track 2018 - Steering committee member for SATToSE - Sub-reviewer for reputed conferences such as ICSE SEIP, ICPC, OSS, TDA, MSR, and ESEM
Workshop organization	- Organizer — SATToSE 2018 - Local publicity chair — IEEE Software Expert Summit 2014.

Released Software

QScored 2020

http://www.qscored.com

QScored is an open platform for code quality ranking and visualization. QScored computes code quality scores for all projects in its corpus and provides a quality ranking to individual projects. It facilitates visualization of analyzed results and interactively shows various code quality aspects for each analyzed project.

Designite 2014 - 2019

http://www.designite-tools.com

Designite is a software design quality assessment tool. It analyzes C# codebase and detects a comprehensive set of architecture, design, and implementation smells. It has been used by many software developers as well as software engineering students/researchers worldwide.

Puppeteer 2016

https://github.com/tushartushar/puppeteer

Puppeteer is an open-source design configuration smell detection tool for Puppet code. It detects 11 design configuration smells.

DesigniteJava 2018-2019

https://github.com/tushartushar/DesigniteJava

DesigniteJava is a software design quality assessment tool for Java. It detects 17 design smells and 10 commonly occurring implementation smells. It also computes various object-oriented code metrics.

DbDeo 2017

https://github.com/tushartushar/DbDeo

DbDeo is a tool that detects smells in database code. Currently, it detects 10 database schema smells.

References

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