

Lecture

Metamorphic Testing

Some Successful Industrial Applications

1

Google

In 2018, Google acquired GraphicsFuz, a spinoff firm from Imperial College London

GraphicsFuzz uses MT as its main technique to test graphics drivers

2

Metamorphic Testing of Android Graphics Drivers

<https://www.youtube.com/watch?v=dkxDLi5cXZs>

3

Facebook

Web-Enabled Simulation (WES) platform to simulate the behaviours of a community of users

Testing Web Enabled Simulation at Scale
Using Metamorphic Testing

<https://www.youtube.com/watch?v=pNKqyn-90Ig>

4

Accenture

A patent - Verifying Machine Learning through Metamorphic Testing

“needs only a few test cases (or even just one) to identify bugs in ML applications, thereby reducing the cost of testing significantly”

5

Adobe System

- Metamorphic Testing for Adobe Data Analytics Software
- Adobe Analytic Data Collection JavaScript Library

6

Baidu

- Baidu has a patent on MT
- Apollo Self-Driving System of Baidu
(Reference: Z. Q. Zhou and L. Sun.
Metamorphic Testing of Driverless Cars.
Communications of ACM, 62(3):61-67,
2019).

7

National Aeronautics and Space Administration (NASA)

Metamorphic Model-Based Testing Applied
on NASA DAT – an Experience Report

See reference paper [130] in [TSE] which
appears in the Reference List of this slide

8

Oak Ridge National Laboratory (US Department of Energy)

MT - epidemiological model simulation
system

See reference papers [112] and [113] in [TSE]
which appears in the Reference List of this
slide

9

US National Institute of Standards and Technology (NIST)

- cryptographic hash function
- Obfuscators

See reference paper [20] in [ACM] which
appears in the Reference List of this slide

10

References:

- [TSE] – S. Segura, G. Fraser, A. B/ Sanchez and A. Ruiz-Cortes, A Survey on Metamorphic Testing, *IEEE Transactions on Software Engineering*, Vol. 42(9), 805-824, 2016.
- [ACM] - T. Y. Chen, F.-C. Kuo, H. Liu, P. L. Poon, D. Towey, T. H. Tse and Z. Q. Zhou, Metamorphic Testing: A Review of Challenges and Opportunities, *ACM Computing Surveys*, Vol. 51(1), 4:1-4:27, 2018.

11

Summary

12