

Pictures at QRS 2015

Day 1 (August 3)











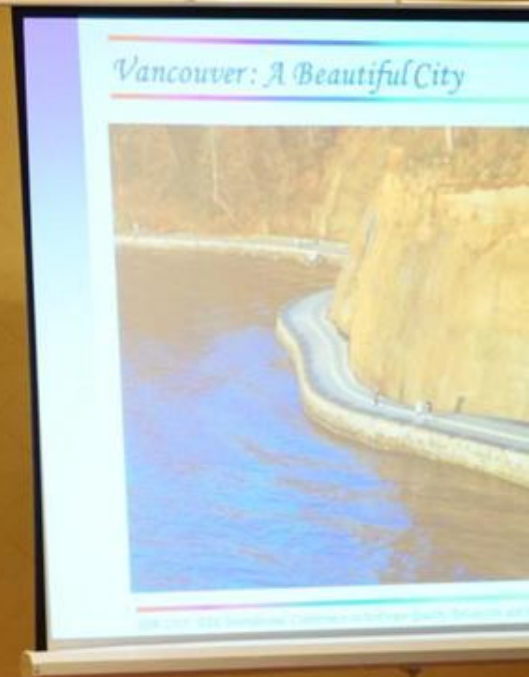


Marriott
VANCOUVER AIRPORT











Marriott
VANCOUVER AIRPORT



Marriott
VANCOUVER AIRPORT



Marriott
VANCOUVER AIRPORT

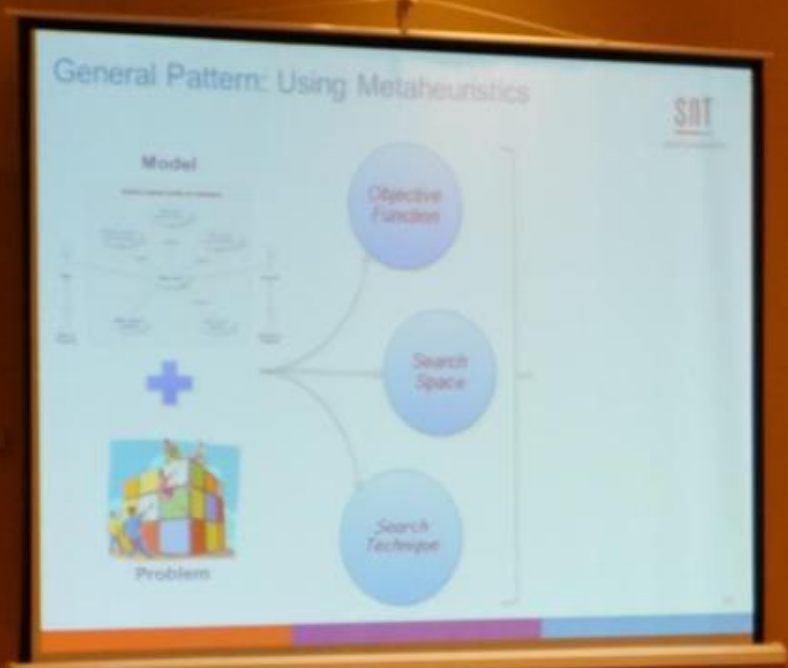














Active Software Testing and Verification
Through Heuristic Search and Optimization

Speaker:
Heuristic Search and Verification, Heuristic Search and Optimization
Heuristic Search and Optimization

Dr. Heuristic Search and Optimization



EXIT



PURDUE
UNIVERSITY

Department of Computer Science

Insider Threat Motivations and Challenges

- Mission-critical information = High-value target
- Threatens US and other Government organizations and large corporations
- Probability is low, but impact is severe
- Types of threat posed by malicious insiders
 - Denial of service
 - Data leakage and compromise of confidentiality
 - Compromise of integrity
- High complexity of problem
 - Increase in sharing of information, knowledge
 - Increased availability of corporate knowledge online
 - "Low and Slow" nature of malicious insiders





FINANCIAL **STRICT & FLEXIBLE POLICIES**

- The length of an investment term depends on the risk profile of the investor.
- The longer the investment term, the more flexible the investment policy should be.
- The shorter the investment term, the more strict the investment policy should be.

Key Points:

- The longer the investment term, the more flexible the investment policy should be.
- The shorter the investment term, the more strict the investment policy should be.
- The longer the investment term, the more flexible the investment policy should be.
- The shorter the investment term, the more strict the investment policy should be.



Praxis **Strict & Flexible Policies**

- The length of an election campaign is determined by the state & the length of the election process is determined by the state.
- The election process is determined by the state & the length of the election process is determined by the state.
- The election process is determined by the state & the length of the election process is determined by the state.

Key Points:

- The length of an election campaign is determined by the state & the length of the election process is determined by the state.
- The election process is determined by the state & the length of the election process is determined by the state.
- The election process is determined by the state & the length of the election process is determined by the state.







Ques







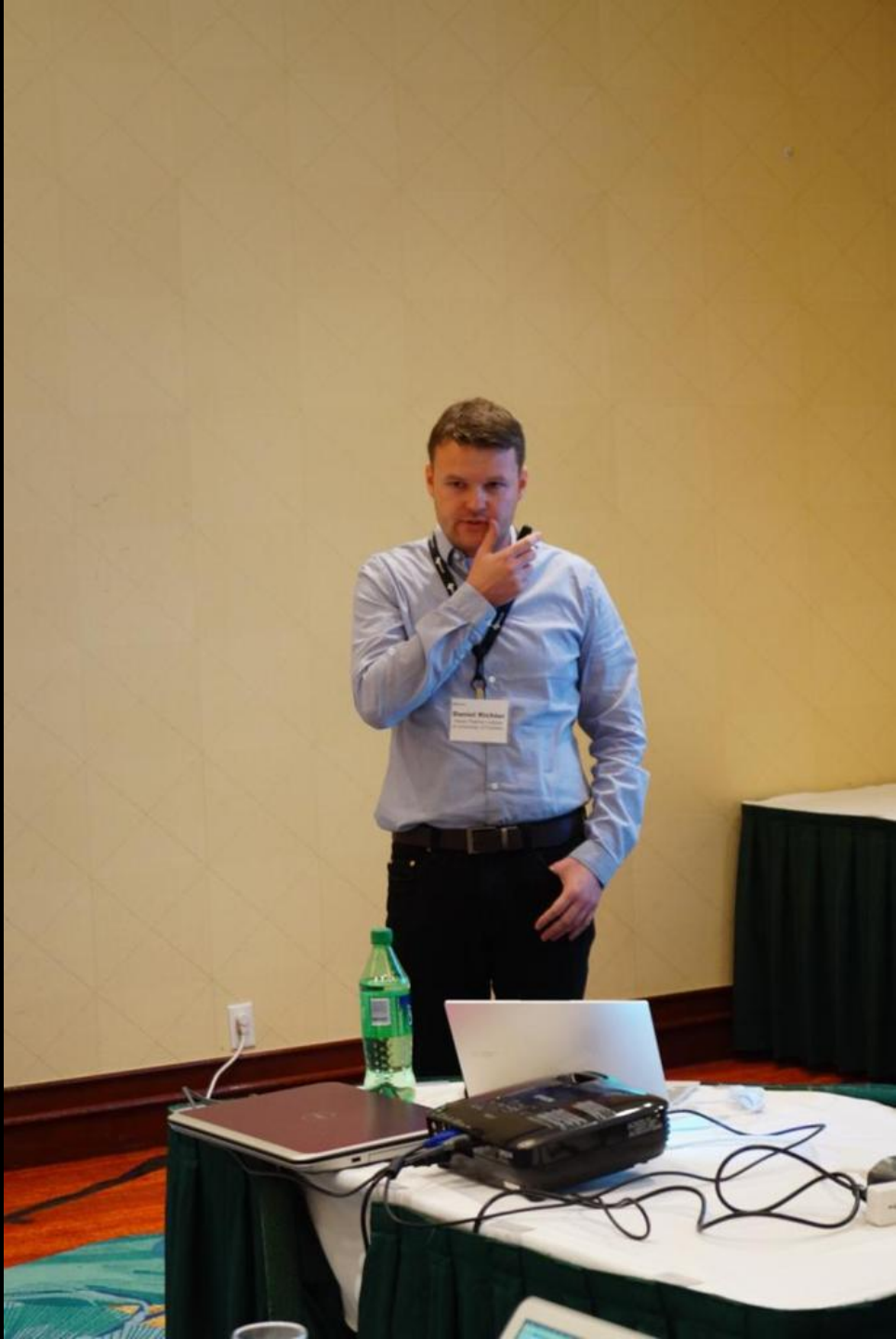




Our Approach
Library Load Time Fault Injection

Injection Time

- when does the injection take place?
 - *linking against the existing code instances*
 - *linking against the only available hardware or software instance (library, kernel, etc.)*
- **At library load time**
- **our approach: linking against a custom error state generating library before the third party library is loaded**



Restricted Boltzmann's Machine(RBM)

RBM is the basic component of DBN. It is a two layer network. The first is called visible layer and the second is called the hidden layer.





Introduction

Empirical software quality prediction - based on constructing and applying statistical/ML methods to historical datasets (See [1], [2], [3], [4], [5], [6], [7], [8], [9], [10], [11], [12], [13], [14], [15], [16], [17], [18], [19], [20], [21], [22], [23], [24], [25], [26], [27], [28], [29], [30], [31], [32], [33], [34], [35], [36], [37], [38], [39], [40], [41], [42], [43], [44], [45], [46], [47], [48], [49], [50], [51], [52], [53], [54], [55], [56], [57], [58], [59], [60], [61], [62], [63], [64], [65], [66], [67], [68], [69], [70], [71], [72], [73], [74], [75], [76], [77], [78], [79], [80], [81], [82], [83], [84], [85], [86], [87], [88], [89], [90], [91], [92], [93], [94], [95], [96], [97], [98], [99], [100], [101], [102], [103], [104], [105], [106], [107], [108], [109], [110], [111], [112], [113], [114], [115], [116], [117], [118], [119], [120], [121], [122], [123], [124], [125], [126], [127], [128], [129], [130], [131], [132], [133], [134], [135], [136], [137], [138], [139], [140], [141], [142], [143], [144], [145], [146], [147], [148], [149], [150], [151], [152], [153], [154], [155], [156], [157], [158], [159], [160], [161], [162], [163], [164], [165], [166], [167], [168], [169], [170], [171], [172], [173], [174], [175], [176], [177], [178], [179], [180], [181], [182], [183], [184], [185], [186], [187], [188], [189], [190], [191], [192], [193], [194], [195], [196], [197], [198], [199], [200], [201], [202], [203], [204], [205], [206], [207], [208], [209], [210], [211], [212], [213], [214], [215], [216], [217], [218], [219], [220], [221], [222], [223], [224], [225], [226], [227], [228], [229], [230], [231], [232], [233], [234], [235], [236], [237], [238], [239], [240], [241], [242], [243], [244], [245], [246], [247], [248], [249], [250], [251], [252], [253], [254], [255], [256], [257], [258], [259], [260], [261], [262], [263], [264], [265], [266], [267], [268], [269], [270], [271], [272], [273], [274], [275], [276], [277], [278], [279], [280], [281], [282], [283], [284], [285], [286], [287], [288], [289], [290], [291], [292], [293], [294], [295], [296], [297], [298], [299], [300], [301], [302], [303], [304], [305], [306], [307], [308], [309], [310], [311], [312], [313], [314], [315], [316], [317], [318], [319], [320], [321], [322], [323], [324], [325], [326], [327], [328], [329], [330], [331], [332], [333], [334], [335], [336], [337], [338], [339], [340], [341], [342], [343], [344], [345], [346], [347], [348], [349], [350], [351], [352], [353], [354], [355], [356], [357], [358], [359], [360], [361], [362], [363], [364], [365], [366], [367], [368], [369], [370], [371], [372], [373], [374], [375], [376], [377], [378], [379], [380], [381], [382], [383], [384], [385], [386], [387], [388], [389], [390], [391], [392], [393], [394], [395], [396], [397], [398], [399], [400], [401], [402], [403], [404], [405], [406], [407], [408], [409], [410], [411], [412], [413], [414], [415], [416], [417], [418], [419], [420], [421], [422], [423], [424], [425], [426], [427], [428], [429], [430], [431], [432], [433], [434], [435], [436], [437], [438], [439], [440], [441], [442], [443], [444], [445], [446], [447], [448], [449], [450], [451], [452], [453], [454], [455], [456], [457], [458], [459], [460], [461], [462], [463], [464], [465], [466], [467], [468], [469], [470], [471], [472], [473], [474], [475], [476], [477], [478], [479], [480], [481], [482], [483], [484], [485], [486], [487], [488], [489], [490], [491], [492], [493], [494], [495], [496], [497], [498], [499], [500], [501], [502], [503], [504], [505], [506], [507], [508], [509], [510], [511], [512], [513], [514], [515], [516], [517], [518], [519], [520], [521], [522], [523], [524], [525], [526], [527], [528], [529], [530], [531], [532], [533], [534], [535], [536], [537], [538], [539], [540], [541], [542], [543], [544], [545], [546], [547], [548], [549], [550], [551], [552], [553], [554], [555], [556], [557], [558], [559], [560], [561], [562], [563], [564], [565], [566], [567], [568], [569], [570], [571], [572], [573], [574], [575], [576], [577], [578], [579], [580], [581], [582], [583], [584], [585], [586], [587], [588], [589], [590], [591], [592], [593], [594], [595], [596], [597], [598], [599], [600], [601], [602], [603], [604], [605], [606], [607], [608], [609], [610], [611], [612], [613], [614], [615], [616], [617], [618], [619], [620], [621], [622], [623], [624], [625], [626], [627], [628], [629], [630], [631], [632], [633], [634], [635], [636], [637], [638], [639], [640], [641], [642], [643], [644], [645], [646], [647], [648], [649], [650], [651], [652], [653], [654], [655], [656], [657], [658], [659], [660], [661], [662], [663], [664], [665], [666], [667], [668], [669], [670], [671], [672], [673], [674], [675], [676], [677], [678], [679], [680], [681], [682], [683], [684], [685], [686], [687], [688], [689], [690], [691], [692], [693], [694], [695], [696], [697], [698], [699], [700], [701], [702], [703], [704], [705], [706], [707], [708], [709], [710], [711], [712], [713], [714], [715], [716], [717], [718], [719], [720], [721], [722], [723], [724], [725], [726], [727], [728], [729], [730], [731], [732], [733], [734], [735], [736], [737], [738], [739], [740], [741], [742], [743], [744], [745], [746], [747], [748], [749], [750], [751], [752], [753], [754], [755], [756], [757], [758], [759], [760], [761], [762], [763], [764], [765], [766], [767], [768], [769], [770], [771], [772], [773], [774], [775], [776], [777], [778], [779], [780], [781], [782], [783], [784], [785], [786], [787], [788], [789], [790], [791], [792], [793], [794], [795], [796], [797], [798], [799], [800], [801], [802], [803], [804], [805], [806], [807], [808], [809], [810], [811], [812], [813], [814], [815], [816], [817], [818], [819], [820], [821], [822], [823], [824], [825], [826], [827], [828], [829], [830], [831], [832], [833], [834], [835], [836], [837], [838], [839], [840], [841], [842], [843], [844], [845], [846], [847], [848], [849], [850], [851], [852], [853], [854], [855], [856], [857], [858], [859], [860], [861], [862], [863], [864], [865], [866], [867], [868], [869], [870], [871], [872], [873], [874], [875], [876], [877], [878], [879], [880], [881], [882], [883], [884], [885], [886], [887], [888], [889], [890], [891], [892], [893], [894], [895], [896], [897], [898], [899], [900], [901], [902], [903], [904], [905], [906], [907], [908], [909], [910], [911], [912], [913], [914], [915], [916], [917], [918], [919], [920], [921], [922], [923], [924], [925], [926], [927], [928], [929], [930], [931], [932], [933], [934], [935], [936], [937], [938], [939], [940], [941], [942], [943], [944], [945], [946], [947], [948], [949], [950], [951], [952], [953], [954], [955], [956], [957], [958], [959], [960], [961], [962], [963], [964], [965], [966], [967], [968], [969], [970], [971], [972], [973], [974], [975], [976], [977], [978], [979], [980], [981], [982], [983], [984], [985], [986], [987], [988], [989], [990], [991], [992], [993], [994], [995], [996], [997], [998], [999], [1000].

Large data repository for research, i.e. PROMISE and ISF data collection and fault non-responses (Myrvtveit, et al. 2012)

Data missingness is a non-ignorable issue - significantly affects the ability of models in knowledge discovery (Little and Rubin 2002)



J. Huang et al. #QRS2015







Abstracting program dependencies

- data dependence
- control dependence

① parameter
② input value
③ heap variable

An example MDG (top) and the cleanup of one node M2 (bottom)

A man in a white shirt and glasses is standing and presenting to the audience.

An audience of several people is seated at tables with white tablecloths, listening to the presentation. A coffee cup is visible on the table in the foreground.



IEEE
Advancing Technology
for Humanity

- Connect
- Network
- Contribute
- Gain
- Expand
- Improve

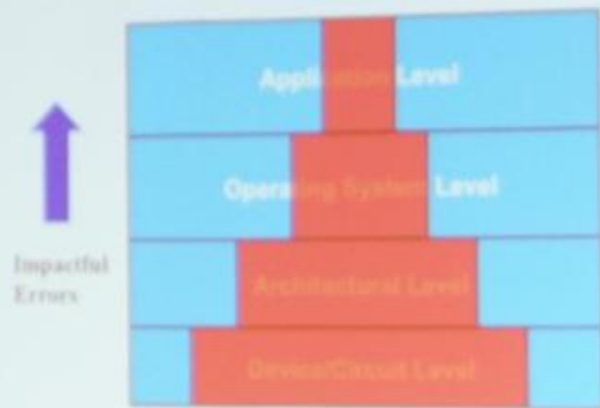
Reliability Society
The Specialty Engineering Society

the organization of choice
to bring reliability professionals together

Join the IEEE Reliability Society

The banner features a central graphic of a hand holding a globe, with lines radiating from the hand. At the bottom, there is a photograph of three people in a meeting setting.





EXIT



obtain coverage -
iteratively improve coverage based on the
errors missed by fault tolerance mechanism
- Analyze the errors that are missed by the FT





◆ runtime phase:
Software rejuvenation



mitigate the effects
and costs of ARBs

Software rejuvenation: A mechanism to counteract the influence of software aging.

AKB within project





The Analysis Technique



- Implications

- Only recursive data structures are considered (DAGs and general graphs are beyond our concern)
- We only consider programs that preserve shapes of data structures





The Analysis Technique



- Example: one execution of the loop body from [a0] to [a1]

```
node* reverse(node* p)
{
    // [pre]
    node *t, *q = NULL;
    while (p != NULL) {
        // [a0]
        t = p->next;
        p->next = q;
        q = p;
        p = t;
        // [a1]
    }
    // [post]
    return q;
}
```











Background and Motivation

• Software Reliability and models

- Software failure is a dynamic process and accelerated in software test
- Most software reliability growth models (SRGMs) utilize the fault-detection record to describe the stochastic behavior of software failure in fault selection process (FSF)
- The most popular parametric models are the non-homogeneous Poisson process (NHPP) models [1]

© 2012 IEEE. All rights reserved. This document is intended for use in the IEEE Global Knowledge Conference on Knowledge Management (GKMM) 2012, 1-4 October 2012, Singapore.



Background and Motivation

- Software Reliability and models
 - Software failure is a dynamic process and accelerated in software test.
 - Most software reliability growth models (SRGMs) utilize the fault detection record to describe the stochastic behavior of software failure in fault detection process (FDP).
 - The most popular parametric models are the non-homogeneous Poisson process (NHPP) models [1].

© 2017 S. Lee, "Software Reliability Engineering in Practice", in Fault-Tolerant Systems of Software Engineering, 2017, pp. 23-25.

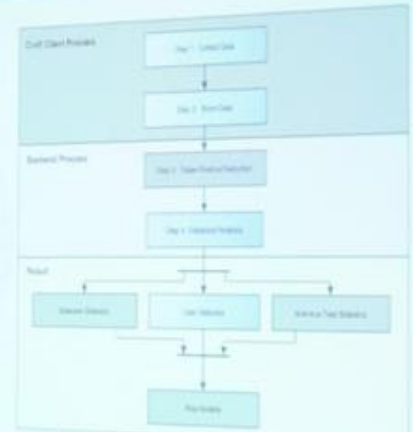






Presented by
Axel Busch
Karlsruhe Institute of
Technology

Data Collection & Planned Statistical Analysis



(Note: Blue rectangles are implemented or used. Grey rectangles are planned)



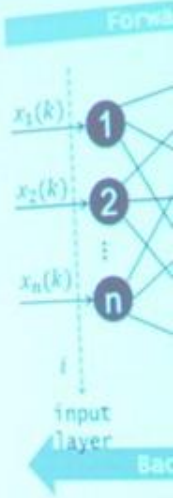
PART 3 CONTROL MODULE

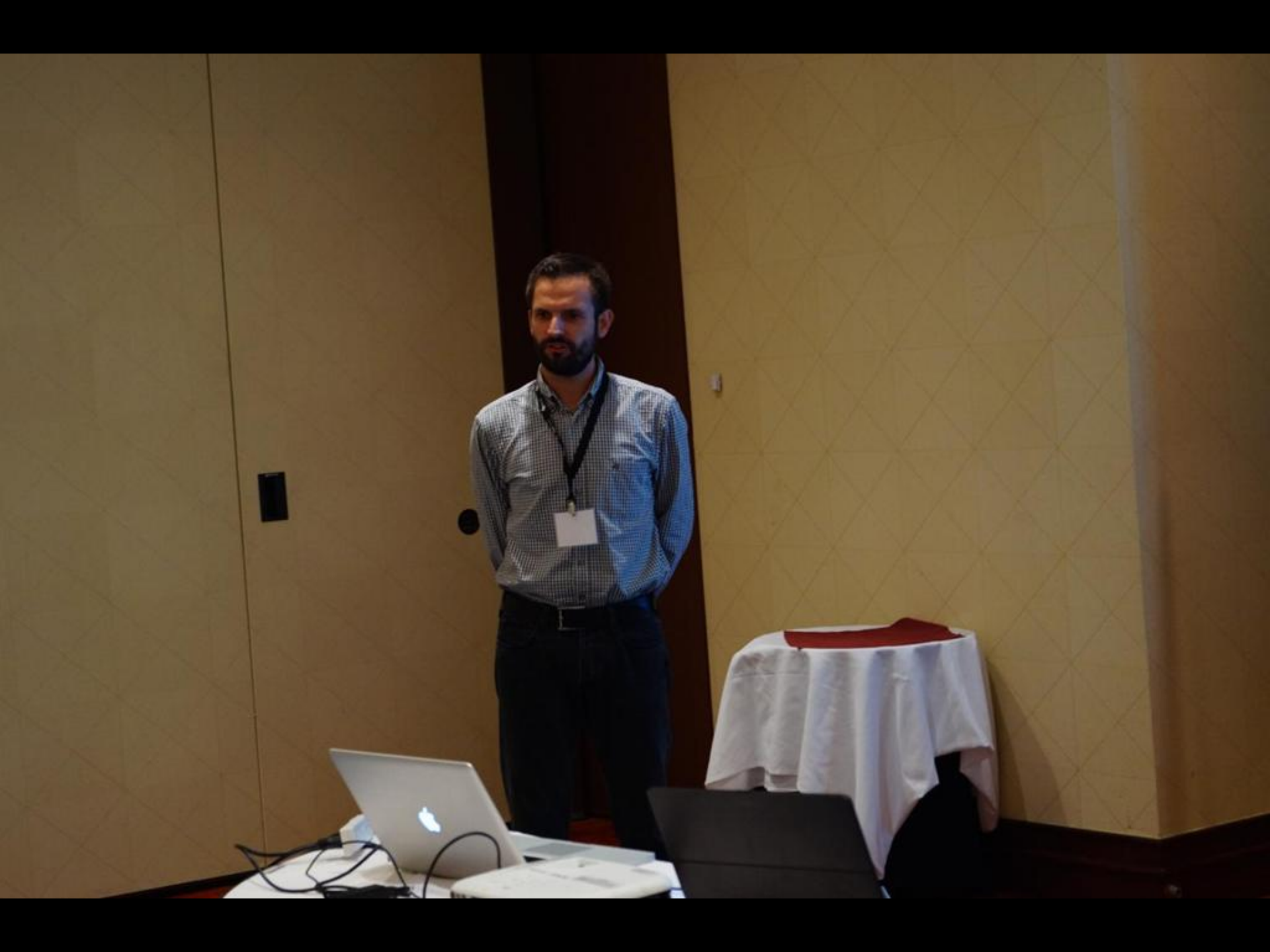
ADAPTIVE MECHANISM

RBF Neural Network



PART • CONTROL
3





Introduction

- Previously works: Automated testing approach for finding vulnerabilities without or at least with little user interactions.
- Depiction of attacks as patterns [2, 3].
- Attack: A sequence of actions.
- Attack is nothing else than finding an interaction sequence that finally leads to a situation where a vulnerability can be exploited as a planning problem.

➤ Model Based Testing (MBT)

- Nguyen et al., and Utting et al., 2012.

➤ Fault Modeling and Analysis

- Tribble et al., 2004. Introduce FTA.

➤ Integration of Safety Analysis Techniques and Beh

- Ariss et al., 2011,
- Kim et al., 2010
- Gario et al. 2014


➤ Mitigation Modeling

- Avizienis et al., 2004 (A Taxonomy of error handling & fault to
- Lerner et al., 2010 (Identify several patterns)

➤ Regression Testing (RT)

- Chen et al., 2002 (use UML activity diagrams and
- Orso et al., 2007 (use a statechart diagram)
- Korel et al., 2002 (uses dependence analysis of a gi
reduce the size of a regression test suite (RTS)).
- Chen et al., 2007 differ from Korel et al., in terms of
a modified transition and how they define dependen



- Tribble et al., 2004. Introduce FTA.
 - Integration of Safety Analysis Techn
 - Ariss et al., 2011, 
 - ... et al., 2010
 - ... et al., 2014
- ### Regression Modeling
- ... et al., 2004 (A Taxonomy of erro
 - ... et al., 2010 (Identify several pattern
- ### Regression Testing (RT)
- ... et al., 2002 (use UML activity
 - ... et al., 2007 (use a statechart di
 - ... et al., 2002 (uses dependence
 - ... size of a regression test su
 - ... 2007 differ from Korel c
 - ... transition and how they c







BACKGROUND (2/2)

➤ Non-homogeneous Poisson Process Model

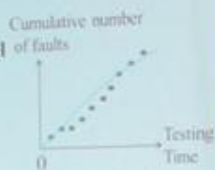
Modeling of the cumulative number of software faults

✓ Parametric model

The form of mean value function of NHPP is known in advance

✓ Nonparametric model

Estimate the mean value function with data directly



Boswell (*Annals of Mathematical Statistics* (1966))

Propose a constrained nonparametric maximum likelihood estimator (CNPMLE) of mean value function of NHPP

BACKGROUND (2/2)

Non-homogeneous Poisson Process Model

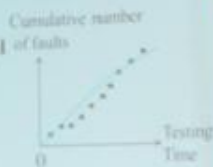
Modeling of the cumulative number of software faults

✓ Parametric model

The form of mean value function of NHPP is known in advance

✓ Nonparametric model

Estimate the mean value function with data directly



Boswell (*Annals of Mathematical Statistics* (1966))

Propose a constrained nonparametric maximum likelihood estimator (CNPMLE) of mean value function of NHPP



RELATED WORK (NHGP MODEL)

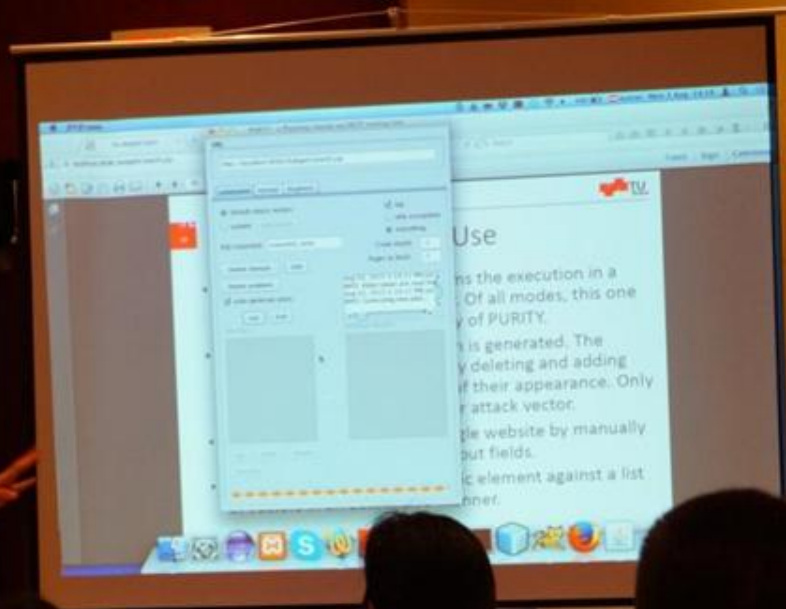
Metriksa (1981))

Non-homogeneous gamma process (NHGP)
characterized as a modulated gamma renewal
trend function

Li (PRDC 2008)

General NHGP-based SRMs and compare
NHGP models having eight trend functions
with NHPP models





Use

ns the execution in a
Of all modes, this one
y of PURITY.
is generated. The
y deleting and adding
of their appearance. Only
attack vector.
le website by manually
put fields.
ic element against a list
inner.



Introduction

- As the functional requirements of software keep growing, the large scale to solve various practical problems, and the growing for researchers to quantify the behavior of software.
- Software, as a typical artificial complex system, is treated as structured features of which are examined and studied. By analyzing modules in other entities into nodes and the interconnections as entities as edges and attaching various attributes of interest to the structure of software may eventually represent a form of interconnected contents.
- Since the complex network models of software are capable to of software, not only the entities in certain granularity can structure of software are available as well.

Background

- Defects are inevitable in software systems



Introduction





Deron Liang
National Central
University

Related Works

5

Utilize metrics of testing activities
(test coverage, the number of test cases, etc.)

Cox Regression + SRGM

→ Shibata et al., ISSRE 2006

Logistic Regression + SRGM

→ Okamura et al., ISSRE 2010

Utilize design metrics of software
(lines of code, complexity, etc.)

Poisson Regression + SRGM

→ Okamura et al., HASE 2014



National Science Foundation
WHERE DISCOVERIES BEGIN

UNIVERSITY of DENVER

School of Engineering & Computer Science

**On the Viability of Using SRGMs for
IT Help Desk Incident Predictions**

Anneliese Andrews and Joseph Lucrite



BBC : Brute-Force Boolean Combination







Contents

- Introduction
 - Scientific Workflow Management Systems (SWFMS)
 - Security of SWFMS to the Cloud
- Kepler SWFMS
 - Workflow and components
- Securing Kepler
 - Problem Statement
 - Investigation: Kepler, Provenance
 - Security Analysis Package (SAP)
 - A Prototype of Secure Kepler
- Conclusion







Contents

Introduction

Fault propagation model

Summary & Conclusion



Prioritization factors

Failure Impact

- user-driven measure of the severity of defects
- calculated based on historical user feedback reports collected from previous versions of system

$$F_i(TC) = \frac{\sum_{k=1}^n F_k}{Max_F_i}$$

Max_Fi - test case maximum failure severity
n - failure indexes that a test case has detected
Fi - failure impact of a test case

EXIT



Combinatorial Testing

Parameter values:

CPU: Intel, AMD
OS: Windows, Linux, Mac
Browser: IE, Firefox, Safari

Constraints:

$(IE \Rightarrow Win) \wedge (Safari \Rightarrow Mac) \wedge$
 $(Mac \Rightarrow \neg AMD)$

An SUT model:

Tests	CPU	OS	Browser
1	Intel	Windows	IE
2	AMD	Windows	Firefox
3	Intel	Windows	Safari
4	AMD	Linux	IE
5	Intel	Linux	Firefox
		...	
		test suite	



s/tools for pair-wise test generation

5. FoCuS
 - by IBM, 2010
 - Algorithm using BDD
6. CASCADE
 - by Chinese Academy of Sciences, 2012
 - using Pseudo-Boolean
7. Calot
 - AIST, 2015
 - Minimization of pair-wise tests
 - Using incremental SAT
8. CTE(Classification Tree Editor)
 - Tree-structured SUT model, 1993
 - By Mercedes, Berner and Mattner

straints



Outline

- Dynamic Software Update (DSU)
- Event-based formal model of DSU
 - how to understand
 - how to formalize
- Optimistic DSU with runtime monitor

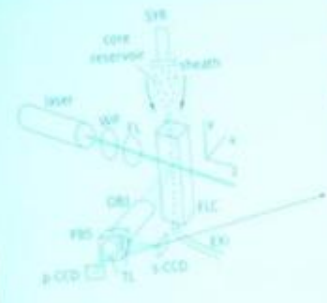




Inevitable Software Updates

- Fix bugs
- Change behavior as requirements evolve
- Enhance functionality
-

Diffraction Images



Speaker presenting at a conference, standing next to a laptop.

Back view of an audience member sitting at a table.



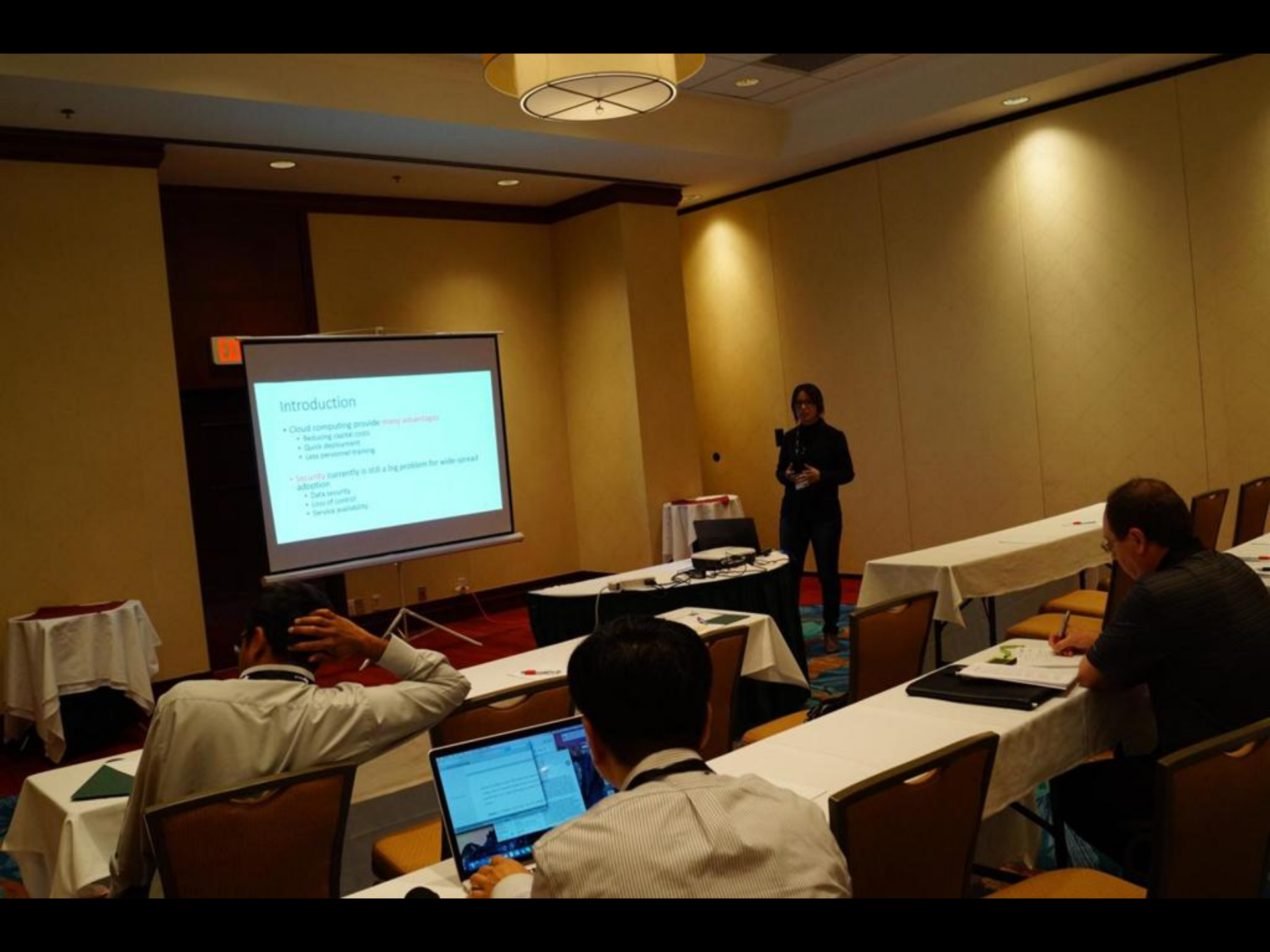




An Adjustable Risk Assessment for a Cloud System

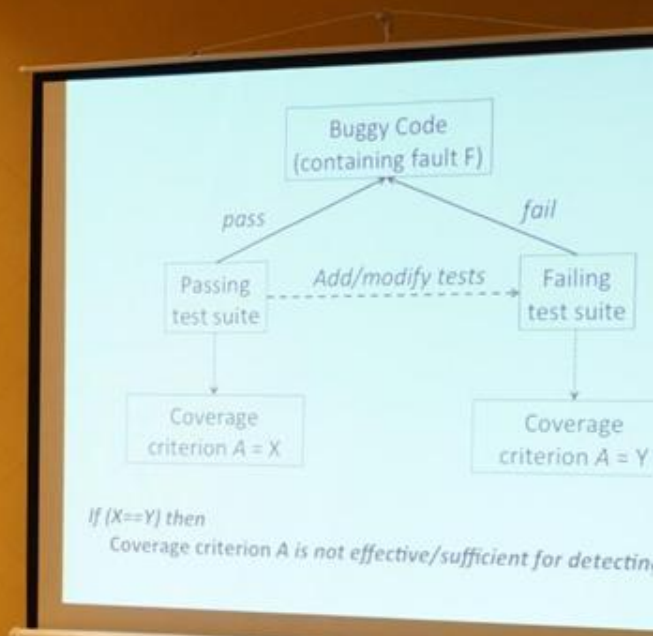
Chi-An Chih, Yu-Lun Huang
Institute of Electrical & Control Engineering,
National Chiao-Tung University

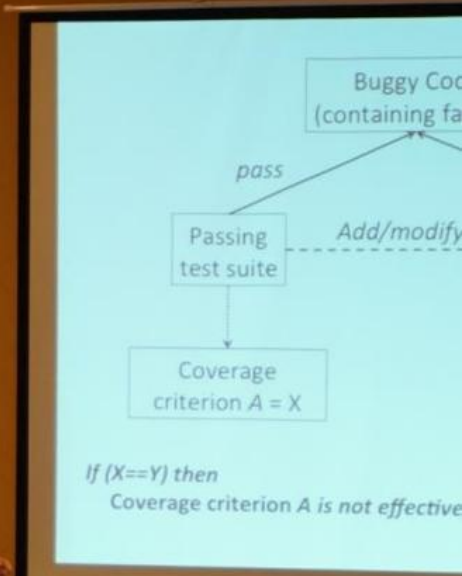




Introduction

- Cloud computing provide *many advantages*
 - Reducing capital costs
 - Quick deployment
 - Less personnel/training
- *Security* currently is still a big problem for wide-spread adoption
 - Data security
 - Loss of control
 - Service availability





Contents

- Introduction



am is
(v2)
m existing



Optimizing Translations of Set Operators

- $x \cap y \rightarrow y \cap x$ if $x \cap y \neq \emptyset$
- $x \cup y \rightarrow y \cup x$ if $x \cup y \neq \emptyset$
- $x \cap y \rightarrow y \cap x$ if $x \cap y \neq \emptyset$
- if x is a machine variable, i is the identifier of x , and t is the table holding sets of x 's type
 - $x \cap y \rightarrow y$
forward = y
insert: agree with t (element, x)
 - $x \cup y \rightarrow y$
forward = $y \cup x$
delete: from t where output = y and output $\neq x$
 - $x \cap y \rightarrow y$
forward = $y \cap x$
delete: from t where output = x and output $\neq x$





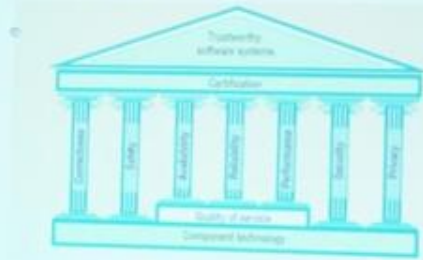


Yujing Ma
East China Normal University

msi

Software Trustworthiness

Hasselbring, Reussner: Software trustworthiness is based on all attributes of software as accuracy, reliability, safety, timeliness, availability, predictability and other attributes of software quality.



1. Wilhelm Hasselbring, Ralf Reussner: Trustworthy software systems, IEEE Computer 39(4):91-92, 2006.

Trigun Mo

Software Assurance of Software

August 8, 2015 11:17:18

Outline

- Fault localization techniques
 - Binary similarity fault localization
 - Network fault localization
 - Traffic parameter
- Single fault v.s multiple fault localization
- SFL v.s NFL





Clock expression

Let a, b be two clocks.

$$C(a) = \{0, 2, 4, 6, \dots\}$$
$$C(b) = \{0, 1, 2, 3, 4, 5, \dots\}$$

- $a \prec b$ states that clock a precedes clock b , which means that every observation point of clock a is earlier than or equal to the related observation point in b .
- $a \prec\prec b$ means that clock a strictly precedes clock b , which means that every observation point of clock a is strictly earlier than the related observation in b .
- $a \sim b$ represents that clock a and b alternates with each other.
- $a \sim\sim b$ represents that the clock a is synchronized with clock b (they are at the same time).











