

XRDS

The Future of Cybersecurity

A City That Thinks—
but Doesn't Overthink

Cyber-Physical Security
in Healthcare

Can You Trust What
AI Hears [and Says]?



Today's Research Driving Tomorrow's Technology

The ACM Digital Library (DL) is the most comprehensive research platform available for computing and information technology and includes the ongoing contributions of the field's most renowned researchers and practitioners.

Each year, roughly 20,000 newly published articles from ACM journals, magazines, technical newsletters and annual conference volumes are added to the DL's complete full text contents of more than 550,000 articles.

The DL also features the fully integrated and comprehensive bibliographic index, *The Guide to Computing Literature*—a continually updated index featuring millions of publication records from over 5,000 publishers worldwide.

For more information, please visit

<https://libraries.acm.org/>

or contact ACM at

dl-info@hq.acm.org

ACM

DL

DIGITAL
LIBRARY

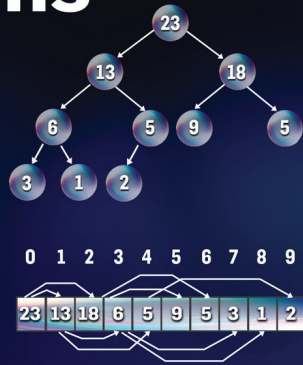
NEW BOOK RELEASE



ACM BOOKS
Collection III

Thinking About Programs

Gavin Lowe



ASSOCIATION FOR COMPUTING MACHINERY

Thinking About Programs

Gavin Lowe

ISBN: 979-8-4007-3163-1

DOI: 10.1145/3731333

This book is based on the author's experience of 30 years of teaching programming at the University of Oxford and is an excellent choice for early programming courses offered by universities worldwide. It is a rigorous and thoughtfully structured textbook designed to equip students with both the theoretical underpinnings and practical skills essential in today's programming landscape.

The first part of the book considers small programs that use a loop, and how to demonstrate their correctness using loop invariants. It also covers some algorithms and algorithmic techniques that every programmer should know. The second half of the book considers slightly larger programs. It teaches the basics of modularization, splitting up a program into manageable chunks. It teaches about abstract datatypes, values within a program that can be treated as mathematical values: how to specify their behaviors formally; and how to treat them as abstract mathematical objects when programming. It also teaches how to use data structures to represent abstract datatypes, and what it means for such a representation to be correct. And it presents some abstract datatypes and data structures that every programmer should know. The book is pragmatic: the philosophy is to include enough formality to be convincing and to guide the programmer towards correct code, without getting bogged down in the mathematics.

<http://books.acm.org>



begin

5 **LETTER FROM THE EDITOR**

Securing our Future

By Denise Doig

7 **INIT**

The Future of Cybersecurity: Emerging challenges and innovative strategies

By Moshe Satt

9 **MILESTONES**

How Attacks Have Shaped Digital Defense

By Frank Schotanus

10 **ADVICE**

The Risks of AI Coding Assistants

By Matthew Galej

12 **USER ACCOUNT**

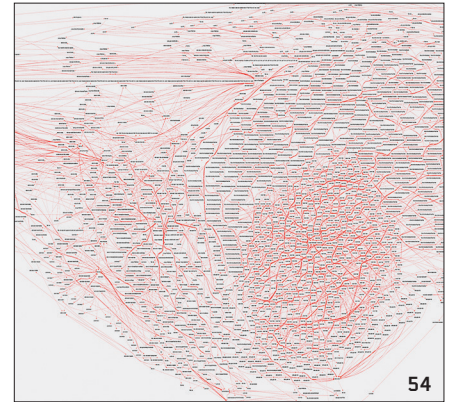
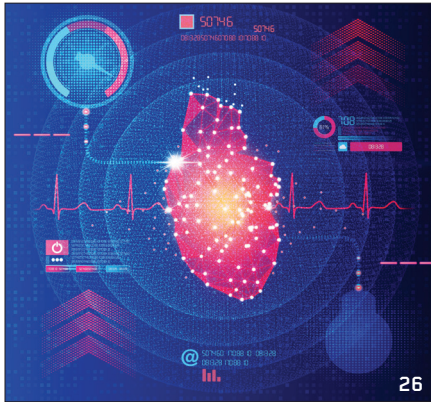
Challenging the Growth Narrative in and Through HCI

*By Vishal Sharma, Asra Sakeen Wani,
Raphaël Marée, Christoph Becker,
Douglas Schuler, Aparajita Marathe,
Neha Kumar, Han Qiao,
Rikke Hagensby Jensen,
and Anupriya Tuli*

On the Cover:

Image by Kirill Stytsenko / Shutterstock.com

THE FUTURE OF CYBERSECURITY



features

18 **FEATURE**
AI-powered Phishing: The current landscape and future projections
By Daniel Aldam

22 **FEATURE**
Scams at Scale: Unmasking crypto fraud and social engineering on the modern web
By Abisheka Pitumpe, Muhammad Muzammil, Xigao Li, Nick Nikiforakis, and Amir Rahmati

26 **FEATURE**
Cyber-Physical Security in Healthcare: Vulnerabilities and emerging solutions
By Aakar Mutha

30 **FEATURE**
Deepfake Technology and the Rise of Misinformation
By Vamsi Koneti

34 **FEATURE**
Can You Trust What AI Hears (and Says)?
By Jaechul Roh

40 **FEATURE**
DMAP: A blockchain-enhanced deepfake verification framework to safeguard individual privacy and national security
By Abdul Waheed and Nicholas S. Reese

46 **FEATURE**
A City That Thinks—but Doesn't Overthink
By Hummd Damita Alikhan

end

54 **LABZ**
Systems Security at LSU
SySec Lab, Louisiana State University
By Julia Gersey

55 **BACK**
The First Computer Password
By Sophia Navalta

56 **HELLO WORLD**
Keeping Your Digital Life Safe: Building a simple password manager
By Pavithra Sripathanallur Murali

58 **JARGON**

58 **POINTERS**

60 **EVENTS**

64 **BEMUSEMENT**



Advertise with ACM!

Reach the innovators
and thought leaders
working at the
cutting edge
of computing
and information
technology through
ACM's magazines,
websites
and newsletters.



Request a media kit
with specifications
and pricing:

Ilia Rodriguez
+1 212-626-0686
acmm mediasales@acm.org



XRDS

EDITORIAL BOARD

Guest Editor
Moshe Satt
New York University, USA

Issue Feature Editor
Jessica Yaune
Stanford University, USA

Feature Editors
Murtaza Ali
University of Washington,
USA

Sejal Bhalla
University of Toronto,
Canada

Poojita Garg
University of Washington,
USA

Prena Ravi
MIT, USA

Jack Thoene
Northwestern University,
USA

Department Editors
Julia Gersey
University of Michigan,
USA

Fiona Herzog
University of Pennsylvania,
USA

Pavithra Sripathanallur
Murali
George Mason University,
USA

Lynette Hui Xian Ng
Carnegie Mellon
University, USA

Frank Schotanus
Florida State University,
USA

ADVISORY BOARD

Mark Allman
International Computer
Science Institute, USA

Bernard Chazelle
Princeton University, USA

Lorrie Faith Cranor
Carnegie Mellon
University, USA

Alan Dix
Lancaster University, UK

David Harel
Weizmann Institute
of Science, Israel

Panagiotis Takis Metaxas
Wellesley College, USA

Noam Nisan
Hebrew University
Jerusalem, Israel

Bill Stevenson
Apple, Inc., USA.

Andrew Tison
City University London, UK

Jeffrey D. Ullman
Stanford University, USA

Moshe Y. Vardi
Rice University, USA

STAFF

Director of Publications
Scott E. Delman

Senior Editor
Denise Doig
Rights and Permissions
Barbara Ryan
Editorial Assistant
Sophia Navalta

Art Director
Andrij Borys
Associate Art Director
Margaret Gray
Assistant Art Director
Mia Balaquiot

Production Manager
Bernadette Shade
Advertising Sales
Account Manager
Ilia Rodriguez

ACM

**Association for
Computing Machinery**
1601 Broadway,
10th Floor
New York, NY
10019-7434 USA
+1 212-869-7440

CONTACT
General feedback:
xrds@acm.org

For submission
guidelines, please see
[http://xrds.acm.org/
authorguidelines.cfm](http://xrds.acm.org/authorguidelines.cfm)

PUBLICATIONS BOARD

Co-Chairs
Wendy Hall and
Divesh Srivastava

Board Members
Jonathan Aldrich;
Rick Anderson; Tom Crick;
Jack Davidson;
Mike Heroux;
Michael Kirkpatrick;
James Larus;
Marc Najork;
Beng Chin Ooi;
Mauro Pezze;
Francesca Rossi;
Bobby Schnabel;
Stuart Taylor;
Bhavani Thuraisingham;
Adeline Uhrmacher;
Philip Wadler;
John West; Min Zhang



SUBSCRIBE

Subscriptions [\$19
per year includes XRDS
electronic subscription]
are available
by becoming an
ACM Student Member
[www.acm.org/
membership/student](http://www.acm.org/membership/student)

Non-member
subscriptions:
\$80 per year
[http://store.acm.org/
acmstore](http://store.acm.org/acmstore)

ACM Member Services
To renew your ACM
membership or XRDS
subscription, please send
a letter with your name,
address, member number
and payment to:

ACM General Post Office
P.O. Box 30777
New York, NY
10087-0777 USA

Postal Information
XRDS [ISSN# 1528-4981]
is published quarterly in
spring, winter, summer
and fall by Association for
Computing Machinery,
1601 Broadway, 10th
Floor, New York, NY
10019. Application to
mail at Periodical Postage
rates is paid at New York,
NY and additional mailing
offices.

POSTMASTER: Send
addresses change to:
XRDS: Crossroads,
Association for
Computing Machinery,
1601 Broadway, 10th
Floor, New York, NY
10019.

Offering# XRDS0171
ISSN# 1528-4972 [print]
ISSN# 1528-4980
[electronic]

Copyright ©2025 by
the Association for
Computing Machinery, Inc.
Permission to make digital
or hard copies of part of
this work for personal or
classroom use is granted
without fee provided that
copies are not made or
distributed for profit or
commercial advantage
and that copies bear
this notice and the full
citation on the first page
or initial screen of the
document. Copyrights for
components of this work
owned by others than
ACM must be honored.
Abstracting with credit
is permitted. To copy
otherwise, republish, post
on servers, or redistribute
requires prior specific
permission and a fee.
Permissions requests:
permissions@acm.org.