# 2021 SEI Software Engineering Workshop for Educators

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DM21-0593

# Poll: Where are you joining us from?

| | |
|---|---|
| Argentina | 2 |
| Bangladesh | 1 |
| Brazil | 1 |
| Germany | 1 |
| India | 2 |
| Jamaica | 3 |
| Mexico | 1 |
| Peru | 2 |
| Portugal | 1 |
| Puerto Rico | 1 |
| Slovenia | 1 |
| Thailand | 1 |
| Turkey | 2 |
| UK | 2 |
| USA | 53 |
| Vietnam | 1 |
| GRAND TOTAL | 75 |

Day 1

# Welcome and Introduction

# Welcome from the SEI Director and CEO Paul Nielsen

Dr. Paul D. Nielsen is the Director and Chief Executive Officer of Carnegie Mellon University's Software Engineering Institute (SEI), a U.S. Department of Defense federally funded research and development center (FFRDC).

The SEI is a global leader in advancing software, cybersecurity, and the engineering of AI systems to support the nation by advancing the science, technologies and practices needed to acquire, develop, operate and sustain software systems that are innovative, affordable, trustworthy and enduring.

# Workshop Objectives

Share and refine ways to include software engineering concepts, methods, and practices in college and university courses

Form working relationships among participants and nurture a software engineering educator community

Collect brief “impact” stories that enable us to justify continuation of the workshops

# Workshop Expectations

The workshop is a two-way conversation

- Ask questions
- Participate in polls and open questions

There are more attendees than usual at the workshop

- Keep your comments brief and to the point
- Give everyone a chance to participate

# Open Question

## What do you expect to get out of the workshop?

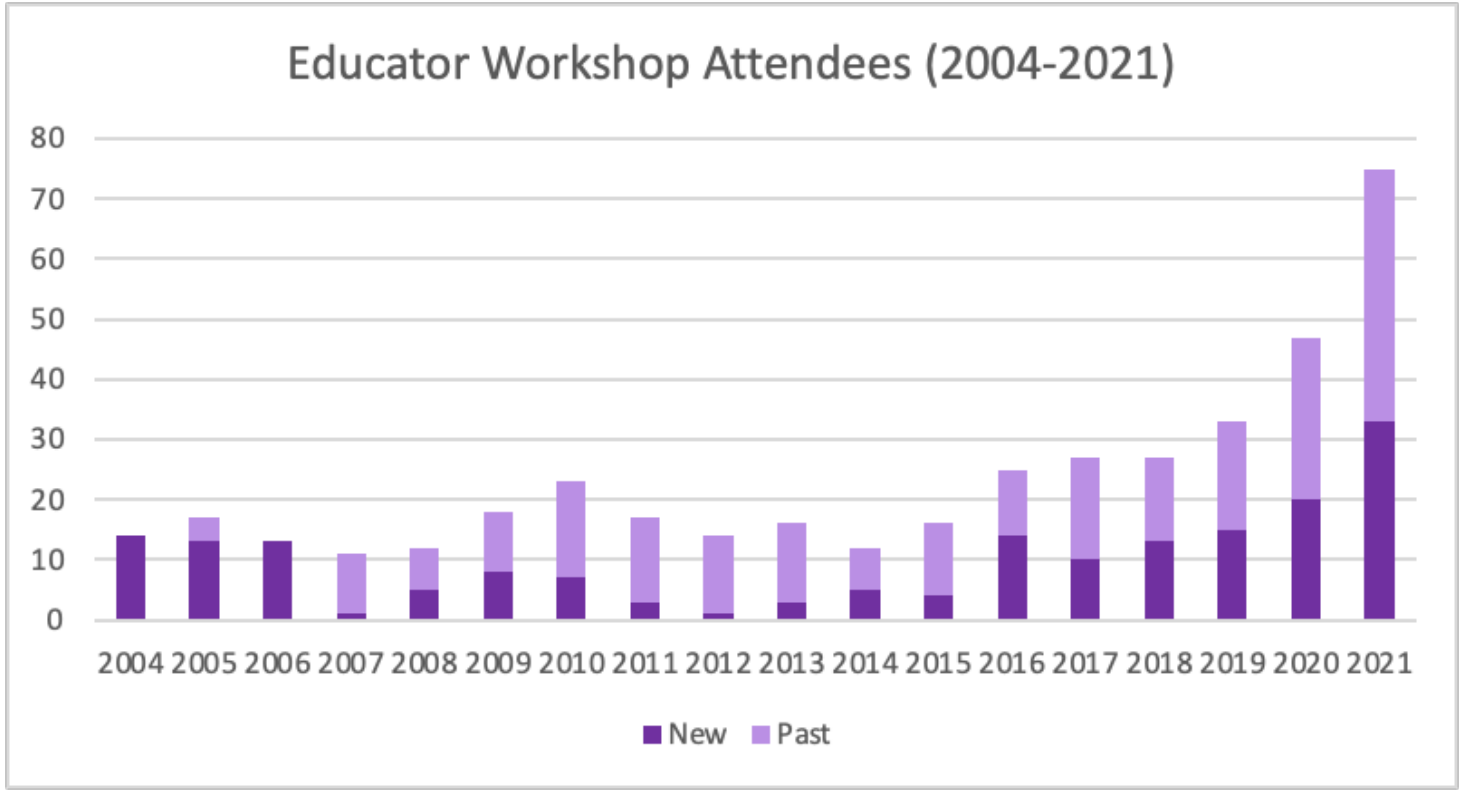
Type your response into the chat window. We will give you a couple of minutes.

# Results from Open Question on Expectations


## Themes

- Teaching software engineering
- Online education, hybrid
- New topics, state of the art
- AI Engineering
- Blockchain
- Community, networking, and discussion

# Workshop History



# Workshop Evolution 1

From how to teach software architecture …

- 2004: Fitting essential concepts into a “small package”
- 2005: How to think architecturally — quality attributes and working in teams
- 2006: Exercises and tool support for exercises

… to teaching others …

- 2007: Forming and expanding the software architecture educator’s community
- 2008: Switch from “How can we do this?” to “Here’s how we do this in my programs”
- 2009: Half-day tutorial presented at CSEET on March 11, 2010
- 2010: Workshop at CSEET on May 22, 2011; group decision to ask for a shared artifact as the “entry fee” for the workshop.
- 2011: Workshop accepted for SIGCSE; low enrollment forced cancellation

# Workshop Evolution 2

… to learning from others …

- 2013: Unique opportunity to interact with like-minded teaching colleagues face to face as well as to connect to a growing community
- 2014: How to apply what I just learned
- 2015: How to include emerging topics in courses

… to moving beyond software architecture to software engineering practices

- 2016: Expanding the software engineering educator's community
- 2017: A new perspective on cost estimation and microservices
- 2018: Project management, DevOps in practice, managing technical debt
- 2019: AI, machine learning, ethical reasoning, software quality
- 2020: SE4ML, quantum computing, SE education
- 2021: AI Engineering, AI4SE, SE4AI, blockchain, remote learning

# Agenda: Day 1

| | |
|---|---|
| 12:00 – 12:30 | Welcome – *Paul Nielsen, SEI, Director and CEO*<br>Introductions – *All*<br>Workshop Goals, Agenda – *Workshop Hosts* |
| 12:30 – 13:00 | AI Engineering<br>*Ipek Ozkaya, Technical Director, Engineering Intelligent Software Systems* |
| 13:00 – 13:15 | Break |
| 13:15 – 14:15 | Instruction: Software Engineering for AI<br>*Grace A. Lewis, Principal Researcher and TAS Initiative Lead* |
| 14:15 – 14:30 | Break |
| 14:30 – 15:30 | Instruction: AI for Software Engineering<br>*James Ivers, Principal Engineer and ADAA Initiative Lead*<br>*Ipek Ozkaya, Technical Director, Engineering Intelligent Software Systems* |

All times are EDT

# Agenda: Day 2

| | |
|---|---|
| 12:00 – 13:30 | Instruction: Designing and Developing Blockchain Applications<br>*Ingo Weber, Chair of Software and Business Engineering, Technische Universitaet Berlin* |
| 13:30 – 13:45 | Break |
| 13:45 – 15:30 | Instruction: Designing and Developing Blockchain Applications<br>*Ingo Weber, Chair of Software and Business Engineering, Technische Universitaet Berlin* |

All times are EDT

# Agenda: Day 3

| | |
|---|---|
| 12:00 – 13:30 | Educator-Led Session: The Post-Covid Classroom<br>• *Raja Sooriamurthi.* Bringing online experiences to the in-person classroom<br>• *Hossein Saiedian.* Student evaluation, assessment, academic integrity<br>• *Janaka Balasooriya.* Student engagement, well-being of students<br>• *Claudine Allen.* Hybrid classroom<br>• *Annajiat Alim Rasel, Len Bass.* Impact of technology on diversity landscape of students |
| 13:30 – 13:45 | Break |
| 13:45 – 14:45 | Educator-Led Session: The Post-Covid Classroom<br>*Breakout Group Discussion* |
| 14:45 – 15:10 | Summary of Breakout Group Discussion<br>*Breakout Group Leads* |
| 15:10 – 15:30 | Closing – *Anita Carleton, Director, Software Solutions Division*<br>Wrap-Up – *Workshop Hosts*<br>Graduation – *All*<br>Request for Feedback and Impact Statements – *Educators* |

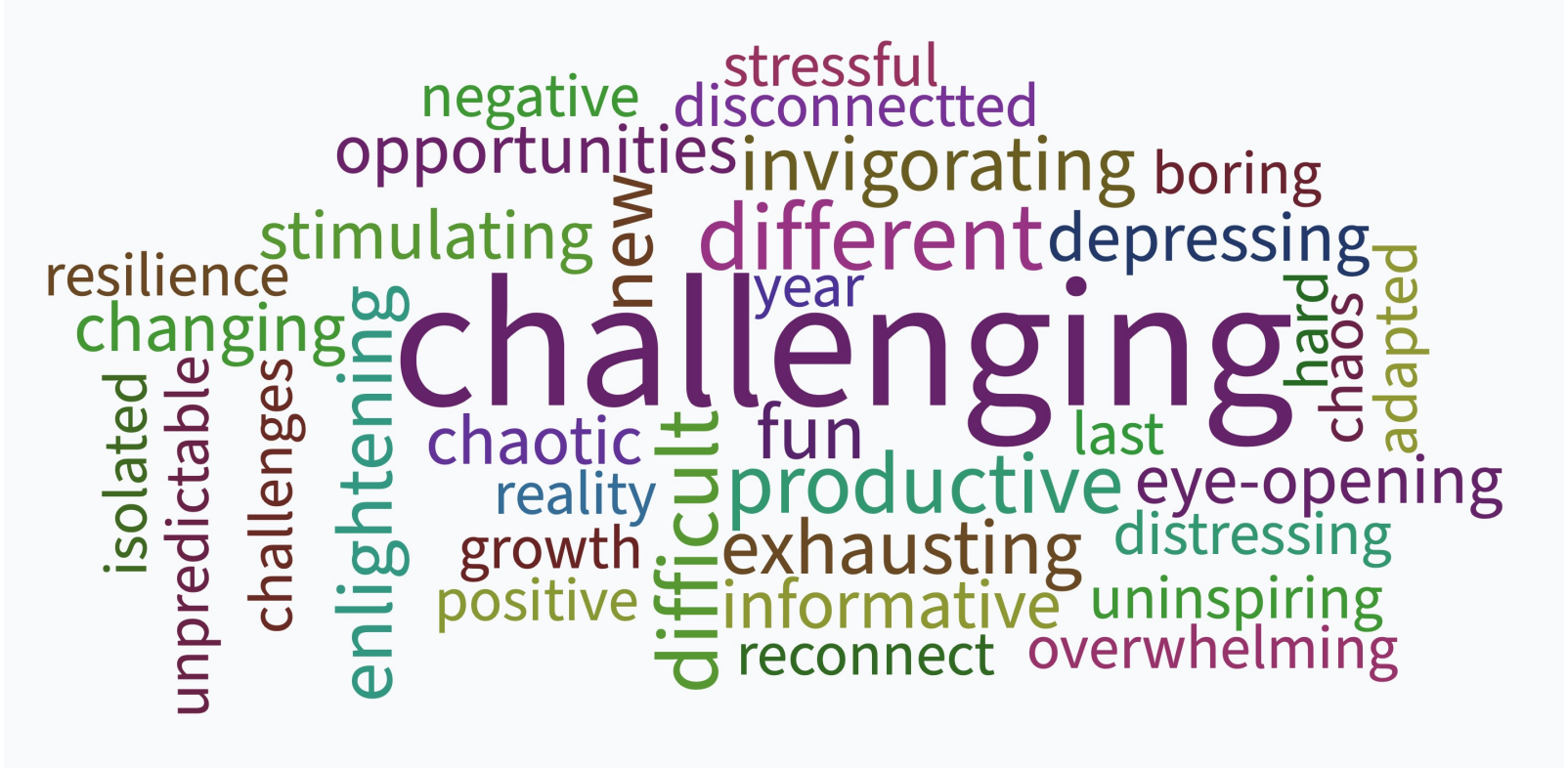
All times are EDT

# Open Question

## In one word, how would you describe the past year?

Type your response into the chat window. We will give you a couple of minutes.

# Results from Open Question on How You Would Describe the Past Year



Day 1

# AI Engineering

# AI Engineering

## Ipek Ozkaya

## Technical Director, Engineering Intelligent Software Systems, SEI Software Solutions Division

Ipek Ozkaya is the Technical Director, Engineering Intelligent Software Systems and a principal researcher at the Carnegie Mellon University Software Engineering Institute (SEI). She leads a team that's helping government and industry organizations by conducting research and development in principles and practices for engineering tactical and Artificial Intelligence (AI)-enabled systems, enabling continuous evolution and modernization through application of software architecture and technical debt management practices, and the application of AI to software architecture design and analysis problems. Ozkaya received a PhD in Computational Design from Carnegie Mellon University. She is the co-author of a practitioner book, Managing Technical Debt Reducing Friction in Software Development and the editor-in-chief of IEEE Software magazine.

# We are currently on our break

**Please return promptly at 1:15pm EDT**

Day 1

# Software Engineering for AI

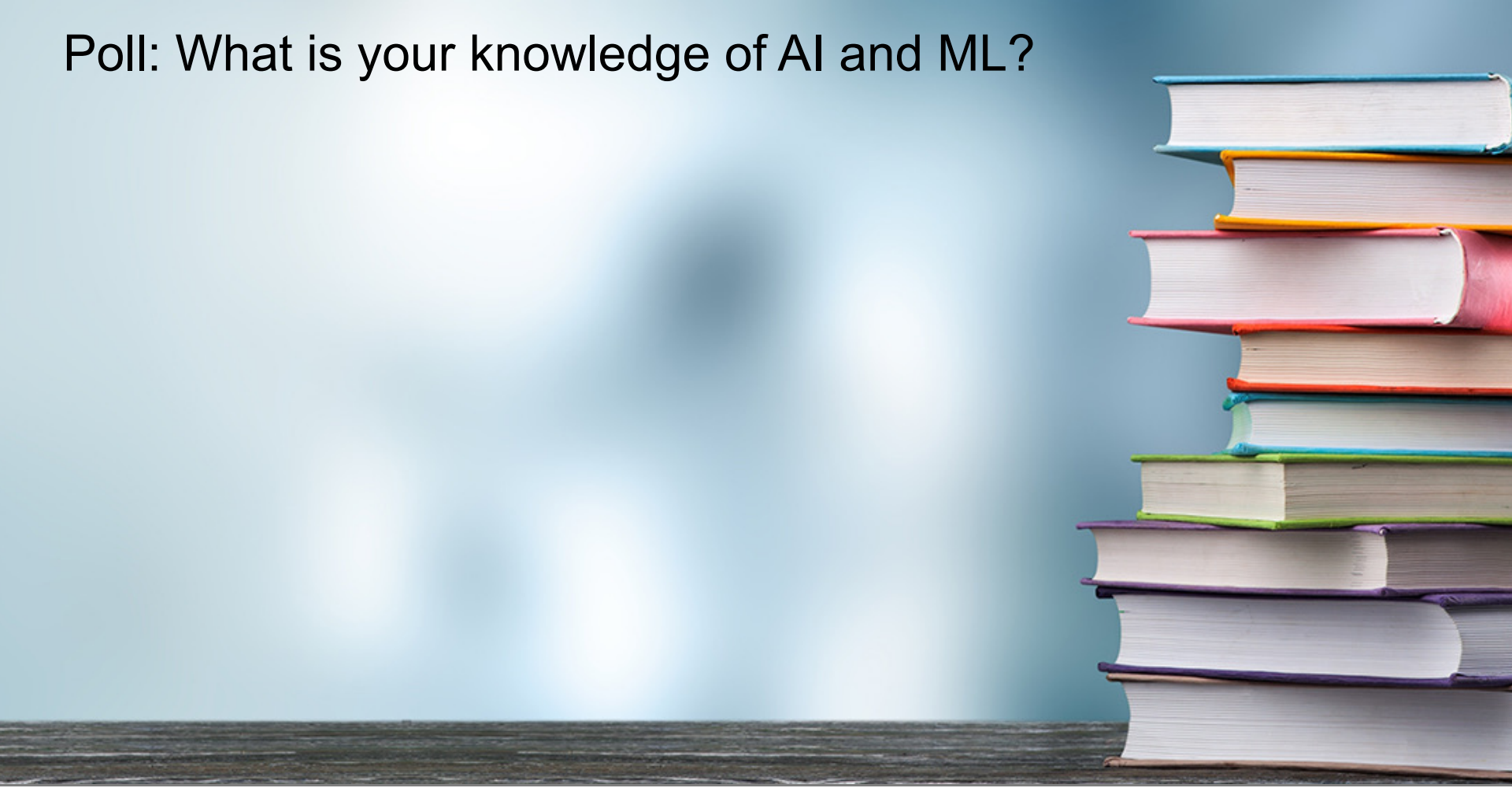
# Software Engineering for AI


## Grace A. Lewis

Principal Researcher and Lead of the Tactical and AI-enabled Systems (TAS) Initiative, SEI Software Solutions Division


Dr. Lewis is principal researcher and lead of the Tactical and AI-enabled Systems (TAS) initiative at the Software Engineering Institute at Carnegie Mellon University. Lewis is the principal investigator for the “Characterizing and Detecting Mismatch in ML-Enabled Systems” research project. She is also a member of the “High Assurance Software-Defined IoT Security” research project and leads the SEI's work in tactical cloudlets. Lewis’ current areas of expertise and interest include software engineering for AI/ML systems, IoT security, edge computing, software architecture (in particular the development of software architecture practices for systems that integrate emerging technologies), and software engineering in society.

# Poll: What is your knowledge of AI and ML?



We are currently on our break

**Please return promptly at 2:30pm EDT**

Day 1

# AI for Software Engineering

# AI for Software Engineering

James Ivers, Principal Engineer and Lead of the Architecture Design, Analysis, and Automation (ADAA) Initiative, SEI Software Solutions Division

Ipek Ozkaya, Technical Director, Engineering Intelligent Software Systems, SEI Software Solutions Division

James Ivers is a Principal Engineer and the lead of the Carnegie Mellon University Software Engineering Institute (SEI)'s Architecture Design, Analysis, and Automation group. Ivers' group helps Department of Defense (DoD) programs by developing, applying, and transitioning technology to accelerate the adoption of proven software architecture modeling and analysis techniques. Ivers is a co-author of the award-winning Documenting Software Architectures book and numerous papers on software architecture and program analysis. His work at the SEI also includes developing tools and approaches for analyzing and recovering the architectures of implemented systems. Prior to joining the SEI, Ivers developed commercial static and dynamic code analysis tools, made substantial contributions to the development of a suite of Institute of Electrical and Electronics Engineers (IEEE) standards for the architecture of distributed simulations, and served as the architect at a mobile computing startup.

Ipek Ozkaya is the Technical Director, Engineering Intelligent Software Systems and a principal researcher at the Carnegie Mellon University Software Engineering Institute (SEI). She leads a team that's helping government and industry organizations by conducting research and development in principles and practices for engineering tactical and Artificial Intelligence (AI)-enabled systems, enabling continuous evolution and modernization through application of software architecture and technical debt management practices, and the application of AI to software architecture design and analysis problems. Ozkaya received a PhD in Computational Design from Carnegie Mellon University. She is the co-author of a practitioner book, Managing Technical Debt Reducing Friction in Software Development and the editor-in-chief of IEEE Software magazine.

# Agenda: Day 2

| | |
|---|---|
| 12:00 – 13:30 | Instruction: Designing and Developing Blockchain Applications<br>*Ingo Weber, Chair of Software and Business Engineering, Technische Universitaet Berlin* |
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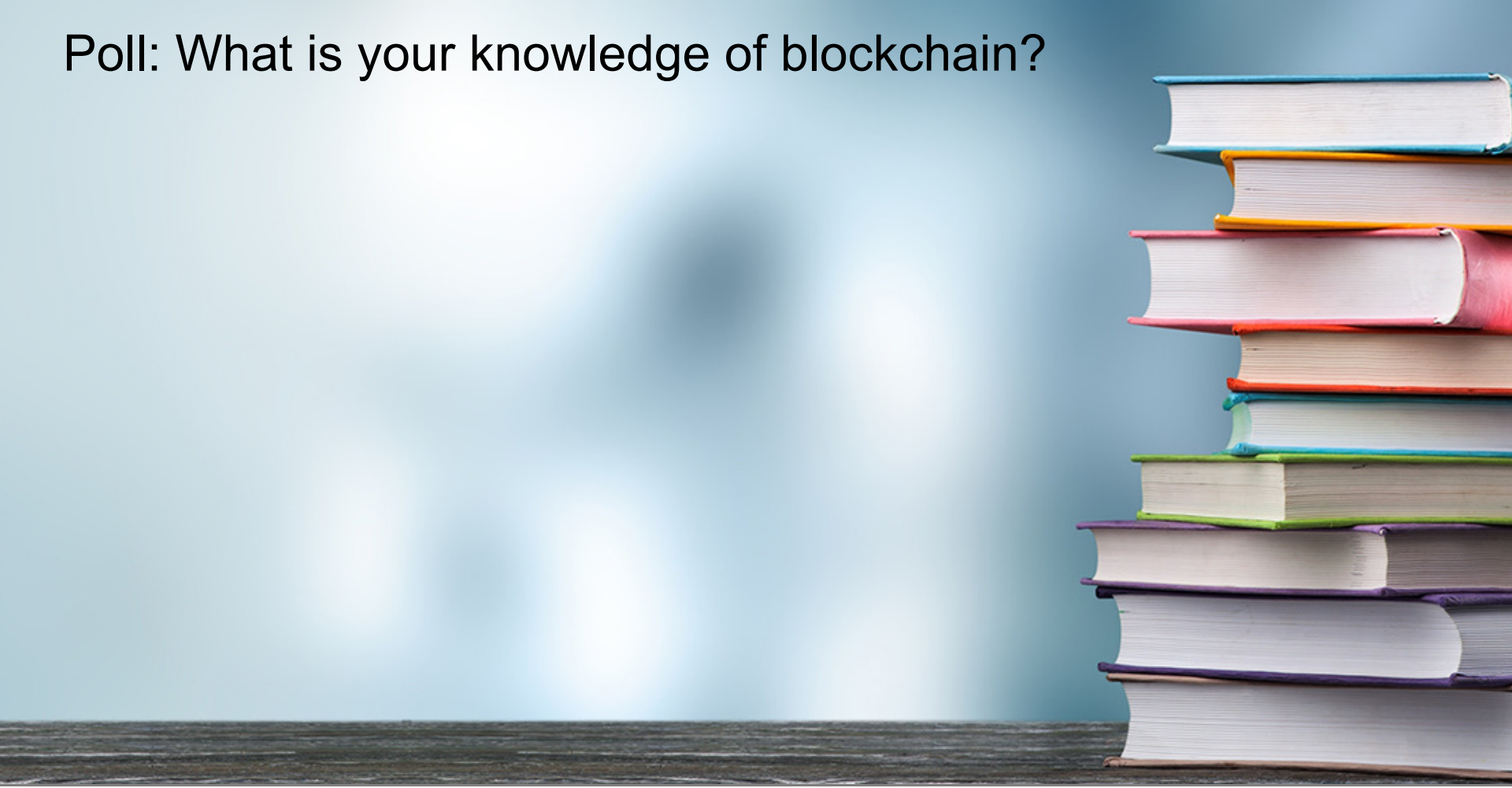
All times are EDT

Day 2

# Designing and Developing Blockchain Applications

# Poll: What is your knowledge of blockchain?



# Designing and Developing Blockchain Applications

## Ingo Weber

## Full Professor and Head of Chair for Software and Business Engineering at TU Berlin, Germany

Ingo Weber is a Full Professor and Head of Chair for Software and Business Engineering at TU Berlin, Germany. In addition he is a Conjoint Associate Professor at the University of New South Wales (UNSW) and an Adjunct Associate Professor at Swinburne University. Ingo has published over 100 refereed papers and three books, including "DevOps: A Software Architect's Perspective", Addison-Wesley, 2015, and "Architecture for Blockchain Applications", Springer, 2019. Ingo has served as a reviewer for many prestigious journals, including various IEEE and ACM Transactions, and as PC member for WWW, BPM (also as PC co-chair), ICSOC, AAAI, ICAPS, IJCAI, and many other conferences and workshops. Prior to TU Berlin, Ingo worked at Data61, CSIRO (formerly NICTA), UNSW in Sydney, Australia, and at SAP Research in Germany. At CSIRO, the team under his leadership became one of the leading research groups on blockchain globally. While at SAP, he completed his PhD with the University of Karlsruhe (TH).

# Open Question

**What did you learn about yourself during the pandemic?**

Type your response into the chat window during the break,
while you have a cup of coffee or tea.

**Please return promptly at 1:45pm EDT**

# Results on What You Learned About Yourself During the Pandemic

- I like remote work and teaching
  - More time with family
  - More productive
  - No commute
  - Less distractions
  - Great for introverts
- Strength, resilience, and flexibility
- Learned how to teach virtually, including tools, speaking skills, and teaching strategies
- Appreciate more than ever the value of personal interactions
- Know more about medicine and pandemics than I ever thought I would
- No in-person interaction with students or colleagues
- Less exercise — just sit all day
- Balancing teaching, child care, and homes tasks and distractions
- Teaching virtually is very difficult for both instructors and students
  - Less interaction
  - Difficult to engage students
  - Tools still have many limitations
- Being home all day is getting really old for everyone in the family

# Agenda: Day 3

All times are EDT

| | |
|---|---|
| 12:00 – 13:30 | Educator-Led Session: The Post-Covid Classroom<br>• *Raja Sooriamurthi.* Bringing online experiences to the in-person classroom<br>• *Hossein Saiedian.* Student evaluation, assessment, academic integrity<br>• *Janaka Balasooriya.* Student engagement, well-being of students<br>• *Claudine Allen.* Hybrid classroom<br>• *Annajiat Alim Rasel, Len Bass.* Impact of technology on diversity landscape of students |
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| 15:10 – 15:30 | Closing – *Anita Carleton, Director, Software Solutions Division*<br>Wrap-Up – *Workshop Hosts*<br>Graduation – *All*<br>Request for Feedback and Impact Statements – *Educators* |

Day 3

# Educator-Led Session: The Post-Covid Classroom

# Poll: What form of teaching will you be **doing** this fall?

1. What form of teaching will you be doing this fall? (Select all that apply) (Multiple Choice) *

46/46 (100%) answered

| | |
|---|---|
| Fully in-person | (16/46) 35% |
| Hybrid (classroom and online) | (16/46) 35% |
| Fully online | (13/46) 28% |
| Still under discussion and rapidly evolving | (8/46) 17% |

# Poll: What form of teaching would you **prefer** this fall?

1. What form of teaching would you prefer this fall? (Select all that apply) (Multiple Choice) *

44/44 (100%) answered

| | |
|---|---|
| Fully in-person | (18/44) 41% |
| Hybrid (classroom and online) | (14/44) 32% |
| Fully online | (10/44) 23% |
| Unsure | (5/44) 11% |

# Open Question

What are items instituted amid the pandemic that could be retained going forward?

Type your response into the chat window.
We will give you a couple of minutes.

# The Post-Covid Classroom


Raja Sooriamurthi


Hossein Saiedian


Janaka Balasooriya


Claudine Allen


Annajiat Alim Rasel


Len Bass

Bringing online experiences to the in-person classroom

Student evaluation, assessment, academic integrity

Student engagement, well-being of students

Hybrid classroom

Impact of technology on the diversity landscape of students

# The Post-Covid Classroom

**Raja Sooriamurthi** is a Teaching Professor with the Information Systems Program at Carnegie Mellon University. His teaching and research interests are in the general realm of "data" and he offers courses at the undergraduate and graduate level in database systems, data science, machine learning, and big data. Along with colleagues he has co-authored a book on creative problem solving titled Guide to Teaching Puzzle-based Learning. https://www.heinz.cmu.edu/faculty-research/profiles/sooriamurthi-raja

**Hossein Saiedian** is a professor of computer science and software engineering at the University of Kansas. His research interest areas include software architecture, formal methods, software processes, and software engineering education. https://people.eecs.ku.edu/~saiedian

**Janaka Balasooriya** is a senior lecturer in the School of Computing Informatics and Decision Systems Engineering (soon to be School of Computing and Augmented Intelligence) at Arizona State University. Prior to joining ASU, Balasooriya was a postdoctoral fellow at Missouri University of Science and Technology. With several years of industry experience as a Software Engineer, his research interests span the areas of distributed computing and mobile computing. Balasooriya has taught courses in Distributed Computing, Mobile Computing, Software Testing, Algorithms and Data Structures, Software Engineering, and Programming Languages. https://isearch.asu.edu/profile/1097689

**Claudine Allen** is a lecturer in The Department of Computing at The University of The West Indies, Mona. She earned her PhD. from The University of The West Indies, Mona in Kingston Jamaica in 2012, and has taught several courses in software engineering, object-oriented design, distributed systems and networking at both the undergraduate and postgraduate levels at multiple Universities in the Caribbean region. Her research areas over the years, span e-learning system design, management of replicated resources and more recently software architecture with a special interest in architectural debt and smells. She is married to David and they have three children.

**Annajiat Alim Rasel** is a Sr. Lecturer at the Department of Computer Science and Engineering at the School of Data and Sciences at Brac University in Bangladesh. His interests include NLP; AI/ML/Quantum Computing, etc. applied to SE as well as SE applied to such systems; parallel, distributed, and high-performance computing (HPC/HPS) Systems, and software-defined systems. http://annajiat.googlepages.com/

**Len Bass** has 55+ years in the computer industry. He has written nine books on software engineering topics. The most recent book is the 4th edition of Software Architecture in Practice. He spent 25 years at the SEI, 3 years at NICTA in Australia, and is currently an Adjunct Faculty of the Institute for Software Research at Carnegie Mellon University. https://mse.isri.cmu.edu/

# Before You Take Your Break

Type the name of your breakout group in the chat window. You will be moved to this group during the break.

- Group 1: Online to in-person
- Group 2: Student evaluation
- Group 3: Student engagement
- Group 4: Hybrid classroom
- Group 5: Technology impact

# Open Question

**What's your best personal remote work hack?**

Type your response into the chat window during the break, while you have a cup of coffee or tea.

**Please return promptly at 1:45pm EDT**

# Results from Open Question on Best Personal Remote Work Hack

Physical space
- Separate (organized) physical space for work
- Multiple physical screens
- Good chair
- Standing desk

Accessories and apps
- Glasses with blue light filters
- Hands-free headset
- Whiteboard (or paper) with dedicated camera (or whiteboard tool)
- A handy app for MacOS which will tell you which desktop you are on

Good habits
- Sit in different places — move around

Teaching strategies and tools
- Multi-tasking during office hours — breakout rooms plus one-on-one
- Play recorded presentation while grading
- Handling after-class questions on Zoom (instead of long line outside your office)

# Breakout Discussion Summary

Group 1: Online to in-person

Group 2: Student evaluation

Group 3: Student engagement

Group 4: Hybrid classroom

Group 5: Technology impact

See slides in Dropbox: Educators Workshop 2021 > Panel - Post-COVID Classroom

# Open Question

**What are your *"Covid Keepers"* – items instituted amid the pandemic that will be retained going forward?**

Type your response into the chat window. We will give you a couple of minutes.

Day 3

# Closing

# Open Question

**In one word, how would you describe the workshop?**

Type your response into the chat window.

# Results of Question on How Would You Describe Workshop

# Closing Words from the Software Solutions Division Director, Anita Carleton

Anita Carleton is an Executive Leadership Team Member and Division Director of the Software Solutions Division (SSD) at the Software Engineering Institute (SEI), Carnegie Mellon University, where she has more than 30 years of technical and senior leadership experience in the software engineering industry.

The mission of SSD is to advance the state of the practice in software engineering through applied research, development, and transition of innovative technologies for building and acquiring software-intensive systems, with the specific goal of making software a strategic advantage for the Department of Defense.

# Graduation

“Group Photo”

- Please turn on your video if you wish to be included in the photo.
- We will take a screen snapshot of the galleries to post on the webpage.

# Group Photo

# Certificates and CEUs

Those of you that attended all three days will receive an online attendance certificate and CEUs (continuing education units)

It will be e-mailed to you in 3-4 weeks

# Feedback and Impact Statements

Please provide feedback.

Your “impact” stories will enable us to justify continuation of the workshops and your comments will help us improve future events.

# Some “Impact” Bullets from Previous Years

Reasons to attend:

- *“This is a great conduit for collaboration among SE Educators and technologists. There were people who are regulars who offer mentors to new folks and new folks bringing new ideas to the conversation.”*
- *“An excellent opportunity in professional development for academics teaching software engineering, the workshop can fill in many holes in a rapidly evolving field.”*
- *“Every time I participate, I use what I learn directly in my curriculum.”*

Take-aways

- Topics in technology: “… *we do a DevOps course, and the material presented there will let us see areas where we need to update that. The whole idea of Technical Debt as a way to explore maintainability and extensibility is very rich.”*
- Teaching: *“As a result of this workshop, I will be making some substantive changes to the software engineering courses that I teach -- not just architecture but others ranging from management to testing. The community of minds represented at the workshop provide a diverse and fascinating set of perspectives on how to teach software engineering. It was both a humbling and informative week.”*
- Networking: *“Meeting new people and establishing new work relationships,” “Collaboration,” “Shared artifacts, talks.”*

# What Should We Do Next Time?

SEI Courses: https://www.sei.cmu.edu/education-outreach/courses/

Annual Events: https://www.sei.cmu.edu/news-events/events/

Emerging technologies of interest?

Emerging software engineering concepts, methods and practices?

What would you like to hear about?

# Contact Information

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