#AI4SWE

AI Powered Software Engineering

Unlocking Innovation

MITRE | SOLVING PROBLEMS FOR A SAFER WORLD®

Trac Bannon

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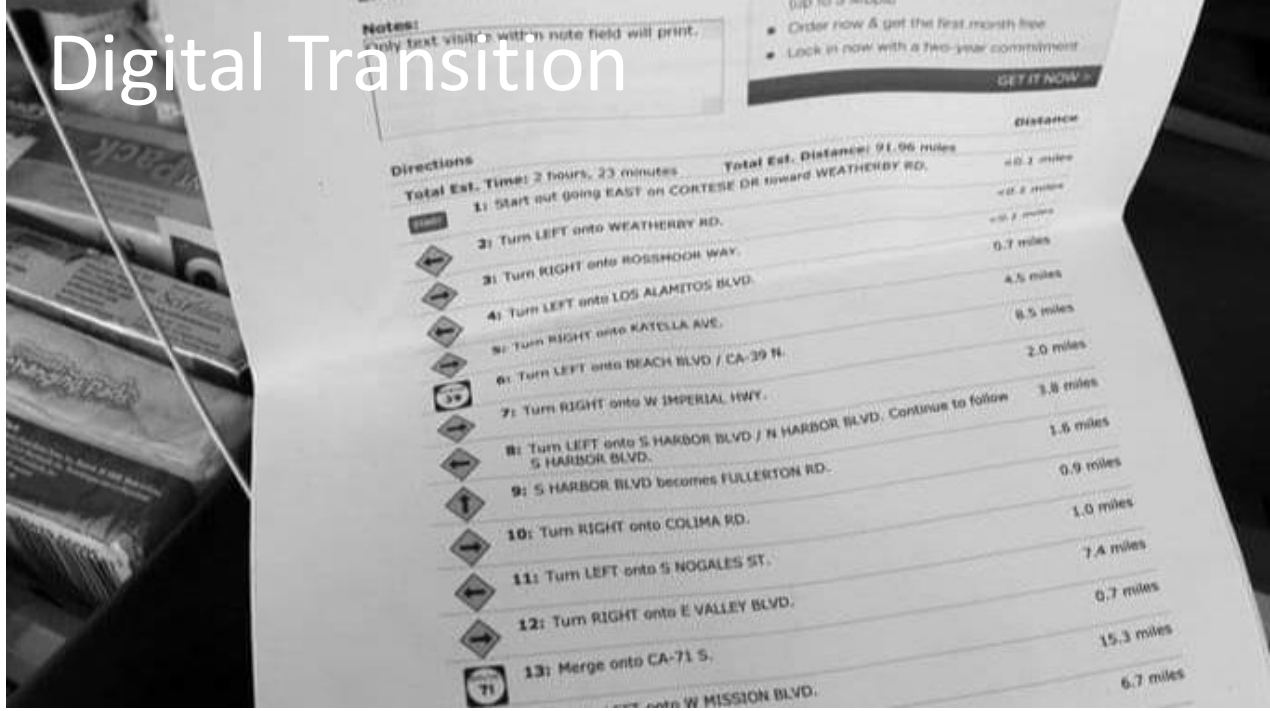
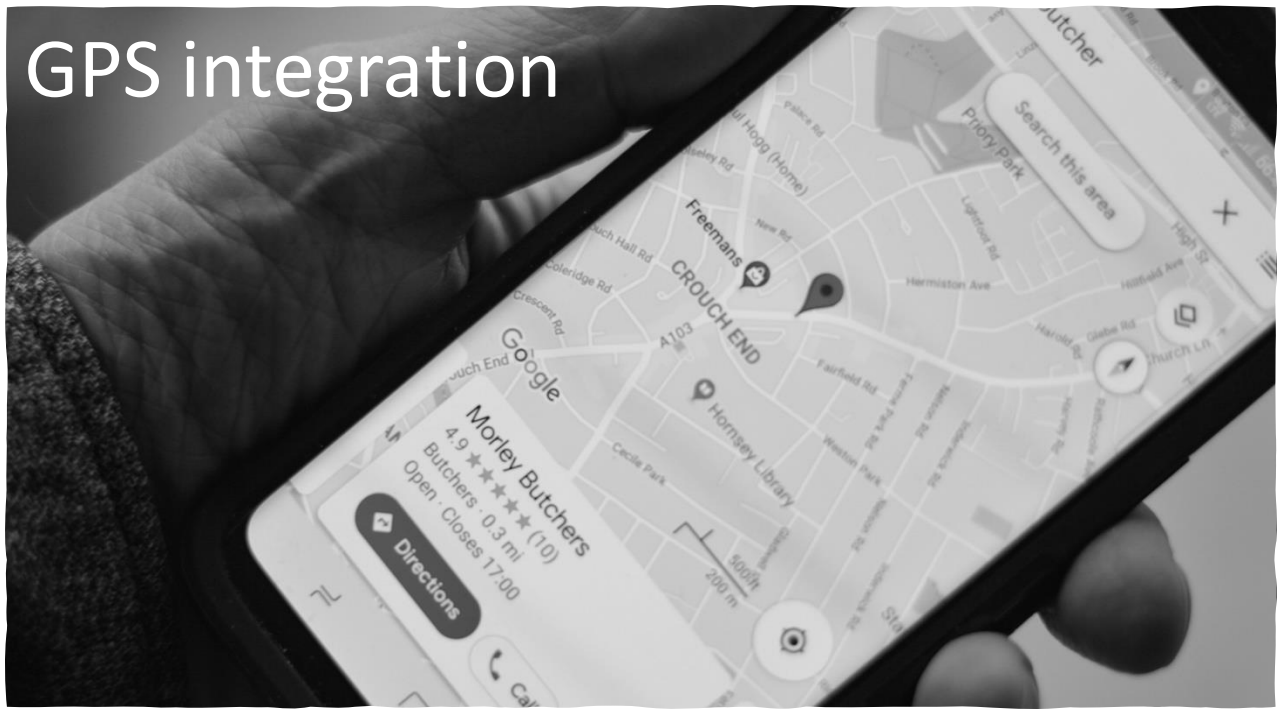
The Early Days


Digital Transition
Directions
Total Est. Time: 2 hours, 23 minutes
Total Est. Distance: 91.96 miles
1: Start out going EAST on CORTESE DR toward WEATHERBY RD.
3: Turn LEFT onto WEATHERBY RD.
3: Turn RIGHT onto ROSSMOOR WAY.
4: Turn LEFT onto LOS ALAMITOS BLVD.
5: Turn RIGHT onto KATELLA AVE.
6: Turn LEFT onto BEACH BLVD / CA-39 N.
7: Turn RIGHT onto W IMPERIAL HWY.
8: Turn LEFT onto S HARBOR BLVD / N HARBOR BLVD. Continue to follow S HARBOR BLVD.
9: S HARBOR BLVD becomes FULLERTON RD.
10: Turn RIGHT onto COLIMA RD.
11: Turn LEFT onto S NOGALES ST.
12: Turn RIGHT onto E VALLEY BLVD.
13: Merge onto CA-71 S.
Distance
0.7 miles
4.5 miles
8.5 miles
2.0 miles
3.8 miles
1.6 miles
0.9 miles
1.0 miles
7.4 miles
0.7 miles
15.3 miles
6.7 miles

Special GPS Units
tomtom
The GPS signal was lost
15 sec ago

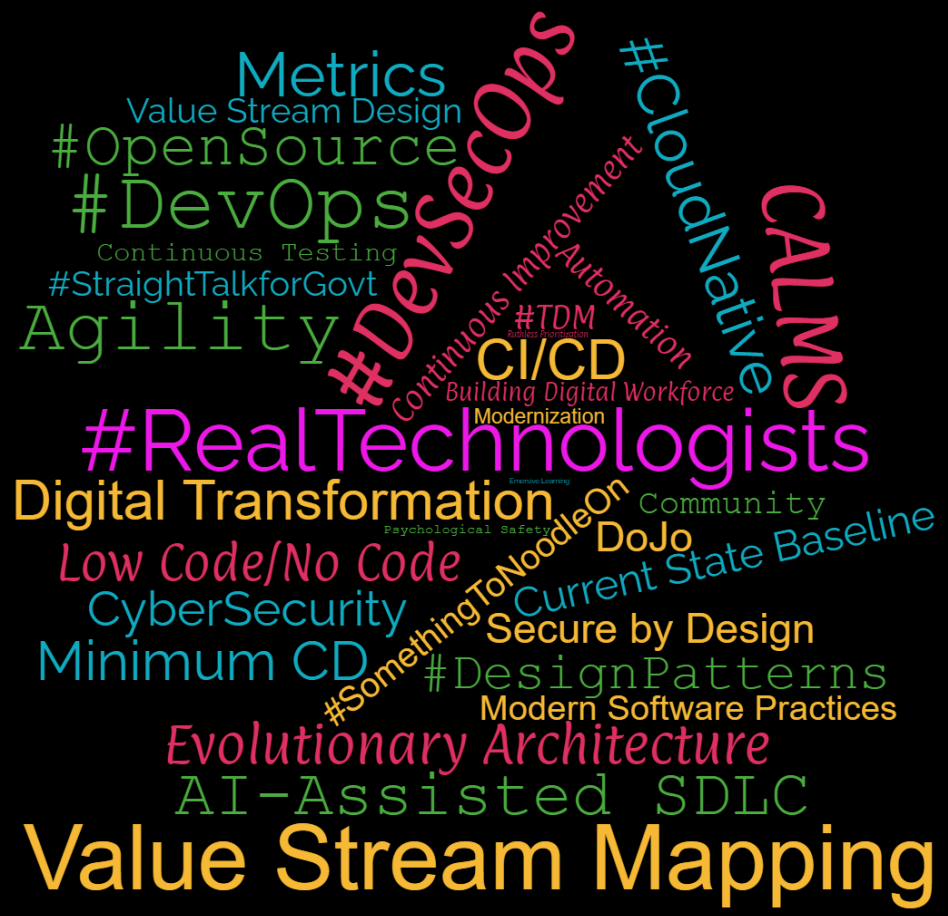

GPS integration
Search this area
Freemans
CROUCH END
Google
Morley Butchers
4.9 ★★★★★ (10)
Butchers · 0.3 mi
Open · Closes 17:00
Directions
Hornsey Library
Priory Park

AI & Software Engineering

Digital Transition: **This is where we are today.**

Who Am I? Tracy "Trac" Bannon

/trās/



vsm consortium
Influencer

AMBASSADOR
DevOps Institute
ADVANCING THE HUMANS OF DEVOPS

IEEE
SENIOR MEMBER

MITRE

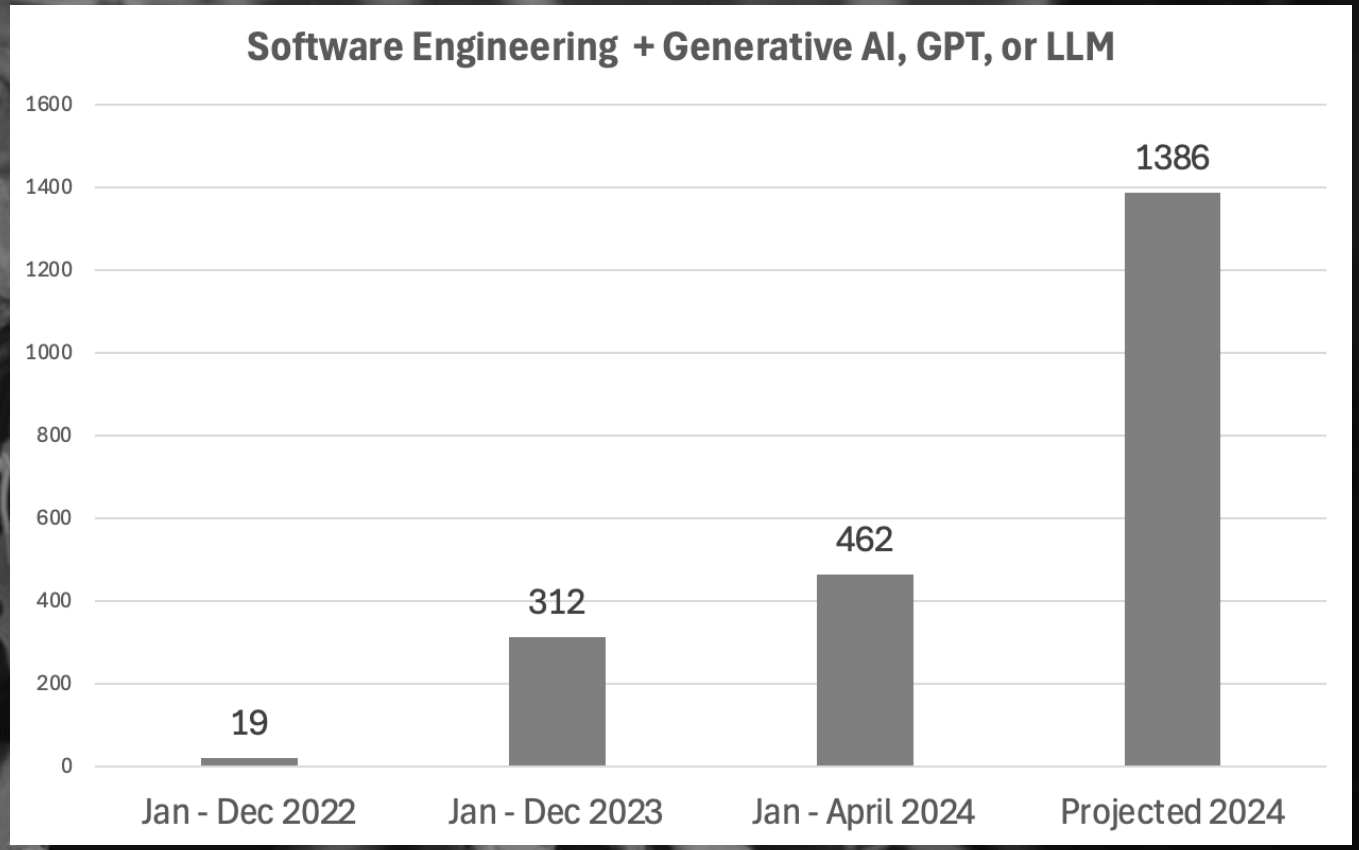
Software architect | researcher | engineer

ArchAITecture Research Collaborative

- Focusing on human/machine teaming and trust
- Diverse thought leaders
- Merging scholars and industry
- Data at scale
- Not-for-profit

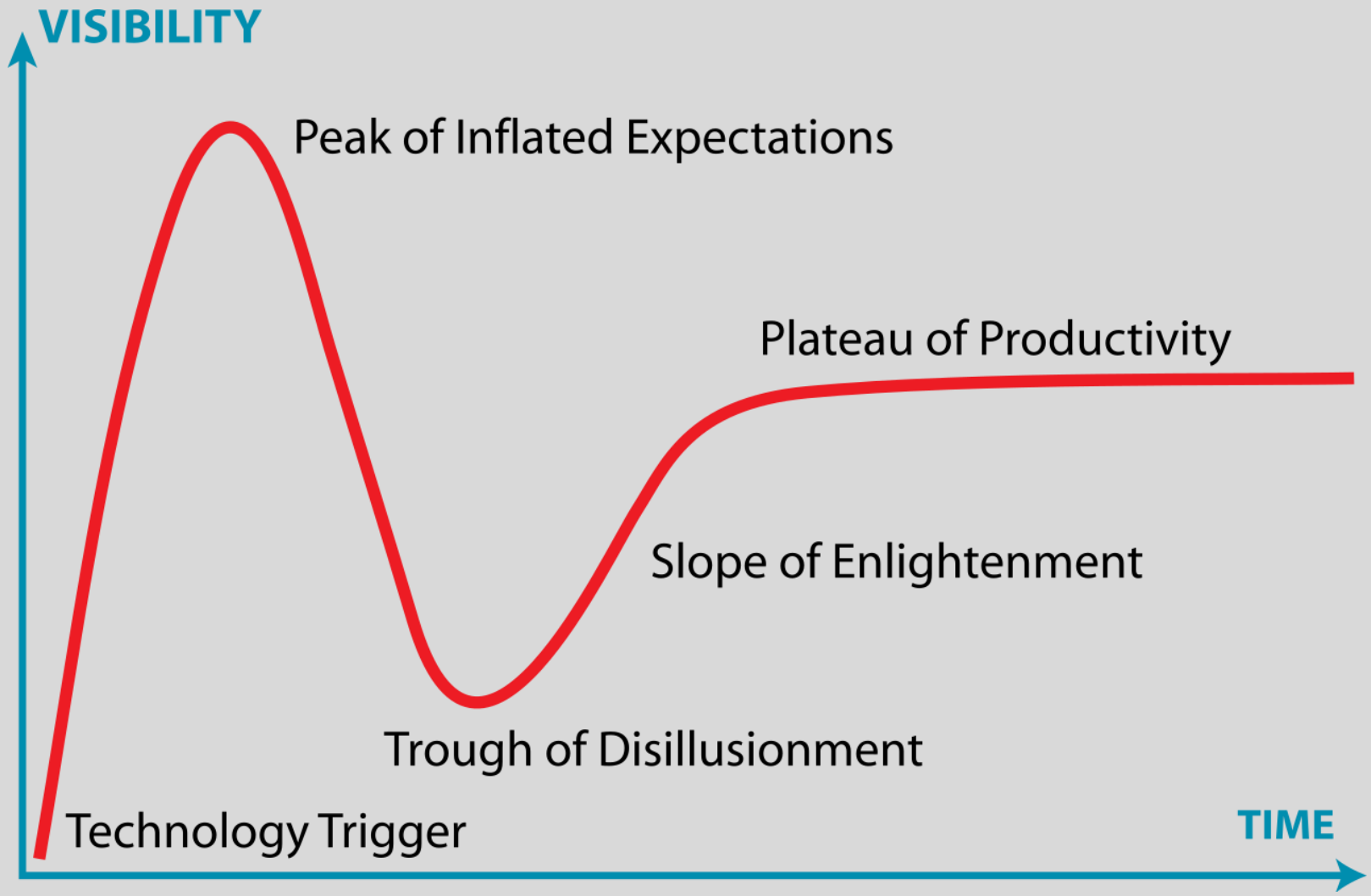
Quick Retrospective

- January 2023 - ChatGPT users hits 100M
- Chronic FOMO
- 2024 - Publishing surges
- Peer-reviewed research lags

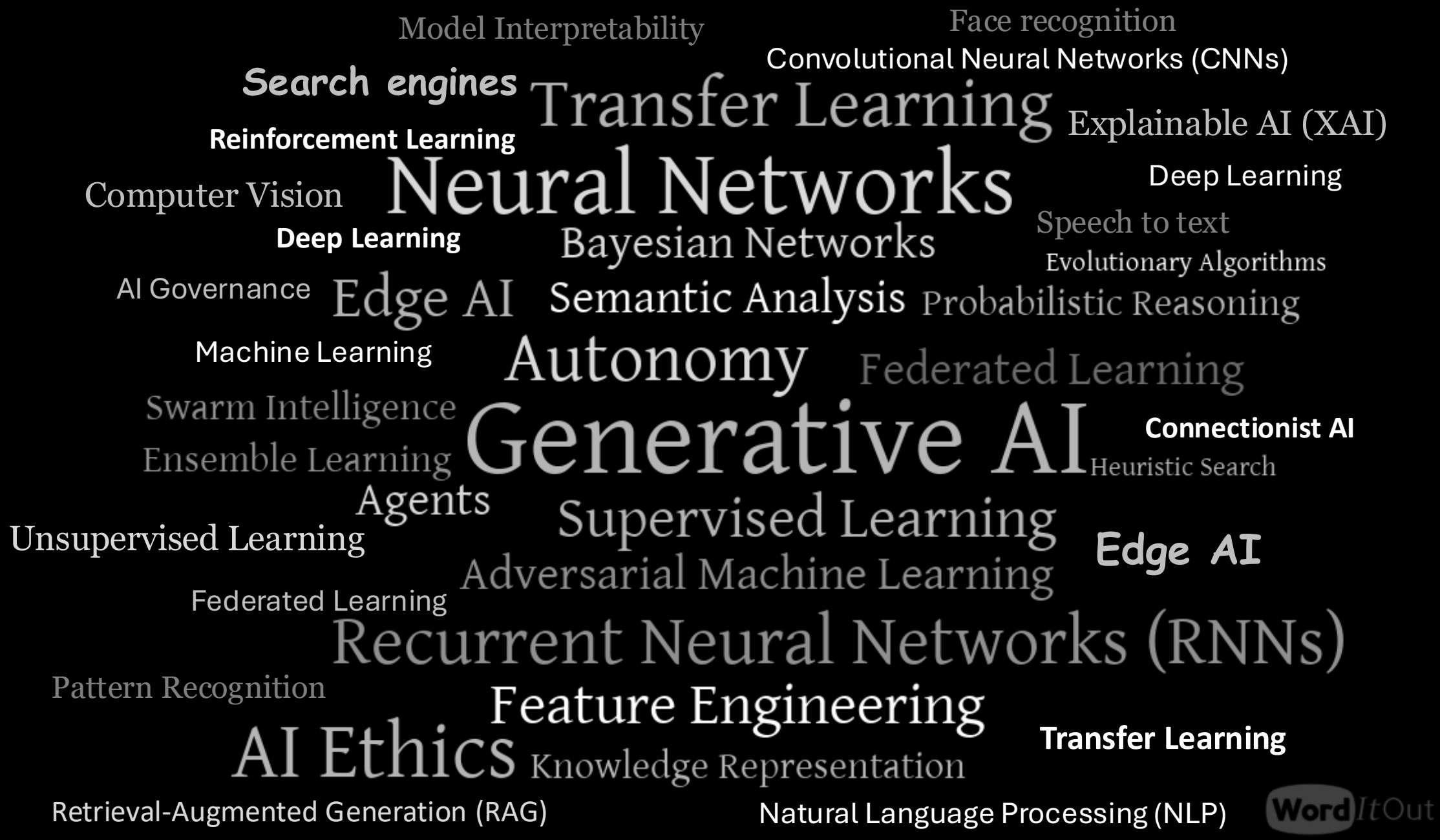


Don’t get swept away by the hype

AI in SwEngineering… where are we now?



Internal Developer Portals
Machine Customers
GitOps
Prompt Engineering
Homomorphic Encryption
AI TRiSM
Federated Machine Learning
Reinforcement Learning
Artificial General Intelligence
Digital Immune System
Autonomous Agents
AI-Augmented Software Engineering
Superapps
Cloud-Native
WebAssembly
Generative AI
AI Supercomputing
6G
Multiagent Systems
Disinformation Security
Cybersecurity
Mesh Architecture
Digital Twin of a Customer
Spatial Computing
Humanoid Working Robots
Large Action Models
2 – 5 years to reach productivity plateau
EXPECTATIONS
As of August 2024
Innovation Trigger
Peak of Inflated Expectations
Trough of Disillusionment
Slope of Enlightenment
Plateau of Productivity
TIME



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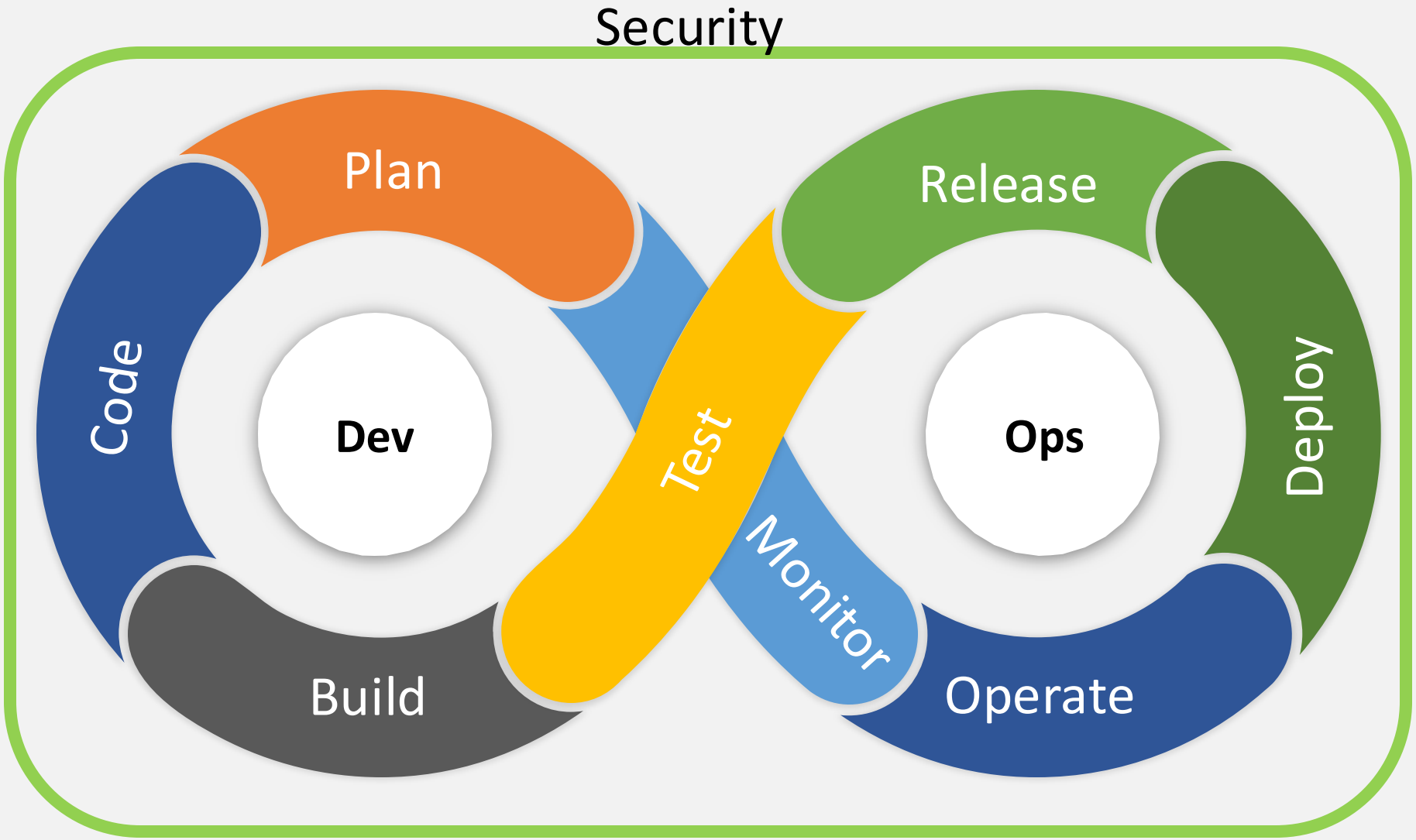
Where can AI be used with Dev*Sec*Ops?



Infusing AI across the Dev*Sec*Ops Continuum

Code
- Architectural Design
- GAI based pair programming
- Code & Unit Testing Generation
- In IDE Secure Code Vulnerability Solution
- ML assisted code review selection
- AI Assisted Code Review
- AI Enabled collaboration
- Suggestive Refactoring

Plan
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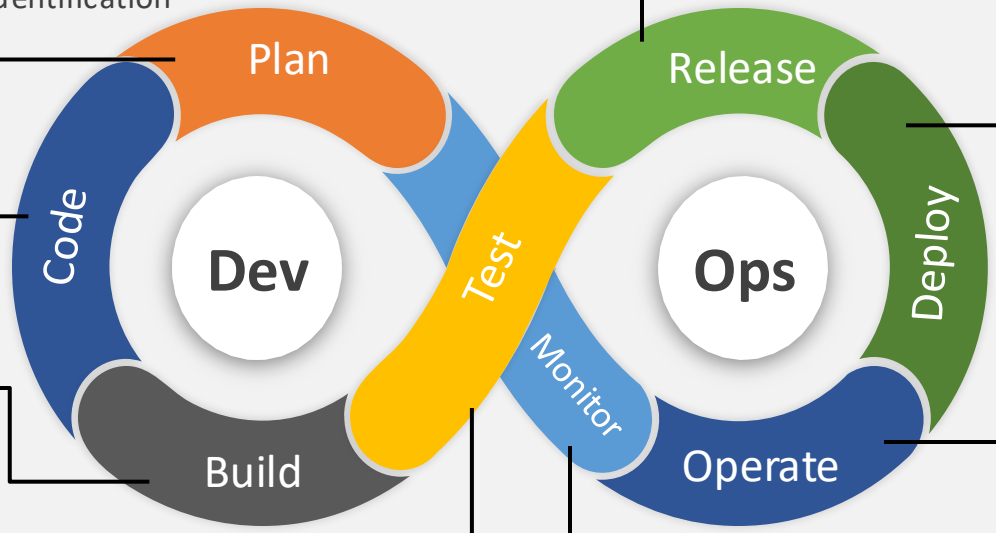

Security
Is infused into all actions and activities

AIOps engines provide correlation and predictive monitoring

Build
- Aggregated Merge Request Impact Analysis
- GAI-based identification of security vulnerabilities
- ML algorithm optimized build times
- AI-Assisted Security Vulnerability Detection
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GAI Usage Patterns

Content Generation

Complex auto-complete as well as new content creation is typically leveraged for generating test cases, code, documentation, and deployment scripts.

Automated Reasoning

Analyzing patterns, suggesting alternatives about code quality, identifying security vulnerabilities, optimizing deployment strategies, and ensuring compliance with standards.

Treat GAI like a young apprentice...

Always pay close attention!!

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Does Generative AI contradict DevSecOps principles?

Where are people using GAI today?

- Searching for answers
- Documentation
- Requirements Analysis
- Debugging
- Code Completion
- Test Case Augmentation

Sources: 2023 & 2024 StackOverflow Developer Survey
TechStrong/Tricentis: AI-Augmented DevOps Report

Unveiling the Human Side of AI in Software Engineering

Practice-wide survey to get to ground truth

Human-Machine Collaboration

Trust Optimization

Skill Evolution & Team Communication

Personal Impact & Future Outlook

Take the Survey

Most challenging, time consuming, or painful tasks^

Challenge	%
Collaborating with cross-functional teams	50%
Managing technical debt	
Continuous integration/continuous deployment (CI/CD) pipeline setup	
Documentation (code, systems, APIs, etc.)	
Maintaining legacy code	
Maintaining security compliance	
[…]	
Code reviews	
Writing New Code	3%

Take the Survey

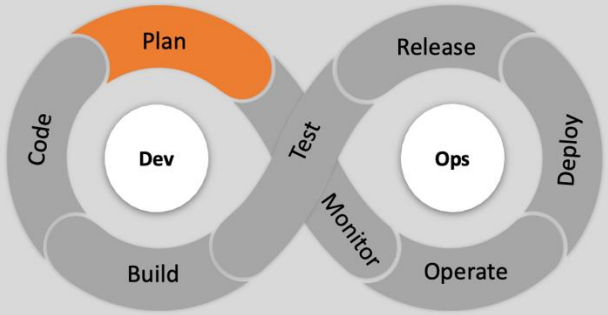
40+ different challenges have been identified so far!

^This data will be more insightful when correlated with role and experience

Are we addressing the pain points?

AI-Augmented

^ Requirements Analysis



Use Case:

- Requirements generation via text analysis
- Analyze user transcripts
- Include crowdsourced survey

Considerations:

- Version control GPT prompts ++
- Diverse Datasets
- QA = rigorous testing + humans in the loop

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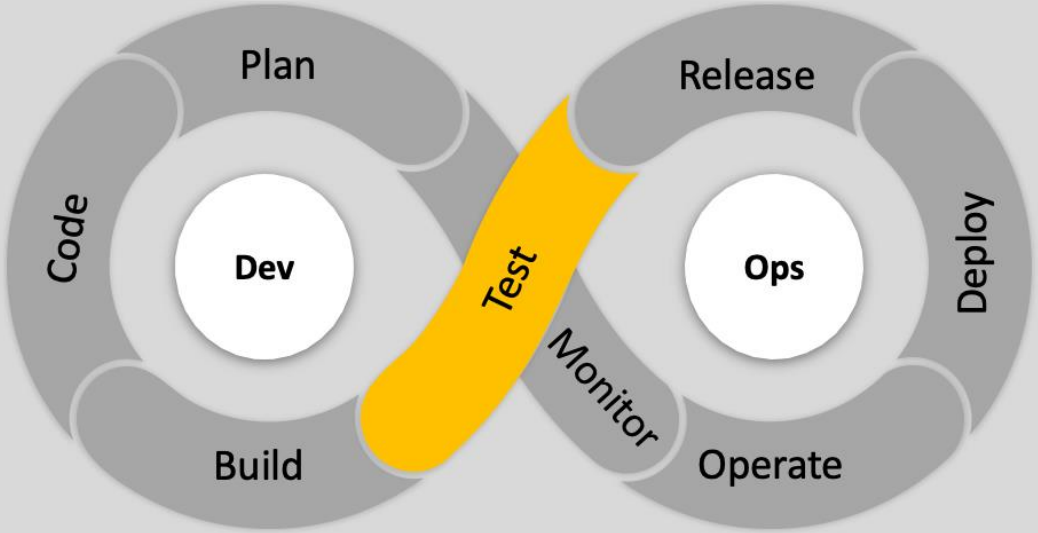
AI-Augmented

^ Testing Use Cases

- Increase test coverage
- Brainstorming
- Synthetic Test Data Augmentation



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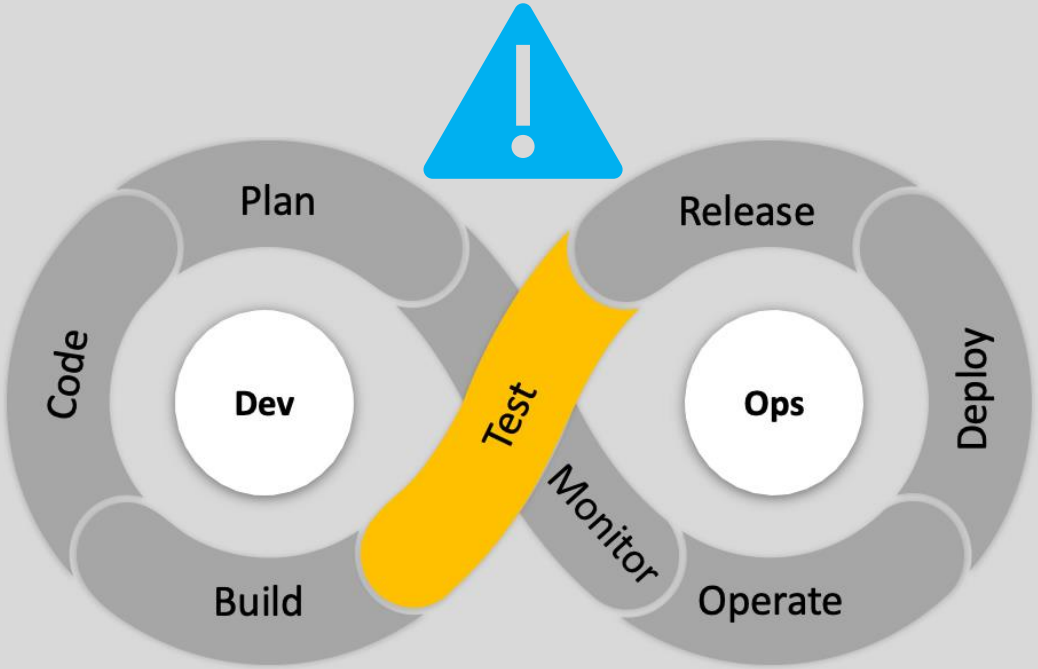
AI-Augmented

^ Testing Considerations

- Data Privacy & Integrity
- Beware of Irrelevant Tests
- Transparency and Explainability



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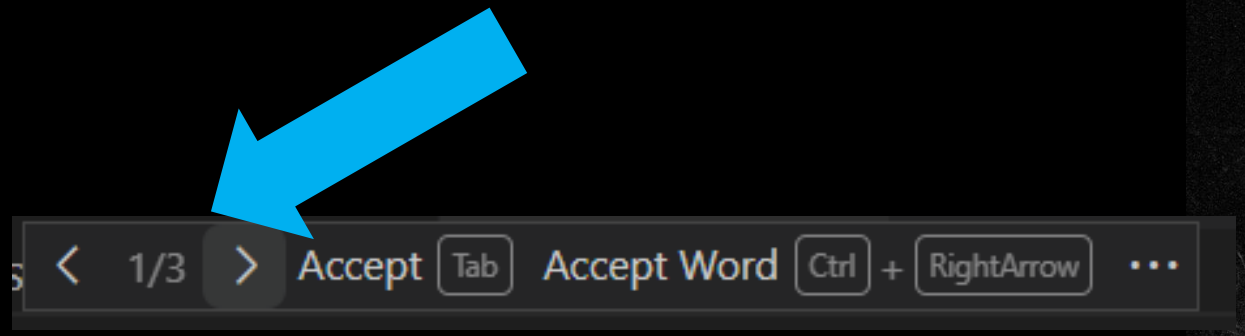
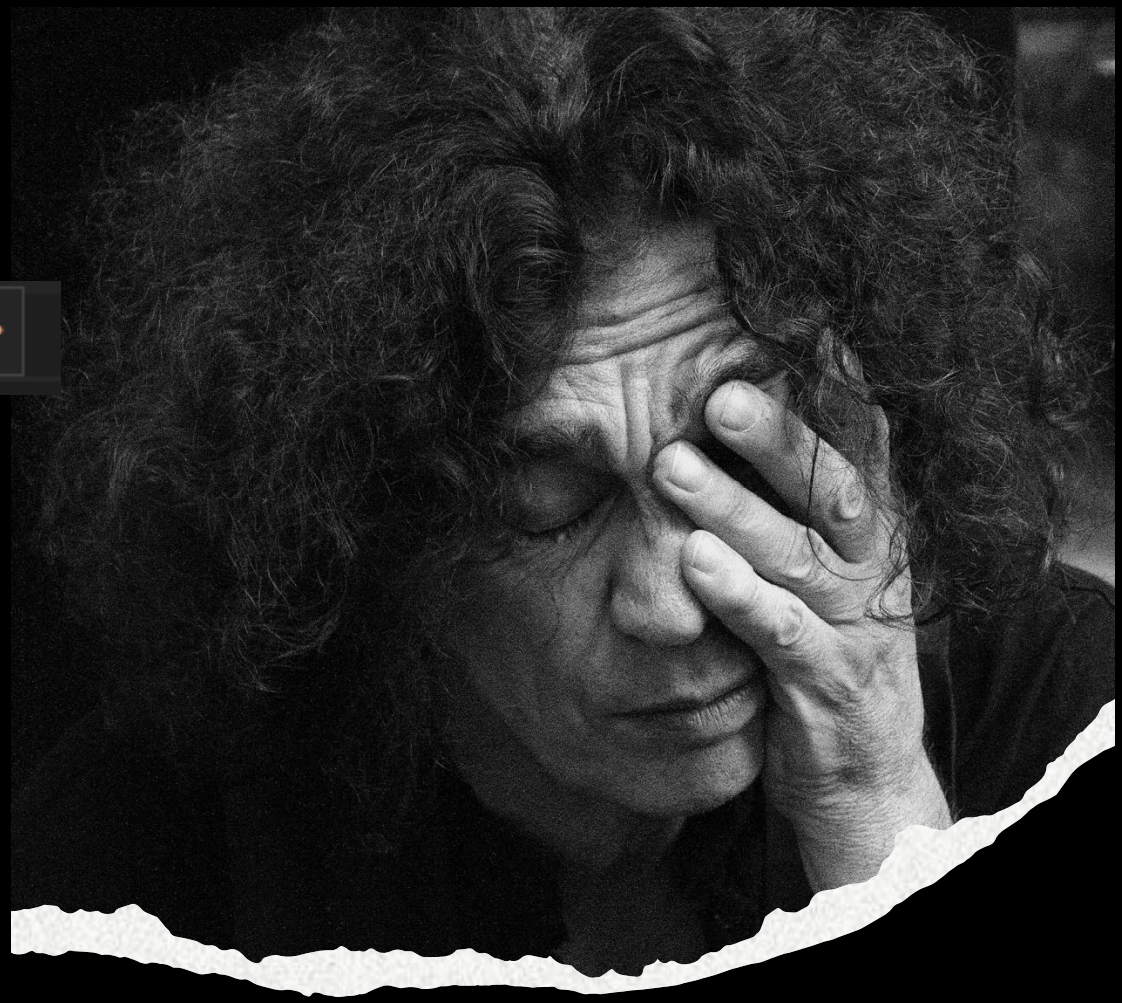
In IDE Help




```python
def max_sum_slice(xs):
    """Return the maximum sum of a slice of xs."""
    max_sum = 0
    for i in range(len(xs)):
        for j in range(i, len(xs)):
            this_sum = 0
            for k in range(i, j + 1):
                this_sum += xs[k]
            if this_sum > max_sum:
                max_sum = this_sum
    return max_sum
```



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Don’t generate code and tests

- Lack of Independent Verification
- Bias and Blind Spots
- Overfitting

GAI can be unreliable.

Pay close attention!

Is your organization prepared?

Fix your SDLC first

- Address existing issues
- GAI can magnify existing problems

Gotchas to avoid

Adaptation to New Workflows

- Measurements and metrics will waiver
- Training is a must
- Humans resist change

What about productivity?

- Perceived productivity
- Team productivity *not* Individual productivity

The Importance of Context

- AI requires a massive corpus of data
- If you subscribe to a service, you must provide context
- Are you okay with sharing?

Keep Humans in the Loop!

Leading practices for today's AI-augmented SDLC

- Keep humans in the loop
- Everything in source control including prompts
- Secure your vulnerabilities
- Don't provide your private info/IP into public AI engines

Choose when and where to start

AI-Augmented

Designing Your ^ Software Engineering Tool Chain

Looking Ahead

The Evolving Role of Digital Platforms

- Making it hard for humans to make mistakes
- Codify leading practices
- ”Pro Code”
- The jumping off point for GAI-augmentation and future agentic capability

What does the SDLC look like over the next few years?

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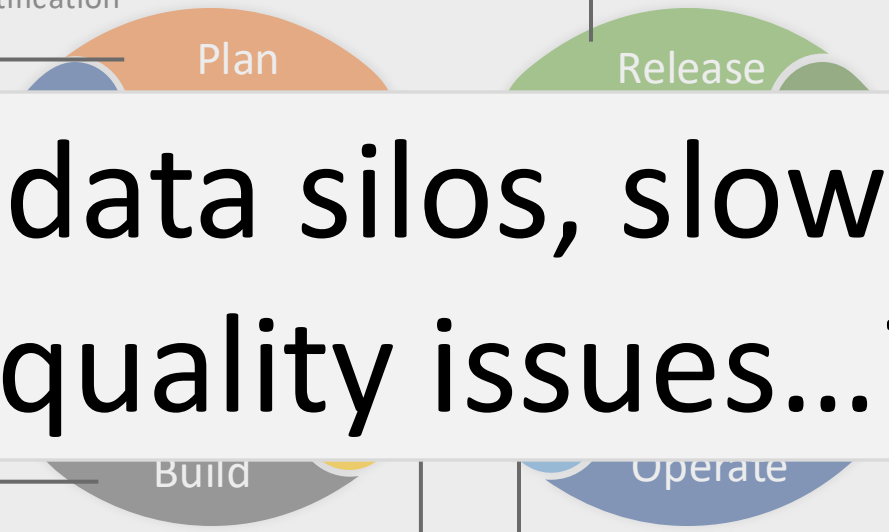

Sec
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acti

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More data silos, slower flow, more quality issues…?

Jensen Huang
CEO@ NVIDIA

But what about this…

Is the future of coding dead?

When will AI-engineers join the team?

Scott Wu
CEO@ Cognition AI

AI/Human Teaming

Who will we optimize for? Humans? AI Agents?

We can’t put the genie back in the bottle

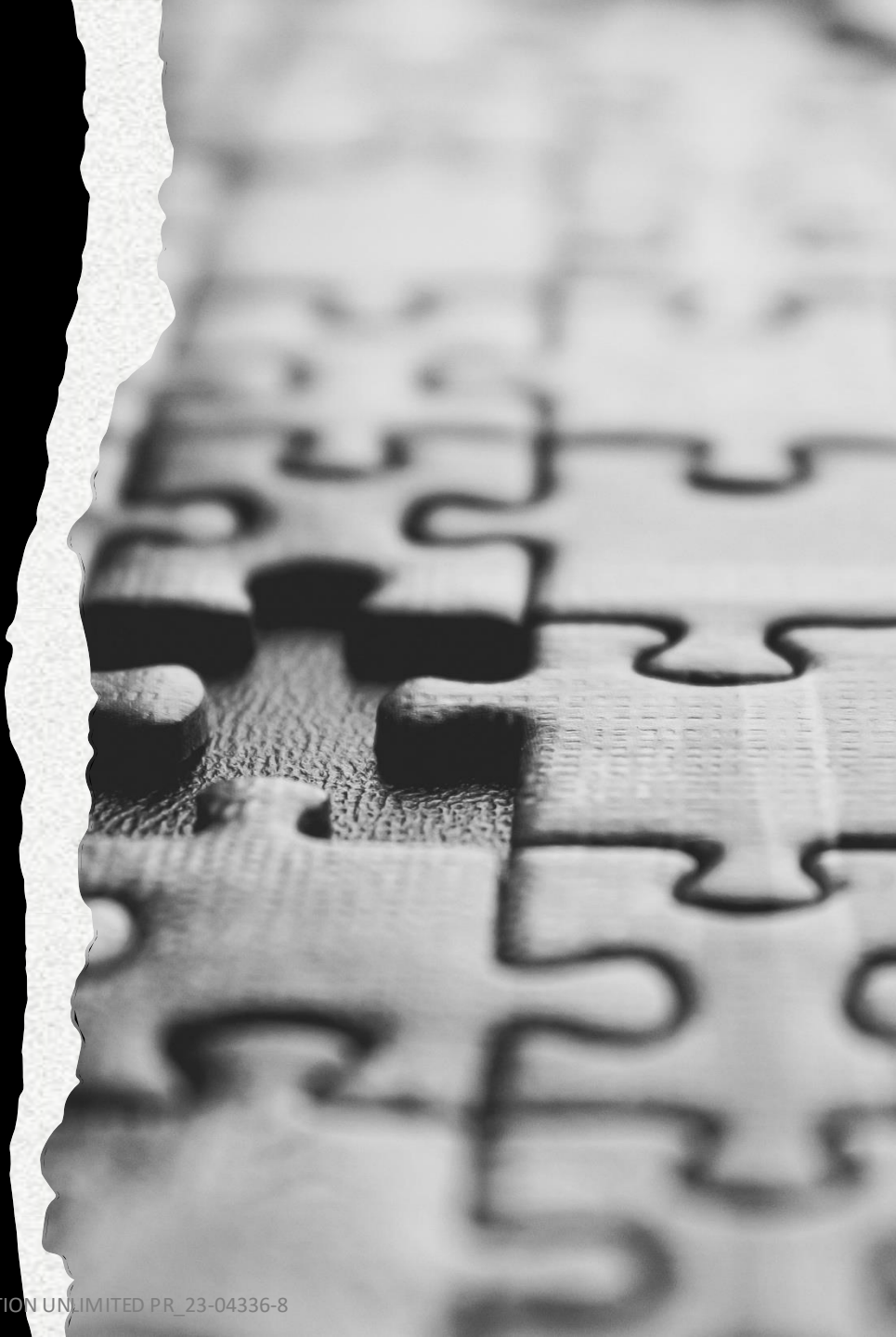
- Prompt engineering as a discipline
- Ethics of prompts
- Who owns the generated outcomes
- Human-Machine teaming
- Software team performance
- Trust and reliability in software outcomes

Call to Action – Your Next Steps

- Make Cybersecurity as your highest priority
- Enable research and discovery for GAI usage
- Establish on reasonable guardrails
- Ask your GAI providers about
  - model quality
  - security
  - roadmap

What I need from you...

- How do you think the SDLC will change?
- How is your organization preparing?
- What are you **personally** focusing on?
- Share your organization's story and lessons learned
- Share out new use cases and new tools



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What matters are the humans.

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ADDO

ALL DAY DEVOPS

BY sonatype

OCTOBER 10, 2024

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References

Academic Research, Industry Reports, Market Analysis

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